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"Essays on the Political Economy of Public Good Provision in Developing Countries"

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Date: April 15, 2008

Essays on The Political Economy of Public Good Provision in Developing Countries

A dissertation presented

by

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to

The Department of Economics

in partial fulfillment of the requirements

for the degree of

Doctor of Philosophy

in the subject of

Economics

Harvard University

Cambridge, Massachusetts

May 2008

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Essays on The Political Economy of Public Good Provision in Developing Countries

Abstract

This dissertation consists of three essays on the political economy of public good provision in Ghana and India. The first chapter takes a macro approach and looks at the effect of the creation of a government institution on restraining the prevalence of patronage in resource allocation for public good provision. The second and third chapters present micro studies on the relationship between population heterogeneity and access to public goods. The tenuous correctness of the assumptions of fiscal federalism in developing countries calls into question a blanket application of its prescribed roles of various levels of government. The micro-level empirical analyses in these chapters reveal patterns that can be informative about the mechanisms by which population heterogeneity influences public goods provision in such areas.

The first chapter presents an empirical investigation of Ghana's District Assemblies Common Fund, a centrally managed formula-based system of transfer of funds to local bodies responsible for development. I find that the tendency for the program to allocate and disburse a greater per capita amount to districts that voted for the ruling government declines over time. Calculated counterfactual allocations suggest some

political manipulation in the determination of the formula and there is a persistent election cycle in the magnitude of annual disbursements. However, a possible mode of channeling more funds to an area through the creation of smaller districts is not prominently exploited.

The second chapter focuses on a comparison of the relationship between social divisions and access to public goods in rural Ghana before and after the government institution investigated in chapter one. The evidence shows that the intervention which made large amounts of funds automatically available to local government reduces the role of population heterogeneity in access to public goods.

In the third chapter, I present an empirical analysis similar to that in Chapter two using data from villages in the neighboring northern Indian states of Bihar and Uttar Pradesh. I find that more homogeneous populations tend to have better access to public goods in the education sector. However, some public goods may have been transformed to club goods and so are positively correlated with population heterogeneity.

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Acknowledgements

My journey through graduate school would not have been possible without the love, support and encouragement of my friends and family. Even though I only mention a few by name, I am truly grateful to each and every person who has contributed to my success.

I grateful to my thesis committee members Professor Michael Kremer, Professor Matthias Schündeln and Professor Rohini Pande for their advice, encouragement and comments. I thank especially Matthias, who spent hours reading my drafts and questioning my regression models. He ensured that I presented my best work at every stage in the process even though I kept misspelling his name. I thank the Harvard Center for International Development and Warburg Funds for research support. I am grateful to Fred Tetteh of the Research Division of the Ghana Electoral Commission, as well as Samuel Aidoo and Patrick Zioku of the District Assembly Common Fund Office for sharing data. I would also like to thank, Mr Magnus Nicol the Administrator of the District Assembly Common Fund, Dr Grace Bediako, Ghana Government Statistician, Dr Regina Adutwum, Director General of the National Development Planning Commission and Professors Kwame Boafo-Arthur and Joseph Ayee of the University of Ghana. I am especially grateful to Occy Banful and William Baah Boateng for invaluable research assistance.

I would like to thank my mentors Dr Janina Matuszeski, Dr Liesl Folks and Dr Chris Mensah-Bonsu who continually assured me that it was possible to survive a PhD. I would also like to thank my dear friends Irene Hagan and William Tetteh who were always ready to provide me with distraction and energy to persevere. I am also grateful

to my friend Awo Ashiabor who gallantly proofread the final copy of this dissertation. I am grateful to Mr and Mrs Kwakwa who took and an interest in me and my sisters' education. Many thanks to my second grade teacher Mrs Owusu-Ansah who inspired me to learn and showed me that school was not all that bad. Mrs Owusu-Ansah, you were the first person to refer to me as clever and I will forever cherish that.

I am deeply indebted to my family for their love and remarkable capacity to provide me with encouragement as well as research assistance. My father, Mr Occy Banful and my mother, Mrs Elizabeth Banful have been an invaluable source of support and inspiration to me throughout my life and I will be eternally grateful to them. Also receiving eternal gratitude are my sisters, Nana Banful and Maame Adwoa Banful who between them provided me with an ideal mix of pragmatism, optimism as well as the occasional data cleaning assistance. Sisters! I could not have done it without you. Finally I would like to thank my four-legged companion Simon who patiently lay by my feet for countless hours as I toiled at my desk and never demanded to be walked before noon.

To Daddy, Mummy, Nana, Ma'Adwoa and Simon,

whose love and support I will always cherish.

Introduction

The non-excludable and non-rival nature of pure public good assures that a market economy will fail to efficiently provide such goods. The provision of public goods is therefore typically viewed as an elemental function of government. However, in the decision of the choice, quantity and quality of public goods to produce, most governments are faced with balancing their political goals with efficiency and welfare considerations. In addition, governments are pressured and influenced in their public sector decisions by myriad special interest and social groups. A thorough understanding of how politics interweaves with decisions about public good provision are therefore as important as any application of fiscal federalism. In this dissertation, I study several aspects of the political economy of public good provision in the archetypical developing countries of Ghana and India.

Analyses of how coveted central government resources in Africa are transferred to different regions within a country have shown widespread patronage, ethnic cronyism and pork barrel politics. Barkan and Chege (1989) show that in the 1980s, there was a positive correlation between funds assigned for construction of new roads in Kenya and whether the area was a political stronghold of the ruling Arap Moi government. Particularly striking evidence was the fact that in 1986, the Rift Valley Province, a political stronghold and home province of the President, received 52% of the road budget even though it contained only 21% of the population[1]. A study of the central government funding for education in Ghana in 1998 by Miguel and Zaidi (2003), also provides similar evidence. The authors found that at a mean of $23.00 per annum per

[1] Fund assignment was statutorily based on the share of the countries population resident in a province.

pupil funding, districts in which the ruling government won by a large percentage received $15.00 more per annum per pupil funding. In another spectacular example of perceived ethnic-cronyism, President Houphouet Boigny in 1983 moved the capital and seat of government from Abidjan to his hometown of Yamoussoukro.

Politics as the basis of relative development between tribes, classes and geographic regions elicits negative consequences both economically and politically. It is no coincidence that Africa with its rampant incidence of patronage politics is also the poorest continent and the rifest with ethnic strife. While some African governments have taken steps to separate central resource allocations from the political realm by establishing revenue sharing formulas, a key unanswered question is whether such institutions are able to achieve this goal. In chapter one I present an empirical investigation of Ghana's formula-based transfer of funds from the centrally managed District Assemblies Common Fund (DACF) to local bodies responsible for development.

There is still theoretical debate about the direction in which political influence will shift development resource allocation to areas based on their political affiliation. There are two groups of theories which guide my analytical frame work. First are the theoretical works of Dixit and Londregan (1996), and Lindbeck and Weibull (1987, 1993) which imply an empirical set-up in which the important explanatory variable is whether a particular district is viewed as a swing district. Those theories argue that politicians spend their resources in areas where the marginal benefit is highest. Their conclusion is that swing-voters are most important and that politicians will spend more in areas where it will switch most votes to their benefit. This methodology is used successfully by Dahlberg and Johansson (2002) who found that temporary grants to

municipalities in Sweden were used tactically by the incumbent government to purchase votes.

The opposing theories on how incumbent governments will allocate development resources are typically based on that proposed by Cox and McCubbins (1986). They argue that politicians view how they spend government resources as investment in their political return. Being risk-averse, politicians therefore invest more in areas which will give them an assured return, that is, they allocate resources favorably to areas where they are assured of a win. I find this group of theories more applicable to the case of Ghana for several reasons. Firstly, Ghana is a very young democracy and there have been only three presidential elections and one change of power in the country in the period under consideration. As a consequence, the country's politicians themselves are unlikely to have formed strong opinions on which districts are swing districts. Furthermore, with data from three elections only, it is difficult to create satisfactory measures for whether a district was a swing district or not. Secondly, I did not have the advantage of a survey like that in Sweden employed by Dahlberg and Johansson (2002) to estimate a distribution of the preferences of voters for public goods over a particular political party.

Using regression models based on the theoretical work of Cox and McCubbins (1986), I find support for their conclusion that the incumbent government invests in areas where they already have high support. I find that the tendency for the program to allocate and disburse a greater per capita amount to districts that voted for the ruling government declines over time. Calculated counterfactual allocations suggest some political manipulation in the determination of the formula and there is a persistent election cycle in

the magnitude of annual disbursements. However, a possible mode of channeling more funds to an area through the creation of smaller districts is not prominently exploited.

The second and third chapters present micro studies on the relationship between population heterogeneity and access to public goods. In many developing countries, the assumptions on which typical theories of fiscal federalism are based are tenuously true at best. For instance, poorly functioning markets induce provision of goods like food, clothing and shelter for the population to take on aspects of public goods which require intervention by government. In addition, many of the principles of fiscal federalism, though not wholly, rely critically on the assumption of mobility of households and factors of production. The mobility of households is remarkably low in developing worlds, especially between rural areas. In addition, most of local government revenue is collected at the highest level of government and sourced from only a small proportion of the population. These stylized facts call into question a blanket application of the prescribed assignment of functions to various levels of government and whether the expected welfare gains from fiscal decentralization are applicable in such areas. There is however empirical evidence that population heterogeneity still influences public good provision in such areas even thought Tiebout (1956) mechanisms are unlikely to be at play. Banerjee, Iyer and Somanathan (2004) find that a higher share of villages in Indian districts that have lower measures of social cleavages, as measured by fractionalization by Hindu caste divisions, colonial power structure and land tenure systems, have access to various to public goods. Easterly and Levine (1997) in a cross country study find a negative correlation between ethnic diversity and numbers of telephones, percentage of roads paved, years of education and efficiency of electric network. The micro-level

empirical analyses in chapters two and three reveal patterns that can be informative about the mechanisms by which population heterogeneity influences public goods provision in such areas.

The second chapter focuses on a comparison of the relationship between social divisions and access to public goods in rural Ghana before and after the establishment of the government institution investigated in chapter one, the District Assemblies Common Fund (DACF). The evidence shows that the intervention which made large amounts of funds automatically available to local government reduces the role of population heterogeneity in access to public goods. This evidence suggests indirectly that one of the important ways by which population homogeneity benefited communities was through their ability to better garner funds from higher levels of government. The evidence in this chapter also provides an indirect assessment of whether the DACF had any impact on the welfare of the citizens of Ghana. The reduced role of population heterogeneity in the access of public goods suggests that at least in more heterogeneous rural communities, there was a positive impact.

In the third chapter, I present a similar empirical analysis to that in chapter two using data from villages in the neighboring northern Indian states of Bihar and Uttar Pradesh. I find that more homogeneous populations tend to have better access to public goods in the education sector. More fractionalized areas are however more likely to have a waste disposal system, telephone line, tarred roads and public irrigation. Surprisingly, more heterogeneous villages are also more likely to have goods like a government subsidized Fair Price Shop and Children's center where people would be forced to fraternize with other caste groups. A common aspect of these public goods that are

positively correlated with population heterogeneity in India is that they are likely to benefit a particular segment of the population more than others. A possibility is that these goods have taken on aspects of club goods and through political or social maneuvering and that in actuality certain groups in the village are excluded from using them. This result suggests that in future work, it is important to consider actual use of a public good rather than just its presence.

The analyses and discussions presented in this dissertation convey once more the importance of political economy in the provision of public goods in the developing world.

Chapter 1

Can Institutions Reduce Clientelism? A Study of the District Assemblies Common Fund in Ghana

1.1 Introduction

The prevailing empirical conclusion about resource sharing in Africa is that governments provide more funds to regions that support them politically. The African electorate has come to believe that it is gravely detrimental if the candidate that one openly supports does not assume power. This perception has been perpetuated by a history of rulers preferentially developing areas where their political support is concentrated[2]. Politics as the basis of relative development between tribes, classes and geographic regions elicits negative consequences both economically and politically. A plausible expectation is that if development funds reaching an area can be made less sensitive to its political affiliation, the ensuing reduction in the high stakes of losing power could possibly temper the pernicious nature of African politics. In addition, resource allocation and social policy based mainly on economic and welfare considerations could bolster the furtherance of development.

Some African governments have established formula-based revenue sharing systems to connote that central resource allocation decisions are separate from the

[2] In a striking example, Cote D'Ivoire's first President Houphouët-Boigny moved the capital of the country from Abidjan to his hometown and political base Yamoussoukro. Barkan and Chege (1989) show that Kenyan new road resources in the 1980s were largely targeted to President Daniel Arap Moi's political strongholds. Miguel and Zaidi (2003) show that in 1998, Ghana government per pupil spending at an average of $23 was $15 higher in districts that had voted overwhelmingly for the political party of President Jerry John Rawlings.

political realm. However, a key unanswered question is whether such institutions are able to detach an area's political affiliation from its resource allocation. Ghana is a pioneer in its formula-based approach to making financial transfers from the central government to partially elected District Assemblies that are responsible for "the overall development"[3] of each district in the country. This paper presents an empirical investigation of that country's District Assemblies Common Fund (DACF) which was implemented in 1994.

I find that while the DACF formula is followed in calculating districts' Allocations, what districts actually receive, the Disbursements, typically differs from this amount. In terms of Disbursements, government supporting districts have an advantage over others which is not clearly evident in terms of Allocations. Disbursements over the period 1994 to 2003 show that the advantage of government supporting districts in terms of per capita DACF Disbursement was 13% higher in 1994 compared to that in 2003. Also, the advantage of government supporting districts over similar non government-supporting districts has been falling by an average of 2.5% per annum over this period. There is a persistent election cycle in the magnitude of disbursements and in the proportion of Allocation that is actually disbursed. In an election year, the increase in Disbursement is 25% higher than in other years and the lowest growth is experienced two years after an election. There is evidence that government-supporting districts perceive a lower variation in the growth of their disbursement over the election cycle compared to non government-supporting districts. I also find evidence that the proportion of Allocation that is disbursed is 2.1% higher in election years compared to other years.

[3] The four hundred and sixty-second act of the parliament of the Republic of Ghana, The local Government Act, (1993). Section 10, Functions of District Assemblies

Using the DACF formula from the previous year, counterfactual Allocations were calculated for years in which the formula underwent a dramatic change. Incidentally, these were all election years. I find that government-supporting districts would have received on average a larger proportion of the fund than non government-supporting districts if the formula had not been changed. It appears that the DACF formula is manipulated to achieve a political goal of attracting votes for the incumbent government in non government-supporting districts in election years. The only non-election year with a remarkable change in the DACF formula was 2002. The counterfactual Allocation in this year shows that the formula change allocated more funds to districts that had voted for the new regime that took office in 2001. This suggests that the formula change was motivated by different political goals than the change in election years.

Considering that each district is entitled to a certain base proportion of the DACF, a mode for channeling more funds to an area because of its political affiliation would be through creating smaller districts than warranted by population and land area considerations. I find no evidence of political influence in the first and as yet only re-demarcation of district boundaries in Ghana after the implementation of the DACF. There is however evidence that more sub-district divisions, constituencies, were created in areas with the same political affiliation as the government that appointed the head of the body that undertook the re-demarcation. Smaller constituencies create a greater number of parliamentarians from these areas as well as affect the amount of DACF Allocation and Disbursement for the area through increasing the total amount of Member of Parliament funds. I also examine the influence of district demographic and economic characteristics on the internal efficiency of District Assemblies. I find evidence of a

gradual reduction of central political influence at the district level. After 2000, there is no more evidence that the political affiliation of the members of the District Assembly have any bearing on its performance measured by percentage utilization of DACF disbursement and proportion of disbursement spent on administration costs.

There is still theoretical debate about the direction in which political influence will shift development resource allocation to areas based on their political affiliation. Dixit and Londregan (1996), and Lindbeck and Weibull (1987, 1993) argue the importance of swing-voters and conclude that politicians will spend more in areas where it will switch most votes to their benefit. On the other hand, Cox and McCubbins (1986) argue that politicians are like risk-averse investors and so invest more in areas which will give them an assured return. They suggest that central governments will spend more funds in areas in which their political support is concentrated. Empirical studies that have explored the relationship between the politics and resource allocation in African countries, notably Barkan and Chege (1989) and Miguel and Zaidi (2003), have typically focused on the role of patronage and ethnic competition in regional variation in provision of one particular public good within a country. Evidence of ruling governments targeting certain public goods to their political supporters does not necessarily signify unfair advantage for these areas due to regional inequality and the possibility of differences in preference for types of public goods[4]. Other analyses of political economy in Africa typically focus on the possible avenues of patronage by which ruling governments target the ethno-regional source of their political support (Kasara, 2007). This study focuses on exploring the evolution of political influence in the single most important source of central government monetary transfers to local governments for use in development. My

[4] See Alesina, Baqir and Easterly (1999) for discussion.

results are consistent with an improvement in the ability of the DACF to extricate itself from political pressures as the program matures.

The rest of the chapter is organized as follows. The next section describes local government in Ghana and presents an overview of the DACF program. Section 1.3 presents the data used in the study. Empirical analysis and a discussion of the results are presented in section 1.4. Section 1.5 concludes the chapter with a summary.

1.2 Local Government in Ghana

1.2.1 Local Government System

The present local government system in Ghana was established in 1988 by the military administration of Jerry John Rawlings and the Provisional National Defense Council (PNDC). It is multi-tiered and at present comprises ten Regional Coordinating Councils under which are three Metropolitan Assemblies, eleven Municipal Assemblies and one hundred and twenty-four District Assemblies[5]. I refer collectively to all the types of assemblies simply as District Assemblies because the nomenclature mainly denotes the population under the assembly's jurisdiction[6]. Each Assembly's area of authority typically comprises of one or more constituencies which are constructs of the legislative arm of government[7]. The substantive share of the work of local government is carried out at the District Assembly level; the Regional Coordinating Councils are mainly responsible for coordinating budget proposals and monitoring districts in the region and

[5] At the time the system was adapted in 1988, there were three metropolitan assemblies, four municipal assemblies and one hundred and three district assemblies.
[6] A District has a minimum population of 75,000 people, a Municipality has a minimum of 95,000 people and a Metropolis has a minimum of 250,000 people.
[7] The Parliament of Ghana consists of one Member of Parliament (MP) from each constituency.

the sub-district tiers are for disseminating information from the District Assemblies to the general public and vice versa. The duties of the District Assemblies include all "deliberative, legislative and executive functions" [8] of government within the district. This broadly describes all aspects of social development in the district including planning, budgeting and provision of public goods, and the promotion of productive activity. The Assemblies are the rating authority for their jurisdiction and charge licensing fees as well as fees for any service or facility they provide.

Each District Assembly consists of a District Chief Executive, the members of parliament representing constituencies within the district, in addition to elected and appointed members. The Assembly functions through a committee system in which final decisions on the proposals and initiatives of sub-committees are made by an executive committee[9]. The District Chief Executive is appointed by the President and is the head of the executive committee. The local government law also states that not less than 30% of the members of the Assembly must be appointed by the President. The other two thirds of the membership are elected by universal adult suffrage, one person from each electoral area within the district. The highest position an elected member of the Assembly can hold within the structure is the office of the Presiding Member whose duty is to convene and preside over meetings. The Presiding Member is ineligible to hold a seat in the executive committee but has the tie-breaking vote in the event of a vote tie in a general meeting. Elections to the District Assemblies are held once every four years and members appointed by the President may be re-appointed. The District Assembly

[8] The four hundred and sixty-second act of the parliament of the Republic of Ghana, The local Government Act, (1993). Section 10, Functions of District Assemblies

[9] Each District Assembly has at least the following sub-committees reporting to an Executive committee; Development and Planning, Social Services, Works, Justice and Security, Finance and Administration.

elections by law are held on non-partisan bases. Even though the District Chief Executive is a political appointee and a representative of the central government in the district, the elected members of the Assembly are to present themselves to the electorate as individuals with no party affiliation. In reality informal party activity plays a major role in the District Assembly elections.

The history of local government in Ghana is deeply intertwined with the political history of the country. The government of the first administration, that of President Kwame Nkrumah, dismantled all structures of local government as part of outlawing all political activity. Nkrumah's government was overthrown in a military coup in 1966 that set a precedent for a tumultuous political environment. Ghana experienced eight military coups in the following fifteen years. The last coup occurred on 31st December 1981, led by Jerry John Rawlings. Until his government established the present system, local government did not exist in any sense as a different entity from central government.

1.2.2 Overview of The District Assemblies Common Fund

The 1992 Constitution of the Republic of Ghana required the establishment of a "District Assemblies Common Fund"[10]. The total allocation of the fund is decided annually by Ghana's Parliament except that it cannot be less than 5% of the total revenues of Ghana. A later Act in 1993 defined total revenues of Ghana as

[10] The Constitution of the Republic of Ghana, Article 252

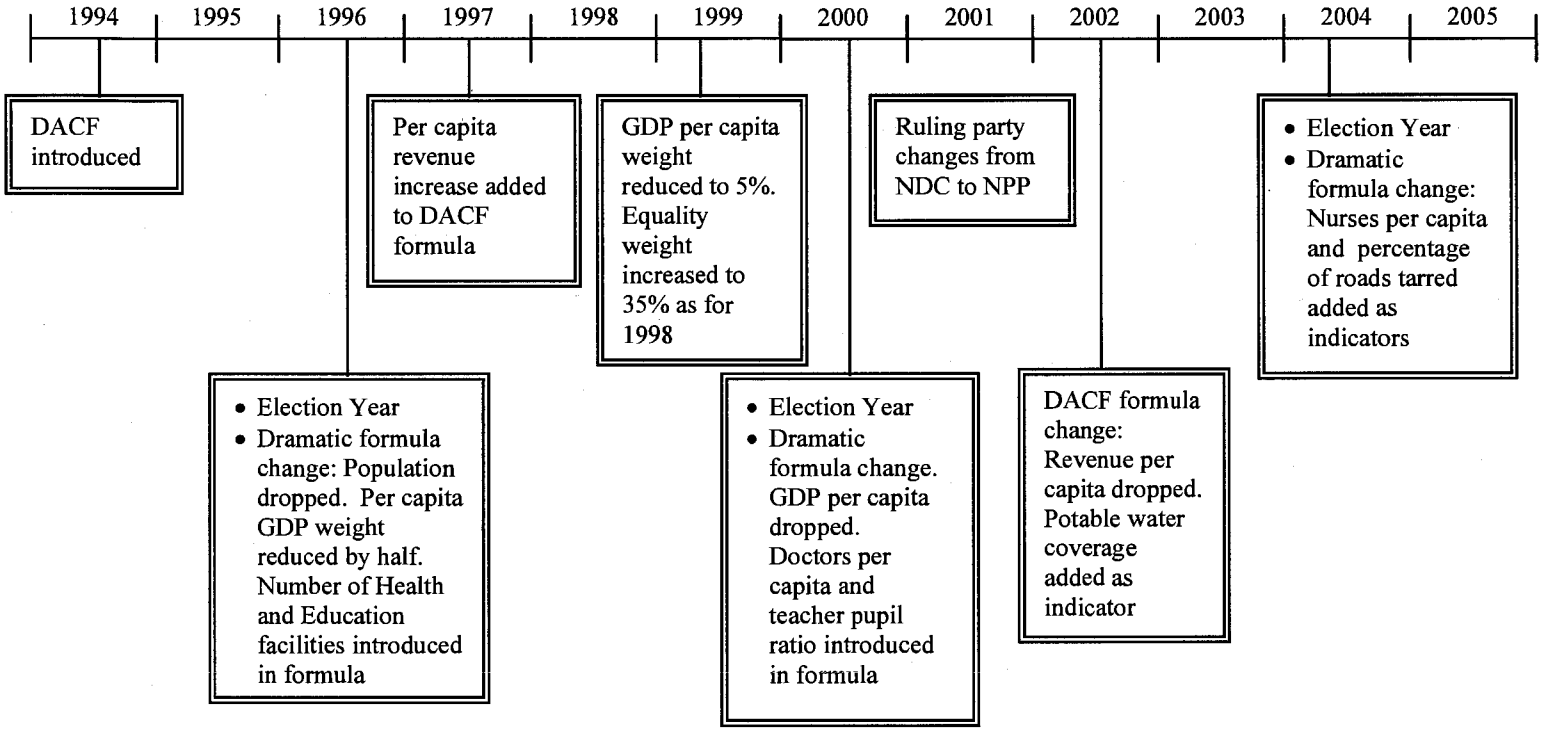
"all revenue collected by or accruing to the central government other than foreign loans, grants, non-tax revenue and revenues already collected by or for DAs under any enactment in force"[11].

