

Old problems in the new solutions? Innovations in fertilizer subsidies and politically motivated allocation of program benefits

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Abstract:

Despite their disappointing performance in the recent past, fertilizer subsidies have reemerged as a tool in the agricultural strategies of many countries in Sub Saharan Africa. The new paradigm for fertilizer subsidies calls for the use of mechanisms like vouchers to target benefits to poor smallholders and, public private partnerships to develop the private markets. There is a belief that with these innovations, the newly instituted subsidy programs will be different from the insidious programs of the past. However, there has been a glaring lack of innovation in how to prevent politics from dominating the allocation of subsidy program benefits as was the experience in earlier programs. This paper studies districts' allocations of vouchers under Ghana's 2008 fertilizer subsidy program. We find that politics played a significant role in the allocation of vouchers. Higher numbers of vouchers were targeted to districts that the ruling party had lost in the previous presidential elections and more so, in the districts that had been lost by a higher margin. A district received 2% more vouchers for each percentage point by which the ruling party had lost the previous presidential election. This amount is both statistically and numerically significant; a district at the average loss margin for the ruling government received 66% more vouchers than a similar district that the ruling government had won. The analysis also showed that district poverty levels, which should have been an important consideration in an economic efficiency based distribution, was not a statistically significant determinant of a districts voucher allocation. This evidence that the vouchers were targeted to areas where there had been strong support for the opposition party is suggestive of the vouchers being used for vote-buying. This finding raises the caution that despite innovations in implementing fertilizer subsidies, political capture remains a major source of possible inefficiency.

1 Introduction

In recent years, there has been a reemergence of fertilizer subsidies in the agricultural strategies of countries in Sub-Saharan Africa. The Malawian government pioneered the return to large scale subsidies in 1998 when it started distributing free fertilizer after having discontinued similar programs in the early 1990s.¹ The Nigerian government, which had halted its decades' long involvement in fertilizer subsidization, procurement and distribution in 1997, resumed its

¹ In 2005, the program was reformed from distributing fertilizer to distributing vouchers which could be used towards the purchase packs of seed and fertilizer for maize and tobacco.

major role in the fertilizer sector in 1999. In 2000, the Zambian government instituted the Food Security Pack which distributes seeds and fertilizer to households. The Tanzanian state returned to subsidizing fertilizer in 2003 and since 2008, has employed a voucher-based scheme. In 2006, Kenya, which has been touted as a country that successfully developed the private agricultural input markets through effective implementation of liberalization policies, also launched a fertilizer subsidy program. In 2008, the government of Ghana instituted a national voucher-based fertilizer subsidy after having been absent from active participation in the sector since liberalization in 1991.

The historical performance of fertilizer subsidies in the pre-reform periods was largely disappointing (Morris, Kelly, Kopicki and Byerlee, 2007). The programs had some success in boosting fertilizer use and food production while they were in place but improvements in yields had always been limited. Administrative weaknesses resulted in pervasive problems of late delivery of fertilizer, delivery of inappropriate fertilizer or insufficient amounts of fertilizer. Rent seeking activities and political manipulation led to rampant leakages and diversion of fertilizer from intended beneficiaries. The programs were inefficient and placed unsustainably high fiscal burdens on governments. By diverting resources from complementary investments in education, road infrastructure, agricultural research and extension, the subsidy programs may have exacerbated the issues of profitability and access which kept fertilizer use low to begin with (Donovan 2004).

The reemergence of fertilizer subsidies after widespread liberalization and government exit from the sector has been precipitated by rising food security concerns in recent years. However, there is a general renewed enthusiasm for governments to once more play an active role in providing agricultural inputs in Africa. At the Africa Fertilizer summit held in 2006 in Abuja Nigeria, the sentiment that fertilizer subsidies were a necessary tool was expressed by several participants (Morris, Kelly, Kopicki and Byerlee, 2007). Proponents of fertilizer subsidies include such important donors and development partners such as the Millennium Villages program, and the Alliance for a Green Revolution in Africa (Minot and Benson, 2009). There is some belief that with a new subsidy approach that includes innovations in both the implementation and the design of the programs, the problems that plagued the programs of the past can be avoided.

The new paradigm of fertilizer subsidies eschews the old methods of universal subsidies through parastatal monopolies and calls for temporary interventions targeted to poor small-holders and implemented in a way that supports private fertilizer markets. The use of agricultural input vouchers has emerged as mechanism for simultaneously targeting subsidies and developing private fertilizer markets as well as encouraging relationships between agricultural input dealers to financial institutions (Gregory 2004, Minot and Benson 2009). Public private partnerships have also been promoted to encourage government programs to both exploit private sector efficiencies and to avoid distorting private markets.

All the countries which have returned to subsidizing fertilizer on a large scale have attempted to incorporate one or more of these innovations for improving efficiency of fertilizer subsidies. However, the tendency of governments has been to adopt only some of the recommendations (for example, the Malawi program utilizes vouchers but the government typically sidelines the private sector in the procurement and distribution of fertilizer), while by design, it is the aggregate use of the innovations, and not a few elements of the set, that is expected to avoid the downsides of the past fertilizer subsidy programs.

Of paramount concern is the glaring absence of innovation on how to constrain what was a major source of inefficiencies of past fertilizer subsidy programs: political manipulation. Holmén, (2005) argues that the pre-structural adjustment period (SAP) state agricultural interventions were partly “aimed at development and partly at nation-building, i.e. the consolidation of power” (p. 90). These agricultural subsidies held immense political appeal because they enabled the construction and sustaining of the clientelistic networks on which the state thrived.

In the present day, the typical country in SSA has at least 60% of its workforce engaged in agriculture (CIA World Factbook) and fertilizer subsidies still present an alluring appeal to politicians as a way of vote-buying and maintaining political support. Direct price subsidies are only one of many alternatives that can be employed to reduce prices and improve farmers’ access to fertilizer. For instance, there is evidence from across SSA, that bulk of the large price difference between farm gate and port prices is constituted of distribution and transportation costs, taxes and other regulatory charges, and, finance charges (IFDC Chemonics 2007). Investments in road infrastructure, policies that improve the efficiency of ports, elimination of bureaucratic hurdles and augmenting the performance of the financial system will likely lead to

significant cost reductions (Donovan 2004). However, the potential political gains of fertilizer subsidies are often more pronounced than those from the alternatives strategies.

Could the discounted role of political incentives, thwart the success of fertilizer subsidy programs even if in design they constitute the gold standard of ‘new’ fertilizer subsidies? Should it be assumed that with the innovations, political manipulation will no longer be a factor that reduces the inefficiency of fertilizer subsidy programs? This paper begins to answer this question using data from Ghana’s 2008 fertilizer subsidy program. With the international food, energy and fertilizer price hikes, 2008 was a crises year in Ghana and there was a sense that a government intervention was warranted. The program as it was designed, incorporated several of the best practices for a fertilizer subsidy: it was announced to be temporary, running from July to December 2008; there was the prospect for targeting specific beneficiaries as the subsidy was administered through vouchers; a public private partnership was arranged in which the sourcing of fertilizer was handled solely by existing fertilizer importers and distribution was by private retail outlets. During the actual implementation of the program, there was limited targeting of vouchers. The program was not as market friendly as assumed as about 70% of fertilizer retailers were precluded from accepting vouchers because of the rules requiring vouchers to be redeemed from fertilizer importers (IFPRI-IFDC survey). Furthermore, though intended to be temporary, the program mushroomed and continued in 2009 even after the triple price crises had subsided.

There are several areas of interest to study in Ghana’s experience with reintroducing fertilizer subsidies. Some of these are: the impact on production, impact on yield, short and long run effects on the private market and fiscal prudence of the program. The scope of this paper however is limited to the role for political incentives to influence the distribution of the subsidy benefits at the district level. Specifically we analyze whether and how a district’s political characteristics have any bearing on the number of vouchers that it received.

In SSA, through a combination of poor record keeping, fraudulent activities and lack of administrative capacity, seldom is it possible to determine how a subsidy is allocated. For instance in Malawi’s subsidy programs, the total number of vouchers printed and distributed is not known (Dorward et al 2008, Holden and Ludunka, 2010). However, Ghana’s case presents a unique opportunity to observe the role that the political influence can play in a fertilizer subsidy

even in programs that incorporate the new best practices of fertilizer subsidies. In the Ghanaian political context, the district emerges as the natural unit at which to observe and discuss the political characteristics of an area. We employ a dataset we assembled containing information on the number and types of vouchers received for all but 6 of Ghana's 138 administrative districts².