The DACF Act, was promulgated on 6th July 1993 and a fund Administrator was appointed immediately afterwards. The Constitution states that the common fund is to be distributed among metropolitan, municipal and district assemblies according to a formula approved by Parliament. The recommendation of the formula and the administration of the fund are conducted by a District Assemblies Common Fund Administrator appointed by the President for renewable terms of four years. Mr J. W. Ampiah was appointed by the office of President Jerry John Rawlings as the First Administrator in 1993. He served until 2001 when he was replaced by J. M. Nicol, the present administrator appointed by the office of President John Agyekum Kufour of a rival political party. The first formula was presented to Parliament in March 1994 and was approved in July 1994. The schematic in Figure 1.1 informs of the timeline of events in DACF administration and Ghanaian politics.

Since the inception of the DACF, five factors have been considered in the calculation of the districts' shares. These are described as "Need", "Responsiveness", "Service Pressure" and "Equality" Factors. In 2003, a "Poverty" factor was included but discontinued thereafter. The measures comprising each factor considered in the formula have generally changed over time. However, the definition of what each factor is meant to capture has remained the same. The "Equality" factor simply stipulates which percentage of the DACF allocation is to be distributed evenly between all the districts.

[11] The District Assemblies Common Fund Act 1993 (act 455)

Figure 1.1: Time Line Of Events In DACF Administration And Ghanaian Politics



This ensures that each district is assured a certain amount of DACF grant. The "Need" factor is meant to measure a district's need for development compared to other districts in the country, the "Responsiveness" factor is incorporated to motivate districts to generate own local revenue and the "Service Pressure" factor is a measure of how much use the facilities in a district received.

Before the formula is applied, an amount called the "Contingency" from 1994 to 1999 and later renamed the "Reserve" is taken from the total DACF allocation. This amount was 5% of the allocation in 1994, 10% from 1995 to 2004, 20% of the total allocation in 2005 and 25% in 2006. The DACF office reports that this "Reserve" amount is used for bulk purchases for the District Assemblies and to support the Regional Coordinating Councils and the office of the DACF Administrator in their monitoring roles. A proportion of the "Reserve" fund is distributed evenly between all the members of Parliament for development projects of their choosing in their constituencies. Table 1.1 shows the measures that comprised each of these factors and their respective weighting used in the DACF formula for the various years since 1994 to 2005. The percentages refer to the percentage of the total DACF allocation that remains after the "Reserve" amount has been deducted. The DACF Administrator suggests the weighting of the factors used in the sharing formula. Throughout its history, the recommendation of the Administrator has been approved for implementation by Parliament.

The "Service Pressure" factor is unique in that it has always been measured solely as the population density of the district. The definition of each of the other factors has changed over time. In general, there has been a progression to include more measures of welfare into the "Need" factor as time passed. In 1994, the "Need" factor was calculated

Table 1.1: Measures Used In Calculating Districts' DACF Allocation And Relevant Weights Applied In Sharing Formula

	Percentage Weight in District Assembly Common Fund Formula in Year:											
Factor	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
'Need'	**35**	**35**	**35**	**35**	**35**	**35**	**40**	**40**	**50**	**55**	**35**	**35**
GDP(1992)	30	30	15	10	10	5						
Population	5	5										
Health facilities			10	12.5	12.5	15	12.5	12.5	12.5	12.5	5	5
Population/Doctor							7.5	7.5	7.5	7.5	5	5
Population/Nurse											5	5
Education facilities			10	12.5	12.5	15	12.5	12.5	12.5	12.5	5	5
Pupil/Teacher							7.5	7.5	7.5	7.5	5	5
Water coverage									10	10	5	4
Tarred Roads mileage											5	6
Dilapidated Schools										5		
'Responsiveness'	**20**	**20**	**20**	**20**	**20**	**20**	**15**	**15**	**5**	**5**	**2**	**3**
Revenue per capita	20	20	15	15	15	15	10	10				
Increase in revenue per capita			5	5	5	5	5	5	5			
Increase in Revenue										5	2	3
'Service Pressure'	**15**	**15**	**15**	**15**	**10**	**10**	**10**	**10**	**10**	**5**	**3**	**2**
Population Density	15	15	15	15	10	10	10	10	10	5	3	2
'Equality'	**30**	**30**	**30**	**30**	**35**	**35**	**35**	**35**	**35**	**35**	**60**	**60**

Source: District Assemblies Common Fund Memoranda and Reports

as a transformation of the per capita 1992 Gross Domestic Product (GDP) of the district and the population of the district. However, in 1996, population was dropped as a consideration in the factor and number of health facilities and basic education facilities were considered. In 2000 further refinements were made to the "Need" factor, by dropping the 1992 GDP per capita and including population per doctor and enrolment per teacher as measures to be considered. In 2002, percentage of the district supplied with safe drinking water was considered in the "Need" factor. There was a one time inclusion measure called "Poverty" in the 2003 formula. The indicator for this measure was the number of schools in the district in need of major repair. In 2002, percentage of the district supplied with safe drinking water was considered in the "Need" factor and in 2004, mileage of tarred roads in the district was also added as an indicator. The measures comprising the "Responsiveness" factor have also changed over time. In 1994, this factor was measured as the revenue per capita of a district in the previous year. In 1996, the percentage increase in revenue per capita was also considered. In 2002, revenue per capita was dropped as a measure of "Responsiveness". The details of the changes in each factor and the relevant weighting are shown in Table 1.1. The measures used in the formula generally undergo a transformation before the weighting is applied[12].

Typically, data used in the formula in any year is applicable to two or three years before and is retrieved from the relevant Sector Ministry. The years from which indicator data was used in the relevant DACF formula is shown in Appendix A. The Ministry of Health provides the number of health facilities in a district and the Ministry of Education provides the number of primary school per district. Data on community

[12] The transformation of each factor that is used in the formula in each year that it is considered is shown in Appendix A.

water sources is supplied by the Ghana water Company. Revenue estimates are obtained from the audit section of the Controller and Accountant General's office. The revenue figures used do not include land revenue, interests earned on investments and grants which do not reflect the efforts of the districts. The 1992 gross domestic product for each district was based on estimates from Plan Consult, a Ghanaian consulting firm, commissioned to undertake the assignment. While there are broad guidelines for the use of the fund, District Assemblies are free to use the funds as they wish as long as the intended use is in the budgets required to be furnished to the Administrator of the DACF before allocations are disbursed.

1.3 Data

The data used in the empirical analysis is a panel data set consisting of three types; election results, data related to the District Assemblies Common Fund and demographic and economic activity data.

Data relating to the district assembly common fund were obtained from internal documents from the headquarters of the District Assembly Common Fund in Accra, Ghana. The unit of observation in this dataset is the district. Even though the disbursement of the DACF was commenced in 1994, the first report of the Administrator showing how each district's allocation was developed was submitted to parliament in June 1995. The DACF data set contains the levels of indicators used in the DACF formula and the allocation of each district based on the relevant DACF formula for each year. The following indicators are available more or less annually from the years in

which they became relevant; population, number of health facilities, population per doctor, population per nurse, number of elementary education facilities, teacher pupil ratio, and percentage of district with safe potable water, percentage of tarred roads in the district compared to national total road network. The formula for each year can be deduced from Table 1.1. The data also includes administration costs and total expenditure for districts in 1997, 2000 and 2003. The data set is missing all information for 1995 and 1996 except the DACF allocation and disbursement of each district. A summary of the dataset is shown in Table 1.2.

Election results for the 1992, 1996, 2000 and 2004 parliamentary and presidential elections were obtained from the Headquarters of the Ghana Electoral Commission in Accra Ghana. The election results data were compiled from various documents supplied by the Research and Monitoring Department of the Electoral Commission. The variables in the dataset include the number of registered voters, the voter turnout, the number of valid votes, the political party of each candidate and the number of votes each candidate received. The unit of observation for all of these election data is the constituency level but the data was further aggregated to the district level. A party is described as winning a constituency or district in the presidential election if it captures a majority of the votes there[13]. The list of political parties that contested each election presented in Table 1.3 shows clearly that the National Democratic Congress (NDC) and the New Patriotic Party (NPP) are the two main political forces in Ghana. Using the election results, the following political variables were created; *Govt* a dummy variable equal to 1 if the

[13] A district was described as voting unanimously for one party if the candidate for that party was declared the winner in all the constituencies in the district however this measure is essentially the same as the party winning the district for all election years.

Table 1.2: Summary Statistics Of DACF Data

Variable	Observations	Mean	Std. Dev.	Min	Max
Real Allocation in Millions (2000 Cedis)	1266	1890	1440	138	8590
Real Disbursements in Millions (2000 Cedis)	1376	1490	1290	156	8650
Proportion of promised allocation disbursed	1266	0.91	0.23	0.25	1.53
Share of DACF fund	1018	0.0088	0.0034	0.0056	0.0451
Population	1376	155581	162946	42721	1658937
Population Density (persons per m^2)	1376	0.0172	0.0212	0.0002	0.1904
Hospitals	1018	12.53	17.01	1.00	198.00
Doctors	578	5.49	12.66	1.00	161.00
Nurses	138	41.83	91.84	2.00	959.00
Enrolment in Elementary School	578	25975	21585	5620	261658
Elementary School Teachers	578	893	746	54	7307
Length of Tarred Roads (Km)	138	64.11	87.35	0.05	791.75
Percentage of District with pipe-borne water	358	41.44	20.90	3.97	100.00
Schools	1018	160.81	82.57	39.00	740.00
Proportion of Schools that are Delapidated	166	0.34	0.08	0.15	0.58
Locally raised revenue in Millions (Nominal Cedis)	660	464	1810	16.3	29900
Locally raised revenue per capita (Nominal Cedis)	880	1563	1852	60	18022
Annual Percentage change in Locally raised revenue	798	46.92	111.60	-88.73	1619.28
Annual Percentage change in Locally raised revenue per capita	770	61.87	146.08	-87.56	1939.74
Gross Domestic Product in 1992 (Nominal Cedis)	110	374	128	133	846
Percentage of DACF disbursement Utilised	428	0.70	0.34	0.01	2.51
Total Expenditure in Millions (Nominal Cedis)	1596	372	983	0	9600
Expenditure on Administration in Millions (Nominal Cedis)	330	692	652	0	4210
Expenditure on Education in Millions (Nominal Cedis)	404	70400	145000	0	1380000
Expenditure on Health in Millions (Nominal Cedis)	404	25500	102000	0	1390000
Expenditure on all other projects in Millions (Nominal Cedis)	404	98900	212000	0	1810000
1994 Education Expenditure paid by DACF office in Millions (Nominal Cedis)	108	17.6	31.4	0	173
1994 Health Expenditure paid by DACF office in Millions (Nominal Cedis)	109	6.28	12.1	0	65.8
1994 Other Expenditure paid by DACF office in Millions (Nominal Cedis)	109	11.2	20.1	0	110

Unless otherwise stated, statistics calculated based on values from 1994 to 2005

Table 1.3: Dates Of Elections, Political Parties Contesting Presidential And Parliamentary Elections In Ghana

Presidential Elections				Parliamentary elections		
Date	Contesting Political Parties	Constituencies Won	Districts Won	Date	Contesting Political Parties	Seats Won
1992, Nov 3	National Democratic Congress (NDC)	153	87	1992, Dec 29*	NDC	189
	New Patriotic Party (NPP)	43	19		National Convention Party (NCP)	8
	People's National Convention (PNC)	5	4		Every Ghanaian Living Everywhere (EGLE)	1
	National Independence Party (NIP)	0	0			
	People's Heritage Party (PHP)	0	0			
1996, Dec 7	NDC	138	80	1996, Dec 7	NDC	133
	NPP	62	30		NPP	61
	PNC	0	0		People's Convention Party (PCP)	5
					PNC	1
2000, Dec 7	NPP	106	53	2000, Dec 7	NPP	99
	NDC	91	55		NDC	92
	PNC	3	2		PNC	3
	National Reform Party (NRP)	0	0		CPP	1
	United Ghana Movement (UGM)	0	0		NRP	0
	Convention People's Party (CPP)	0	0		UGM	0
					EGLE	0
					Great Consolidated Popular Party (GCPP)	0
2000, Dec 28	NPP	129	68			
	NDC	71	42			
2004, Dec 7	NPP	126	76	2004, Dec 7	NPP	128
	NDC	104	62		NDC	94
	PNC	0	0		PNC	4
	CPP	0	0		CPP	3

In 1992, 1996 and 2000, there were 110 districts and 200 constituencies in Ghana. In 2004, there were 138 districts and 230 constituencies. * Opposition parties boycotted 1992 Parliamentary Elections due to accusations of electoral fraud and malpractices and voter intimidation during the Presidential elections.

district was won by the ruling government in the last presidential election and equal to 0 otherwise; *WinnerMarg* which is equal to the difference between the percentage of votes captured by the political party that won the district and the percentage of votes captured by the political party in second place; *Govt*WinnerMarg* which is an interaction of *Govt* and *WinnerMarg*; and *VoteHerf* = $\sum_i (V_i)^2$ where V_i is the percentage of votes for candidate of political party i. *VoteHerf* is a measure of vote concentration in the district. A summary of election data is shown in Table 1.4.

The unit of observation of the housing and demographic data is the district. The data is obtained from the results of the 2000 census and as such describes the districts' situations in the year 2000. The variables in this data set are concerned with age structure, fertility and literacy rates, educational attainment, marital status, economic activity, ethnicity, number of households, materials used in house structures and household amenities. The data were compiled from the publications obtained from the offices of the Ghana Statistical Services Accra, Ghana. Using the ethnicity data, a variable similar to the measure of ethnic fragmentation, ETHNIC, in Alesina and Baqir (1999), was calculated as *Ethnic* = $\{1 - \sum_i (E_i)^2\}$ where E_i is the percentage of population belonging to ethnic group i. Ethnic measures the probability that two individuals picked at random in the district belong to same ethnic group. A summary of the data from the population and housing census is shown in Table 1.5.

Table 1.4: Summary Statistics Of Election Data

Variable Description	Observations	Mean	Std. Dev.	Min	Max
Districts won by elected president in 1994	110	0.79	0.41	0	1
Vote Concentration* in 1994	110	0.50	0.15	0.25	0.91
Margin of Victory in 1994	110	38.93	25.40	0.10	94.79
Margin of Victory in districts won by elected president in 1994	110	34.33	28.63	0.00	94.79
Districts won by elected president in 1996	110	0.73	0.45	0	1
Vote Concentration* in 1996	110	0.59	0.14	0.39	0.98
Margin of Victory in 1996	110	37.14	27.38	0.46	96.85
Margin of Victory in districts won by elected president in 1996	110	31.07	31.03	0.00	96.85
Districts won by elected president in 2000 first round election	110	0.48	0.50	0.00	1.00
Vote Concentration* in 2000 first round election	110	0.52	0.12	0.31	0.89
Margin of Victory in 2000 first round election	110	31.57	24.53	0.88	92.05
Margin of Victory in districts won by elected president in 2000 1st round election	110	13.00	19.62	0.00	71.72
Districts won by elected president in 2000 run off election	110	0.62	0.49	0.00	1.00
Vote Concentration* in 2000 run off election	110	0.59	0.10	0.50	0.93
Margin of Victory in 2000 run off election	110	33.86	23.59	0.07	91.48
Margin of Victory in districts won by elected president in 2000 run off election	110	19.71	22.33	0.00	76.90
Districts voting won by elected president in 2004	138	0.55	0.50	0	1
Vote Concentration* in 2004	138	0.54	0.11	0.32	0.90
Margin of Victory in 2004	138	30.82	22.21	0.41	89.25
Margin of Victory in districts won by elected president in 2004	138	15.81	20.84	0.00	75.98
**NDC political Stronghold	110	0.35	0.48	0	1
**NPP political Stronghold	110	0.13	0.33	0	1
Districts Split in 2004 redistricting	110	0.25	0.44	0	1
District distance to Accra in Km between 1992 and 2003	110	249	166	0	640
District distance to Accra in Km after 2004	138	264	171	0	642
District Area in between 1992 and 2003 (Km^2)	110	2172	2561	122	17440
District Area after 2004 (Km^2)	138	1720	1793	150	12955

* Vote Concentration is calculated as the sum of the squares of the vote share of each political party. A lower value of vote concentration symbolizes a higher vote dispersion. **A political stronghold is a district that has voted for the same political party in all elections from 1992 to 2000

Table 1.5: Summary Statistics Of Population And Housing Data

Variable	Observations	Mean	Std Dev	Min	Max
Percentage of population that is:					
Illiterate	110	47.13	16.31	14.90	87.00
Literate in English and Ghanaian Language	110	36.24	15.23	3.00	63.50
Employed in agriculture, fishing or hunting	110	62.81	18.34	3.70	87.20
Households	110	33993	35143	9918	365550
Houses	110	22265	15339	6224	131355
Ethnic*	110	0.42	0.20	0.07	0.81

All data shown are assembled from reports of the Ghana 2000 Population and Housing Census published by the Ghana Statistical Services. *Definition: probability of two randomly picked individuals belonging to same ethnic group

1.4 Empirical Analyses and Discussion

1.4.1 Background

A difficulty in arguing that some central government transfers are influenced by political considerations, be it a political cycle or the political affiliation of the receiving group, is that the criteria for resource allocation can often be arbitrarily amended to justify any transfers. In the case of District Assemblies Common Fund (DACF) in Ghana, this problem is minimized because the formula for determining each district's allocation each year is recorded in memoranda between the DACF office and the Parliament of Ghana. There is however still a possibility that the choice of the formula variables, their weighting, and non-linear transformations used in calculating district allocations can be manipulated to achieve politically motivated targeting of certain areas during a particular year. I find that the DACF formula rules are strictly followed in determining districts DACF Allocations, (henceforth Allocation). However the amount

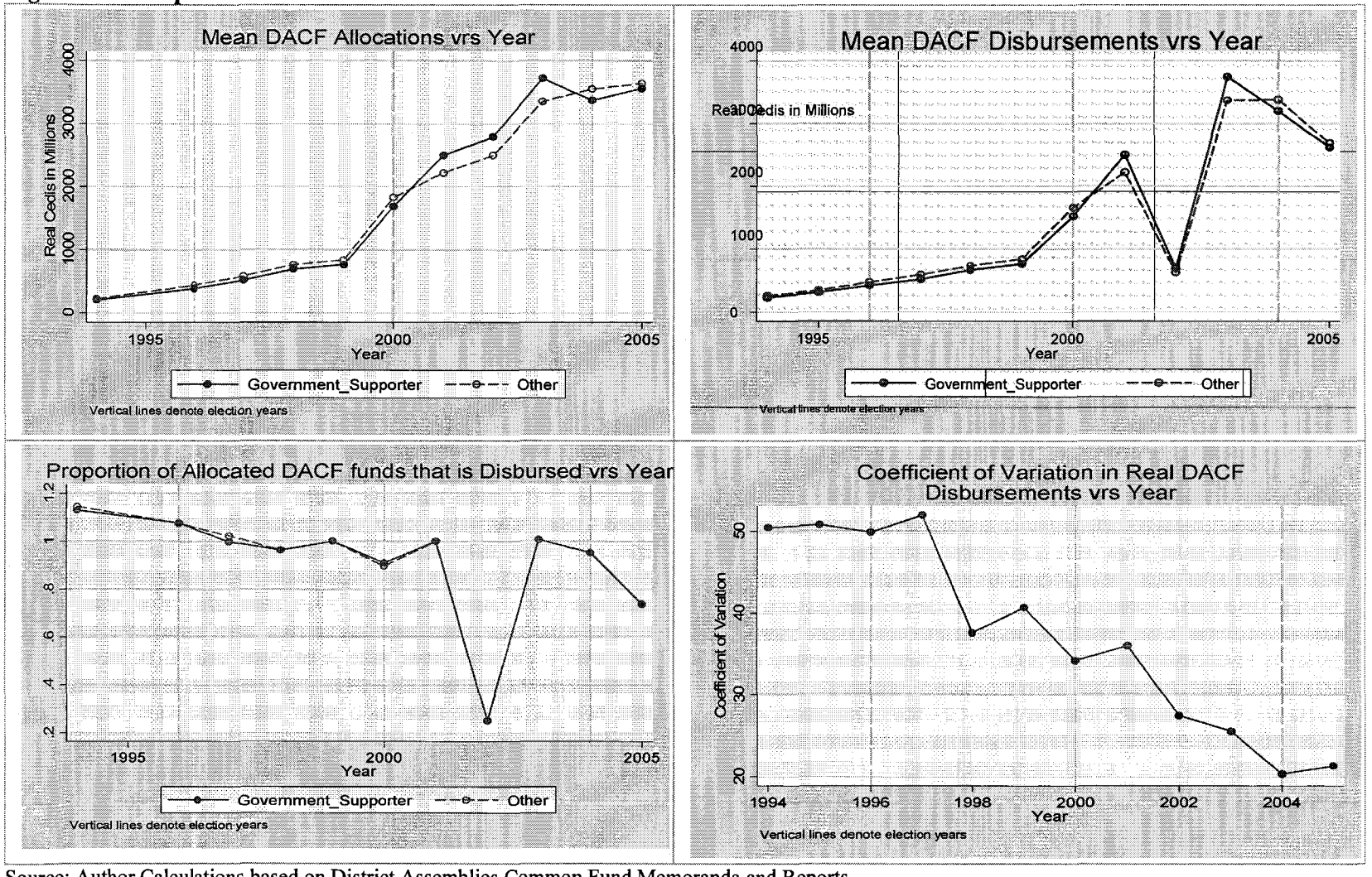
of funds actually released to districts, DACF Disbursements (henceforth Disbursement), generally differs from the Allocation. This distinction allows for analyses of political influence in the DACF in its original form and for determining politically motivated non-random deviations of Disbursement from Allocation.

Figure 1.2 shows some statistics of Allocations and Disbursements in real terms[14]. Both the districts' Allocations and Disbursements have been growing over time for government-supporting as well as non government-supporting districts. The average of the Disbursement to Allocation ratio is also shown. In general it is falling over the years with a large dip in 2002 when only about one quarter of the amounts allocated to districts were disbursed. The DACF office explains the low Disbursement to Allocation ratio in 2002 as a result of difficulties involved with changes in the DACF personnel during transfer of administration from the first DACF Administrator to the second. The unit-less coefficient of variation, which is often used as a measure of inequality in a distribution, is shown. The data shows that the first four years of the DACF program was characterized by highest inequality in the distribution. There was a sharp reduction in inequality beginning in 1998. A likely reason for this trend is that the formula for DACF allocation has been progressively refined to include more indicators over the years.

Each of the following sub-sections presents an empirical answer to one of the following questions. Does the political affiliation of a district affect its DACF Allocation and Disbursement and the deviation of Disbursement from Allocation? Is there a political cycle in the DACF program? Is the DACF formula manipulated for political reasons? Was there political motivation in redistricting of Ghana? Is there political influence in the performance of the non-partisan District Assemblies?

[14] The annual total endowment DACF is shown in Appendix A.

Figure 1.2: Graphical Presentation Of Statistics Of Real DACF Allocations And Disbursements



Source: Author Calculations based on District Assemblies Common Fund Memoranda and Reports.

1.4.2 Does the Political Affiliation of a District affect its DACF Allocation and Disbursement?

The empirical approach adopted is one that measures the salience of political influence in various aspects of the DACF during the evolution of the program from its implementation in 1994 to 2005. Despite the statistics in Figure 1.2 which suggest that government-supporting districts and non government-supporting districts receive different Allocations, this fact may not be the result of any political manipulation. There are differences between the types of areas that support the two political parties that have been in power over the period covered[15]. A regression framework cannot achieve a deconvolution of the effects of choice of the DACF formula indicators, their weighting and non-linear transformations of formula indicators, from deliberate political manipulation in calculating district Allocations. I therefore compare the importance of political affiliation of a district's Allocation, Disbursement or proportion of Allocation disbursed in each year starting from 1994 to that in 2003, the year before district boundaries were re-demarcated. Fixed effects estimation on the regression models

$$y_{it} = \alpha_0 + \alpha_1 t + \alpha_2 Govt_{it} + \alpha_3 t*Govt_{it} + a_i + u_{it}, \quad t = 1994, 1995, \ldots 2003, \qquad \textbf{Equation 1.1}$$

and

$$y_{it} = \alpha_0 + \alpha_2 Govt_{it} + \sum_{t=1994}^{t=2002} \gamma_t(Year_t\ Dummy) + \sum_{t=1994}^{t=2002} \varphi_t(Year_t\ Dummy * Govt_{it}) + a_i + u_{it}, \quad t = 1994, 1995, \ldots 2003, \qquad \textbf{Equation 1.2}$$

[15] Some evidence is presented in Appendix A

where y_t is either ln(Per capita DACF Disbursement), ln(Per capita DACF Allocation) or Disbursement/Allocation and *Govt* is a binary variable which equals one if ruling government won the district in last presidential election.

The results of the regression in Equation 1.1 for the various dependent variables are shown in Table 1.6. The results show that in terms of per capita DACF Disbursement, per capita DACF Allocation and Disbursement/Allocation over the period 1994 to 2003, government-supporting districts had an initial advantage over non government-supporting districts which has been decreasing over time. Table 1.7 shows the results of the regression in Equation 1.2 where a comparison is made between the advantage that a government-supporting district had over non-government-supporting districts in terms of the dependent variable in 2003 and the advantage it had in each of the earlier years. Figure 1.3 shows a summary of the results in Table 1.7 and shows that the advantage of government-supporting districts has been falling over time. In terms of Disbursement/Allocation, 1997 is the only year in which there is a statistically significant difference between this measure amongst government-supporting districts compared to these districts in 2003. In 1997, the proportion of Allocation that was disbursed is 2.4% lower amongst government-supporting districts compared to their experience in 2003. This result suggests that the deviation of Disbursement from Allocation has not been used to a great degree to target districts based on their political affiliation.

Table 1.6: Fixed Effects Regressions of DACF Disbursement and Allocation from 1994 to 2003

Dependent Variables:	Ln(Per Capita DACF Disbursement)*	Ln(Per Capita DACF Allocation)	(Disbursement/ Allocation)*
Period	0.285***	0.292***	-0.009***
	(0.006)	(0.006)	(0.002)
Government Supporter	0.072**	0.031	0.036***
	(0.044)	(0.046)	(0.014)
Period *Government Supporter	-0.025***	-0.012**	-0.010***
	(0.007)	(0.007)	(0.002)
Constant	7.800***	7.734***	1.055***
	(0.036)	(0.037)	(0.011)
Observations	990	990	880
R-Squared	0.78	0.80	0.32

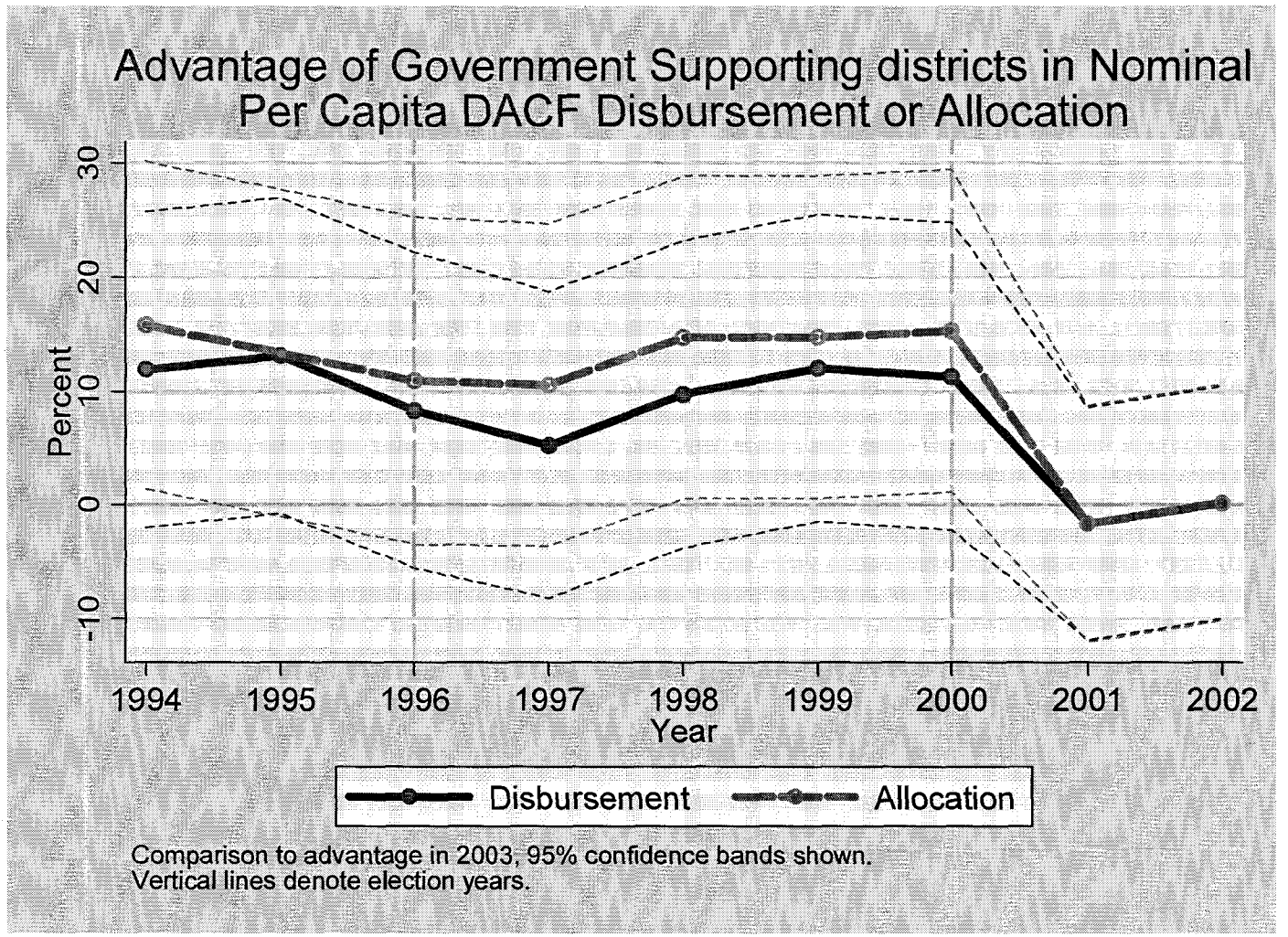
Period 1 is 1994. *Observations from 2002 are omitted because only 1st quarter disbursements were made. Standard errors are shown in brackets. *** significant at 5%, ** significant at 10%

Table 1.7: Fixed Effects Regressions of DACF Disbursement and Allocation from 1994 to 2003

Dependent Variables	Ln(Per Capita DACF Disbursement)	Ln(Per Capita DACF Allocation)	(Disbursement/Allocation)
Government Supporter	-0.094***	-0.106***	-0.001
	(0.041)	(0.043)	(0.008)
Government Supporter*1994	0.119**	0.158***	-0.017
	(0.071)	(0.073)	(0.013)
Government Supporter*1995	0.131**		
	(0.071)		
Government Supporter*1996	0.083	0.109	0.000
	(0.071)	(0.073)	(0.013)
Government Supporter*1997	0.052	0.105	-0.026***
	(0.069)	(0.072)	(0.013)
Government Supporter*1998	0.097	0.147***	0.000
	(0.069)	(0.072)	(0.013)
Government Supporter*1999	0.120**	0.147***	-0.001
	(0.069)	(0.072)	(0.013)
Government Supporter*2000	0.113**	0.153***	-0.012
	(0.069)	(0.072)	(0.013)
Government Supporter*2001	-0.017	-0.017	0.000
	(0.052)	(0.053)	(0.009)
Government Supporter*2002	0.002	0.002	0.000
	(0.052)	(0.053)	(0.009)
Constant	10.469***	10.467***	1.008***
	(0.027)	(0.028)	(0.005)
Time Dummies (2003 omitted)	Yes	Yes	Yes
Observations	1100	990	990
R-Squared	0.78	0.81	0.98

Standard errors are shown in brackets. *** significant at 5% , ** significant at 10%

Figure 1.3: Coefficients on interaction of Year and Government Supporter Dummies in Fixed Effects Regression



1.4.3 Is There a Political Cycle in the DACF?

I consider that there may be a political cycle in DACF Disbursements, Allocations and the proportion of Allocation that is disbursed and that the political influence in these measures may change according to the proximity to elections. Fixed effects estimation of the models

$$y_{it} = \alpha_0 + \alpha_1 t + \alpha_2 Elecyear_t + \alpha_3 Govt_{it} + \alpha_4 Elecyear_t * Govt_{it} + a_i + u_{it}, \quad t = 1994, 1995, \ldots 2005, \qquad \textbf{Equation 1.3}$$

and

$$y_{it} = \beta_0 + \beta_1 t + \beta_2 Elecyear1_t + \beta_3 Elecyear2_t + \beta_4 Elecyear3_t + \beta_5 Govt_{it} + \beta_6 Govt_{it} * Elecyear1_t + \beta_7 Govt_{it} * Elecyear2_t + \beta_8 Govt_{it} * Elecyear3_t + a_i + u_{it,,} \quad t = 1994, 1995, \ldots 2005, \qquad \textbf{Equation 1.4}$$

where i indexes districts, y is either ln(Allocation), ln(Disbursement) or Disbursement/Allocation, *Elecyear* is a dummy that equals 1 if the year is a presidential election year and 0 otherwise, *Elecyear1* is a dummy that equals 1 if year is one year after a presidential election, *Elecyear2* and *Elecyear3* are defined similar to *Elecyear1*, and *Govt* is a dummy variable set to 1 if the district supported the ruling government in the last presidential election and 0 otherwise, are carried out.

Table 1.8 shows fixed effects regression coefficient estimates of full and nested versions of the models in Equations 1.3 and 1.4. In Panel A, y is always natural log of a district's real DACF Allocation and shows that over time, the Allocation has been growing by about 29% each year. The coefficients also show that in election years, there

Table 1.8: Fixed Effects Regressions of Real DACF Allocation and Disbursement on Election Cycle

Panel A:	Dependent Variable: Natural Log of Real **DACF Allocation**						
	I	II	III	IV	V	VI	VII
Year	0.290***	0.291***	0.290***	0.291***	0.293***	0.288***	0.290***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
Election year	0.082***					0.000	
	(0.016)					(0.010)	
Elecyearplus1		-0.055***			-0.097***		0.002
		(0.018)			(0.020)		(0.060)
Elecyearplus2			0.006		-0.051***		0.012
			(0.031)		(0.020)		(0.032)
Elecyearplus3				-0.048***	-0.100***		-0.016
				(0.021)	(0.023)		(0.048)
Government supporter						-0.110***	-0.012
						(0.020)	(0.029)
Government supporter* Election Year						0.094***	
						(0.037)	
Government supporter* One Year after Election							-0.110***
							(0.046)
Government supporter* Two Years after Election							-0.077**
							(0.045)
Government supporter* Three Years after Election							-0.108***
							(0.050)
Observations	1266	1266	1266	1266	1266	1210	1210
R-squared	0.90	0.90	0.90	0.90	0.90	0.89	0.89
Panel B:	Dependent Variable: Natural Log of Real **DACF Disbursement**						
	I	II	III	IV	V	VI	VII
year	0.240***	0.239***	0.226***	0.240***	0.227***	0.238***	0.225***
	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)
election year	0.252***					0.240***	
	(0.026)					(0.050)	
elecyearplus1		0.068***			-0.121***		-0.011
		(0.027)			(0.027)		(0.050)
elecyearplus2			-0.507***		-0.581***		-0.745***
			(0.024)		(0.029)		(0.051)
elecyearplus3				0.148***	-0.103***		-0.001
				(0.027)	(0.028)		(0.063)
Government supporter						-0.056**	-.0925***
						(0.032)	(.047)
Government supporter* Election Year						-0.018	
						(0.060)	
Government supporter* One Year after Election							-0.087
							(0.063)
Government supporter* Two Years after Election							0.286***
							(0.061)
Government supporter* Three Years after Election							-0.110**
							(0.061)
Observations	1376	1376	1376	1376	1376	1320	1320
R-squared	0.79	0.78	0.83	0.78	0.83	0.78	0.82

Standard errors shown in brackets. ***significant at 5%, **significant at 10% .

is a larger than normal growth in the total allocation of funds to the districts. Column I estimates that districts get an amount eight percentage points higher in election years than in non-election years. The coefficients in this table show the presence of an 'election cycle' to the amount of funds promised to districts. As shown in Column V, in the year before an election and in the year after an election, the growth in the amount of funds promised to districts is ten percentage points less than in non election years. The decrease in the middle of the election cycle is only half of this. Column VI shows that government-supporting districts can expect nine percentage points more of DACF Allocation in an election year than they can expect otherwise. However, in non election years, government supporting districts see a growth in their Allocation eleven percentage points less than comparable districts that are non government-supporting. The results suggest that in an election year, growth in Allocation in government supporting districts is two percentage points less than non government-supporting districts. The regression coefficients show that the political affiliation of a district is significant in the growth of its DACF Allocation and those in Column VII show that the election cycle is perceived differently by government and non government-supporting districts.

Table 1.8 Panel B shows fixed effects regression results for the models in Equations 1.3 and 1.4 where y is always the natural log of DACF Disbursement. While the growth in Allocations is 29% a year, the growth in Disbursements is 24% a year. There is an even larger an election cycle in the DACF Disbursements compared to Allocation. In election years, districts can expect to receive twenty-five percentage points more in DACF Disbursement than the disbursement they receive in non election years. This percentage is much larger than the eight percentage point disparity between

election and non-election years in the Allocations. The election cycle is also evident in the coefficients in Panel B Column V. In the middle of the cycle, two years after an election, a district received almost 60% less in DACF disbursements compared to the amount it receives in an election year. This is after detrending the disbursement. In the other years of the cycle, the reduction in disbursement compared to an election year is about ten percent. Column VII shows that this election cycle coefficients are driven mainly by different treatment of government-supporting and non government-supporting districts during the cycle. As with DACF allocations, government-supporting districts see a growth in their DACF disbursement which is about ten percentage points less than in non government-supporting districts in the year after an election and the year just before an election. However, in the middle of the election cycle, the growth in DACF Disbursement in government-supporting districts is almost twenty percentage points higher than non government-supporting districts. The results in Table 1.8 are summarized in Figures 1.4 and 1.5.

In 2002, there were delays in the formulation of the DACF formula and hence in the disbursement of the fund. To ensure that the observed trend in DACF disbursements is not driven solely by the anomalous data in 2002, fixed effects estimation of Equations 1.3 and 1.4 are carried out without observations for 2002. The results shown in Table 1.9 lead to the same conclusions as when the whole data set is considered. The main difference is in the magnitude of the coefficients. Without the abnormally low releases in 2002, the growth in disbursements is about 26% per year. There is again a political cycle in the disbursements which suggests that districts get thirteen percentage points more in an election year than they would have otherwise. Column V again shows

Figure 1.4: Election Cycle In Growth Of DACF Disbursement And Allocation

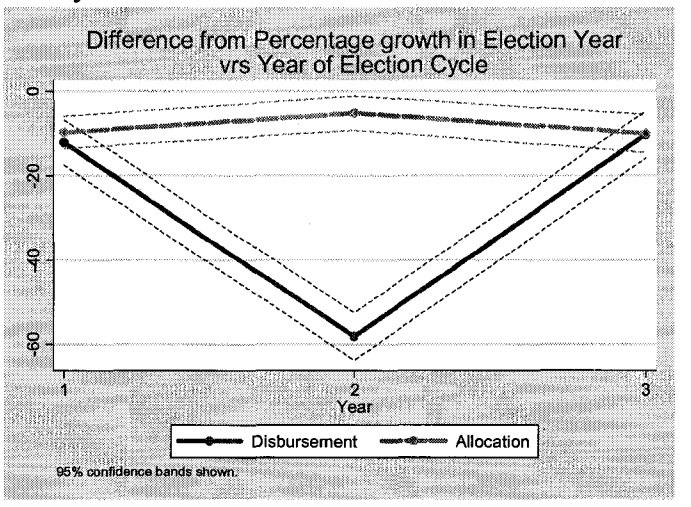


Figure 1.5: Election Cycle In Growth Of DACF Disbursement And Allocation by Political Affiliation

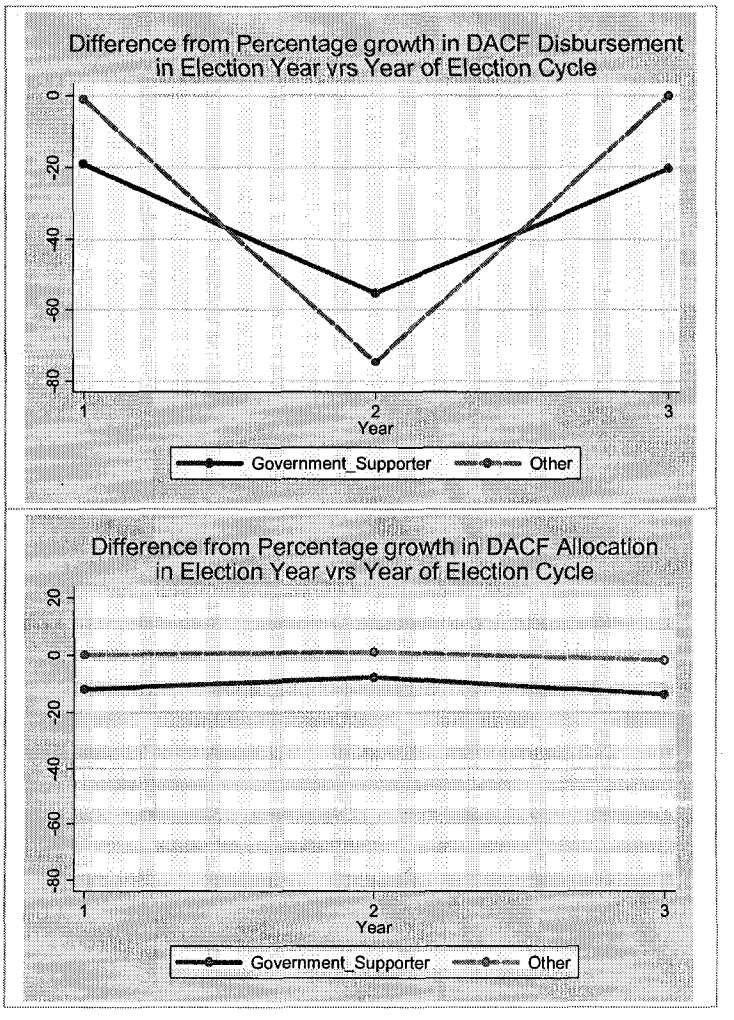


Table 1.9: Fixed Effects Regressions for Natural Log of Real DACF disbursements, without year 2002

Dependent Variable: Natural Log of Real DACF disbursement, no observations from 2002 included							
	I	II	III	IV	V	VI	VII
year	0.264***	0.269***	0.260***	0.265***	0.263***	0.261***	0.260***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
election year	0.134***					0.036	
	(0.018)					(0.034)	
elecyearplus1		-0.103***			-0.157***		-0.032
		(0.019)			(0.022)		(0.040)
elecyearplus2			-0.101***		-0.171***		-0.142***
			(0.024)		(0.027)		(0.051)
elecyearplus3				0.021***	-0.082***		0.010
				(0.019)	(0.023)		(0.040)
Government supporter						-0.134***	-0.052
						(0.023)	(0.036)
Government supporter* Election Year						0.082***	
						(0.042)	
Government supporter* One Year after Election							-0.103***
							(0.050)
Government supporter* Two Years after Election							-0.007
							(0.058)
Government supporter* Three Years after Election							-0.095***
							(0.048)
Constant	-507.00***	-517.73***	-499.85***	-509.89***	-504.86***	-502.77***	-452.35***
	(5.08)	(5.33)	(5.70)	(5.18)	(5.68)	(5.40)	(6.16)
Observations	1266	1266	1266	1266	1266	1210	1210
R-squared	0.88	0.87	0.87	0.87	0.87	0.88	0.87

Standard errors are shown in Brackets. *** significant at 5% , ** significant at 10% .

a statistically significant election cycle in which districts' disbursements in the year after an election is fifteen percentage points less the than in an election year, and an eight percentage points less in the year just before an election. These magnitudes are comparable to the twelve percentage point and ten percentage point reductions respectively when the entire sample is considered. With the exclusion of observations from 2002, the fifty-eight percentage point reduction in disbursements two years after an election is reduced to seventeen percentage points. Also, the election cycle is no longer driven mainly by differential treatment between government-supporting and non government-supporting districts.

The results of the fixed effects estimation of the models shown in Equations 1.3 and 1.4 when y is Disbursement/Allocation are shown in Table 1.10. Table 1.11 shows the results of these regressions repeated without observations from 2002 as a robustness check. Table 1.10 shows that in general, the proportion of funds promised that are released over the years, has been falling by about five percentage points each year. Column III shows that two years after an election, the administration of the DACF is at its worst in terms of disbursements as a proportion of allocation; it is almost thirty percentage points less than it is in an election year. The statistically significant coefficients in column V suggest the presence of an election cycle. Disbursement/Allocation is two percentage points lower in the year after an election and twenty-nine percentage points lower two years after an election, compared to an election year. However in the year preceding an election, Disbursement/Allocation is eight percentage points higher than in an election year. Column VII shows the trend of falling then rising Disbursement/Allocation depending on stage of the election cycle is robust to

Table 1.10: Fixed Effects Regressions Of Proportion Allocation That is Released

Dependent Variable: DACF Disbursement/DACF Allocation							
	I	II	III	IV	V	VI	VII
year	-0.036***	-0.037***	-0.050***	-0.041***	-0.051***	-0.036***	-0.051***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
election year	0.095***					0.123***	
	(0.013)					(0.025)	
elecyearplus1		0.041***			-0.024***		-0.010
		(0.014)			(0.012)		(0.022)
elecyearplus2			-0.305***		-0.293***		-0.409***
			(0.011)		(0.013)		(0.023)
elecyearplus3				0.177***	0.083***		0.087***
				(0.015)	(0.014)		(0.024)
Government supporter						0.018	-0.060***
						(0.017)	(0.021)
Government supporter* Election Year						-0.058**	
						(0.031)	
Government supporter* One Year after Election							0.011
							(0.028)
Government supporter* Two Years after Election							0.193***
							(0.027)
Government supporter* Three Years after Election							0.005
							(0.030)
Constant	72.74***	75.74***	101.68***	82.51***	103.55***	72.08***	102.26***
	(3.82)	(3.95)	(3.22)	(3.77)	(3.19)	(4.03)	(3.23)
Observations	1266	1266	1266	1266	1266	1210	1210
R-squared	0.27	0.24	0.53	0.29	0.54	0.28	0.60

Standard errors are shown in brackets. *** significant at 5% , ** significant at 10% .

the inclusion of government supporter dummies. It also suggests that in year 2 of the election cycle, government supporting districts have Disbursement/Allocation 13.3% higher than in an election year, compared to non-government supporting districts. The results in Table 1.10 are summarized in Figures 1.6 and 1.7.