The subsidy vouchers approximate a transfer from the central government to the district and as such, we look to the literature on tactical redistributive politics to guide our analytical framework. The theoretical literature presents opposing theories of which areas politicians will target for higher transfers. The 'swing voter' models (Lindbeck and Weibull (1993), Dixit and Londregan (1996, 1998)) predict higher transfers to districts which do not show clear preference for any particular party. On the other hand, the 'core supporter' models (Cox and McCubbins (1986)) predict that the incumbent party will target more resources to areas where it perceives strong support. In the empirical literature, which political characteristics are most salient, and in which direction intergovernmental transfers have been affected, are also varied. Barkan and Chege (1989), Miguel and Zaidi (2003) and Case (2001) find that governments gave preferential treatment to their core supporters and that higher transfers or resources went to areas in which the incumbents president's vote share was higher the previous election. However, there is also evidence that politicians engage in targeting swing voters as in Cole (2009) who finds that Indian state governments supplied more subsidized agricultural loans in election years to districts in which they had a narrow margin of victory or loss. Khemani (2007) and Dahlberg and Johansson (2002) also find evidence of politically aligned agencies targeting benefits to swing voters.

In our empirical analysis, the political characteristics of the districts are captured by variables of relevance in both the swing voter and core supporter models. We find that beyond economic and demographic considerations, political characteristics are statistically significant determinants of the number of vouchers districts received. Higher numbers of vouchers were targeted to districts that the ruling party had lost in the previous presidential elections and more so, in the districts that had been lost by a higher margin. A district received 2% more vouchers for each

² The district is the second tier and of Ghana's decentralized structure of government. At the time of the subsidy program there were 138 districts. There has since been re-demarcation of district boundaries and as of 2010, there were 169 districts in Ghana.

percentage point by which the ruling party had lost the district. This amount is both statistically and numerically significant implying 66% higher vouchers in a district that the ruling government lost by the average loss margin compared to a similar district it had won. The analysis also showed that district poverty levels, which should have been an important consideration in an economic efficiency based distribution, was not a statistically significant determinant of a districts voucher allocation. In fact, district poverty levels were negatively correlated with their voucher allocation. Data availability limits the scope of this analysis to political considerations in district level allocation. However, the finding of political considerations influencing the voucher allocation at the district level suggests that political characteristics of the individual farmers will also influence their voucher allocation.

This evidence of ‘vote-buying’ activity in Ghana’s 2008 subsidy program suggests that despite the innovations in design and implementation of fertilizer subsidies, these new programs have potential to experience at least some of the significant pitfalls of subsidy programs from the past. The current innovations are not enough to make the new fertilizer subsidy programs economically and socially efficient.

The remainder of the paper is structured as follows. In the next section, we present a brief description of the history of fertilizer subsidies in Sub-Saharan Africa and discuss the context within which Ghana instituted a subsidy program in 2008. In Section 3, we describe the timeline of events and the design of the subsidy program, and some observations of how it was actually implemented. In section 4, we present the data used in the analysis. The empirical evidence is presented in section 6. In section 7, we discuss some issues of interpretation of the findings and how they are addressed. Section 8 concludes the paper.

2.0 Contextual Background

2.1 Fertilizer subsidies in SSA

From the late 60s to the 80s, many governments in sub-Saharan Africa (SSA) actively intervened in the agricultural sector in an effort to boost food production and encourage agricultural intensification. Strategies employed were varied and included, state farms and irrigation programs (for example in Ghana and Nigeria), collectivization (Nigeria, Ethiopia and Tanzania), government subsidized agricultural input credit programs (Zambia, Ethiopia, Ghana, Nigeria,

Kenya) and output market price controls (Malawi, Ghana, Uganda) (Holmen 2005). However, one strategy that was ubiquitous in SSA in this period was large universal subsidies for fertilizers. These typically took the form of direct price subsidies through centralized state monopolies for procuring and distributing fertilizer, and price controls and pan territorial fertilizer pricing.

A common objective of these agricultural programs was national food self sufficiency partly in an effort to ensure food security, but also as a source of national pride (Holmén 2005). In many countries, small holder farmers were therefore the implicit intended beneficiaries of the fertilizer subsidy programs. However, there is widespread evidence that subsidized fertilizer was typically captured by wealthy local elites and politicians. By the nature of the implementation and lack of record keeping of the activities under the subsidy programs, much of this evidence is however anecdotal. As is summarized by Holmén (2005): Friss-Hansen (1994 p.13) mentions that in Tanzania, “a politically well-connected village could receive more than it demanded [of scarce hybrid maize seed], while other villages received only a fragment of their requirement.”; Bazaara and Muhereza, (2003 p. 8) describe that in Uganda’s agricultural programs, the main beneficiaries were politically connected people and political supporters “who had nothing to do with farming”; Olayide and Idachaba, (1987) describe a similar outcome of the agricultural interventions in Nigeria where credit and subsidized input were funneled to and captured by “absentee farmers, retired civil servants, and soldiers”. In Zambia also, “The fertilizer that did make its way to farmers often ended up being captured by wealthy farmers who least needed assistance, rather than reaching the smallholders who were supposed to benefit” (Morris, Kelly, Kopicki and Byerlee, 2007 p.32)

Government monopolies, subsidies and high default credit programs have been a way for states to ingratiate themselves with the largely agrarian population. As such, inefficiencies “malpractices, nepotism and diversion of resources from their intended use were often tolerated” (Holmén 2005 p. 91). The political attractiveness of the subsidy programs is highlighted by the upheaval typically required for the subsidies to be repealed. Gulati and Narayanan (2003) document how political interests have prevented reform in agricultural subsidies in India when evidence shows that such reform is necessary from an efficiency perspective. In SSA, despite the exacerbating effects of agricultural input subsidies on the already precarious fiscal position of many countries, widespread reforms were largely the result of outside donor pressure (Morris,

Kelly, Kopicki and Byerlee, 2007). It was not until the SAP period that many governments withdrew from their monopolies and pursued reforms to privatize the fertilizer sector.

Despite the system inefficiencies, the scale back or complete curtailment of fertilizer subsidy programs in the late 80s and 90s had evident effects on agriculture in SSA. The fertilizer use in several countries, for example, Ghana, Malawi, Nigeria, Tanzania and Zambia either stagnated or declined. However, the collapse of food production and fertilizer use after the withdrawal of the subsidies does not imply that they should have been maintained. Rather, the evidence is suggestive that collapse resulted from partial implementation, or sometimes non-implementation of the reforms which would have brought the private sector in to play the role that the government had vacated. In many countries, despite an official policy of privatization and liberalization to encourage the development of a private distribution system, reform was riddled with policies that allowed the government and connected individuals to maintain control over fertilizer sector. For instance, in Zambia, even though the government relinquished its monopoly on fertilizer procurement and distribution, it distorted the market by continuing to distribute large amounts of fertilizer through local agents, invariably local political elites, in a very high default rate credit program (Jayne, Govereh, Wanzala, and Demeke , 2003). Similarly in Ethiopia, after the government limited the monopoly of the state parastatal, it continued to play a large role by allowing the formation of regional fertilizer companies by individuals with political ties which were then given preferential treatment in access to foreign exchange for fertilizer importation and also awarded contracts to supply fertilizer for government programs. Kenya, which was a notable exception in that fertilizer use increased after the removal of the subsidies is also one of the few countries that fully undertook reform and implemented legislation and structures to meaningfully support the private sector.

There is a recognized need for fertilizer use to increase dramatically in Africa. In 2002, fertilizer nutrient consumption in SSA was only 8kg/ha compared to 101 kg/ha in South Asia where yield rates in cereals are typically 2 or 3 fold that in SSA (Donovan, 2004). While fertilizer is not a panacea for low agricultural productivity, “there is little doubt that fertilizer use must increase in Africa if the region is to meet its agricultural growth targets, poverty reduction goals and environmental sustainability objectives” Morris, Kelly, Kopicki and Byerlee (2007 p. 9). There are alternatives to increasing fertilizer use on the continent other than direct price subsidies. Significant reductions in farm gate fertilizer prices can result from investments in infrastructure at the port

and in-land transportation and telecommunications networks. Policy changes that improve the functioning of financial markets and the broader macro economy are also expected to reduce farm gate prices. High risk in the profitability of using fertilizer has been identified as one of the reasons for low adoption (Pender, Nkonya and Rosegrant, 2004). Interventions that directly address this issue, like improving and expanding extension activities to disseminate appropriate fertilizer recommendations, agricultural research to develop crop varieties that are responsive to fertilizer, and investments in complementary technologies like irrigation, will also likely result in increased demand for fertilizer. Reducing post-harvest losses and replacing policies and infrastructure that result in rigidities in the output markets may also make fertilizer use more attractive over time. These alternatives invariably require lower administrative costs than those related to fertilizer subsidies and almost all have positive externalities in the rest of the economy. Indeed, some of these alternatives are needed to set the foundation on which fertilizer subsidies can be effective and efficient. Drawing from past experience, it is apparent that subsidies which supported Asia's Green Revolution were bolstered by "substantial public investment in education, infrastructure (roads and irrigation), and research and extension" (Donovan 2004).

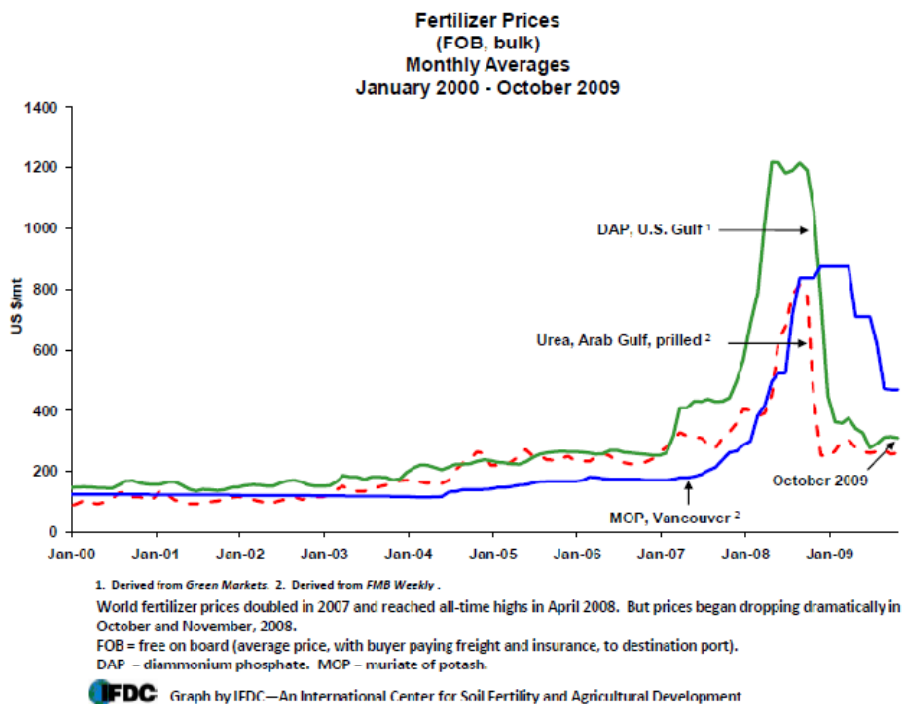
The renewed enthusiasm for governments to play an active role in providing agricultural inputs in Africa is evidenced by a number of countries that have actually re-instituted large scale subsidy programs. Part of the acceptance of fertilizers subsidies despite their deficient past can be explained by the many innovations to address of the pitfalls of the past programs. Regardless of the fact that no country has successfully adopted and implemented all the recommendations of the new fertilizer subsidies, several of them have made impressive gains, at least in the formulation and design stage. Fertilizer subsidies of the 21st century are typically no longer universal and almost all pronounce goals of being targeted to poor farmers. The subsidy programs in Malawi, Nigeria, Tanzania, Zambia and Kenya have express goals to target subsidies to the vulnerable groups like female-headed households. Instead of government monopolies to distribute fertilizer, subsidy programs, now claim to work to develop demand for private retailers. Government programs utilize market based innovations such as bid tender systems to source product using the private sector. There has been a proliferation in the use of vouchers (for example in Malawi, Ghana, Nigeria, Tanzania, Zambia and Kenya) to be used towards the purchase of fertilizer instead of distribution of the actual product. However, like in the periods before, fertilizer subsidy programs still have particular appeal to politicians because

of the possibility of manipulating and targeting benefits. Politics comes into play in almost every aspect of the design and implementation of a subsidy program. Despite the innovations in subsidy implementation, it is not clear how the new subsidy programs expect to avoid being overrun by political incentives.

2.2 Situational Context of Ghana’s 2008 fertilizer subsidy program

In 2008, world fertilizer prices soared (Fig 1). Between Jan 2007 and Jan 2008, the average price of a ton of urea, the world’s most commonly used nitrogen fertilizer, underwent what was then considered a sharp rise by increasing from \$272 to \$415³. However, by April 2008, a ton of urea cost on average \$452 and then rose to a peak of \$815 in August.

Figure 1: Global fertilizer prices, 2000 - 2009



In Ghana, fertilizer prices rose in concert with the global prices. The price of nitrogen-phosphorous-potassium (NPK) 15:15:15, the most widely used food crop fertilizer in Ghana increased from Ghana cedis (GH) ¢26 to GH¢35 per 50 kilogram (kg) bag between June 2007

³ Free on Board average price calculated by Policy, Trade, and Markets Program of IFDC using data from ‘Green Markets’ and FMB Weekly

and March 2008 (Ministry of Food and Agriculture, 2008).⁴ Food prices in the country also rose rapidly. Between May 2007 and May 2008, the price of the food staple maize, rose by an average of 77 percent in the metropolitan areas of Accra and Tamale. In the same period in 2006 - 07 it had fallen by 2.2 percent⁵. The prices of other staples such as rice and wheat also spiked as a result of shocks in the global food market and skyrocketing energy costs. Since liberalization reforms in the fertilizer sector in 1991, there had been no large scale government intervention in the fertilizer sector in Ghana. The decision to implement a national subsidy program in 2008 was justified as a temporary response to the unusual confluence of events in that year that led to simultaneous spikes in global food, energy and fertilizer prices.⁶

Agriculture is almost entirely rain-fed in Ghana and so planting of virtually all types of annual crops follows the rainfall pattern which is bimodal (March - July and August – November) in the southern areas of the country and uni-modal (May – September) in the northern savannah ecological zones (Kambiok, 2008, FAO 2005). Planting was well underway in the entire country when in May, 2008 the government announced its intention to subsidize fertilizer as a part of its efforts to mitigate the hardship of the population due to high food and fuel costs. The announcement was made by the President during an hour-long nationally televised address. The only reference to a fertilizer subsidy was, “Government will subsidize the cost of fertilizer and ensure effective distribution to farmers to assure a good harvest.” There were no further details publicized regarding what would be subsidized, when the subsidy would take effect or the design of the program. When the subsidy program was rolled out in early July 2008, it came as a surprise to most of the stakeholders, including district agricultural directors, employees of the Ministry of Food and Agriculture and farmers (Peasant Farmers Association of Ghana, 2009).

Aside from the price crises, 2008 was also significant because presidential and parliamentary elections were scheduled for November of that year. In Ghana, a president is elected by national majority rule (50% plus one vote) every four years. Members of the unicameral legislature, the Parliament of Ghana, are elected concurrently for four year terms.⁷ Since the return to

⁴ GH¢1 was approximately equal to US\$1 at that time.

⁵ Calculated as an average of consumer price index (CPI)-deflated prices in Accra and Tamale markets as reported by “Ghana food price tracking database”.

⁶ It should be noted that the program was continued in 2009 after prices of fertilizer, food and energy had collapsed.

⁷ The Parliament of Ghana consists of one Member of Parliament (MP) from each of 230 constituencies.

democratic rule in 1992, two parties have dominated politics in Ghana; The National Democratic Congress (NDC) and the New Patriotic Party (NPP). The NDC was founded just before the elections in 1992 by Jerry John Rawlings, the head of the military government at the time of democratization. The NPP was also founded around the same time but it was reconstituted from the United Party which was formed in 1957 by a group of African intellectuals who had fought for the creation of Ghana and its independence from the British. The party ideologies of the NPP and the NDC are not very distinct. However, the NDC, which garners its core support from a populist base in rural areas, is perceived to have a more center-left bias. Support for the NPP is higher amongst the urban educated population and it is often accused of being the party of ‘elites’. Mr Rawlings stood for and won the Ghanaian presidency on the NDC party ticket in 1992 and 1996. In 2000, the NPP came into power in an election that saw the first democratic change of regime in the country in decades. The NPP government was re-elected with a comfortable margin of 8% of the votes over the NDC in 2004. However, in 2008 the incumbent NPP was facing what was expected to be a difficult re-election bid. A fertilizer subsidy in that year simultaneously addressed the concerns of food security and showed farmers that the NPP government had empathy for the rural population who were largely farmers.

In Ghana, the fertilizer sector is completely liberalized and the government is not involved in any major way in procurement, distribution, and retailing of fertilizer. All inorganic fertilizer in the country is imported ready-for-use by private importers. Four private companies import essentially 100 percent of the fertilizers on the market. These importers in order of market size are Yara Ghana Ltd (subsidiary of Yara International ASA) and its partner cocoa fertilizer company Wienco Ghana Ltd; Golden Stork (subsidiary of SCPA Sivex International); Dizengoff Ghana Ltd (subsidiary of Balton CP Ltd); and Chemico Ltd. In the 2008 subsidy program, there was no public tender process for the procurement of subsidized fertilizer, nor did the government attempt to directly import fertilizers for use in the program as in Malawi, Nigeria, Kenya and Tanzania. The government’s decision to rely entirely on the private sector to source and distribute subsidized fertilizers may have been necessitated by the haste with which the program had to be implemented. Nevertheless, various aspects of the program design showed the government’s commitment to supporting the private markets.