The coefficients in Table 1.11 show that the trends in Disbursement/Allocation discussed are generally borne out when data from 2002 is dropped from the fixed effect regressions. Importantly, there is still strong statistical evidence of an election cycle as shown in column V. There is a decrease in Disbursement/Allocation of five and three percentage points one and two years after an election respectively compared to an election year. However in the year prior to an election year, Disbursement/Allocation is

four percentage points higher than in an election year. There is also statistically significant evidence of the proportion of funds allocated that is disbursed varying by district political support for the government. Column VI shows that in election years, government-supporting districts have Disbursement/Allocation that is three percentage points lower than non government-supporting districts. Without the anomalously low observation in 2002, there is virtually no difference in Disbursement/Allocation compared to its value in election years between government-supporting and non government-supporting districts.

Table 1.11: Fixed Effects Regressions of Proportion of Allocation Released to Districts without year 2002

Dependent Variable: DACF Disbursement/DACF Allocation (no observations from 2002)							
	I	II	III	IV	V	VI	VII
year	-0.022***	-0.019***	-0.023***	-0.024***	-0.023***	-0.022***	-0.024***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
election year	0.021***					0.0001	
	(0.005)					(0.0091)	
elecyearplus1		-0.061***			-0.052***		-0.025***
		(0.005)			(0.005)		(0.009)
elecyearplus2			-0.022***		-0.030***		-0.036***
			(0.007)		(0.007)		(0.012)
elecyearplus3				0.071***	0.042***		0.057***
				(0.006)	(0.006)		(0.010)
Government supporter						-0.025***	-0.027***
						(0.006)	(0.009)
Government supporter* Election Year						-0.001	
						(0.010)	
Government supporter* One Year after Election							-0.003
							(0.012)
Government supporter* Two Years after Election							0.025**
							(0.014)
Government supporter* Three Years after Election							0.004
							(0.012)
Constant	44.11***	39.98***	46.93***	48.49***	47.20***	44.51***	48.77***
	(1.50)	(1.45)	(1.79)	(1.47)	(1.64)	(1.44)	(1.57)
Observations	1156	1156	1156	1156	1156	1100	1100
R-squared	0.53	0.59	0.53	0.59	0.62	0.55	0.64

Standard errors are shown in brackets. *** significant at 5% , ** significant at 10%.

Figure 1.6: Election Cycle In DACF Disbursement/DACF Allocation

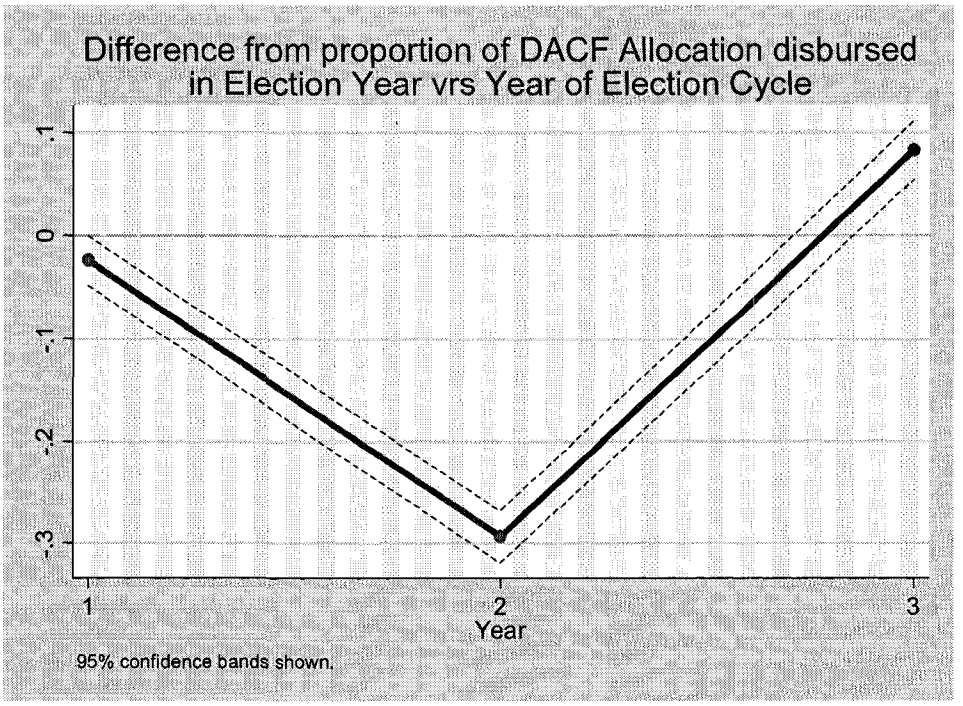
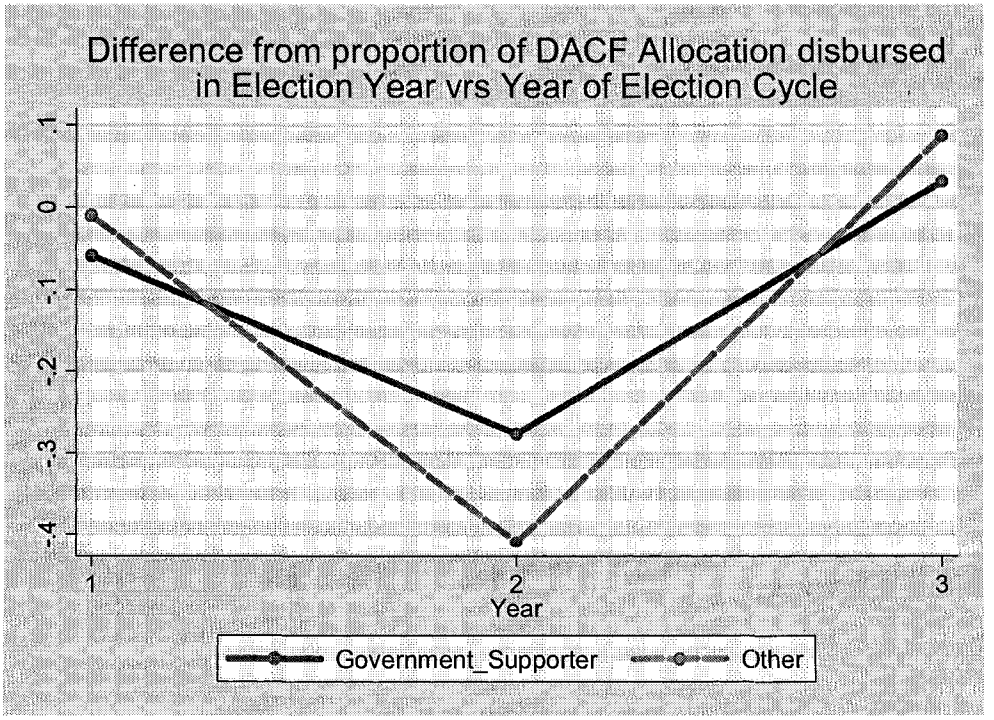


Figure 1.7: Election Cycle In DACF Disbursement/DACF Allocation by Political Affiliation



The evidence that the political cycle varies by a district's political affiliation raises the possibility that any advantage or disadvantage in a DACF outcome that a district receives in a particular year, may be eliminated when the entire four years comprising one election cycle is considered. For instance, is the advantage that government-supporting districts have in terms of higher percentage growth in their DACF disbursement in year two of the four year election eliminated by the disadvantage they face in year one and year three of the political cycle? To answer this question, the DACF Disbursement, and Allocation of each district is aggregated across the four years corresponding to each presidential term. The data is then used in fixed effects estimation of the model in Equation 1.5

$$y_{it} = \alpha + \beta_1 \text{Period 1}_i + \beta_2 \text{Period 2}_i + \beta_3 \text{Period 3}_i + \beta_4 \text{Govt}_{it} + \beta_5 \text{WinnerMarg}_{it} + \beta_6 \text{Govt}_{it}^* \text{ WinnerMarg}_{it} + \beta_7 \text{VoteHerf}_{it} + \beta_8 \text{Pop}_{it} + \text{Period 1}_i^*(\gamma_1 \text{Govt}_{it} + \gamma_2 \text{WinnerMarg}_{it} + \gamma_3 \text{Govt}_{it}^* \text{ WinnerMarg}_{it} + \gamma_4 \text{VoteHerf}_{it} + \gamma_5 \text{Pop}_{it}) + \text{Period 2}_i^*(\delta_1 \text{Govt}_{it} + \delta_2 \text{WinnerMarg}_{it} + \delta_3 \text{Govt}_{it}^* \text{ WinnerMarg}_{it} + \delta_4 \text{VoteHerf}_{it} + \delta_5 \text{Pop}_{it}) + \text{Period 3}_i^*(\varepsilon_1 \text{Govt}_{it} + \varepsilon_2 \text{WinnerMarg}_{it} + \varepsilon_3 \text{Govt}_{it}^* \text{ WinnerMarg}_{it} + \varepsilon_4 \text{VoteHerf}_{it} + \varepsilon_5 \text{Pop}_{it}) + a_i + u_{it}, \quad t = 1, 2, 3, 4 \qquad \textbf{Equation 1.5}$$

where y_{it} is either the natural log of Disbursement, Allocation, or the level of Disbursement/Allocation. Period 1 is a dummy variable equal to 1 if the observations are related to observation from 1992 to 1996, Period 2 is similarly defined for observations related to 1997 to 2000 and Period 3 is also similarly defined for observations related to 2001 to 2003. The results from the regression are presented in Table 1.12 below.

Table 1.12: Fixed Effects Regressions of DACF Outcomes aggregated over each of the four election cycles in Ghana from 1992-2005

	ln(Real Disbursement)	ln(Real Allocation)	Disbursement/ Allocation
Period 1	-2.096***	-2.723***	0.740***
	(0.062)	(0.061)	(0.013)
Period 2	-0.660***	-0.788***	0.117***
	(0.058)	(0.058)	(0.012)
Period 3	-0.030	0.059	-0.073***
	(0.046)	(0.045)	(0.010)
Govt	-0.119***	-0.124***	0.004
	(0.046)	(0.045)	(0.009)
Winner Margin	-0.0032***	-0.0032***	0.0001
	(0.0008)	(0.0008)	(0.0002)
Govt * Winner Margin	0.0026***	0.0025***	0.0000
	(0.0012)	(0.0012)	(0.0002)
Population (Millions)	0.163***	0.186***	-0.020***
	(0.042)	(0.041)	(0.008)
Period 1 * Govt	0.173***	0.152***	0.027**
	(0.073)	(0.073)	(0.016)
Period 1 * Winner Margin	0.0055***	0.0045***	0.0013***
	(0.0019)	(0.0019)	(0.0004)
Period 1 * Govt * Winner Margin	-0.0064***	-0.0052***	-0.0012***
	(0.0023)	(0.0023)	(0.0005)
Period 1 * Population	0.267***	0.245***	0.018**
	(0.045)	(0.044)	(0.011)
Period 2 * Govt	0.064	0.075	-0.011
	(0.072)	(0.071)	(0.015)
Period 2 * Winner Margin	0.0008	0.0010	-0.0004
	(0.0019)	(0.0019)	(0.0004)
Period 2 * Govt * Winner Margin	-0.0017	-0.0014	0.0001
	(0.0023)	(0.0023)	(0.0005)
Period 2 * Population	0.099***	0.076**	0.020***
	(0.041)	(0.040)	(0.009)
Period 3 * Govt Supporter	0.052	0.074	-0.012
	(0.062)	(0.062)	(0.014)
Period 3 * Winner Margin	0.0010	0.0011	-0.0001
	(0.0010)	(0.0010)	(0.0002)
Period 3 * Govt * Winner Margin	4.91E-5	-0.0004	0.0002
	(0.0016)	(0.0016)	(0.0004)
Period 3 * Population	0.092***	0.065***	0.021***
	(0.042)	(0.041)	(0.010)
Constant	22.56***	22.73***	0.84***
	(0.03)	(0.03)	(0.01)
Observations	468	468	468
R-squared	0.96	0.98	0.99

Standard errors are shown in brackets. *** significant at 5% , ** significant at 10%. Aggregation of data to form election cycles were achieved as follows; Period 1 comprised of observations related to 1994 to 1996, Period 2 comprised of observations from 1997 to 2000, Period 3 was made up for observations from 2001 to 2003 and Period 4 comprised of observations from 2004 and 2005. Population is in millions.

The results in Table 1.12 agree with previous ones which show that there has been growth in real Disbursements and Allocation but also that the ratio of Disbursement to Allocation has been falling over time. The regression model allows a comparison of the outcomes of government-supporting districts in the first three presidential terms to their outcomes in the fourth presidential term. The evidence shows that in terms of the four-year total DACF Disbursement and Allocation as well as ratio of Disbursement to Allocation, government-supporting districts have a statistically significant advantage over others in the first election cycle. Government-supporting districts received on average 17.3% more DACF Disbursement and 15.2% more DACF Allocation than non government-supporting districts during the first election cycle with the DACF program in existence.

In the second and third election cycle, there is no significant difference between government-supporting districts and others. It is important to note that this evidence is does not imply that the advantage or disadvantage that a district faces in any year is eliminated. Time and credit constraints are typically very important in the production function of public goods and even though the total Disbursement over four years that government-supporting districts receives is no different from a similar non government-supporting district, the timing of the release can have important ramifications for how the funds benefit a population. The negative coefficients on Govt, the government supporter dummy variable, and Winner Margin interaction in the first two election cycles suggests some political manipulation of the district outcomes according to its political affiliation and the competitiveness of the political market there. The evidences shows that the outcome of a district over the entire four years that the political party it supported is in

power, is better for districts in which the government faced more competition in the election. A possible explanation is that the ruling government disburses more DACF funds to areas where it faces stiff competition in its road to victory to detriment of areas that it is assured of winning. This evidence is in line with the theories of Dixit and Londregan (1996) and Lindbeck and Weibull (1987, 1993).

The sign of the coefficients on Winner Margin and Govt and Winner Margin interaction shows a division between political strategies that coincides with the transfer of power from the National Democratic Congress (NDC) political party to a government led by the New Patriotic Party (NPP). In the first two periods, those in which the NDC was in power, relatively less DACF Disbursement was targeted to government-supporting districts in which the ruling party had won by a higher percentage of votes compared to districts that it had won with a smaller percentage. On the other hand, in the third and fourth periods, those in which the NPP party was in power, the exact opposite is true and relatively more DACF Disbursement is targeted to government-supporting districts where the party won by a higher percentage. Additional evidence of the differing strategies resource allocation of the two political parties is that in the third period, there is no apparent advantage for government-supporting districts and that in deed in the fourth period, non government-supporting districts are the ones that have an advantage.

The results of the analysis of the districts' outcomes summed over the entire election cycle is further evidence that the existence of a formula-based system of resource allocation does not preclude political motivations for influencing the development resources that districts receive.

1.4.4 Is the formula manipulated?

A possible avenue for government to target districts is through the choice of indicators and weights used in the formula. Since the inception of the DACF, the recommendation of the DACF Administrator, which must first be approved by the office of the President, has been accepted by Parliament for implementation without change. It is striking that the major changes in the DACF formula all took place in election years, 1996, 2000 and 2004. I calculate the proportion of the fund that each district would have received in each of these years if the formula in the previous year had been employed. I then compare the outcome for government-supporting and non government-supporting districts under the actual formula to the calculated counterfactuals. I also calculate the counterfactual in 2002 because it was the first year of the DACF under an Administrator appointed by the government of a new regime.

The results of this exercise are shown in Table 1.13. In the election years, 1996, 2000 and 2004, the actual average proportion of the fund received by non government-supporting districts is higher than that received by other districts. Interestingly, this trend is exactly the opposite under the counterfactual; government-supporting districts would have received on average a larger proportion of the fund than non government-supporting districts. Also, the factual average proportion for government-supporting districts is lower than the counterfactual average while the factual average for non government-supporting districts is higher than counterfactual. These results suggest that if the formula was manipulated for political reasons in election years, it was changed to provide non government supporting districts larger proportions of the fund than they would have received otherwise. Using political support for the incumbent government in

Table 1.13: Districts' Proportion Of DACF Funds Under Actual And Counter Factual DACF Formula

District Share of Fund	Average in All Districts	Average in Government Supporting Districts	Average in Non-Government Supporting Districts
1996 Actual	0.0091	0.0088	0.0101
	(0.0045)	(0.0045)	(0.0047)
1996 Counter Factual	0.0091	0.0093	0.0085
	(0.0028)	(0.0030)	(0.0019)
2000 Actual	0.0091	0.0089	0.0097
	(0.0031)	(0.0029)	(0.0037)
2000 Counter Factual	0.0091	0.0093	0.0087
	(0.0023)	(0.0025)	(0.0018)
2002 Actual	0.0091	0.0096	0.0086
	(0.0025)	(0.0033)	(0.0015)
2002 Counter Factual	0.0091	0.0085	0.0096
	(0.0022)	(0.0021)	(0.0022)
2004 Actual	0.0072	0.0070	0.0074
	(0.0015)	(0.0014)	(0.0015)
2004 Counter Factual	0.0072	0.0073	0.0072
	(0.0017)	(0.0020)	(0.0013)

Standard Deviations are shown in Brackets.

the last presidential election as a predictor of expected support in the next election (see Table 1.3), one can conclude that the political landscape in Ghana in 1996 and 2000 was much more unsymmetrical than in 2004. I suggest that in 1996, the incumbent government perceived such widespread political support that it could actively pursue non government-supporting districts with the DACF even to the detriment of its supporters. A similar political scenario existed in 2000 even though to a lesser extent. In 2004 when the political support for the districts is split almost fifty-fifty between the incumbent and the opposition, the government-supporting and non government-supporting districts are treated very similarly. The variance of the distribution under the counterfactual in 1996 and 2000 is lower than the factual variance. However, the variance of the counterfactual in 2004 is slightly higher than the factual variance. The tighter distribution in a highly

competitive election year is suggestive of a lower willingness to benefit any one group to the detriment of the other.

The counterfactual in 2002 suggests that the formula was changed to benefit districts which had brought into power the new regime of the NPP government in 2001. With the appointment of an NPP selected DACF Administrator at the end of 2001, the first opportunity for the central government to show any preferential treatment to its supporting districts through the disbursement of the DACF would have been in 2002. The departure from the tradition of major changes in the DACF formula in election years also suggests a different motivation for the formula change. This hypothesis is borne out in the differences between the counter factual compared to the actual proportions in 2002 as opposed to election years. Table 1.13 shows that the formula change in 2002 resulted in average proportion of the DACF received by government-supporting districts being higher under the actual formula than under the counterfactual. The average proportion received by non government-supporting districts would have been higher under the counterfactual if the formula had not changed. The variance of the factual distribution of districts' proportions of the fund is also larger than in the counterfactual. The evidence in Table 1.13 shows that there is some merit to both of the opposing theories of how governments shift development resources to areas based on their political affiliation. In election years, the government targets districts that it did not win in the previous election suggesting that the marginal district is more important to the incumbent as argued by Dixit and Londregan (1996) and Lindbeck and Weibull (1987, 1993). However, in 2002, the result of the formula change is in line with the model presented by Cox and McCubbins (1986). The model that best describes the situation in Ghana depends on the

stage of the political cycle and possibly the overall political climate and strategy of the ruling party.

1.4.5 Was there Political Motivation in redistricting?

The DACF formula has a factor that divides a proportion of the total DACF allocation equally between all districts. In addition to this base amount, each Member of Parliament receives an equal amount of funds out of the 'Contingency' portion of the DACF. Therefore a possible avenue for the central government to distribute funds preferentially to an area is to simply create more districts or constituencies in that area. Since the inception of the DACF in 1994, there has only been one episode of redistricting which occurred after the 2000 population census. Article 47 of the 1992 constitution states that:

"The Electoral Commission shall review the division of Ghana into constituencies at intervals of not less than seven years, or within twelve months after the publication of the enumeration figures after the holding of a census of the population of Ghana, whichever is earlier, and may, as a result, alter the constituencies."

I search for any effect of the political affiliation of a district in the last election before the redistricting, the 2000 elections. In this election, with the exception of two out of one hundred and ten districts, and four out of two hundred constituencies, either the candidate for NDC or NPP came out as winner. Due to the fact that boundaries can only be altered rarely, I consider that this mode of preferentially targeting government-supporting areas may be used reservedly so that it is the district or constituency's history

of political support, and not just political support in 2000 that has an influence on whether or not it was split. I estimate

$$y_i = \beta_0 + \beta_1 Pop_i + \beta_2 Popdense_i + \beta_3 Politics_i + u_{it} \qquad \textbf{Equation 1.6}$$

where y is a dummy variable for whether a district (constituency) was split, *Pop* is the population of a district (constituency), *Popdense* is the population density in the district (constituency) and *Politics* is one of the following dummy variables; *NDC* which equals 1 if NDC won the district (constituency) in the 2000 presidential elections, or, *NPP* similarly defined, or, *NDCPAR* which equals 1 if NDC won the parliamentary seat in the constituency, or *NPPPAR* similarly defined, or, *NDCBOTH* which equals 1 if NDC won the constituency in the presidential election as well as the parliamentary seat, or, *NPPBOTH* similarly defined, or, *NDCSTRONGHOLD* which equals 1 if the district has voted for NDC in all election from 1992 to 2000, or *NPPSTRONGHOLD* similarly defined.

The coefficients on Politics when y is the dummy for splitting of districts are all insignificant. This suggests that there is no political consideration in the re-demarcation of districts.

The results of the regressions in Equation 1.6 where y = 1 if a constituency is split are shown in Table 1.14. There is strong evidence that a constituency that voted for NPP in the 2000 presidential or parliamentary elections was less likely to be split than one that voted for NDC. The coefficients estimate suggests that probability for a constituency that supported NPP in the 2000 presidential or parliamentary elections is 10% less than a

similar constituency that voted for NDC in either of these elections. Further evidence of a higher probability for NDC constituencies to be split is shown in columns V and VI of panel A. The coefficient *NDCSTRONGHOLD* suggests that these areas are 10% more likely to be split than other similar areas. The Head of the Electoral commission at the time of the re-demarcation was an appointee of the military government of the People's National Defense Council (PNDC) which became the National Democratic Congress (NDC) in 1992.

Table 1.14: OLS Regressions Of Probability Of Constituency Being Split In 2004

Panel A	Dependent Variable: 1 if Constituency was split					
	I	II	III	IV	V	VI
Population (Millions)	5.80***	6.96***	5.96***	6.97***	5.86***	7.02***
	(0.66)	(0.65)	(0.68)	(0.65)	(0.66)	(0.65)
Population Density		-77.0		-72.0		-75.9
		(16.1)		(16.1)		(15.9)
NDC winner parliamentary election	0.075**	0.016				
	(0.044)	(0.042)				
NDC winner Presidential election			0.14***	0.077**		
			(0.04)	(0.042)		
NDC stronghold					0.10***	0.05
					(0.05)	(0.05)
Panel B	**Dependent Variable: 1 if Constituency was split**					
	I	II	III	IV		
Population (Millions)	6.04***	6.98***	5.86***	6.97***		
	(0.65)	(0.65)	(0.66)	(0.65)		
Population Density		-70.0		-75.0		
		(16.2)		(16.0)		
NPP winner Parliamentary and Presidential election	-0.153***	-0.085***				
	(0.043)	(0.042)				
NDC winner Parliamentary and Presidential election			0.101***	0.044		
			(0.044)	(0.042)		

Standard errors shown in brackets. *** significant at 5% , ** significant at 10%. Population data relates to 2000. Population density measured in millions per km^2

1.4.6 Is there Political Influence in the performance of District Assemblies?

Whilst there is evidence that the disbursement of the DACF from central government to the district assemblies is influenced by political variables, the question of whether political influence exists at the District assembly level is particularly interesting because of the formal non-partisan politics required for election to a District Assembly. Even though elected members form a majority, final decisions are made by a political appointee of the central government. If this structure results in antagonism that impedes the planning and budgeting functions of the Assemblies, one can expect that Assemblies in government-supporting areas may have a higher percentage utilization of their disbursement. This is because elected Assembly members are more likely to belong to the same political party as the District Chief Executive. Administrative costs of the assembly are also likely to be affected by the political affiliation of elected members. One can imagine that a more politically disharmonious Assembly has to convene several meetings in order to reach any consensus thereby driving up administrative costs. On the other hand it may be easier for a politically harmonious Assembly to use money in costly administrative endeavors such as visits to program sites and official perks[16].

In order to distinguish the effects of the influence of political affiliation of elected members of the District Assembly, from other factors that can affect its performance, I estimate the regression model in Equation 1.7

$$y_{it} = \gamma_0 + \gamma_1 \mathbf{Govt}_{it} + \gamma_2 \mathbf{GDP}_{it} + \gamma_3 \mathbf{Ethnic}_{it} + \gamma_4 \mathbf{Literacy}_{it} + \gamma_4 \mathbf{DACF}_{it} + \gamma_4 \mathbf{Pop}_{it} + \gamma_5 \mathbf{Popdense}_{it} + \varphi_2 \mathbf{RegionDums}_{it} + \nu_{it} \qquad \textbf{Equation 1.7}$$

[16] Personnel emoluments for Assembly members and co-opted members of Assembly sub-committees are decided by Assembly members. A more politically harmonious Assembly can have higher administrative costs because members vote to give special officers with whom they share political allegiance relatively higher perks.

where y is one of the following measures of performance of the District Assembly; percentage utilization of disbursement, administration costs, total expenditure, proportion of expenditure spent on administration or proportion of disbursement spent on administration. *Govt* is the political support dummy previously defined, *GDP* is the district 1992 gross domestic product, *Ethnic* is a measure of the ethnic fragmentation, *Literacy* is the percentage of population above fifteen years literate in English or a Ghanaian language, *DACF* is the district disbursement from the DACF, *Pop* is district population, *Popdense* is population density and ***RegionDums*** is a set of region dummies. *Govt* and *Ethnic* measure the ease of assembly to agree on initiatives for various parts of the districts. *Literacy* proxies for the quality of members of the Assembly in their ability to carry out functions of the Assembly, such as producing and submitting budgets required for timely release of funds. *GDP, Pop, Popdense* and ***RegionDums*** measure the urgency with which additional expenditure on public good provision is needed.

The results of OLS estimation of Equation 1.7 when y is percentage utilization of DACF disbursement is shown in Table 1.15. Data availability for this variable is restricted to 1994, 1997, 2000 and 2003 but there is evidence that in the early years of the DACF, District Assemblies in areas that voted for the ruling central government were better able to spend down their allocation. In 1994 and 1997, Assemblies in government areas were able to achieve percentage utilization ten and twelve percentage points more respectively than non government-supporting areas. This higher percentage utilization of disbursements does not exist in the data for 2000 and 2003. Part of the better performance in government areas in 1994 likely comes from intervention by the office of

the DACF itself. In 1994 during the transfer of projects centrally run by the government to district assemblies, the office of the DACF handled the payment of some projects for some districts. The regressions in Table 1.16 show that in the sectors of education, health and other local government branches, the amount paid by the DACF on behalf of districts is larger in government-supporting districts than in similar non government-supporting districts.

Table 1.15: OLS Regressions of Percentage Of District Disbursement Utilized

	Dependent Variable: Percentage of Disbursement Utilized Annually			
	1994	1997	2000	2003
Government Supporter	0.098**	0.117**	-0.035	0.004
	(0.051)	(0.061)	(0.092)	(0.051)
DACF Disbursement in Billions	-0.490**	0.130	-0.100	-0.004
	(0.270)	(0.100)	(0.074)	(0.019)
Ethnic	0.041	-0.254***	0.318	0.121
	(0.087)	(0.125)	(0.183)	(0.111)
Literacy rate	0.003	0.003	0.007**	0.003
	(0.002)	(0.003)	(0.004)	(0.003)
Population (Millions)	0.14	0.18		
	(0.20)	(0.25)		
Population Density	-1.99	0.94	0.43	-0.07
	(2.03)	(2.75)	(2.15)	(1.31)
1992 GDP per capita	0.0004***	-0.0005***		
	(0.0002)	(0.0002)		
Distance from Accra (km)	0.0004	-0.0003		
	(0.0003)	(0.0004)		
Employment in Agriculture			-0.0041	0.0003
			(0.0031)	(0.0014)
Constant	-0.12	0.73***	0.74***	0.61***
	(0.15)	(0.20)	(0.34)	(0.22)
Region Dummies	Yes	Yes	Yes	Yes
Observations	100	110	108	110
R-Squared	0.25	0.28	0.21	0.11

Standard errors shown in brackets. *** significant at 5% , ** significant at 10%. All demographic data relates to 2000. Population density measured in millions per km²

Table 1.16: OLS Regressions of Funds paid on Behalf of districts by the office of the DACF in 1994

	Ln(Education expenditure)		Ln(Health expenditure)		Ln(Other Expenditure)	
Government Supporter	3.58**	2.15	3.38**	3.78*	5.01***	3.38*
	(1.93)	(2.65)	(1.95)	(2.50)	(1.72)	(2.30)
Ln(Disbursement)	-1.41	4.00	-4.13	-5.53	-6.49**	-6.29**
	(4.02)	(4.35)	(3.89)	(4.09)	(3.55)	(3.72)
Population (Millions)	1.9	-2.3	11.0	17.0	14.0***	12.0**
	(11.0)	(13.0)	(14.0)	(16.0)	(7.2)	(7.2)
Area * 1000	0.60**	0.21	0.20	0.67**	-0.42	-0.73***
	(0.33)	(0.38)	(0.33)	(0.37)	(0.30)	(0.34)
Schools	0.021	0.027				
	(0.016)	(0.020)				
Hospitals			0.026	-0.009		
			(0.102)	(0.109)		
1992 GDP per capita	0.0133**	0.0125	0.0089	0.0068	0.0002	-0.0084
	(0.0071)	(0.0080)	(0.0070)	(0.0081)	(0.0064)	(0.0072)
Constant	23.1	-87.2	77.0	104.4	124.5**	134.7**
	(79.5)	(85.5)	(74.0)	(79.1)	(67.7)	(72.0)
Region Dummies	No	Yes	No	Yes	No	Yes
Observations	108	108	109	109	109	109
R-squared	0.15	0.26	0.1	0.22	0.12	0.23

Standard errors are shown in brackets. *** significant at 5% , ** significant at 10%..

Table 1.17 shows the results of regressions on Equation 1.7 when y is administration costs and also when it is total expenditure. These results also suggest that government influence was stronger in the early years of the District Assemblies compared to later years. In 1997, a District Assembly in a government-supporting district spent about 22% more than a similar district in a non government-supporting area. In this year also, Assemblies in government areas spent 108% more on administration than others. The higher spending and higher administrative costs are not present in 2000 and in 2003, the two other years for which data is available. Due to the fact that Assemblies in government-supporting areas received higher DACF disbursements, it is not surprising that they had higher total expenditures and administration costs.

Table 1.17: OLS Regressions Of Total Expenditure And Administrative Costs

Panel A:	Natural Log of **Total Expenditure** in Year:					
	1997		2000		2003	
Government Supporter	0.215***	0.076	-0.092	0.332	-0.004	-0.047
	(0.085)	(0.069)	(0.766)	(0.615)	(0.073)	(0.060)
Log Disbursement	1.02***	0.96***	0.95	-0.00	0.94***	0.88***
	(0.14)	(0.11)	(1.76)	(2.12)	(0.19)	(0.17)
Ethnic	-0.44***	-0.40***	-0.90	-0.87	0.15	0.12
	(0.17)	(0.15)	(1.60)	(1.34)	(0.15)	(0.13)
Literacy rate	0.007**	0.000	-0.008	0.004	0.003	-0.000
	(0.004)	(0.002)	(0.036)	(0.021)	(0.004)	(0.002)
Population (Millions)	0.30	0.39**	1.01	1.76	0.037	0.14
	(0.26)	(0.24)	(2.30)	(2.04)	(0.23)	(0.19)
Population Density	-0.68	-0.59	12.48	0.81	-0.25	-1.15
	(1.62)	(1.51)	(18.36)	(16.24)	(1.79)	(1.58)
Constant	-1.07	0.65	1.08	20.30	0.92	2.24
	(2.90)	(2.33)	(35.84)	(31.23)	(4.18)	(3.73)
Region Dummies	Yes	No	Yes	No	Yes	No
Observations	110	110	110	110	110	110
R-squared	0.68	0.62	0.06	0.02	0.45	0.41
Panel B:	Natural Log of **Administration Costs** in Year:					
	1997		2000		2003	
Government Supporter	1.078**	0.314	0.219	0.458	0.077	-0.072
	(0.576)	(0.475)	(1.043)	(0.804)	(0.225)	(0.184)
Log Disbursement	1.34	1.40**	1.26	0.46	0.77	0.77
	(0.97)	(0.78)	(2.29)	(1.93)	(0.58)	(0.52)
Ethnic	-2.09**	-1.47	-2.49	-2.92**	0.19	0.22
	(1.17)	(1.04)	(2.11)	(1.76)	(0.47)	(0.40)
Literacy rate	0.058***	0.013	0.039	0.022	-0.006	-0.006
	(0.025)	(0.016)	(0.047)	(0.028)	(0.012)	(.007)
Population (Millions)	-1.11	-0.44	-0.27	0.74	0.17	0.094
	(1.81)	(1.60)	(3.00)	(2.61)	(0.70)	(0.59)
Population Density	9.89	8.03	22.48	6.92	3.57	3.32
	(10.99)	(10.29)	(24.18)	(20.96)	(5.58)	(4.89)
Constant	-10.67	-10.04	-7.71	9.44	3.60	3.78
	(19.76)	(15.93)	(48.20)	(41.03)	(12.84)	(11.46)
Region Dummies	Yes	No	Yes	No	Yes	No
Observations	110	110	110	110	110	110
R-squared	0.2	0.06	0.06	0.03	0.15	0.09

Standard errors are shown in brackets. *** significant at 5% , ** significant at 10%. Population density measured in millions per km²

Table 1.18 shows that even as a proportion of disbursements or proportion of total expenditure, there is still evidence that Assemblies in government-supporting districts spent more on administration than others. There is only marginal statistical evidence that the proportion of disbursements spent on administration is higher for government-supporting districts in 1997. However, in 2000, there is evidence that administration costs as a proportion of both total expenditure and District DACF disbursement is higher in Assemblies in government-supporting districts. I suggest that this observation is linked to the fact that 2000 was a major election year. Some Assemblies may have engaged in higher community outreach and in other activities requiring Assembly funds. It follows that such activities would only happen in government-supporting districts because typically, the performance of a District Assembly is attributed to the political party in power at the highest level of government. In 2003, this disparity no longer exists.

In general, it appears that there is some influence of the politics of a District Assembly in its performance in the early 1990s. However the influence has apparently decreased over time.

Table 1.18: OLS Regressions of Proportion of District Assembly Expenditure spent on Administration and Proportion of District Assembly DACF Disbursement spent on Administration

	Dependent Variable: **Administration Cost/Total Expenditure** in year:			Dependent Variable: **Administration Costs/DACF Disbursement** in year:		
	1997	2000	2003	1997	2000	2003
Government Supporter	0.037	0.081**	0.013	0.071	0.084***	0.004
	(0.048)	(0.042)	(0.036)	(0.045)	(0.043)	(0.033)
Population (Millions)	-0.16	-0.12	-0.05	-0.15	-0.12	-0.14
	(0.20)	(0.11)	(0.10)	(0.19)	(0.17)	(-.11)
Total expenditure (billions)	-0.011	-0.011	0.006	0.009	-0.015	0.171
	(0.061)	(0.031)	(0.011)	(0.071)	(0.061)	(0.021)
ETHNIC	-0.067	-0.225***	0.017	-0.129	-0.081	0.073
	(0.095)	(0.089)	(0.076)	(0.092)	(0.089)	(0.068)
Literacy	0.0003	-0.0017	-0.0007	0.0005	0.0009	0.0009
	(0.0021)	(0.0021)	(0.0017)	(0.0020)	(0.0021)	(0.0016)
Population Density	1.00	1.52	1.71***	0.39	1.42	1.43**
	(0.89)	(1.03)	(0.87)	(0.86)	(1.03)	(0.79)
Constant	0.33***	0.48***	0.31***	0.23	0.25**	0.09
	(0.14)	(0.12)	(0.11)	(0.14)	(0.14)	(0.12)
Region Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observation	110	110	110	110	110	110
R-Squared	0.17	0.24	0.28	0.17	0.21	0.24

Coefficients on all included explanatory variables except for region dummies are shown. Standard errors are shown in brackets. *** significant at 5%, ** significant at 10%.

1.5 Conclusion

The District Assemblies Common Fund (DACF) in Ghana was created in 1994 to galvanize the performance of District Assemblies, the workhorses of the system of decentralized local government that was created in 1988. The resources from the DACF alleviated the immense financial inadequacy of locally raised resources of District Assemblies in relation to their mandated responsibilities. With over 90% of the revenue of District Assemblies being derived from the DACF, the fund creates a direct link between central government influence and the welfare of citizens at the local level. This situation immediately raises an opportunity for the DACF to become a political tool. The distinctive feature of the DACF is that it relies on a formula to determine Districts' Allocations. An important question that remained however was whether and how political influence and motivation exists in the framework of a centrally managed formula-based system of monetary transfer. To this end, I conducted an empirical investigation of the relationship between DACF Allocation, Disbursements and political factors.

I find that the DACF formula rules are followed in calculating the districts' Allocations however, the amount of funds that the districts receive, their Disbursements, is generally different from this amount. In the early years of the DACF program, government supporting districts experienced an advantage in terms of per capita Disbursements, per capita Allocation and proportion of Allocation disbursed that has been declining over time.

Counterfactual allocations calculated suggest that the DACF formula was purposefully manipulated as most of the major changes occurred in election years. These

formula changes resulted in non government-supporting districts receiving a higher allocation than government-supporting districts in election years. The formula change in 2002, the only non election year with a major formula change, resulted in an allocation that provided government-supporting districts with a greater allocation than they would have received otherwise.

The growth in DACF Disbursements and the proportion of DACF Allocations that are disbursed follow an election cycle. The DACF Disbursement follows an election cycle which is perceived to a greater degree by non government-supporting districts. Growth in DACF disbursement is highest in an election year and lowest two years after an election. One and two years following a presidential election, the Disbursement to Allocation ratio is lower than it is in year three and in the election year of the election cycle. The election cycle in Disbursement/Allocation is also experienced to a greater degree by non-government-supporting districts compared to government-supporting ones. Districts that are non government-supporting have a higher Disbursement to Allocation ratio than government supporting districts in election years and a lower one in the other three years of the election cycle.

There is apparently no political motivation in the first and as yet only re-demarcation of districts in Ghana after the implementation of the DACF. However, more constituencies were created in areas which voted for the political party of the government that appointed the head of the body that undertook their re-demarcation. The smaller constituencies created a greater number of parliamentarians from these areas as well as increased the total Member of Parliament DACF funds to these areas.

I find some evidence of political influence in the performance of the formally non-partisan District Assemblies in 1994 and in 1997[17]. District Assemblies in areas that supported the ruling government in the previous election were able to achieve a higher percentage utilization of their disbursement than other similar districts. In 1994, this fact is possibly driven in part by the fact that the DACF office made direct payments on behalf of some districts. Costs attributed to the administration of District Assemblies, in level terms and as a proportion of total disbursements or expenditure, are significantly higher in government-supporting districts than others in 2000. I suggest that this observation may be linked to Assemblies involving themselves in activities in government-supporting districts as part of the politicking for the incumbent in the presidential and parliamentary elections at the end of that year. There is no evidence of higher administrative costs in government-supporting districts in 1997 and in 2003, the other years for which data is available.

The results of this study are encouraging and suggest that even though there is a scope for political influence in a formula-based system of central transfers, over time the institution shows a tendency limit the extent to which politics drives resource allocation. With further evidence of efficient utilization of disbursements at the district level, such formula-based systems of monetary transfer to locally based development agents in a country could become the instrument of precipitating local development that is relatively free of central political influence.

[17] District Assembly expenditure data is only available for the years 1994, 1997, 2000 and 2003.

Chapter 2

Population Heterogeneity And Local Public Good Provision: The Impact Of A Government Intervention in Ghana

2.1 Introduction

An understanding of the factors that influence public good production is critical in the developing world where adequate provision can tip the scale in favor of a reasonable standard of living over dire outcomes like abject poverty, sickness or even death. Empirical evidence by authors like Banerjee, Iyer and Somanathan (2004), Easterly and Levine (1997), and Miguel (2000), show that population homogeneity is an important factor in local public good provision in areas where the mechanisms described by Tiebout and related theories are unlikely to be at play. The exact mechanisms by which population heterogeneity influence public good provision in such areas are still not well understood[18]. One approach to unearthing the possible mechanisms is to observe how this relationship is impacted by particular government interventions. To this end, I study how the creation of a program that automatically made large sums of money available to local governments influenced the relationship observed between population heterogeneity and public good provision.

Specifically I compare the relationship between population heterogeneity and public good provision in Ghana before and after the introduction of a new formula-based system of funding for local public good provision, the District Assemblies Common Fund (DACF). The DACF was created in 1994 by the central government to provide financial

[18] A summary of various mechanisms are discussed in Banerjee, Iyer and Somanathan (2006)

assistance to District Assemblies, which had been formed in 1988 to be the work horses of its new system of decentralized government. Prior to 1988, local government in Ghana did not exist in any sense as separate from central government and public goods were provided through a monolithic structure. The creation of District Assemblies by the 1988 Local Government Law did little to change that system in actuality because the assemblies were unable to raise funds commensurate with their legislated mandate. The creation of the DACF was an important boost to the operation and relevance of District Assemblies.

In the original relationship, I find that communities[19] that have lower levels of fractionalization along religious and language lines tend to have better access to public goods. A comparison of the relationship between social fragmentation and access to public goods two years before the introduction of the DACF and four years after the introduction shows some evidence that the new system of funding for local governments reduces the number of categories of public goods in which more heterogeneous communities are disadvantaged. The evidence suggests that one of the ways in which population homogeneity influences provision of local public goods is through the ability of more homogeneous populations to better garner funds for use in provision in their communities.

The remainder of the chapter is organized as follows. A background is presented in the next section. A description of the data used is presented in section 2.3 and the empirical strategy is described in section 2.4. The results are discussed in section 2.5 and section 2.6 concludes.

[19] A community is an area with an average of two hundred and forty households.

2.2 Background

Conditions in Ghana, like in many developing countries, cannot be accurately described by the assumptions on which typical theories of fiscal federalism are based. As such the prescribed assignment of functions to various levels of government and the expected welfare gains from fiscal decentralization may not be applicable in such areas. For instance, most developing countries have very low mobility of households and factors of production; 64% of respondents in the Ghana Living Standards Survey 1998/1999 reported that they had lived in the home of their birth their entire lives and 74% had lived in the same community. This is in stark contrast to a moving rate of 46% in the United States. Many of principles of fiscal federalism, though not wholly, rely critically on the assumption of household mobility. In addition, most of government revenue is collected at the highest level of government and sourced from only a small proportion of the population. This is suggestive of the need for a better understanding for the mechanisms and factors which influence public good provision in such areas.

Empirical evidence has so far implicated population homogeneity as an important factor in the process of public good provision in developing countries. As discussed in Banerjee, Iyer and Somanathan (2006), the mechanisms considered generally regard the role of population homogeneity in collective action. There is however a variety of reasons why more heterogeneous populations are less able to engage in collective action. These range from the difference in tastes for public goods across different segments of the population, the possibility that more heterogeneous populations have lower scope for social sanctions against free riders or corrupt officials, or a general mistrust amongst members of more heterogeneous communities which prevents them from engaging with

each other even for their common good. An approach for demonstrating the relative importance of each of these possible mechanisms is to observe the change in the relationship between population heterogeneity and public good provision when each of these factors is eliminated from consideration.

The creation of the DACF in Ghana is an important intervention by the government which dramatically increased the capacity of District Assemblies to perform their functions by improving their financial independence. This scenario allows an observation of how eliminating the need for a community to actively lobby for financial assistance from the central government influences the role of population heterogeneity in access to public provision. This in turn enables an indirect assessment of how important population heterogeneity of a community is in garnering funds from the central government. It also narrows the list of the important mechanisms through which population heterogeneity impacts local public good provision.

A better understanding of the factors that influence local public good provision can encourage policy makers to explore innovative ways of combining aspects of typical fiscal federalism with programs that are uniquely suited to developing countries.

2.3 Data and Descriptive Statistics

Data used in the empirical analysis is compiled from two of the World Bank's Living Standards Measurement Studies; the *Ghana Living Standards Survey, 1991 - 1992* (GLSS3) and *Ghana Living Standards Survey 1998 – 1999* (GLSS4). It includes

observations from rural areas in all the regions of the country. The timing of the two Ghanaian Living Standards Surveys is such that the introduction of the District Assemblies Common Fund falls in between the periods from which the surveys were conducted. GLSS3 was taken just prior to the return of democratic governance in Ghana in 1993. GLSS3 is also representative of access to public amenities and services under the nascent system of District Assemblies that were required to execute their mandate under locally raised revenue. An important improvement in the capacity of District Assemblies occurred with the establishment in 1994 of the District Assemblies Common Fund (DACF). The DACF is therefore an important demarcation between access to public goods as described in GLSS3 and GLSS4.

The GLSS3 and GLSS4 rural data utilized include household-level as well as community level data. The GLSS3 data was collected over the period of September 1991 to September 1992 and covers four thousand five hundred and fifty-two households in three hundred and sixty-six 1984 population census enumeration areas. Of these enumeration areas, two hundred and forty-two were classified as rural communities and it is only data pertaining to these that are utilized. This is because community level data is only available for rural areas. With the exception of the expenditure data, the sample survey design was chosen so that each observation had a weighting of one. Further details on the survey methodology are in the user documentation. The community questionnaire was administered at a meeting with the community chief along with elders and other knowledgeable people in the community. GLSS4 was collected from April 1998 to March 1999 and covers five thousand five hundred and ninety-eight households

in three hundred 1984 population census enumeration areas. One hundred and ninety of the enumeration areas were classified as rural.

The household dataset utilized includes data on household demographics, ethnic identification, primary language and religion, economic activities, housing amenities, educational attainment of members and household wealth. It also includes the distances that a household has to travel to access each public good. The community datasets contain data on population characteristics such as size and infrastructure, availability of communication and transportation facilities, schools and health centers and water sources. The relevant sections of the two questionnaires used to create the datasets for GLSS3 and GLSS4 are identical except that GLSS3 reports the primary language of a household instead of its ethnic identification.

The explanatory variables of interest are measures of social divisions in a community. The first group of measures studied is simply the number of different groups in a classification based on either primary language (as determined by ethnicity) or religion, present in a community. The second group of measures is the same ethnolinguistic fractionalization measure usually used in the literature except that social divisions are considered along religious and language lines. The probability that two randomly selected individuals in a community belong to separate groups was calculated for each community according to Equation 2.1

$$\mathbf{Frac}_{\lambda} = \mathbf{1} - \sum_{i}^{x} s_i^2 \qquad \textbf{Equation 2.1}$$

where $Frac_{\lambda}$ is the measure of heterogeneity in a population with x different groups in a classification on the basis of a characteristic λ, and s_i is the percentage of the population

that has the same classification of the characteristic λ. Using the household level data, the religion, ethnic identification or primary language of the household head was used as a proxy for the characteristic of the entire household. The shares of the community falling within each category of a characterization where calculated on this basis. The ethnic identification of a household head was used to identify its primary language so that fractionalization measures from GLSS3 could be readily compared to GLSS4. The religious classifications in GLSS4 were also more desegregated than the classifications used in GLSS3. These two classifications were made comparable by aggregating subdivisions of religious classifications so that religious fractionalization could also be compared across GLSS3 and GLSS4; for example, the Methodist and the Presbyterian categories were combined to a single Protestant category.