It is noteworthy that the NPP government narrowly lost its re-election bid in 2008. The NPP candidate garnered the highest number of votes in the first round but with only 49%, it was shy

of the majority rule requiring a runoff vote against the NDC which had garnered 48% of the vote (Electoral Commission of Ghana). In the runoff, the NDC defeated the NPP by less than .01% of the votes. Despite the absence of the stressors that were used to justify the need for a temporary fertilizer subsidy for 2008, the subsidy program was expanded and re-instituted in 2009 by the NDC government. This situation sheds light on the lack of political will for states to withdraw fertilizer subsidies once they are in place.

3.0 Program design and actual implementation of Ghana's 2008 fertilizer subsidy

On July 2, 2008, the Minister for Food and Agriculture, held a press briefing at which he announced that there would be temporary country-wide subsidy on NPK 15:15:15, NPK 23:10:05, sulphate of ammonia, and urea from July 4 to December 31, 2008. Farmers were to receive the subsidy in the form of fertilizer-specific and region-specific vouchers distributed by agricultural extension agents (AEAs). Ordinarily fertilizer prices are set by fertilizer retailers but as part of the subsidy program, the government and the private fertilizer importers negotiated the price per 50kg bag in each district capital.⁸ The vouchers had face values of approximately 50% of these negotiated prices. A voucher could be used towards the purchase of the relevant fertilizer from any retailer in the region of issue that was willing to accept it.⁹ The retailer then passed on the redeemed vouchers to an importer (in practice, one with whom they were contracted). The importer in turn was to transmit an invoice for the value of vouchers to the Ministry of Food and Agriculture (MoFA) and receive payment within a week.

The subsidy level was chosen with two objectives: 1) to return the price farmers paid for fertilizer to the levels prevailing in July 2007, and 2) to create pan-territorial pricing for fertilizer. There were no specifically articulated goals of the subsidy program and it did not call for targeting of the voucher to farmers based on their income or the crop they cultivated. However, the types of fertilizers subsidized were generally not for use on cocoa, the major cash crop in the country. NPK 15:15:15 was already widely used in the country as a basal dressing fertilizer

⁸ The negotiated prices were generally higher than the market prices that had prevailed just before subsidy program by an average of GH¢10.00 and as much as GH¢25.00 per bag. (Banful, 2009)

⁹ There are 10 administrative regions in Ghana.

while urea and sulphate of ammonia were the typical top dressing fertilizers. On the other hand, NPK 23:10:05, a special maize formulation and a product of Yara, was largely unknown to farmers before the subsidy program.

On June 30, 2008, the first batch of vouchers was delivered to the headquarters of the Ministry of Food and Agriculture in Accra. It appears that the regional agricultural directors convened meetings with their district agricultural directors to inform them about the details of the subsidy program at about the same time that the program was announced to the public¹⁰. The district agricultural directors in turn convened meetings with the AEAs either just before or on July 4, 2008, to inform them about their roles in the subsidy scheme. AEAs were to distribute vouchers to farmers within their operational areas.¹¹ After July 2, the supplemental cash amount to be used with vouchers, that is, the price per 50kg bag for fertilizer purchased with a voucher, was announced widely on radio, and television. It was mainly through these announcements that farmers learnt that a subsidy program had begun and details of the program.

Figure 3 shows the timeline of some major events in the fertilizer subsidy program.

Figure 2: Timeline of major events in Ghana's 2008 fertilizer subsidy program.

¹⁰ Based on personal conversation with the Regional Agricultural director of the Brong Ahafo region of Ghana, October 23, 2008.

¹¹ The MoFA guidelines state that a district should be divided into 32 operational areas each served by 1 agricultural extension agent (AEA). However, most districts do not have enough agents on staff to allow this many operational areas. The boundaries of operational areas are typically not clearly demarcated and are not easily recongized.

Source: Banful, 2009

During the peak fertilizer application periods of April, May, June and July, the subsidized fertilizer was not available. The planned total number of vouchers for the duration of the program was 600,000 covering 30,000 metric tons of fertilizer, with the total value of subsidy offered amounting to about US\$15 million. However, the total number of vouchers printed was actually 1,140,850. By the end of the planting seasons, less than 50 percent of the vouchers had been redeemed. There was significant regional variation in the voucher redemption rates with regions in northern Ghana achieving higher rates (Banful 2009).

4.0 Data

The empirical analysis utilizes district level data consisting of demographics, number and types of vouchers received under the 2008 fertilizer subsidy program, and election results.

The data relating to the subsidy program were from a primary data collection effort by the author. Ghana's ministry of food and agriculture (MoFA) has decentralized regional offices in each of the ten administrative regions of the country, and district offices in each of the administrative districts of the country. In May 2009, a questionnaire was dispatched to the

district agricultural directors in each district office requesting information about the number and types of vouchers received, the dates of delivery, and the number and types of vouchers leftover as of Dec 31st 2008. The district agricultural office staff that provided the requested data was also asked to fill out an open ended comment card. Each of the ten regional agricultural offices was also asked to provide this same data disaggregated at the district level. This attempt to collect the same information from two different sources was to compensate for possible lapses in record keeping at either of these sources. In most regions, the district agricultural offices provided the requested data except for the dates of delivery. In combination with the data obtained from all 10 regional agricultural officers and resulting dataset was complete for all but six out of 138 districts.¹² Based on the records of the Ministry of Food and Agriculture, the total number of vouchers printed and distributed was 1,140,850.¹³ Based on the data collection from the district and regional agricultural offices, the total number of vouchers summed to 964,950. This total excludes the number of vouchers received by the six districts on which we have no data. Nevertheless, an estimate of the number of vouchers that each of the districts on which we have no data would have received (based on statistics of other districts in the region), yields a total national number of vouchers that agrees closely with the number expected.

Election results for the 2004 parliamentary and presidential elections were obtained from the headquarters of the Ghana Electoral Commission in Accra, Ghana. The variables in the dataset include number of registered voters, voter turnout, number of valid votes, political party of each presidential and parliamentary candidate and 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 defined as winning a district in the presidential or parliamentary election if it captures a majority of the votes there. It has almost always been the case that the candidate from the NPP or the NDC wins in both the presidential and the parliamentary election. The vote shares of political parties in the parliamentary election, which are reported at the constituency level, are virtually identical to the presidential election results. The analysis therefore focused on presidential election results only. The vote margin between

¹² Data was missing for Bole, Karaga, Nanumba north and Nanumba South districts in the Northern region and Amansie west and Builsa in the Ashanti and Upper East regions respectively

¹³ The authors interviewed the accountant in charge of managing the voucher program and the stock keeper in charge of receiving and disbursing vouchers at the Ministry of Food and Agriculture. Additional data was collected until November 17th 2008 by which time the last disbursements had been made.

the two dominant parties, the NDC and the NPP, in the presidential elections was used as a proxy for electoral competition in the district.

Demographic data such as district population, district area, percentage of labor force engaged in agriculture, were obtained from the 2000 census results published by the Ghana statistical services. Measures of poverty used were district level poverty headcount, poverty gap and poverty severity developed by Harold Coulombe based on the 2000 census (Coulombe 2005). These demographic and poverty data were disaggregated based on the 110 districts that existed at the time of the census. In the instances where a district had since been split, the data values of the district from which the new districts had been formed, were assigned to the new districts.

The area of maize cropped in the district is used as a measure of district demand for fertilizer. The maize data was obtained from Statistics Research and Information Directorate of the Ministry of Food and Agriculture (SRID). In Ghana, maize is produced and consumed in all agro-ecological zones and is the food crop that has historically been cultivated on the largest area of land (FAO 2005, SRID 2009). Data from an IFPRI/IFDC census of agricultural input dealers in Ghana confirmed the dominant position of maize amongst crops to which fertilizer is applied¹⁴. The area of maize cultivated in a district is therefore a reasonable proxy for the demand for the types of fertilizers subsidized.

A summary of the data used in the analysis is shown in Table 1.

Table 1: Summary Statistics

Variable	Number of observations	Mean	Std	Min	Max
Number of vouchers	132	7308	7093	150	49550
District population in 2000 ^a	138	137044	169386	42721	1658937
Percentage of district labor force engaged in agriculture in 2000 ^a	138	61.91	18.62	3.7	87.2
Farmers*	138	68351	25700	12637	191944
Vote percentage of ruling government 2004 elections ^b	138	48.29	20.17	4.24	88.20
Ruling government won	138	0.55	0.50	0	1

¹⁴ Vegetables such as, tomatoes, garden eggs, peppers, onions and okro are fed with fertilizers at about the same rate as maize but the area of these each of these crops cultivated is miniscule compared to the acreage of maize.

district in 2004 elections ^b					
District area in km ² ^a	138	1719	1792	150	12955
Doctors per district in 2000 ^a	138	5.55	9.13	1	89
Teachers per district in 2000 ^a	138	600	597.0	54	5265
Nurses per district in 2000 ^a	138	41.83	91.84	2	959
Enrolment per teacher in district in 2000 ^a	138	44.37	19.48	21.54	110.9
Poverty Headcount Index ^c	138	0.48	0.18	0.05	138
Poverty Gap Index ^c	138	0.19	0.11	0.01	138
Poverty Severity Index ^c	138	0.10	0.07	0.00	138
Maize area cultivated (km ²) in 2007 ^c	138	57.25	58.94	0.70	319.45

a: 2000 Population and Housing Census of Ghana. Ghana Statistical Services. b: Electoral commission of Ghana. c: Statistics, Research and Information Directorate of the Ministry of Food and Agriculture. d: IFDC/IFPRI Survey of Agricultural input dealers in Ghana e: Coulombe 2005. * Number of farmers per district is calculated as the product of the district population and the percentage of the labor engaged in agriculture

5.0 Did politics play any role in the allocation of the vouchers?

5.1 Voucher allocation in practice and basic statistics

We start the empirical analysis with a description of how the vouchers were allocated in practice based on the results of field work undertaken by the author in seven districts spread over four regions of the country in October 2008.¹⁵ Upon receipt from the printers, vouchers were sent from the Ministry of Food and Agriculture headquarters in the capital Accra to the regional agricultural offices. The regional office received the total regional allocation in batches, spread out over 2 to 6 different dates, over the period from the June 30th 2008 to mid October 2008.