The dependent variables of interest are measures of household access to a particular public good. These variables were of three main types; a summary index of access to public goods in a particular sector, a dummy variable for whether a particular public good is present anywhere in the community, the share of the population that has access to a particular good or the proximity of a particular public good to a household residence. The summary indices are calculated as the equally weighted average of the z-scores of the component measures in the sectors considered. The indicators are transformed so that a higher index always signifies a better outcome. For example, the component indicators of the summary index for the Education sector are measures of the presence of primary, middle and secondary school in an area minus the distance households have to travel to reach them.

The summary statistics of the measures of fractionalization in the two surveys show that the population heterogeneity of the communities had remained virtually unchanged between 1991/1992 and 1998/1999. The distributions of each primary language category and each religious category from the two periods are also essentially identical. Summary statistics of population heterogeneity and other variables for GLSS3 are shown in Table 2.1. Similar statistics for GLSS4 are presented in Table 2.2.

Table 2.1: Summary Statistics from Ghana Living Standards Survey 3 1991-1992

	Variable	Mean	Std. Dev.	Min	Max	Obs
Fractionalization by	Language	0.17	0.21	0.00	0.80	242
	Religion	0.54	0.20	0.00	0.82	242
Number of Distinct groups by	Language	1.74	0.96	1	6	242
	Religion	3.43	1.18	1	6	242
Present in Village:	Adult Literacy Program	0.64	0.48	0	1	242
	Clinic	0.23	0.42	0	1	242
	Community Health Worker	0.19	0.39	0	1	242
	Doctor	0.03	0.17	0	1	242
	Hospital	0.02	0.13	0	1	242
	Immunization Drive	0.97	0.17	0	1	242
	Malaria Drive	0.59	0.49	0	1	242
	Primary School	0.86	0.35	0	1	242
	Middle School	0.62	0.49	0	1	242
	Secondary School	0.12	0.33	0	1	242
	Nurse	0.18	0.39	0	1	242
	Phone	0.03	0.17	0	1	241
	Post Office	0.17	0.37	0	1	241
	Public Transport	0.51	0.50	0	1	241
	Road	0.79	0.41	0	1	241
	Traditional Birth Attendant	0.85	0.36	0	1	242
Share of Population who have	Rubbish Collected	0.00	0.01	0.00	0.11	242
	Rubbish Burnt	0.02	0.05	0.00	0.40	242
	Rubbish Burnt or dumped	0.99	0.07	0.00	1.00	242
	Rubbish Buried or Collected	0.01	0.07	0.00	1.00	242
	Rubbish Buried	0.01	0.07	0.00	1.00	242
	Rubbish dumped	0.97	0.09	0.00	1.00	242
	Electricity	0.06	0.19	0.00	1.00	242
	Pipe borne water	0.11	0.30	0.00	1.00	242
Distance (km) to	Middle School	4.54	5.62	1	35	90
	Secondary School	11.17	10.05	1	56	216
	Public Transport	8.56	12.27	0	94	173
Other:	Average Income (cedis)	338589	215898	34008	1968736	241
	Average Household Size	4.68	1.34	2.10	11.1	241
	% of Household Landless	0.50	0.37	0.00	1.00	240

Table 2.2: Summary Statistics from Ghana Living Standards Survey 4 1998-1999

	Variable	Mean	Std. Dev.	Min	Max	Obs
Fractionalization by:	Language	0.17	0.20	0	0.74	187
	Religion	0.60	0.17	0	0.81	187
Number of Distinct groups by	Language	1.93	0.98	1	5	187
	Religion	4.32	1.16	1	6	187
Present in Village:	Clinic	0.30	0.46	0	1	187
	Community Health Worker	0.33	0.47	0	1	187
	Doctor	0.04	0.20	0	1	187
	Electricity	0.33	0.47	0	1	187
	Hospital	0.02	0.13	0	1	187
	Immunization Drive	0.97	0.18	0	1	186
	Malaria Drive	0.56	0.50	0	1	186
	Primary School	0.86	0.35	0	1	187
	Middle School	0.64	0.48	0	1	187
	Secondary School	0.12	0.32	0	1	187
	Nurse	0.26	0.44	0	1	187
	Post Office	0.17	0.38	0	1	187
	Public Transport	0.70	0.46	0	1	187
	Road	0.86	0.35	0	1	187
	Traditional Birth Attendant	0.75	0.43	0	1	187
Share of Population who have:	Rubbish collected	0.01	0.07	0.00	0.95	187
	Rubbish Burned	0.03	0.10	0.00	0.75	187
	Rubbish Burned or Dumped	0.98	0.09	0.05	1.00	187
	Rubbish buried or collected	0.02	0.09	0.00	0.95	187
	Rubbish dumped	0.95	0.14	0.05	1.00	187
	Rubbish Buried	0.01	0.05	0.00	0.65	187
	Electricity	0.15	0.27	0.00	1.00	187
	Pipe borne water	0.18	0.36	0.00	1.00	187
Distance (km) to:	Middle School	4.90	4.87	1	24	68
	Secondary School	13.49	12.59	1	63	156
	Public Transport	8.38	11.20	1	70	55
Other	Average Income (cedis)	1951082	1208772	24965	6229723	186
	Average Household Size	4.66	1.16	2.55	9.0	187
	% of Household Landless	0.59	0.33	0.00	1.00	184

2.4 Empirical strategy

The aim of the empirical analysis is twofold. First is to discover the relationship between access to public goods and the level of social fragmentation in a community in Ghana as shown in the data from the *Ghana Living Standards Survey, 1991 - 1992* (GLSS3) and *Ghana Living Standards Survey 1998 – 1999* (GLSS4). Second and more important is to compare the differences and similarities in the relationships between population heterogeneity and access to public goods in the two time periods. The dependent variable in each model is some measure of access to a particular good or summary index public goods related to a particular sector, for example, education or health. The main coefficient of interest is that on the measure of social fragmentation. I first consider the datasets from the two periods separately. The two datasets are then pooled to allow for statistical tests on whether there is a difference between the models which explain the presence or access to the particular goods. In that analysis, my main interest is whether the way in which Social Divisions are related to the public good is different in the two periods, Ghana in 1991/1992 and Ghana in 1998/1999.

In Ghana, variation in the religious identification of households and language spoken allows for analysis of the relationship between social fragmentations along religious and language lines. For data relating to 1991 – 1992 (GLSS3), four measures of social fragmentation are analyzed; the number of the six possible categories of religion according to the classification reported in the *Ghana Living Standards Survey, 1991 - 1992* represented in the enumeration area and fractionalization along religious lines, as well as the number of the seven possible categories of the primary language of the household head in the community and fractionalization of the community along language

lines. Similar analysis is carried out for data relating to rural Ghana from 1998/1999 (GLSS4). Finally, the two datasets are pooled and the same analysis is carried out on the pooled data.

The relationship between social divisions and access to public goods in rural Ghana in the period 1991-1992 is analyzed based on regression estimation on

$$\mathbf{y_i = \alpha_1 + \alpha_2 Social\ Division_i + \alpha_3 Community\ Size_i + \alpha_4\ Average\ Income_i + \alpha_5 Community\ Wealth_i + \sum_{r=1}^{r=5} \gamma_r Share\ Religion\ r_i + \sum_{l=1}^{l=6} \gamma_l Share\ Language\ l_i + \nu_i}$$

Equation 2.2

where the coefficient of interest is that on Social Division, which is one of the following four measures of social divisions in the community; the number of the six possible religious groups represented in the community, the community fractionalization along lines of religion, the number of the seven possible primary languages of the household or the community fractionalization along lines of primary language. The dependent variable is either a summary index of community access to a sector of public goods or a measure of access to a particular public good. Community size is the average size of a household in the community, and Average Income is the average income of households in the community. It was apparent the social division defined as the number of religious or language groups did not change the sign of the relationship of interest and so only results where social division is defined as fractionalization along religious and language lines are presented for the individual public good analysis. The results of the regressions based on Equation 2.2 where the dependent variable is a summary index in rural Ghana in

1991/1992 is presented in Table 2.3. Results for individual measures on particular public goods in rural Ghana for that period are presented in Table 2.4.

Table 2.3: Relationship between Social Division and Summary indices in rural Ghana 1991/1992

		HEALTH		
	Fractionalization by Religion	Number of Religious groups	Fractionalization by Language	Number of Language groups
Social Division	-2.20	-0.13	-3.03***	-0.49
	(1.77)	(0.28)	(1.57)	(0.36)
R-squared	0.07	0.07	0.08	0.08
		HOUSEHOLD AMMENITIES		
	Fractionalization by Religion	Number of Religious groups	Fractionalization by Language	Number of Language groups
Social Division	-3.80***	-0.31**	-1.63	-0.37
	(1.17)	(0.19)	(1.06)	(0.24)
R-squared	0.13	0.10	0.10	0.10
		COMMUNICATION and TRANSPORTATION		
	Fractionalization by Religion	Number of Religious groups	Fractionalization by Language	Number of Language groups
Social Division	0.34	0.01	-0.72	-0.07
	(0.57)	(0.09)	(0.50)	(0.12)
R-squared	0.19	0.19	0.20	0.19
		EDUCATION		
	Fractionalization by Religion	Number of Religious groups	Fractionalization by Language	Number of Language groups
Social Division	-1.30	-0.13	-1.95***	-0.18
	(0.97)	(0.16)	(0.85)	(0.20)
R-squared	0.10	0.10	0.12	0.10

Coefficients on Social Division from Equation 2.4. Standard error shown in parenthesis. *** significant at 5%, ** significant at 10%. Number of observations in all regressions is 240. R-squared from each regression shown. Summary indices are equally weighted averages of z-score of summary indicators. Health index indicators are presence of doctor, nurse, midwife, traditional birth attendant, community health worker, or clinic in village and weather village has had immunization and malaria drive in past 5 years. Household amenities indicators are proportion of households with access to pipe-borne water and electricity, proportion of households who dump rubbish in open, proportion of households who burn their rubbish and proportion of households who bury their rubbish of have it collected. Communication and Transportation indicators are distance to post office and distance to public transport depot. Education indicators are primary school, middle school and adult literacy program present in community and distance to middle school and to secondary school.

Table 2.4: Relationship between Social Divisions and some public goods in Rural Ghana 1991/1992

	EDUCATION									
	Social Division: Fractionalization by Religion					Social Division: Fractionalization by Language				
	Primary School	Middle School	Adult Literacy Program	Distance to Middle School	Distance to Secondary School	Primary School	Middle School	Adult Literacy Program	Distance to Middle School	Distance to Secondary School
Social Division	-0.09	-0.15	-0.29	1.65	0.90	-0.01	-0.02	-0.39***	6.33***	7.98***
	(0.14)	(0.19)	(0.19)	(3.58)	(4.07)	(0.12)	(0.17)	(0.17)	(3.28)	(3.50)
Observations	240	240	240	90	214	240	240	240	90	214
R-squared	0.1	0.15	0.07	0.15	0.15	0.1	0.15	0.08	0.19	0.17
	COMMUNICATIONS AND TRANSPORTATION									
	Social Division: Fractionalization by Religion					Social Division: Fractionalization by Language				
	Road	Public Transport	Distance to Public Transport	Post Office	Phone	Road	Public Transport	Distance to Public Transport	Post Office	Phone
Social Division	0.06	0.26	-2.08	-0.20	-0.17***	0.22*	0.27**	6.83	-0.00	-0.05
	(0.16)	(0.18)	(5.19)	(0.14)	(0.06)	(0.14)	(0.16)	(5.06)	(0.15)	(0.06)
Observations	239	239	172	239	239	239	239	172	239	239
R-squared	0.16	0.29	0.22	0.16	0.17	0.17	0.29	0.23	0.16	0.15
	HOUSE HOLD AMENITIES									
	Social Division: Fractionalization by Religion					Social Division: Fractionalization by Language				
	Pipe borne Water	Electricity	Rubbish dumped	Rubbish burned	Rubbish collected/ buried	Pipe borne Water	Electricity	Rubbish dumped	Rubbish burned	Rubbish collected/ buried
Social Division	0.08	-0.12**	0.13***	-0.04***	-0.09***	-0.16	-0.12**	0.02	-0.01	-0.01
	(0.11)	(0.07)	(0.04)	(0.02)	(0.03)	(0.10)	(0.06)	(0.03)	(0.02)	(0.03)
Observations	240	240	240	240	240	240	240	240	240	240
R-squared	0.13	0.16	0.14	0.09	0.15	0.13	0.17	0.09	0.07	0.11

Standard errors shown in parentheses. *** significant at 5%, ** significant at 10%. All regressions include controls for village size, and percentage of population landless and shares of population in all but one Ethnicity group and shares of population in all but one religion group.

Table 2.4 continued: Relationship between Social Divisions and some public goods in Rural Ghana 1991/1992

HEALTH										
	Social Division: Fractionalization by Religion					Social Division: Fractionalization by Language				
	Doctor	Nurse	Midwife	Clinic	Community Health Worker	Doctor	Nurse	Midwife	Clinic	Community Health Worker
Social Division	-0.01	-0.08	-0.12	-0.18	-0.18	-0.02	-0.19	-0.23**	-0.20	-0.19
	(0.06)	(0.15)	(0.16)	(0.17)	(0.16)	(0.06)	(0.14)	(0.14)	(0.15)	(0.14)
Observations	240	240	240	240	240	240	240	240	240	240
R-squared	0.03	0.07	0.11	0.08	0.07	0.03	0.07	0.12	0.08	0.07

HEALTH					
	Social Division: Fractionalization by Religion			Social Division: Fractionalization by Language		
	Traditional Birth Attendant	Immunization Drive	Malaria Drive	Traditional Birth Attendant	Immunization Drive	Malaria Drive
Social Division	-0.20	-0.10*	0.19	-0.20	-0.02	-0.10
	0.15	0.07	0.18	0.13	0.06	0.16
Observations	240	240	240	240	240	240
R-squared	0.06	0.06	0.26	0.06	0.05	0.25

Standard errors shown in parentheses. *** significant at 5%, ** significant at 10%. All regressions include controls for village size, and percentage of population landless and shares of population in all but one Ethnicity group and shares of population in all but one religion group.

Data from GLSS4 is analyzed similarly and the results are presented in Tables 2.5 and 2.6. The dependent variable in Table 2.5 is always a summary index of community access to public goods in a particular sector in rural Ghana in 1998/1999. The relationship between individual measures of access to public goods and the two measures of social division in Ghana in 1998/1999 are presented in Table 2.6.

Table 2.5: Relationship between Social Division and Sector Summary indices in rural Ghana 1998/1999

	HEALTH			
	Fractionalization by Religion	Number of Religious groups	Fractionalization by Language	Number of Language groups
Social Division	1.97	-0.34	-1.34	0.04
	(2.50)	(0.33)	(1.87)	(0.37)
R-squared	0.13	0.13	0.13	0.13
	HOUSEHOLD AMMENITIES			
	Fractionalization by Religion	Number of Religious groups	Fractionalization by Language	Number of Language groups
Social Division	-0.30	-0.38**	-2.03**	-0.15
	(1.67)	(0.21)	(1.20)	(0.25)
R-squared	0.17	0.18	0.18	0.17
	COMMUNICATION and TRANSPORTATION			
	Fractionalization by Religion	Number of Religious groups	Fractionalization by Language	Number of Language groups
Social Division	-1.97***	-0.30***	-0.34	-0.10
	(0.57)	(0.08)	(0.44)	(0.09)
R-squared	0.21	0.22	0.15	0.16
	EDUCATION			
	Fractionalization by Religion	Number of Religious groups	Fractionalization by Language	Number of Language groups
Social Division	0.68	-0.23	-2.47***	-0.30
	(1.24)	(0.16)	(0.90)	(0.19)
R-squared	0.27	0.28	0.30	0.28

Coefficients on Social Division from Equation 2.4. Standard error shown in parenthesis. *** significant at 5%, ** significant at 10%. Number of observations in all regressions is 184. R-squared from each regression shown. Summary indices are equally weighted averages of z-score of summary indicators. Health index indicators are presence of doctor, nurse, midwife, traditional birth attendant, community health worker, or clinic in village and weather village has had immunization and malaria drive in past 5 years. Household amenities indicators are proportion of households with access to pipe-borne water and electricity, proportion of households who dump rubbish in open, proportion of households who burn their rubbish and proportion of households who bury their rubbish of have it collected. Communication and Transportation indicators are distance to post office and distance to public transport depot. Education indicators are primary school, middle school and secondary school present in community and distance to middle school and to secondary school.

Table 2.6: Relationship between Social Divisions and some public goods in Rural Ghana 1998/1999

EDUCATION										
	Social Division: Fractionalization by Religion					Social Division: Fractionalization by Language				
	Primary School	Middle School	Secondary School	Distance to Middle School	Distance to Secondary School	Primary School	Middle School	Secondary School	Distance to Middle School	Distance to Secondary School
Social Division	0.32	0.28	0.03	-1.97	14.01***	-0.23	-0.38***	-0.12	0.92	10.34***
	(0.20)	(0.24)	(0.17)	(3.65)	(6.67)	(0.15)	(0.18)	(0.13)	(3.18)	(5.07)
Observations	184	184	184	67	156	184	184	184	67	156
R-squared	0.08	0.25	0.13	0.28	0.26	0.08	0.26	0.13	0.27	0.26
COMMUNICATIONS AND TRANSPORTATION										
	Social Division: Fractionalization by Religion					Social Division: Fractionalization by Language				
	Road	Public Transport	Distance to Public Transport	Post Office	Distance to Post Office	Road	Public Transport	Distance to Public Transport	Post Office	Distance to Post Office
Social Division	-0.19	0.37	16.80**	-0.03	14.50**	0.08	-0.03	-6.60	-0.06	6.22
	(0.18)	(0.24)	(9.71)	(0.21)	(8.06)	(0.13)	(0.18)	(9.78)	(0.15)	(6.09)
Observations	184	184	55	184	150	184	184	55	184	150
R-squared	0.19	0.16	0.23	0.13	0.23	0.19	0.15	0.18	0.13	0.21
HOUSE HOLD AMENITIES										
	Social Division: Fractionalization by Religion					Social Division: Fractionalization by Language				
	Pipe borne Water	Electricity	Rubbish dumped	Rubbish burned	Rubbish collected/ buried	Pipe borne Water	Electricity	Rubbish dump	Rubbish burned	Rubbish collected/ buried
Social Division	-0.11	0.09	0.02	0.04	-0.06	-0.17	-0.08	0.07	-0.03	-0.04
	(0.19)	(0.14)	(0.07)	(0.05)	(0.04)	(0.14)	(0.10)	(0.05)	(0.04)	(0.03)
Observations	184	184	184	184	184	184	184	184	184	184
R-squared	0.14	0.16	0.25	0.16	0.24	0.15	0.16	0.25	0.16	0.24

Standard errors shown in parentheses. *** significant at 5%, ** significant at 10%. All regressions include controls for village size, and percentage of population landless and shares of population in all but one Ethnicity group and shares of population in all but one religion group.

Table 2.6 continued: Relationship between Social Divisions and some public goods in Rural Ghana 1998/1999

HEALTH										
	Social Division: Fractionalization by Religion					Social Division: Fractionalization by Language				
	Doctor	Nurse	Midwife	Clinic	Community Health Worker	Doctor	Nurse	Midwife	Clinic	Community Health Worker
Social Division	-0.10	0.23	0.21	0.08	0.26	-0.07	0.04	0.02	-0.15	-0.20
	(0.11)	(0.23)	(0.23)	(0.25)	(0.25)	(0.08)	(0.18)	(0.18)	(0.18)	(0.19)
Observations	184	184	184	184	184	184	184	184	184	184
R-squared	0.07	0.15	0.11	0.14	0.14	0.07	0.15	0.11	0.15	0.14

HEALTH						
	Social Division: Fractionalization by Religion			Social Division: Fractionalization by Language		
	Traditional Birth Attendant	Immunization Drive	Malaria Drive	Traditional Birth Attendant	Immunization Drive	Malaria Drive
Social Division	0.33	-0.08	0.18	-0.04	-0.04	-0.02
	(0.24)	(0.10)	(0.27)	(0.18)	(0.07)	(0.20)
Observations	184	183	183	184	183	183
R-squared	0.1	0.05	0.09	0.09	0.05	0.09

Standard errors shown in parentheses. *** significant at 5%, ** significant at 10%. All regressions include controls for village size, and percentage of population landless and shares of population in all but one Ethnicity group and shares of population in all but one religion group.

Data from the two periods, 1991/1992 and 1998/1999 are then pooled to increase the number of observations and also to allow for statistical tests on whether slope and intercept coefficients are different in each period. One set of analysis estimates a restricted model in which all the explanatory variables, with the exception of Social Division are assumed to have the same coefficients in the two periods under consideration. The model estimated is Equation 2.3

$$\mathbf{y_i = \alpha_1 + \alpha_2 Period_i + \alpha_3 Social\ Division_i + \alpha_4 Period_i * Social\ Division_i + \alpha_5 Community\ Size_i + \alpha_6 Average\ Income_i + \alpha_7 Community\ Wealth_i + \sum_{r=1}^{r=5} \gamma_r Share\ Religion\ r_i + \sum_{l=1}^{l=6} \gamma_l Share\ Language\ l_i + \nu_i} \qquad \textbf{Equation 2.3}$$

where all variables are defined as in Equation 2.2 and Period is a dummy variable that equals 1 if the observation relates to 1998/1999. In addition to the coefficient on Social Division, the coefficient on the Period and Social Division interaction is my main interest. Another set of analyses includes period interactions for all the explanatory variables. The model employed is

$$\mathbf{y_i = \alpha_1 + \alpha_2 Period_i + \alpha_3 Social\ Division_i + \alpha_4 Period_i * Social\ Division_i + \alpha_5 Community\ Size_i + \alpha_6 Period_i * Community\ Size_i + \alpha_7 Average\ Income_i + \alpha_8 Period_i * Average\ Income_i + \alpha_9 Community\ Wealth_i + \alpha_{10} Period_i * Community\ Wealth_i + \sum_{r=1}^{r=5} \gamma_r Share\ Religion\ r_i + \sum_{r=1}^{r=5} \delta_r Period_i * Share\ Religion\ r_i + \sum_{l=1}^{l=6} \gamma_l Share\ Language\ l_i + \sum_{l=1}^{l=6} \delta_l Period_i * Share\ Language\ l_i + \nu_i} \qquad \textbf{Equation 2.4}$$

where all variables have been previously defined. The model in Equation 2.4 is estimated and a Chow test for the null hypothesis that the slope and intercept coefficients are the same in both periods is conducted.

The models in Equations 2.3 and 2.4 serve as robustness checks on the period by period estimations of Equation 2.2. In the discussion of the results in the next section, special attention is thus given to coefficients obtained from these equations. In the case of particular public goods, the results of regressions based on Equations 2.3 and 2.4 are presented separately. The results of the restricted model in Equation 2.3 are presented in Table 2.7 below. The results of the unrestricted model in Equation 2.4 allow for the largest number of statistical tests and are most informative of the relationship between access to public goods and population heterogeneity in the two periods. The results of the estimations in Equations 2.3 and 2.4 when the dependent variables are the summary indices previously defined are presented together in Table 2.8 in the next section. The estimates for particular public goods in the unrestricted model shown in Equation 2.4 are also presented in the next section, specifically in Table 2.9. The p-value of the F statistic on the Chow test on the coefficient estimates for Equation 2.4 is also presented.

Table 2.7: Relationship between Social Divisions and public goods in Rural Ghana; Pooled data, Restricted Model

EDUCATION								
	Social Division: Fractionalization by Religion				Social Division: Fractionalization by Language			
	Primary School	Middle School	Distance to Middle School	Distance to Secondary School	Primary School	Middle School	Distance to Middle School	Distance to Secondary School
Period Dummy	-0.08	-0.34***	-0.31	-1.79	0.02	2E-3	0.06	0.01
	(0.12)	(0.16)	(2.60)	(3.89)	(0.06)	(0.07)	(1.53)	(1.00)
Social Division	0.02	-0.18	0.13	3.42	0.01	-0.01	4.44	10.15***
	(0.13)	(0.17)	(3.25)	(4.07)	(0.12)	(0.15)	(2.81)	(3.60)
Social Division *Period	0.14	0.54***	-0.39	1.80	-0.22	-0.31	-3.09	-0.92
	(0.20)	(0.26)	(4.28)	(6.42)	(0.17)	(0.23)	(4.07)	(5.40)
Observations	424	424	157	370	424	424	157	370
R-squared	0.07	0.13	0.15	0.16	0.07	0.13	0.17	0.19
COMMUNICATIONS AND TRANSPORTATION								
	Social Division: Fractionalization by Religion				Social Division: Fractionalization by Language			
	Road	Public Transport	Distance to Public Transport	Post Office	Distance to Post Office	Road	Public Transport	Distance to Public Transport	Post Office	Distance to Post Office
Period Dummy	0.20	0.26**	-14.87***	-0.13	-1.19	0.17***	0.22***	-0.71	0.001	3.28***
	(0.13)	(0.16)	(5.13)	(0.12)	(4.41)	(0.06)	(0.07)	(2.83)	(0.057)	(1.98)
Social Division	0.05	0.34***	-3.73	-0.21	0.40	0.14	0.17	5.86	-0.025	7.73**
	(0.14)	(0.16)	(4.90)	(0.13)	(4.49)	(0.12)	(0.15)	(4.97)	(0.117)	(4.16)
Social Division *Period	-0.06	-0.12	26.54***	0.23	6.97	0.06	-0.19	-1.93	6E-04	-0.94
	(0.21)	(0.25)	(8.45)	(0.20)	(7.19)	(0.18)	(0.22)	(9.64)	(0.175)	(6.24)
Observations	423	423	227	423	349	423	423	227	423	349
R-squared	0.12	0.24	0.18	0.13	0.19	0.13	0.23	0.15	0.13	0.20

Table 2.7 continued: Relationship between Social Divisions and public goods in Rural Ghana; Pooled data, Restricted Model

HOUSE HOLD AMENITIES										
	Social Division: Fractionalization by Religion					Social Division: Fractionalization by Language				
	Pipe borne Water	Electricity	Rubbish dumped	Rubbish burned	Rubbish collected/ buried	Pipe borne Water	Electricity	Rubbish dumped	Rubbish burned	Rubbish collected/ buried
Period	0.03	-0.13**	-0.01	0.01	3E-03	0.07	0.02	-0.02	0.02**	0.00
	(0.11)	(0.07)	(0.04)	(0.03)	(0.03)	(0.05)	(0.03)	(0.02)	(0.01)	(0.01)
Social Division	-0.01	-0.13**	0.09***	-0.03	-0.06***	-0.18**	-0.13**	0.03	7E-4	-0.03
	(0.11)	(0.08)	(0.04)	(0.03)	(0.03)	(0.10)	(0.07)	(0.04)	(0.03)	(0.03)
Social Division *Period	0.11	0.30***	-0.02	0.03	-0.01	0.06	0.04	-0.01	-1E-3	0.02
	(0.18)	(0.12)	(0.06)	(0.04)	(0.05)	(0.15)	(0.11)	(0.06)	(0.03)	(0.04)
Obs	424	424	424	424	424	424	424	424	424	424
R-squared	0.11	0.17	0.09	0.07	0.08	0.12	0.16	0.08	0.06	0.06

HEALTH												
	Social Division: Fractionalization by Religion						Social Division: Fractionalization by Language					
	Nurse	Clinic	Immun-ization Drive	Malaria Drive	Tradition Birth attendant	Community Health Worker	Nurse	Clinic	Immun-ization Drive	Malaria Drive	Traditional Birth attendant	Community Health Worker
Period	-0.16	-0.17	2E-3	0.47***	-0.23	-0.15	0.06	0.03	1E-3	-0.05	-0.08	0.12**
	(0.14)	(0.15)	(0.06)	(0.17)	(0.14)	(0.15)	(0.06)	(0.07)	(0.02)	(0.08)	(0.06)	(0.07)
Social Division	-0.15	-0.27**	-0.09	0.46***	-0.23	-0.19	-0.19	-0.23	-0.05	-0.03	-0.21**	-0.20
	(0.15)	(0.16)	(0.06)	(0.18)	(0.14)	(0.15)	(0.13)	(0.14)	(0.06)	(0.17)	(0.13)	(0.14)
Social Division *Period	0.46***	0.41**	0.01	-0.92***	0.32	0.51***	0.24	0.15	0.03	-0.04	0.18	0.04
	(0.23)	(0.24)	(0.10)	(0.28)	(0.22)	(0.24)	(0.20)	(0.21)	(0.09)	(0.25)	(0.19)	(0.21)
Obs	424	424	423	423	424	424	424	424	423	423	424	424
R-squared	0.10	0.08	0.03	0.09	0.06	0.10	0.09	0.08	0.03	0.06	0.06	0.09

Standard errors shown in parentheses. *** significant at 5%, ** significant at 10%. All regressions include controls for village size, and percentage of population landless and shares of population in all but one Ethnicity group and shares of population in all but one religion group.

2.5 Results and Discussion

In rural Ghana, the evidence in Tables 2.3 through 2.7 show that population heterogeneity is often statistically significant in its relationship with access to public goods and that the correlations are mostly negative. This evidence is best summarized by the results presented in Table 2.8 below, of the coefficient estimates from regressions on Equations 2.3 and 2.4 where the dependent variables are summary indices. An important observation is that the coefficient on the Period and Social Division interaction, mostly and always if it is significant, acts to counteract the advantage or disadvantage that population heterogeneity has on access to public good access in a community. Changing the measure of population heterogeneity from fractionalization to number of distinct groups does not change the sign of the correlation. As such only the relationship when population heterogeneity is measured by fractionalization is discussed. In the discussion, I typically start by describing the results from the less robust estimations based on Equation 2.2 and show that the results from the unrestricted model in Equation 2.4 concur with that evidence.

In rural Ghana, population heterogeneity both in terms of religious affiliation and language spoken is mostly negatively correlated with access to public goods. The similar relationships when these two measures of Social Division are employed is not surprising because the correlation between fractionalization by religious affiliation and language spoken is 27% and significant at greater than 1% level. I find no evidence that fractionalization by either measure is more important than the other but find instead that there is general agreement between the two measures. Table 2.3 shows that for the summary indices in the sectors of health, household amenities, communication and

Table 2.8: Relationship between Social Division and Sector Summary indices in rural Ghana 1991/1992 and 1998/1999

	HEALTH			
	Fractionalization by Religion		Fractionalization by Language	
Period 2	-1.56	-2.24	-0.40	0.23
	(1.56)	(5.75)	(0.71)	(5.70)
Social Division	-1.94	-2.20	-3.02***	-3.03***
	(1.64)	(1.79)	(1.47)	(1.58)
Social Division *Period 2	2.87	4.17	2.13	1.68
	(2.54)	(3.07)	(2.20)	(2.44)
Period interactions	No	Yes	No	Yes
p value of Chow test		0.74		0.80
R-squared	0.07	0.10	0.08	0.10
	HOUSEHOLD AMMENITIES			
	Fractionalization by Religion		Fractionalization by Language	
Period 2	-1.52	1.25	-0.29	4.16
	(1.06)	(3.78)	(0.48)	(3.59)
Social Division	-3.11***	-3.80***	-1.86**	-1.63
	(1.10)	(1.17)	(1.00)	(1.05)
Social Division *Period 2	2.51	3.50**	0.92	-0.40
	(1.72)	(2.00)	(1.49)	(1.60)
Period interactions	No	Yes	No	Yes
p value of Chow test		0.00		0.01
R-squared	0.07	0.15	0.06	0.14
	COMMUNICATION and TRANSPORTATION			
	Fractionalization by Religion		Fractionalization by Language	
Period 2	1.35***	0.74	-0.01	-0.67
	(0.45)	(1.62)	(0.20)	(1.55)
Social Division	0.37	0.34	-0.85***	-0.72
	(0.47)	(0.51)	(0.42)	(0.46)
Social Division *Period 2	-2.23***	-2.31***	0.48	0.38
	(0.73)	(0.87)	(0.63)	(0.70)
Period interactions	No	Yes	No	Yes
p value of Chow test		0.15		0.61
R-squared	0.17	0.20	0.16	0.19
	EDUCATION			
	Fractionalization by Religion		Fractionalization by Language	
Period 2	-1.29	-1.76	-0.02	-0.20
	(0.83)	(3.03)	(0.38)	(2.83)
Social Division	-1.35	-1.30	-2.12***	-1.95***
	(0.86)	(0.94)	(0.77)	(0.82)
Social Division *Period 2	2.54**	1.98	0.17	-0.52
	(1.35)	(1.60)	(1.12)	(1.27)
Period interactions	No	Yes	No	Yes
p value of Chow test		0.26		0.30
R-squared	0.14	0.18	0.16	0.20

Standard errors shown in parenthesis. *** significant at 5%, ** significant at 10%. Period 2 = 1 if period is 1998/1999. Number of observations in all regressions is 424. R-squared from each regression shown. Also shown is the p-value of the Chow statistic for the null hypothesis that the relationships follow the same model for both periods (ie 1991/1992 and 1998/1999). Summary indices are as defined above.

transportation, and education in Ghana in 1991/1992, all the statistically significant coefficients suggest that communities with more homogenous populations have better outcomes. This is the conclusion whether fractionalization or number of groups by religion or language spoken is considered. On the other hand, the same regressions using data for Ghana in 1998/1999 in Table 2.5 shows that there are fewer instances of statistically significant coefficients on social division measures.

Summary statistics for the two datasets in Tables 2.1 and 2.2 show that the distribution of fractionalization by language and religion remain largely unchanged over the period considered. This suggests that differences in relationship can be attributed in large part to the government intervention in 1994 when District Assemblies started receiving funds for local public good provision. After this intervention, only two of the negative correlations between fractionalization and summary indices, are statistically significant compared to all four in 1991/1992. This evidence concurs with what is presented in Table 2.8 above. In this table, the evidence shows that in the second period, i.e. 1998/1999, the slope coefficient on measures of population heterogeneity is always of a lower magnitude. This suggests that population heterogeneity of a community has less of an influence on the provision of public goods there.

The correlation between measures of social division and access to particular public goods in rural Ghana in 1991/1992 presented in Table 2.4 agrees with the scenario portrayed by the summary indices. For goods in the education category, lower fractionalization is again correlated with better outcomes. More fractionalized communities tend to be larger and so this observation suggests a mechanism by which population homogeneity overrides the importance of more people possibly benefiting

from a good. Additionally in Ghana, more fractionalized areas tend to have higher average incomes. I find that communications services such as post offices and telephone connections are more likely to exist in areas with lower fractionalization. Household amenities like pipe-borne water, electricity and proper waste disposal are also more likely to be present in communities with lower fractionalization. Population heterogeneity is correlated negatively with presence of various public goods in the health sector. The finding that less fractionalized areas are more likely to have access to these goods then also suggests a mechanism in which the importance of population homogeneity supersedes that of the average wealth of the benefiting population. More fractionalized communities are more likely to have better road access and access to public transport services. These are again goods that have more relevance in larger areas. It also suggests that these types of goods are produced by a mechanism in which the average income of the receiving population is important.

The contrast between the statistical significance of the coefficients on social division in Tables 2.4 and 2.6 suggest that the government intervention in the form of disbursing annual funds to districts had an impact on the relationship between measures of social division and access to public goods. This result is again evident in Table 2.9 below which shows regression results of the more robust unrestricted model in Equation 2.4 where data from the two periods are pooled. The pattern of the relationship between measures of social division and access to particular public goods in Ghana 1998/1999 is identical to the scenario in Ghana 1991/1992 but there is a stark reduction in the number of individual goods that have a statistically significant correlation. In 1998/ 1999, the

Table 2.9: Relationship between Social Divisions and public goods in Rural Ghana; Pooled data, Unrestricted Model

EDUCATION								
	Social Division: Fractionalization by Religion				Social Division: Fractionalization by Language			
	Primary School	Middle School	Distance to Middle School	Distance to Secondary School	Primary School	Middle School	Distance to Middle School	Distance to Secondary School
Period Dummy	-0.62	-0.70	2.33	-13.13	-0.32	-0.34	-0.61	-6.99
	(0.45)	(0.58)	(11.08)	(13.97)	(0.43)	(0.55)	(10.18)	(13.18)
Social Division	-0.09	-0.15	1.65	0.90	-0.01	-0.02	6.33***	7.98***
	(0.14)	(0.18)	(3.36)	(4.48)	(0.12)	(0.15)	(3.09)	(3.80)
Social Division *Period	0.41**	0.44	-3.62	13.12**	-0.22	-0.37	-5.41	2.36
	(0.24)	(0.31)	(5.32)	(7.50)	(0.19)	(0.25)	(4.66)	(6.04)
Observations	424	424	157	370	424	424	157	370
R-squared	0.09	0.19	0.20	0.22	0.09	0.19	0.22	0.23
p value, Chow	0.88	0.01	0.97	0.10	0.92	0.00	0.90	0.36

COMMUNICATIONS AND TRANSPORTATION										
	Social Division: Fractionalization by Religion					Social Division: Fractionalization by Language				
	Road	Public Transport	Distance to Public Transport	Post Office	Distance to Post Office	Road	Public Transport	Distance to Public Transport	Post Office	Distance to Post Office
Period Dummy	0.14	0.33	-5.37	0.48	-3.88	0.02	0.38	11.16	0.63	5.50
	(0.46)	(0.56)	(20.66)	(0.46)	(16.15)	(0.40)	(0.54)	(19.23)	(0.43)	(14.86)
Social Division	0.06	0.26	-2.08	-0.20	-2.17	0.22**	0.27**	6.83	0.00	7.42**
	(0.15)	(0.18)	(5.32)	(0.14)	(5.17)	(0.13)	(0.16)	(5.14)	(0.15)	(4.47)
Social Division *Period	-0.25	0.10	18.87**	0.18	16.67**	-0.14	-0.29	-13.19	-0.05	-1.21
	(0.25)	(0.30)	(10.97)	(0.24)	(8.59)	(0.20)	(0.24)	(10.73)	(0.19)	(6.71)
Observations	423	423	227	423	349	423	423	227	423	349
R-squared	0.18	0.27	0.23	0.15	0.22	0.18	0.26	0.22	0.15	0.22
p value, Chow	0.00	0.09	0.22	0.89	0.41	0.00	0.05	0.31	0.92	0.70

Table 2.9 continued: Relationship between Social Divisions and public goods in Rural Ghana; Pooled data, Unrestricted Model

	HOUSE HOLD AMENITIES									
	Social Division: Fractionalization by Religion					Social Division: Fractionalization by Language				
	Pipe borne Water	Electricity	Rubbish dumped	Rubbish burned	Rubbish collected/ buried	Pipe borne Water	Electricity	Rubbish dumped	Rubbish burned	Rubbish collected/ buried
Period	0.64	0.03	-0.04	0.13	-0.09	0.53	0.17	-0.15	0.19***	-0.04
	(0.40)	(0.27)	(0.14)	(0.09)	(0.09)	(0.38)	(0.25)	(0.13)	(0.09)	(0.09)
Social Division	0.08	-0.12	0.13***	-0.04	-0.09***	-0.16	-0.12	0.02	-0.01	-0.01
	(0.12)	(0.08)	(0.04)	(0.03)	(0.03)	(0.11)	(0.07)	(0.04)	(0.03)	(0.03)
Social Division *Period	-0.19	0.21	-0.12	0.09**	0.03	-0.01	0.04	0.05	-0.02	-0.03
	(0.21)	(0.14)	(0.07)	(0.05)	(0.05)	(0.18)	(0.12)	(0.06)	(0.04)	(0.04)
Observations	424	424	424	424	424	424	424	424	424	424
R-squared	0.14	0.19	0.21	0.14	0.20	0.15	0.20	0.20	0.14	0.18
p value, Chow	0.31	0.18	0.00	0.00	0.00	0.39	0.34	0.00	0.00	0.00

	HEALTH											
	Social Division: Fractionalization by Religion						Social Division: Fractionalization by Language					
	Nurse	Clinic	Immun-ization Drive	Malaria Drive	Tradition Birth attendant	Community Health Worker	Nurse	Clinic	Immun-ization Drive	Malaria Drive	Traditional Birth attendant	Community Health Worker
Period	-0.22	0.13	-0.11	-0.26	-0.20	-0.03	-0.07	0.31	-0.06	-0.32	0.11	0.26
	(0.51)	(0.56)	(0.22)	(0.60)	(0.50)	(0.50)	(0.48)	(0.52)	(0.22)	(0.57)	(0.49)	(0.51)
Social Division	-0.08	-0.18	-0.10	0.19	-0.20	-0.18	-0.19	-0.20	-0.02	-0.10	-0.20	-0.19
	(0.16)	(0.17)	(0.07)	(0.19)	(0.16)	(0.17)	(0.14)	(0.15)	(0.06)	(0.16)	(0.14)	(0.15)
Social Division *Period	0.32	0.27	0.02	-0.01	0.53***	0.44	0.24	0.06	-0.02	0.08	0.16	-0.01
	(0.27)	(0.29)	(0.12)	(0.27)	(0.27)	(0.29)	(0.22)	(0.23)	(0.10)	(0.25)	(0.21)	(0.22)
Observation	424	424	423	423	424	424	424	424	423	423	424	424
R-squared	0.12	0.11	0.05	0.19	0.09	0.13	0.12	0.12	0.05	0.18	0.09	0.13
p value, Chow	0.42	0.34	0.93	0.00	0.35	0.11	0.48	0.37	0.93	0.00	0.52	0.22

Standard errors shown in parentheses. *** significant at 5%, ** significant at 10%. All regressions include village size, and percentage of population landless and shares of population in all but one language group and shares of population in all but one religion group and period interactions of each variable.

importance of population heterogeneity is only statistically significant in the relationship of access to goods in the education category and access to transportation and communication services; specifically, the presence of a middle school in a community and the distance to the nearest secondary school. The results in Table 2.9 again show that in 1991/1992, communities with more homogeneous populations tend to have better access to public goods. This is true for all the individual goods studied except for the presence of a road and a bus depot in the community. Yet for even these two goods, the magnitude of the slope coefficients in the second period is smaller than the first suggesting once more about the diminished importance of population homogeneity in the production of public goods.

The culmination of all the results described is that population heterogeneity was a disadvantage in provision or access to public goods in a community. However, the disbursement of funds from the District Assembly Common Fund, being the major difference in the two periods considered, reduced the importance of population heterogeneity in provision of public goods in a community. This suggests that one of the ways in which population homogeneity influenced local public good provision was through accessing funds for use by local government agencies.

2.6 Conclusion

Data from the *Ghana Living Standards Survey, 1991/1992* (GLSS3) and *Ghana Living Standards Survey 1998/1999* (GLSS4) were used to determine the relationship between social divisions, as measured by population heterogeneity, and access to public

goods in rural Ghana. It was argued that in Ghana and similar countries, theories of fiscal federalism may not be wholly applicable and that population heterogeneity influences access to public goods through mechanisms that are not yet well understood. More importantly, the same data was used to observe the impact of a government intervention on that relationship. The intervention was the establishment of the District Assemblies Common Fund (DACF), a centrally managed system of transfer in which Districts Assemblies automatically received grants for public good provision in their jurisdictions. The amount disbursed to districts was determined by a formula that was applied to all the districts. The commencement of the DACF resulted in a dramatic increase in the capacity of these local government bodies to carry out their mandate.

The measures of social divisions in the population were fractionalization along religious identification and language spoken as well as the number of possible categories of religion and primary language groups represented in a community. In the original relationship observed before the introduction of the DACF, communities that are less fractionalized are more likely to have a greater number of public goods. Although the general relationship remains after the commencement of the DACT, there is a reduction in the statistical significance of the negative correlation between population heterogeneity and access to various public goods. This evidence suggests that one of the ways in which population homogeneity is advantageous for communities is that it increases their ability to garner funds from the central government. The establishment of the DACF apparently reduced the difference in the capacity of the various District Assemblies in extracting resources from the central government making population homogeneity of a community less important in access to public goods.

The impact of the intervention in Ghana suggests that once the mechanisms that influence provision of public goods in such countries are better understood, there is scope for policy to mitigate or intensify the role of population heterogeneity.

Chapter 3

Population Heterogeneity and Access to Public goods: Observations from Rural India

3.1 Introduction

Charles Tiebout's (1956) theory of public sector efficiency showed that household mobility leading to more homogenous communities increased the efficiency of locally funded provision of public goods[20]. There is however some evidence, such as that presented in the previous chapter that population homogeneity plays an important role in the provision of local public goods even in areas where there is essentially no household mobility and funding for provision is derived mostly from outside the community. In this chapter, the relationship between population heterogeneity and access to local public goods in rural India is studied. The aim of this empirical analysis is to observe patterns in the way population heterogeneity is correlated with access to public goods in India.

The various predictions of Tiebout's theory have been demonstrated convincingly in many developed country settings where the assumptions of extreme fiscal decentralization and household mobility between a large number of communities closely approximates reality. For instance, Alesina, Baqir and Easterly (1999) show that shares of spending on education, roads and sewers supplied by US cities are inversely related to ethnic fragmentation in those cities. Hoxby (1999, 2000) demonstrate that public schools are more productive, and that there are fewer private schools in US metropolitan areas

[20] Notable extensions of Tiebout's work are Epple and Zelnitz (1981), Epple, Filimon, and Romer (1984), and Epple, and Platt (1998).

with a larger number of jurisdictions. Oates (1969, 1973) and Rosen (1982) study the effect of changes in local public budgets and revenue creation on property values and provide evidence on Tiebout capitalization in American states.

Population homogeneity appears to be an important factor in local public good provision in areas where the mechanisms described by Tiebout and related theories are unlikely to be at play. Banerjee, Iyer and Somanathan (2004) find that the share of villages in a district with access to a particular public good is higher in Indian districts that are more homogeneous using Hindu caste divisions, colonial power structure and land tenure systems as measures of social cleavages. Easterly and Levine (1997) in a cross country study find a negative correlation between ethnic diversity and numbers of telephones, percentage of roads paved, years of education and efficiency of electric network. Miguel (2000) explores the relationship between ethnic diversity and local primary school funding in rural western Kenya and finds that higher levels of local ethnic diversity is associated with sharply lower primary school funding and worse school facilities in western Kenya. These results are suggestive that there may be a consistent role for population heterogeneity in local public good provision even in areas where Tiebout's mechanisms do not apply. Further evidence on this relationship may provide clues to the mechanisms and factors involved in public good provision in the many parts of the world that do not employ decentralized fiscal systems for local public good provision and where household mobility is very low.

In this chapter, I examine the relationship between population heterogeneity and access to public goods in the Indian states of Bihar and Uttar Pradesh. While the results from Banerjee, Iyer and Somanathan (2004) at the district level in India is suggestive of

the relationship at the village level, the considerable size difference between the two units makes analyses at the village level important to confirm the relationship. I find that villages[21] that have more social cleavages as measured by fractionalization along caste lines and number of distinct caste groups tend to have lower access to public goods in the education sector and in provision of electricity service. However, in telephone service, road access, government subsidized shops and children's center as well as waste disposal systems and public irrigation, more homogeneous areas are at a disadvantage. This result may be partially explained by the fact that these goods have been transformed to club goods which benefit only particular segments of the population.

The chapter is divided as follows: a background is presented in section 3.2. The data used and the empirical strategy are presented in sections 3.3 and 3.4 respectively. The results and discussion are presented in section 3.5. The chapter concludes with section 3.6.