At the regional agricultural office, the regional allocation was distributed amongst the districts within the region. The first consignment of vouchers to the region received on or shortly after June 30 2008, was typically distributed in the following way. Regional agricultural directors convened meetings of all district agricultural directors in their jurisdiction. At this meeting, through some combination of bargaining and discussion, the vouchers for the region were shared between districts. It appears that this procedure occurred only for the first batch of vouchers and

¹⁵ Districts visited were: Suhum Kraboa Coalta and Juaben in Eastern Region; Asante Akim North and Kumasi Metropolitan Area in Ashanti Region; Sunyani District in Brong Ahafo Region; Tamale Metropolitan Area and Tolon Kumbugu in the Northern Region. During the field visits, interviews were conducted with seven district agricultural directors; two extension agents in each district; the regional agricultural director for Brong Ahafo region; four farmers and 14 fertilizer retailers

that districts subsequently received vouchers by making requests to the regional agricultural office. These requests were not necessarily honored and districts and the number and types of vouchers districts received were typically different from what they had requested.

The regional distribution of the first 601,400 vouchers printed, roughly followed a predetermined distribution pattern of 15% each to Northern and Brong Ahafo regions; 13% to Ashanti region; 9% each to Upper East, Upper West, Central, Eastern and Volta regions; 6% each to Western and Greater Accra regions.¹⁶ However, there was subsequent printing of vouchers for all regions except for Western, Central, and Greater Accra regions. The distribution of these extra vouchers by fertilizer type and region of redemption did not follow any clear pattern.

Table 2 shows data on how vouchers were distributed across the 10 administrative regions of Ghana. There was significant regional variation in the number of vouchers a district received. Number of vouchers per district, were generally higher in the regions in the northern part of the country. This amount ranged from an average of about 15000 vouchers per district in the Northern region, to an average of less than 1000 vouchers per district in the Western region. The approximate number of vouchers available per 1000 farmers, ranged from an average of 200 in districts in the Northern region to an average of about 10 in districts in the Western region. Districts in the northern regions of the country generally had higher number of vouchers available per farmers. The exception is the Greater Accra region, which is located in the southern most part of the country but ranks 3rd in terms of the highest average number of vouchers available per 1000 farmers.

Figure 3 shows the proportions of the various types of vouchers which comprised the voucher allocation for districts within each of the 10 administrative regions of Ghana. The composition of the total voucher allocation is of interest as the vouchers were fertilizer specific. The late start of the subsidy program means that discriminating farmers would have preferred the ‘top dressing’ fertilizers like sulphate of ammonia and urea.¹⁷

Table 2: Regional voucher allocation

Regions Ranked by:	Regions Ranked by:	Regions Ranked by:
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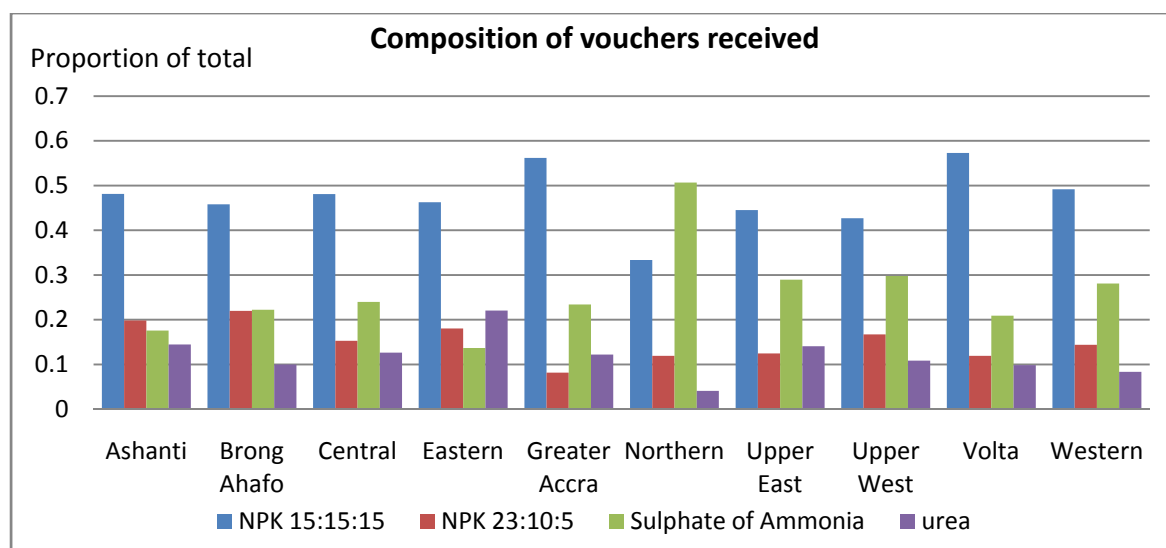
¹⁶ Planned distribution sourced from memo to Regional Agricultural directors from Ministry of Food and Agriculture June,2008. Actual distribution from Banful (09).

¹⁷ Apart from urea which has a recommendation of 50kg per acre, the recommended application rate of all the other types of subsidized fertilizer is 100kg per acre. However, urea is typically less preferred amongst farmers because of the extra labor needed to apply it by burying (Kambiok, 2008).

Total number of vouchers to region		Average number of vouchers per district		Average number of vouchers available per 1000 farmers	
Northern*	206950	Northern	14782	Northern	194
Brong Ahafo	193550	Upper East	11293	Brong Ahafo	172
Ashanti*	157500	Brong Ahafo	10187	Greater Accra	163
Eastern	105750	Ashanti	7875	Upper West	147
Upper East*	79050	Upper West	6831	Upper East	142
Volta	70700	Eastern	6221	Ashanti	105
Upper West	54650	Greater Accra	5650	Eastern	97
Central	51950	Volta	4713	Volta	89
Greater Accra	33900	Central	3996	Central	72
Western	10650	Western	819	Western	10

Note: Calculations do not include data for 4, 2 and 1 districts in Northern, Ashanti and Upper East regions respectively. *Total does not include data for some districts in the region.

Figure 3: Average composition of fertilizer vouchers received by districts



The data shows again that the composition of the vouchers that districts received also varied depending on the region of location. With the exception of districts in the Northern region, about half of the vouchers districts received were for NPK 15:15:15. In the Northern region, the majority of the vouchers districts received were for sulphate of ammonia which would have been highly desirable vouchers.

At the regional level of disaggregation, there is too much heterogeneity to determine how political, demographic, agro-ecological, and agricultural characteristics influenced the distribution. There is clearly pattern in which regions in the northern parts of the country

received higher number of vouchers than those nearer the south. However, even within regions, there was variation in the amount that districts received.

5.2 What were the determinants of voucher allocations?

Given that vouchers are a form of income support, the vouchers distributed to districts under a subsidy program is essentially a form of intergovernmental transfers. The district allocation of vouchers during the subsidy program in Ghana was in some sense a measure of the per capita benefits that the central government sought to transfer to the district. Like any other benefits that can be targeted to specific groups or areas, the vouchers can be tactically distributed to achieve goals other than those that maximize economic or welfare outcomes. Tactical distribution of intergovernmental transfers is typically aimed at maximizing the reelection prospects of incumbent governments. The empirical strategy we employ to test whether political considerations played a role in voucher allocations is to determine whether a district's political characteristics are statistically significant determinants of the number of vouchers it received.

We focus on the district as the main level of analysis for several reasons but primarily because it is the lowest functioning tier of the decentralized local government structure of Ghana is also the most important unit in the political discourse of the country. Much of government activities are concentrated at this level through local government structures called District Assemblies.¹⁸ The district is small enough for there to be considerable homogeneity in the geographic and demographic characteristics of the area it covers. Furthermore, the district is often the lowest level of disaggregation at which demographic, economic, agricultural and other data is reported.

The announcement of the subsidy program emphasized its role to support poor food crop producers under the burden of the increasing fertilizer prices. If politics was not a consideration in the allocation of vouchers, we should find that only demographic, economic and agricultural activity variables are significant determinants of voucher allocation. Under purely economic efficiency distribution criteria, voucher allocation should be higher to districts with more food

¹⁸ District Assemblies are formally non partisan but they are always headed by a political appointee of the ruling president. 30% of the Assembly comprises appointed members which are also from the political party of the ruling President. The rest of the membership is elected based officially on non partisan platforms but informal party activity plays a major role in the district assembly elections.

cropping activity and those with poorer populations among which a subsidy is likely to induce the most new demand for fertilizer. An econometric specification that would capture the salient determinants of voucher allocation under a purely efficiency-motivated distribution is given by

$$\text{Equation 1 } y_i = \alpha_0 + \alpha_1 \text{AREA}_i + \alpha_2 \text{FARMRS}_i + \alpha_3 \text{POVRTY}_i + \alpha_4 \text{ECLGY}_i + \alpha_4 \mathbf{Z}_i + u_i$$

where y_i is the total number of vouchers received by the district, AREA is a proxy for the agricultural activity in the district and is measured either by the total area of the district in km^2 or the area of maize that was cultivated in the district in 2007, FARMRS is the approximated number of farmers in the district, POVRTY is a measure for district level poverty, ECLGY captures district agro-ecology and \mathbf{Z}_i is a vector of region specific dummies. Measures of district agro-ecology are important because even though, the subsidy program started after the optimal fertilizer application periods in all parts of the country, the delay was more pronounced amongst districts in the southern parts. A purely economic efficiency basis of distribution may have resulted in vouchers being targeted to districts in the ecological zones in the north. In our regression estimations, ECLGY is captured by the latitude of the centroid of the district. District poverty is measured by the poverty head count ratio, the poverty gap index or the poverty severity index.

The estimated coefficients of the regression specification in Equation 1 are shown in Table 3. In panel A, the extent of agricultural activity in the district is measured by number of farmers in the district and the area of maize cropped in the previous planting season. The voucher allocation of the district is increasing in the number of farmers as well as the area of maize cropped. The coefficient estimate suggests that the voucher allocation of the district increases by 6% for every additional 10000 farmers in the district and 0.3% for every km^2 of maize cultivated in the districts.

Table 3: Economic determinants of the number vouchers transferred to each district

Panel A	Dependent Variable: Ln (Vouchers received)					
	1	2	3	4	5	6
Farmers (10,000s)	0.061 (0.038)	0.061 (0.038)	0.064* (0.038)	0.064* (0.038)	0.065* (0.038)	0.065* (0.038)
Maize cropped (km2)	3.7e-3** (1.7E-03)	3.8e-3** (1.7E-3)	3.6e-3** (1.7E-03)	3.8e-3** (1.7E-3)	3.6e-3** (1.7E-03)	3.8e-3** (1.7E-03)
Poverty headcount ratio	-0.01 (0.10)	0.07 (0.96)				
Poverty gap index			-1.06	-0.76		

Poverty severity index			(1.81)	(1.70)	-2.13 (2.72)	-1.57 (2.53)
Latitude	0.06 (0.19)		0.10 (0.20)		0.12 (0.20)	
Region Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	7.01*** (1.07)	7.67*** (0.47)	6.94*** (1.07)	7.73*** (0.44)	6.84*** (1.08)	7.72*** (0.43)2
R-squared	0.47	0.47	0.47	0.47	0.47	0.47
Panel B		Dependent Variable: Ln (Vouchers received)				
	1	2	3	4	5	6
Farmers (10000s)	0.092** 0.039	0.092** (0.039)	0.098** 0.039	0.100** (0.039)	0.100** (0.039)	0.100** (0.039)
Total Area (km2)	-9.9E-5 6.1E-05	-9.3E-5 (6.1E-5)	-1.1E-4* (6.2E-05)	-1.0E-4 (6.2E-5)	-1.2e-4* (6.28E-05)	-1.06E-04 (6.18E-05)
Poverty headcount ratio	-0.28 (1.01)	-0.08 (0.97)				
Poverty gap index			-2.04 (1.86)	-1.32 (1.74)		
Poverty severity index					-3.94 (2.83)	-2.61 (2.62)
Latitude	0.155 (0.195)		0.218 (0.201)		0.248 (0.202)	
Region Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	6.83*** (1.15)	7.66*** (0.48)	6.53*** (1.18)	7.73*** (0.44)	6.337*** (1.20)	7.710*** (0.44)
R-squared	0.46	0.46	0.47	0.46	0.47	132

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses. 132 observations in all regressions.

The positive coefficients on measures of agricultural activity in the districts suggest that the voucher allocation was at least in part influenced by economic considerations. However, the regression results show that district poverty does not influence its voucher allocation in the way that would be expected under a purely efficiency-based distribution pattern. The negative coefficients on measures of district poverty suggest that less poor districts received more vouchers. These coefficients are statistically insignificant but they show that at best, district poverty was not a determinant in its voucher allocation. From an efficiency perspective, voucher allocation should be increasing in measures of district poverty.

In panel B of Table 3, the area of maize cropped is replaced by the total land area of the district as a measure for agricultural productivity. In these regressions as well, the district allocation is

increasing in the number of farmers. However, the number of vouchers a district received is decreasing in the total land area versus increasing as would be expected under a distribution pattern based solely on efficiency considerations. However the coefficients are only marginally significant and it is possible that total land area is not a suitable proxy for area of food crop cultivation in a district. As in panel A, the positive coefficients on district latitude shows that districts in more northern ecological zones received higher voucher allocation than similar districts in southern ecological zones.

As has been argued, the pattern of voucher allocation is likely to have been influenced by district political characteristics. To test this, we estimate an augmented version of Equation 1 in which we include political characteristics of the districts. The district political characteristics that are expected to matter are informed by theories of redistributive politics. The ‘core supporter’ models of (Cox and McCubbins (1986)) predict that politicians are like risk-averse investors will give little transfers (vouchers) to districts where opposition to their party is strong, somewhat more in districts which have not shown a clear preference for one party or the other, and the most in districts which clearly support them. Therefore if the voucher allocation was manipulated by the ruling party to target its core supporters, we would expect the districts voucher allocation to be increasing in measures of ruling party support. We use as a measure of the political support for the ruling party, the vote share or the dummy variable for whether it won the district in the last presidential elections. This leads to a specification given by Equations 2

Equation 2
$$y_i = \beta_0 + \beta_1 \text{AREA}_i + \beta_2 \text{FARMRS}_i + \beta_3 \text{POVRTY}_i + \beta_4 \text{ECLGY}_i + \beta_5 \text{INCBSupp}_i + \beta_6 \mathbf{Z}_i + u_i$$

where INCBSupp is a measure of support for the incumbent party in the district given by the vote share of the ruling party or the dummy variable for whether it won the district in the last presidential election.

A contrasting set of theoretical models (Lindbeck and Weibull (1993), Dixit and Londregan 1996, 1998) predicts that the district political characteristics that matters is the prevalence of

‘swing voters’, those voters who can be easily swayed by transfers to support one party or the other. That framework implies that politicians will target benefits to districts where there is high electoral competition illustrated by a lower margin between the vote shares of the two political parties. We consider the vote margin between the two parties in the last presidential elections and vote margin interacted with the identity of the winning political party as salient political characteristics of the district. A positive coefficient on the vote margin in districts which the ruling party has won also suggests targeting of vouchers to core-supporters of the ruling party. However, a positive coefficient on the vote margin in district which the ruling party lost suggests that vouchers were used for vote-buying, that is, an attempt curry favor with those who had voted for the opposition party. The specification to test this hypothesis is given by Equation 3

Equation 3
$$y_i = \gamma_0 + \gamma_1 \text{AREA}_i + \gamma_2 \text{FARMRS}_i + \gamma_3 \text{POVRTY}_i + \gamma_4 \text{ECLGY}_i + \gamma_5 \text{INCBwinner} + \gamma_6 \text{VTMARG}_i + \gamma_7 \text{INCBwinner}_i * \text{VTMARG}_i + \gamma_8 \mathbf{Z}_i + u_i$$

where INCBwinner is a dummy for whether the incumbent party won the district in the previous presidential election and VTMARG is the margin by which presidential election in the district was won.