3.2 Background

The mechanisms laid out in Tiebout's theory of public good provision cannot be applied to a considerable proportion of the world's communities. Many developing countries, especially the rural areas, fall in this category. Typically, funding for public good provision is sourced mostly from outside the community and from higher levels of government. Additionally, households in these areas are unable or unwilling to move in search of better provision of public goods. For example, the moving rate[22] in India in

[21] A village is an area containing an average of two hundred and sixty households.
[22]Moving rate is the percentage of people who changed residence in a 1-year period (number of movers divided by the total population under consideration).

1991 was only 27%[23] compared to 46%[24] in 2000 in the United States. Srivastava and Sasikumar, (2003) report that a significant proportion of moves in India were short distance moves by newly married women and temporary migration in for employment. On the other hand, 50% of people who moved in the United States sited 'better neighborhood' as the reason for moving. In addition, funding for public goods in India is highly centralized with the state responsible for most provision at the local level.

Theoretical analyses on how population homogeneity can influence local public good provision in areas where Tiebout mechanisms are not applicable generally look to the role of collective action in political competition as the origin of the relationship. Driving the theoretical predictions is a variety of reasons why more heterogeneous populations are less able to engage in collective action. One is the possibility that different groups of people have different tastes for public goods and so it is harder to organize and lobby higher levels of government for funding for any particular good. Another possible avenue is that more heterogeneous populations have lower scope for social sanctions and so are less able to combat the free rider problem or punish corrupt officials for misappropriating funds. There could also be a general mistrust amongst members of more heterogeneous communities which prevents then in engaging in the necessary community actions to compete for scare state resources. Aside from collective action for political competition, population heterogeneity may play a role in the ability for communities to tax themselves either for monetary or time contributions to construct and maintain public goods. People may also be less likely to engage in community

[23] 1991 Indian Census and National Sample Survey
[24] US Census Bureau census 2000

initiatives if they perceive that the benefits will be shared with other social groups than their own.[25]

With a variety of possible mechanisms for population heterogeneity to influence local access to public goods, empirical analyses of the relationship between these two concepts can reveal patterns that provide clues to the more important mechanisms.

3.3 Data and Descriptive Statistics

The village and community level data on access to public goods is assembled from the *Survey of Living Conditions in Uttar Pradesh and Bihar December 1997 – March 1998* (SLC). Even though the SLC only includes observations from the neighboring Northern Indian states of Uttar Pradesh and Bihar, is representative of the most rural households in the India. The SLC includes household-level as well as village-level data from two thousand two hundred and fifty households from one hundred and twenty villages drawn from thirteen districts in Uttar Pradesh and twelve districts in Bihar collected over December 1997 to March 1998. Details on the stratification and sampling strategy used can be found in the documentation of the survey. The household dataset utilized includes data on household demographics, caste and religion, economic activities, housing amenities, educational attainment of members, assets and household wealth. The village datasets contain data on village population characteristics such as size and caste composition, and village infrastructure such as availability of

[25] Alesina and La Ferrara (2000) assert that, individuals from different groups dislike "mixing" across ethnic lines. Vigdor (2004) finds that individuals prefer to fund public goods that benefit their own ethnic group.

communication and transportation facilities, schools and health centers, irrigation, main water sources, anti-poverty programs and organizations.

The explanatory variables of interest are measures of social divisions in a village or community. The measure studied is simply the number of different groups in a classification based on the Hindu caste system. The second is the fractionalization measure typically used in the literature. It is given by

$$\textbf{FracCaste} = 1 - \sum_{i} s_i^2 \qquad \textbf{Equation 3.1}$$

where FracCaste is the measure of the fractionalization along caste lines in the village and s_i is the percentage of the population that are in the same caste. In the data set, all respondents were either Muslim or Hindu and Hindi or Urdu speaker. As such only social divisions along caste groupings were considered. Using the household level data, the caste group, religion, ethnic identification or primary language of the household head was used as a proxy for the characteristic of the entire household.

The dependent variables of interest are measures of household access to a particular public good. These variables were of three main types; a summary index of access to public goods in a particular sector, a dummy variable for whether a particular public good is present anywhere in the community, the share of the population that has access to a particular good or the proximity of a particular public good to a household residence. The summary indices are calculated as the equally weighted average of the z-scores of the component measures in the sectors considered. The indicators are transformed so that a higher index always signifies a better outcome. The summary statistics of the data is shown in Table 3.1.

Table 3.1: Summary Statistics of Survey of Living Conditions in Uttar Pradesh and Bihar

	Variable	Mean	Std. Dev.	Min	Max	Obs
Fractionalization by:	Caste	0.60	0.18	0.00	0.80	120
Number of Distinct groups by	Caste	3.98	1.18	1	7	120
Present in Village?:	Aganwadi	0.36	0.48	0	1	120
	Electricity	0.53	0.50	0	1	119
	Hospital	0.02	0.13	0	1	119
	Primary School	0.79	0.41	0	1	120
	Middle School	0.25	0.44	0	1	119
	Secondary School	0.09	0.29	0	1	119
	Food Distribution (PDS)	0.58	0.50	0	1	119
	PDS shop Sufficient	0.19	0.39	0	1	69
	Public Health Center	0.12	0.32	0	1	119
	Tarred Road	0.27	0.45	0	1	120
Distance (km) to:	Public Health Center	5.61	5.92	0	40	117
	Hospital	21.72	14.93	1	70	118
	Primary School	0.67	0.94	0	5	108
	Middle School	3.06	2.58	0	13	113
	Secondary School	5.19	4.04	0	20	116
Proportion of House Holds who have amenity in Bustee	Aganwadi	0.183	0.302	0.000	1.000	120
	Hospital	0.002	0.020	0.000	0.219	120
	Food Distribution (PDS)	0.362	0.358	0.000	1.000	120
	Public Health Center	0.059	0.179	0.000	1.000	120
	Primary School	0.534	0.363	0.000	1.000	120
	Middle School	0.139	0.277	0.000	1.000	120
	Secondary School	0.048	0.181	0.000	1.000	120
Proportion of House Holds who have amenity in Village	Aganwadi	0.30	0.43	0.00	1.00	120
	Hospital	0.00	0.04	0.00	0.47	120
	Food Distribution (PDS)	0.64	0.45	0.00	1.00	120
	Public Health Center	0.10	0.28	0.00	1.00	120
	Primary School	0.81	0.38	0.00	1.00	120
	Middle School	0.25	0.42	0.00	1.00	120
	Secondary School	0.09	0.28	0.00	1.00	120
Ordinal variables*	Drinking water source	2.64	0.53	2	4	119
	Road Access Type	2.71	0.99	1	4	119
	Waste Disposal Type	2.76	0.43	2	3	119
	Pumps Operating	9.31	8.57	0	50	118
	Hours with Good Electricity	8.33	3.95	0	20	60
Other:	Number of Households	257	163	48	811	120
	Average Household size	6.28	1.18	4	11	120
	% Households landless	23.58	20.93	0	90	120
	% Households with Electricity	34.66	26.73	0	90	59

*Higher values signify better outcomes

3.4 Empirical strategy

The aim of the empirical analysis is to discover the relationship between access to particular public goods and the level of social fragmentation in a community. The dependent variable in each model is some measure of access to a particular good or summary index public goods related to a particular sector, for example, education or health. The main coefficient of interest is that on the measure of social fragmentation.

Two measures of social fragmentation along caste lines are used. First is the number of the seven categories of caste classification reported in the *Survey of Living Conditions in Uttar Pradesh and Bihar December 1997 – March 1998* (SLC) that are represented in a village. The second measure is population heterogeneity as measured by fractionalization along caste lines defined in Equation 3.1. The analysis on rural India is based on the coefficients estimated by Ordinary Least Squares, PROBIT or Ordered PROBIT where relevant, on the model

$$\mathbf{y_i = \alpha_1 + \alpha_2 Social\ Division_i + \alpha_3 Village\ Size_i + \alpha_4 Village\ Wealth_i + \alpha_5 Bihar_i + \alpha_6 Share\ Hindi_i + \alpha_7 Share\ Hindu_i + \sum_{s=2}^{s=7} \gamma_s Share\ Caste\ s_i + v_i} \qquad \textbf{Equation 3.2}$$

where y_i is either a dummy variable for whether a particular public good is present anywhere in community i, a summary index of goods in a particular sector, the share of the population that has access to a particular good or the proximity of a particular public good to a household residence. Social Division is either fractionalization in the village along caste lines or the number caste groups represented in the village. Village Size is the number of households in the village, Village Wealth is the percentage of households

in the village that are landless, Bihar is a dummy variable that equals one if the village is in the state of Bihar, Share Hindi is the percentage of households that report Hindi as their main language, Share Hindu is the percentage of households that identify Hinduism as their religion and Share Caste s is the share of the village that belongs to caste s where s is one of the seven caste categories according to the classification in the (SLC). The results from Equation 3.2 where the dependent variable is a summary index is presented in Table 3.2. Results for individual measures on particular public goods in rural India are presented in Table 3.3.

Table 3.2: Relationship between Social Division and Sector Summary indices in rural India

	EDUCATION	
	Fractionalization by Caste	Number of Caste Groups
Social Division	-2.96**	-0.29
	(1.73)	(0.29)
R-squared	0.28	0.27
	HEALTH	
	Fractionalization by Caste	Number of Caste Groups
Social Division	0.52	-0.01
	(0.99)	(0.14)
R-squared	0.22	0.22
	ELECTRICITY	
	Fractionalization by Caste	Number of Caste Groups
Social Division	-0.90	0.03
	(0.89)	(0.13)
R-squared	0.23	0.18
	AGANWADI (CHILD WELFARE CENTER)	
	Fractionalization by Caste	Number of Caste Groups
Social Division	1.73	0.26
	(1.18)	(0.21)
R-squared	0.15	0.15
	FAIR PRICE SHOP	
	Fractionalization by Caste	Number of Caste Groups
Social Division	1.07**	0.14
	(0.63)	(0.09)
R-squared	0.23	0.22

Coefficients on Social Division from Equation 2 and Equation 3. Standard error shown in parenthesis. *** significant at 5%, ** significant at 10%. Number of observations in all regressions is 120. Summary indices are equally weighted averages of z-score of summary indicators. Education indicators are proportion of households who have primary school, middle school and secondary school in locality and proportion of households who have primiary school, middle school and secondary school in village. Electricity components are electricity present anywhere in village, proportion of village households with electricity and hours of good electricity service. Aganwadi components are presence of Aganwadi anywhere in village, proportion of household who have Aganwadi in locality and proportion of households aware of Aganwadi in village. Fair price shop indicators are presence of shop in village and whether supplies of shop are sufficient. Health index indicators are proportion of households aware of health center in locality and proportion of households aware of health center in village.

Table 3.3: Relationship between Social Divisions and Some public goods in Rural India

	Fractionalization by Caste			Number of Caste Groups		
PRIMARY SCHOOL						
	Present in Village[a]	In Bustee	In Village	Present in Village[a]	In Bustee	In Village
Social Division	-3.23***	-0.74***	-0.51***	-0.39***	-0.10***	-0.08***
	(1.34)	(0.14)	(0.15)	(0.19)	(0.03)	(0.03)
Observations	119	120	120	119	120	120
R-squared		0.35	0.35		0.31	0.35
MIDDLE SCHOOL						
	Present in Village[a]	In Bustee	In Village	Present in Village[a]	In Bustee	In Village
Social Division	0.02	-0.02	-0.03	0.10	0.01	0.01
	(0.77)	(0.12)	(0.20)	(0.12)	(0.02)	(0.03)
Observations	119	120	120	119	120	120
R-squared		0.18	0.17		0.18	0.17
SECONDARY SCHOOL						
	Present in Village[a]	In Bustee	In Village	Present in Village[a]	In Bustee	In Village
Social Division	-0.72	0.05	0.08	0.09	0.01	0.02
	(0.96)	(0.07)	(0.13)	(0.20)	(0.01)	(0.03)
Observations	119	120	120	119	120	120
R-squared		0.15	0.15	0.094	0.01	0.021
HEALTH CENTER						
	Present in Village[a]	In Bustee	In Village	Present in Village[a]	In Bustee	In Village
Social Division	1.36	0.04	0.08	0.17	-0.01	0.01
	(1.33)	(0.09)	(0.14)	(0.16)	(0.01)	(0.02)
Observations	111	120	120	111	120	120
R-squared		0.18	0.26		0.18	0.26
ELECTRICITY						
	Present in Village[a]	Fraction of Households with	Hours of good service [b]	Present in Village[a]	Fraction of Households with	Hours of good service [b]
Social Division	0.30	-30.26	-1.52	0.08	3.79	-0.15
	(0.80)	(22.75)	(0.81)	(0.12)	(4.36)	(0.17)
Observations	119	59	60	119	59	60
R-squared		0.31	0.1		0.3	0.1
ANGANWADI CENTER						
	Present in Village[a]	In Bustee	In Village	Present in Village[a]	In Bustee	In Village
Social Division	2.13***	0.18	0.25	0.21	0.03	0.05
	(0.93)	(0.12)	(0.17)	(0.14)	(0.02)	(0.03)
Observations	120	120	120	120	120	120
R-squared	0.22	0.13	0.16	0.2	0.13	0.16

Table 3.3 continued: Relationship between Social Divisions and Some public goods in Rural India

	Fractionalization by Caste		Number of Caste Groups	
FAIR PRICE SHOP				
	Present in Village[a]	Supplies Sufficient[a]	Present in Village[a]	Supplies Sufficient[a]
Social Division	0.48	18.29***	0.20	0.35
	(0.83)	(5.33)	(0.13)	(0.34)
Observations	119	69	119	69
R-squared				
WATER				
	Pumps Operating[b]	Water Source[b]	Pumps Operating[b]	Water Source[b]
Social Division	3.83	-0.73	-0.23	-0.11
	(3.36)	(0.73)	(0.69)	(0.12)
Observations	118	119	118	119
R-squared	0.36		0.36	
WASTE DISPOSAL SYSTEM				
	Present in Village	Present in Village[a]	Present in Village	Present in Village[a]
Social Division	0.43***	2.00	0.094***	0.41***
	(0.22)	(1.48)	(0.04)	(0.21)
Observations	120	120	120	120
R-squared	0.24		0.26	
TELEPHONE				
	Present in Village	Present in Village[a]	Present in Village	Present in Village[a]
Social Division	0.36***	2.54***	0.04	0.23***
	(0.18)	(1.30)	(0.03)	(0.12)
Observations	119	119	119	119
R-squared	0.17		0.16	
ROAD				
	Access Type	Tarred Road	Access Type	Tarred Road
Social Division	1.54***	0.44***	0.35***	0.08***
	(0.54)	(0.18)	(0.09)	(0.03)
Observations	119	120	119	120
R-squared		0.12		0.13
PUBLIC IRRIGATION				
	Present in Village	Present in Village[a]	Present in Village	Present in Village[a]
Social Division	0.90***	0.42	0.13**	0.12
	(0.41)	(0.75)	(0.08)	(0.12)
Observations	120	120	120	120
R-squared	0.11		0.11	

Coefficients on Social Division in Equation 2.2 are shown. [a]PROBIT Estimation. [b]Ordered PROBIT Estimation. Standard errors in parentheses. ***significant at 5%, **significant at 10%. "In Bustee" refers to proportion of Households who are aware of service in their Bustee, "In Village" is similarly defined.

3.5 Results and Discussion

The evidence in Tables 3.2 and 3.3 show that population heterogeneity is statistically significant in its relationship with access to public goods. In the education sector, the correlation is negative but there are some goods in the communications and transportation category in which population heterogeneity is positively correlated. It appears that changing the measure of population heterogeneity from fractionalization to number of distinct groups does not change the sign of the correlation the two measures. I therefore only discuss the relationship when population heterogeneity is measured by fractionalization.

The summary indices in Table 3.2 show that heterogeneity by caste fractionalization is negatively correlated with access to education facilities. The correlation between population heterogeneity and the health and electricity summary indices are positive and negative respectively but both are statistically insignificant. In the data, villages with population that are more fractionalized along caste lines are more likely to have government supported children's centers (Aganwadis) and fair price shops. This finding is rather surprising because the conventional wisdom is that people of different caste groups would not want their children to interact in an Aganwadi or to interact with each other in a fair price shop. The relationship between social divisions and access to particular public goods presented in Table 3.3 shows that access to education facilities, electricity and safer drinking water are superior in areas that have lower caste fractionalization. In the data, more fractionalized villages are larger and so the finding that population homogeneity increases the probability that the village has these facility implies a mechanism by which lower population fractionalization outweighs

the tendencies for public provision in areas where a larger population will benefit. There are some goods that are more likely to be present in more fractionalized villages. More fractionalized areas are more likely to have a waste disposal system, telephone line, tarred roads and public irrigation. These are all goods that are more relevant in larger villages. Additionally, a common aspect of these public goods is that with the possible exception of a waste disposal system, they are all goods that are likely to benefit a particular segment of the population more than others. A possible explanation is that even though these goods are present, they have taken on aspect of club goods where certain prominent caste groups are able to exclude others from using them.

The results overall suggest that social divisions in rural poor areas in countries such as India have an important role in determining access to public goods. The difference between the sign of the correlation between population heterogeneity and some types of public goods could be useful in narrowing the type of mechanisms that can be at play.

3.6 Conclusion

Data on rural India from the *Survey of Living Conditions in Uttar Pradesh and Bihar December 1997 – March 1998* (SLC) were used to determine the relationship between measures of social divisions and access to public goods. In rural India, two measures of social divisions were used. These were social fragmentation along caste lines and the number of the seven categories of caste classification reported in SLC that

are represented in a village. The dependent variables of interest were summary indices of access to public goods in a sector in addition to access to particular goods.

It has been recognized that the mechanisms by which population homogeneity influence public sector efficiency as presented in Tiebout and related theories are not applicable to many communities in the developing world. This calls into question an across the board application of our typical understanding of ideal fiscal federalism and the roles of various levels of government. This empirical analysis aimed to provide empirical evidence of how population heterogeneity is related to access to public goods so as to reveal patterns that could be informative about the mechanisms at play.

The results overall suggest that social divisions in rural poor areas in countries such as India have an important role in determining access to public goods. The tendency is for more homogeneous populations to have better provision or access to public goods in the education sector. The varying sign of the correlation between population heterogeneity and some types of public goods could be useful in narrowing the type of mechanisms that can be at play. The surprising result that population heterogeneity is positively correlated with the presence of public goods that require fraternization across caste groups, such as Aganwadi centers and Fair Price Shops suggests that further study is required to illuminate the mechanisms by which these goods are provided in India. A possible explanation is that the use of the public good by the members of various castes, rather than just its presence is an important factor. Some public goods may have taken on more of the aspects of club goods through various political and social maneuverings. In such cases, evidence that such goods are present in a village may not be indicative of its availability to the entire population.

Appendix A: Supplementary Materials for Chapter 1

Table A1: Transformation Of Variables As Used In DACF Formula

Variable	Transformation to which weight in formula is applied
GDP(1992)	Y_i = GDP per capita of District i $1/(Y_i) \Big/ \sum(1/(Y_i)$
Population	P_i = Population of District i $(P_i/\sum P_i)$
Health facilities	H_i = Health Facilities in District i $1/\{(H_i/\sum H_i)/(P_i/\sum P_i)\} \Big/ \sum\{(1/(H_i/\sum H_i)/(P_i/\sum P_i)\}$
Population/Doctor	D_i = Doctors in District i P_i = Population of District i $1/\{(D_i/\sum Di)/(P_i/\sum P_i)\} \Big/ \sum\{(1/(D_i/\sum D_i)/(P_i/\sum P_i)\}$
Population/Nurse	N_i =Nurses in District i P_i = Population of District i $1/\{(N_i/\sum N_i)/(P_i/\sum P_i)\} \Big/ \sum\{(1/(N_i/\sum N_i)/(P_i/\sum P_i)\}$
Education facilities	E_i = Education Facilities in District i P_i = Population of District i $1/\{(E_i/\sum E_i)/(P_i/\sum P_i)\} \Big/ \sum\{(1/(E_i/\sum E_i)/(P_i/\sum P_i)\}$
Education facilities In need of major repair	E_i = Education Facilities in District i DE_i = Dilapidated Education Facilities in District i $\{(DE_i/\sum DE_i)/(E_i/\sum E_i)\} \Big/ \sum\{(DE_i/\sum DE_i)/(E_i/\sum E_i)\}$
Pupil/Teacher	T_i = Teachers in District i S_i = Student enrolment of District i $1/\{(T_i/\sum T_i)/(S_i/\sum S_i)\} \Big/ \sum\{(1/(T_i/\sum T_i)/(S_i/\sum S_i)\}$
Water coverage	W_i = Percentage of District i with access to safe water source P_i = Population of District i $1/\{(W_i/\sum W_i)/(P_i/\sum P_i)\} \Big/ \sum\{(1/(W_i/\sum W_i)/(P_i/\sum P_i)\}$
Revenue per capita	RP_i = Revenue per Capita of District i $(RP_i/\sum RP_i)$
Increase in revenue per capita*	$IncRP_i$ = Percentage increase in Revenue per Capita of District i $(IncRP_i/\sum IncRP_i)$
Population Density	S_i = Population Density of District i $(S_i/\sum S_i)$
Increase in Revenue *	$IncR_i$ = Percentage increase in Revenue of District I $(IncR_i/\sum IncR_i)$

* This variable is set to 0% for districts that do not have a positive increase

Table A2: Total Endowment of District Assembly Common Fund (DACF)

Year	Budget Allocation for DACF Releases Real Cedis in Billion[a]	Funds Transferred to DACF Administrator Real Cedis in Billions[b]	Actual DACF Releases Real Cedis in Billions[c]
1994	24	27	26
1995	35	34	35
1996	50	47	47
1997	69	65	59
1998	87	81	75
1999	102	70	87
2000	212	150	172
2001	288	183	259
2002	270	233	73
2003	431	484	391
2004	532	579	456
2005	620	415	366

Base Year is 2000. a District Assembly Common Fund Sharing proposal for relevant year. b Official DACF website http://www.commonfund.gov.gh . c Author calculations from Annual DACF reports

Table A3: Statistics Of DACF Formula Indicators In Political Strongholds* Of The Two Leading Political Parties In Ghana, NDC And NPP

Variable [a]	Average in NDC Strongholds	Average in NPP Strongholds
Population	124038	139924
Revenue (Millions of Cedis)	182	277
Percentage Change in Revenue	44	42
Revenue per capita (Cedis)	1197	1568
Distance of Tarred roads (km)	46	61
Population Density (persons per km^2)	0.022	0.013
Hospitals	11	11
Schools	145	161
Percentage of population with access to safe water	48	40
Distance to Accra km	298	173
Teachers	723	1068
Doctors	3	5
Enrolment in Primary School	20242	26998
Nurses	30	36

*A political stronghold is a district that has voted for the same political party in all elections from 1992 to 2000. [a] All values relate to 2005.

Table A4: Data Used In Calculating District Allocations

	Applicable year from which level of indicator measurements were used in DACF formula for year:											
Indicators	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
GDP	1992	1992										
Population	1984	1984										
Health facilities			1995	1995	1996	1997	1997	1999	1999	2001	2002	2002
Doctors/population							1998	1999	2000	2000	2002	2002
Nurses/population											2002	2002
Education facilities			1995	1995	1996	1997	1997	1999	1999	2000	2002	2002
Teacher/ pupil							1998	1999	2000	2000	2002	2002
Water coverage									2000	2000	2002	2002
Length of Tarred Roads											2000	2000
Revenue per capita	1992	1992	1992	1994	1995	1996	1998	1998				
Increase in revenue per capita			1992 to 1994	1994 to 1995	1995 to 1996	1996 to 1997	1998 to 1999	1998 to 1999	1999 to 2000			
Increase in Revenue										1999 to 2001	1999 to 2001	1999 to 2003
Population Density	1984	1984	1995	1995	1996	1997	1998	1999	2000	2000	2000	2000

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