The results of the regressions based on Equations 2 and 3 are shown in Table 4. The regression results were similar utilizing all three different measures of poverty and so we show only the results from the estimation using poverty severity index as the measure of poverty. The coefficients on measures of support for the ruling government in columns 1 – 4 present strong

Table 4: Political and economic determinants of number of vouchers received

	Dependent Variable: Ln(Vouchers received)							
	1	2	3	4	5	6	7	8
Ruling party winner	-0.331 (0.252)	-0.343 (0.239)					0.312 (0.383)	0.104 (0.347)
Ruling party vote share			-0.0137* (0.0080)	-0.0140* (0.0079)				
Vote Margin					0.015*** (0.006)	0.014** (0.006)	0.0261*** (0.0089)	0.0218*** (0.0083)
Ruling party winner * Vote Margin							-0.0214* (0.0121)	-0.0171 (0.0116)
Farmers (10000s)	0.064* (0.037)	0.064* (0.038)	0.069* (0.038)	0.070* (0.038)	0.060 (0.037)	0.060 (0.037)	0.063* (0.037)	0.063* (0.037)
Maize area (km ²)	3.4e-5** (1.7E-3)	3. 5e-3** (1.7E-3)	3.0e-5* (1.7E-3)	3.1e-3* (1.E-3)	4.2e-5** (1.7E-3)	4.4e-3*** (1.7E-3)	3.5e-3** (1.7E-3)	3.8e-3** (1.7E-3)
Poverty severity	-1.94 (2.72)	-1.80 (2.53)	-2.40 (2.70)	-2.03 (2.53)	-2.35 (2.65)	-1.27 (2.48)	-2.61 (2.65)	-1.40 (2.48)
Latitude	0.031 (0.210)		0.079 (0.200)		0.228 (0.200)		0.278 (0.220)	
Region Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	7.64*** (1.24)	7.96*** (0.46)	7.89*** (1.24)	8.33*** (0.55)	5.93*** (1.11)	7.41*** (0.44)	5.60*** (1.39)	6.26*** (0.67)
Observations	132	132	132	132	132	132	132	132
R-squared	0.48	0.48	0.49	0.49	0.50	0.50	0.52	0.51

*** p<0.01, ** p<0.05, * p<0.1 Standard errors in parentheses.

evidence against the incumbent government targeting its supporters for higher vouchers. The coefficients instead suggest that areas that supported the ruling government were disadvantaged in terms of the number of vouchers they received. The regressions in columns 5 and 6 include the vote margin as the main political characteristic of the district. The positive coefficients on vote margin are strongly statistically significant and in contrast to the negative coefficients that are expected if vouchers were targeted to areas with high electoral competition. These regressions do however show strong evidence that politics of the district was a consideration in the allocation of vouchers. The regression results in columns 7 and 8, in which the vote margin is interacted with the identity of the winning party, provide more insights into how political considerations played a role and which districts were targeted for higher vouchers. The coefficients on vote margin in column 7 and 8 show vouchers were targeted to districts with higher vote margins but only those districts in which the ruling government had lost. The magnitude of the estimate is 2% more vouchers for each percentage point of the votes by which the ruling party had lost the districts. The vote margin in districts which the ruling party had won did not influence their voucher allocation. This is evidence that the vouchers were targeted to areas where there had been strong support for the opposition party. This is suggestive of the vouchers being used in an attempt at vote-buying. The advantage that opposition supporting districts had was not only statistically significant but also numerically significant. The average difference between the vote share of the incumbent and the opposition party in districts which the incumbent had lost was 33 percentage points. A district which the opposition party had won with this vote margin would have received approximately 66% more vouchers than a similar district which the ruling party had won.

The inclusion of political variables in the specification of the determinants of the voucher allocation did not significantly alter the estimated impact of the economic variables on voucher allocation. Across the regressions in columns 1 – 8 in Table 4, the coefficients on the farmers in the districts suggest that voucher allocation in a district increased by about 6% per every 10000 farmers. This is the same estimate as in economic variables only specification. As was the estimate when only economic variables were considered, each km² of maize cropped increased the voucher allocation of the district by 0.3%. The impact of district poverty on voucher allocation is unchanged from in the economic variables only specification. It appears less poor districts received higher number of vouchers.

6.0 Issues that may challenge the findings and interpretations

To reach that conclusion that political considerations explain in part the pattern of allocation of vouchers under Ghana's 2008 fertilizer subsidy program, certain assumptions were made. We discuss the justification for these assumptions and explain why these assumptions are not likely to be the drivers of our main finding. We also considered alternative interpretations, other than the political manipulation, for why the political characteristics of the district are predictors for its voucher allocation.

Within our analytical framework, we make the assumption that it is the political goals of the ruling party in the presidential elections that is manifested in the pattern of allocations at the district level. Even though we discuss vouchers being transferred from central government to the districts, this process in actuality includes several players who may also have their own political and other motivations (such as economic rents) for distributing vouchers the way they did.

However, we argue that in the political context of Ghana, all the players in the chain through which vouchers are transferred from the headquarters of the Ministry of Food and Agriculture in Accra to the district agricultural offices, have incentives that are aligned with the politicians in the ruling party. The regional allocation is implicitly determined by the number of region-specific vouchers which are printed. It is reasonable to assume that for reasons such as planning and budgeting, that the decision on the number and kinds of vouchers to be printed would have been reviewed by several top level members of the government. These Ministers and other members of the ruling executive would have been able to influence the regional distribution in a way that supported the political interests of the party through which they had gained their offices.

We showed that the region of location was an important predictor of the number of vouchers a district received. However, once vouchers reached the regional agricultural offices, they were distributed amongst districts based on some discretionary criteria. Again, we argue that at this stage of distribution, any political manipulation would have been in line with the goals of the ruling party. The regional agricultural directors, who either personally or through their proxies decide the district allocation, are de facto political appointees of the ruling government. Any proxy for a regional agricultural director, perhaps, the stock keeper or the disbursing financial officer at the regional level, reports either formally or informally to the regional agricultural director. There is therefore no incentive for the regional agricultural directors nor their proxy to

distribute vouchers in a way that would not meet with the approval of the ruling party. The question remains as to how the wishes of the ruling party were conveyed to the individuals distributing vouchers at the regional agricultural offices. We do not have an answer for this but conjecture that there may have been cues for how the ruling party wanted the vouchers distributed that were picked up by those in charge of the distribution.

A challenge can be raised to our choice of the total number of vouchers a district received as a measure of the benefit a district received from the voucher program. For starters, the vouchers were fertilizer-specific and some types of vouchers may have been more valuable to farmers than others. There were also different cash supplements for the vouchers depending on which fertilizer was being purchased. The announced subsidized price to farmers in district capitals was GH¢26, GH¢26, GH¢24, and GH¢18 for urea, NPK 15:15:15, NPK 23:10:05, and sulphate of ammonia respectively. It is possible that the benefit that districts perceived of their allocation was not just the total number but the composition. We elect to focus on the total number of vouchers because it is the most straight-forward measure - any other measure would require a space and time varying quantification of how farmers in the districts trade-off price versus ease of application, versus type of fertilizer. We are confident that total number of vouchers is at least a good proxy for the benefit that a district received from the voucher program based on anecdotal evidence that while farmers did often show a preference for some types of fertilizer, they were glad to receive any voucher.

A related challenge may be why we do not consider the number of vouchers actually used as the measure of the benefit to the district. The national level redemption rates of about 50% of vouchers by the conclusion of the planting seasons camouflage remarkably wide variation in regional redemption rates. For example, the redemption rate for NPK 15:15:15 was only 8% in the Western region compared to 69% in the Northern region, (Banful 09). We argue that the variation of the redemption rate does not alter our conclusions for the following reason. It would have been a considerable coordination and data intensive effort for the government to make voucher allocations accurately compensate for spatial variation in redemption rates. Without prior knowledge of exactly how the redemption rates would differ across districts, it is was not possible for the government to predict the variation in redemption rates. Redemption rates varied in part due to fertilizer shortages at the time it was needed. With fertilizer distribution left to the private sector, and minimal data about the agricultural input dealer network, it is unlikely

that the government could have known how and when product shortages could hit. The total number of vouchers transferred to the district still remains the better measure of how much subsidy benefits the government sought to transfer to the district. It was a reasonable assumption, for the government, as we have assumed, that the more vouchers a district got, the more it was benefited.

Political manipulation of a transfer program can take many forms and there are other dimensions of manipulation which we have not considered. In our analysis, we have not broached the timing of the release of vouchers to the district during the subsidy program. It is known that districts did not receive their voucher allocation in one bulk disbursement but on several dates during the subsidy program. Fertilizer application is time sensitive and a district that received a higher number of vouchers towards the end of the planting season may have been less well off than a district that received a lower number of vouchers but earlier in the planting season. We do not have an accurate record of when districts received their voucher allocation, and so do not consider this in our analysis.

An implicit assumption we make is that the number of vouchers available for farmers resident in a district is necessarily no more than what was allocated to the district office. Our results would be corrupted if it was the case that the government made allocations to the districts expecting that vouchers could be transferred across districts. This concern is allayed due to the subsidy design which called for extension agents to distribute vouchers only to farmers within their operational area. Farmers from within the district, who had it in their interest to guard their district allocation fiercely, policed who got a voucher and it is not likely that there were significant leakage of voucher allocation from one district to another. Furthermore, since the leakage was not explicitly anticipated, the total voucher allocation to the district still remains a measure of the benefits the ruling party sought to make available there.

It can be argued that our main finding that vouchers were used for vote buying and targeted to opposition districts can be explained by other factors based on efficiency considerations. We find this argument highly unlikely as these considerations would first have had to be omitted from the variables we control for, and secondly they would have to be perfectly correlated with the vote margin in districts. It is hard to think of any economic efficiency variable which has both of these properties. The estimates on the economic efficiency variables that we did include,

such as the number of farmers, the district poverty and the area of food cropped, were all robust to the inclusion of political variables. It is unlikely then that any other omitted economic variables are perfectly correlated to the political variables of interest.

One could argue that even though the political characteristics of the district are determinants of its voucher allocation, it does not suggest that the ruling party systematically influencing voucher allocations. Perhaps, the political manipulation was at the district level where members of parliament or other politically influential individuals at the district lobbied for higher voucher allocation. The observed allocation pattern could result if lobbying for vouchers was more aggressively pursued or more successful in districts where the ruling government had lost by a higher margin. This scenario is unlikely as it is in the interest of all incumbent politicians' to lobby for benefits for their constituents, especially in an election year. There is no a priori reason to expect that members of parliament in opposition districts lobbied more strongly than members of parliament affiliated with the ruling government. If lobbying was the way in which voucher allocation was determined, it would be more likely for members of the ruling government party to be able to extract more generous voucher allocations from the government instead of the pattern observed. Our interpretation that the political manipulation was orchestrated from the ruling party at the center fits the data and is a more likely scenario.

7.0 Conclusion

Malawi, Ghana, Nigeria, Kenya, Tanzania and Uganda are just some of the countries in SSA that have returned to large-scale government interventions to promote fertilizer use following a period of liberalization and government exit from the fertilizer sector. This is despite experience from the recent past in which fertilizer subsidy programs were inefficient and placed unsustainably high fiscal burdens on governments. Innovations in implementing fertilizer subsidies have emboldened the increasing acceptance of fertilizer subsidies as a necessary tool to increase agricultural productivity in SSA.

The new paradigm of fertilizer subsidies emphasizes the need for benefits to be targeted to poor smallholders through the use of mechanisms like vouchers and for subsidy programs to bolster private markets through public private partnerships in their implementation. While these innovations address some of the sources of inefficiency of past subsidy programs, they do not

address how to prevent political manipulation of subsidy benefits as was the typical experience of past programs.

In this paper, we employed a unique dataset of how subsidy benefits were allocated across districts in a subsidy program that incorporated several of the new innovations; Ghana's 2008 fertilizer subsidy. We combine district level data on vouchers received, with election data to rigorously determine how the political characteristics of districts affected their voucher allocations. In our empirical analysis, the political characteristics of the districts are captured by variables of relevance in both the swing-voter and core supporter models. The political support that the ruling party has in the district is measured by its vote share or the dummy variable for whether it won the district in the last presidential elections. The margin between the vote shares of the two dominant political parties is used as a measure of how strongly one party is preferred over the other in the district.

We find that political characteristics of the districts are a statistically significant determinant of the number of vouchers received controlling for agro-ecology and district demographics. However, we do not find that vouchers are targeted to the government supporters as have been the case in some other programs. Rather we find that vouchers are used in an attempt at vote-buying. Higher numbers of vouchers were targeted to districts that the ruling party had lost in the previous presidential elections and more so, in the districts that had been lost by a higher margin. A district received 2% more vouchers for each percentage point by which the ruling party had lost the district. This amount is both statistically and numerically significant; a district at the average loss margin for the ruling government received 66% more vouchers than a similar district that the ruling government had won. The analysis also showed that contrary to what would be expected under a purely efficiency-based allocation, poorer districts received relatively fewer vouchers.

This evidence suggests that despite the innovations in the design and implementation of fertilizer subsidies, political capture which was a major source of inefficiency of the subsidy programs of the past remains unresolved. Until there are viable innovations that prevent political manipulation, the new subsidy programs have potential to experience at least some of the significant pitfalls of subsidy programs from the past.

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References

- Banful, A. 2009. Operational details of the 2008 fertilizer subsidy in Ghana: Preliminary report. International Food Policy Research Institute Ghana Strategy Support Program Background Paper 18.
- Barkan, J., and M. Chege. 1989. Decentralizing the state: District focus and the politics of reallocation in Kenya. *Journal of Modern African Studies* 27 (3): 431–453.
- Bazaara, N. and F. Muhereza. 2003. Afrint Macro Study Report – agricultural intensification and food security issues in Uganda (mimeo). Centre for Basic Research, Kampala.
- Case, A. 2001. Election goals and income redistribution: Recent evidence from Albania. *European Economic Review* 45: 405–423.
- Chemonics International Inc., and IFDC(International Center for Soil Fertility and Agricultural Development), 2007. *Fertilizer supply and costs in Africa*. Publication for review by the Bill and Melinda Gates Foundation. Washington, D.C.: Chemonics International Inc., and IFDC.
- Cole, S. 2009. Fixing market failures or fixing elections? Agricultural credit in India. *American Economic Journal: Applied Economics* 1(1): 219–250.
- Coloumbe, H. 2005. *Ghana census-based poverty map: District and sub-district level results*. Mimeo. Ghana Statistical Services and Department for International Development. U.K.
- Cox, G., and M. McCubbins. 1986. Electoral politics as a redistributive game. *Journal of Politics* 48 (2): 370–389.
- Dahlberg, M., and E. Johansson, E. 2002. On the vote-purchasing behavior of incumbent governments. *The American Political Science Review* 96 (1): 27–40.
- Dixit, A., and J. Londregan. 1996. The determinants of success of special interests in redistributive politics. *Journal of Politics* 58 (4): 1132–1155.

- _____. 1998. Ideology, tactics, and efficiency in redistributive politics. *Quarterly Journal of Economics* 113 (1): 497-529.
- Donovan, G. 1996. *Agriculture and economic reform in Subs-Saharan Africa*. AFTES Working Paper 18. Washington, D.C.: World Bank.
- _____. 2004. *Fertilizer subsidy in Sub-Saharan Africa: A policy note*. Draft paper. Washington, D.C.: World Bank
- Dorward et al. 2008. *Evaluation of the 2006/07 Agricultural Input Subsidy Programme*. Final Report. Ministry of Agriculture and Food Security. Lilongwe, Malawi.: March.
- FAO (Food and Agriculture Organization of the United Nations). 2005. Fertilizer use by crop in Ghana. Rome.
- Friis-Hansen, E. 1994. Hybrid maize production and food security in Tanzania. *Biotechnology and Development Monitor*. (12-13)
- Gregory, I. 2006. *The Role of Input Vouchers in Pro-Poor Growth*. Background Paper for the African Fertilizer Summit. Abuja, Nigeria. 9-13 June
- Gulati, A., and S. Narayanan. 2003. *The subsidy syndrome in Indian agriculture*. New Delhi: Oxford University Press.
- Holmén, H. 2005. The state and agricultural intensification in Sub-Saharan Africa. In *The African food crisis: lessons from the Asian Green Revolution*, ed. G. Djurfeldt, H. Holmén, and M. Jirstrom. Oxon, U.K.: CABI Publishing
- Jayne, T., J. Govereh, M. Wanzala, and M. Demeke. Fertilizer market development: A comparative analysis of Ethiopia, Kenya and Zambia. *Food Policy* 28 (4): 293–316
- Khemani, S. 2003. *Partisan politics and intergovernmental transfers in India*. Policy Research Working Paper Series 3016. Washington, D.C.: World Bank
- Ministry of Food and Agriculture. 2009. *Agriculture in Ghana: Facts and figures*. Ministry of Food and Agriculture. Statistics Research and Information Division. Ghana.
- Minot N., and T. Benson. 2009. *Fertilizer subsidies in Africa: Are vouchers the answer?*. IFPRI Policy Brief 60. Washington, D.C.: International Food Policy Research Institute.
- Morris, Michael, Valerie A. Kelly, Ron J. Kopicki, and Derek Byerlee (2007). *Fertilizer Use in African Agriculture: Lessons Learned and Good Practice Guidelines*. Washington DC: World Bank.

Olayide, S. and F. Idachaba. 1987. Input and output marketing systems: a Nigerian case. In Mellor, J. W., Delgado, C.C. and Blackie, M. J. (eds) *Accelerating Food Production in Sub-Saharan Africa*. The Johns Hopkins University Press, Baltimore, Maryland.

Pender, J., E. Nkonya, and M. Rosegrant. 2004. *Soil Fertility and Fertilizer Subsidies in Sub Saharan Africa: Issues and Recommendations*. PowerPoint presentation. Washington, D.C.: International Food and Policy Research Institute

PFAG (Peasant Farmers Association of Ghana). 2009. *Report on assessing the effectiveness and efficiency of the coupon system of distribution of fertilizer to peasant farmers*. Ghana: Ghartey Associates Limited.

Stein, H., and R. Lunduka. 2010. *Impacts of the fertilizer subsidy program in Malawi: Targeting, household perceptions and preference*. Draft. Ås, Norway: Department of Economics and Resource Management. Norwegian University of Life Sciences