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E 2012.26

**Pro-Poor Policies in Sudan and South Sudan
A Study Based on the National Baseline Household Survey of 2009***

Submitted to the African Development Bank

by

David E. Sahn

Stephen D. Younger

This draft: *February 2, 2012*

Les auteurs

David E. Sahn

Cornell University, Ithaca, New York, and Clermont Université, Université d'Auvergne, CNRS, UMR 6587, Centre d'Etudes et de Recherches sur le Développement International (CERDI), F-63009 Clermont-Ferrand, France

Email: David.Sahn@Cornell.edu (corresponding author)

Stephen D. Younger

Cornell University and Ithaca College

La série des *Etudes et Documents* du CERDI est consultable sur le site :

<http://www.cerdi.org/ed>

Directeur de la publication : Patrick Plane

Directeur de la rédaction : Catherine Araujo Bonjean

Responsable d'édition : Annie Cohade

ISSN : 2114-7957

Acknowledgements

We are grateful to Kira Villa for excellent research assistance.

Avertissement :

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Sudan and South Sudan: Distributional Impact of Public Spending and Taxation

1. Introduction

- 1.1 While there are many motivations for a government's tax and expenditure policies, an important one is to transfer real resources from richer to poorer people – to make fiscal policy “pro-poor” and to improve the post-fisc distribution of well-being. This report considers options for the governments of Sudan and South Sudan¹ to use tax and expenditure policy to reduce poverty and inequality. While our focus is on the distributional or equity consequences of public spending and taxes, we fully recognize that the efficiency consequences of public policy matter, too. Despite their oil resources, both countries are poor, and South Sudan in particular is very underdeveloped. Neither country will eliminate poverty by relying solely or even primarily on redistribution. They need significant economic growth and development. Nevertheless, the distributional consequences of public policies do matter, and our purpose here is to shed as much light on those consequences as possible.
- 1.2 Both Sudan and South Sudan face extraordinary, though different, fiscal challenges. As a new country, South Sudan must establish its fiscal policy from scratch. The country is extremely underdeveloped in terms of public services. Only 40 percent of primary school-age children actually attend school.² 40 percent of households have no access to even a rudimentary health facility. 45 percent have no access to potable water. Only one percent have access to the electricity grid. These numbers are low compared to other African countries, highlighting the need for significant public expenditures on basic services and infrastructure.
- 1.3 At the same time, South Sudan's bureaucracy is poorly developed, including the tax authority. Non-oil tax revenue is less than one percent of GDP.³ Fortunately, this is not an immediate constraint because oil revenues are, for the time being, large. The petroleum sector accounts are quite opaque, but by any reckoning, oil revenues are substantial. The 2011 budget shows oil revenues of 5.6 billion SDG, which are almost 20 percent of GDP. Such revenues are adequate to fund a typical African country's public expenditures. What's more, these revenues seem likely to increase significantly with independence as South Sudan captures a larger share of the overall value of oil exports. It also seems likely that donor support will increase in South Sudan post independence.
- 1.4 Given this revenue, it is not imperative for South Sudan to raise non-oil revenue in the short-term. So while our report will discuss the redistributive consequences of some standard taxes, we do not believe that development of such taxes should be an immediate priority. Instead, the present challenge for the government of South Sudan is to manage its oil income well and spend it wisely. An important part of that challenge

¹ Since we are dealing with both countries, it is tempting to use “North” and “South,” but we prefer to use the actual country names. Thus, “Sudan” refers to the northern country and “South Sudan” to the southern one.

² All percentages in this paragraph are drawn directly from the NBHS and the authors' calculations.

³ Calculated from the 2011 Budget document and the NBS press release on GDP.

is macroeconomic: how much of the revenue to spend vs. save, and where.⁴ But the focus of this report is different: how can the government spend these oil revenues in ways that benefit poorer citizens, thus helping to reduce poverty? And, to a lesser extent, how can the government raise non-oil revenues in a way that is least detrimental to the poor? Getting these policies right early on is important because the pattern of public expenditures, once established, tends to change only gradually. In particular, most budgeting starts with the previous year's budget and then makes marginal changes. If a country's initial budgets allocate resources well, then subsequent budgets will mostly allocate resources well, too.

- 1.5 The fiscal problems in Sudan are more traditional. Even before separation, Sudan had a huge debt burden and large fiscal deficits. The IMF estimated that the government needed to reduce its fiscal deficit by at least 4 percent of GDP (Abbas et.al. 2010). Given that separation implies a loss of oil revenue that is likely much greater than any reduction in expenses resulting from South Sudan's independence, Sudan is faced with a huge fiscal hole. Expenditures will require substantial reduction, and tax revenues will have to increase. Such adjustment is sure to be painful, but it remains important to try to protect the poor as much as possible during the fiscal retrenchment. Knowing which public services are most used by the poor (and the rich), and which taxes are most progressive, will help in that regard.
- 1.6 The types of questions that we address in this report are usually called "incidence analysis." We ask: when the government spends money on something – paying teachers, building clinics, subsidizing food or petrol – who benefits from that expenditure? And in particular, how are the benefits of the expenditure distributed amongst poorer and richer residents? These are basically questions about the *equity* consequences of public expenditures. We reiterate that while this is an important criterion for evaluating public spending, it is not the only one: the efficiency consequences also matter as much or more. Consider building an airport. Almost no poor people will be direct beneficiaries of this infrastructure because poor people do not fly, so its targeting is not at all "pro-poor." At the same time, investing in an airport can be a highly productive way to integrate the domestic and international economies. The resulting economic growth may have indirect benefits for the poor, but even if it does not, it still makes sense for the government to make highly productive investments; the well-being of the non-poor matters, too. So, readers should keep in mind the limited scope of this report. We are concerned only with the equity consequences of public spending and taxation. These are important, but they are not the be all and end all of public finance.
- 1.7 After a brief discussion of the methods that we use, we present two sets of results, one for South Sudan and one for Sudan. Our aim is not so much to compare results across countries, but rather to compare the incidence of individual taxes and expenditures within each country. That is the information that can help to guide fiscal policy in each country.

⁴ In particular, establishing a functional off-shore stabilization fund to help mitigate the impact of dramatic fluctuations in international oil prices on the domestic economy and to limit "Dutch disease" problems is a high priority.

2. Methodology

2.1 Background

2.1.1 Appendix I give a detailed presentation of the methods that we use in this report. Here, we focus on the careful interpretation of the output of an incidence analysis. Table 1 is a typical example of such output. It gives the value that households in South Sudan report receiving in kind from government non-food aid programs in the past year. These shares are aggregated by beneficiaries' quintile or decile in the income distribution.⁵ It also shows the division of benefits between the poor and non-poor. This table provides answers to questions like “what share of the benefits of in-kind non-food transfers does the poorest quintile receive? The richest?”, etc. The second column of Table 1 shows that the poorest quintile received 3.8% of such transfers, while the richest quintile received 47.0%. Those falling below the poverty line, “the poor,” received 33.1% of the benefits, while the non-poor received 66.9%.

Table 1- Example of Incidence Table – In-kind food aid in South Sudan

Quintile	transfer	Share	
		population	welfare
1	0.038	0.200	0.040
2	0.146	0.200	0.088
3	0.198	0.200	0.144
4	0.148	0.200	0.230
5	0.470	0.200	0.498
Poor	0.331	0.506	0.196
non-poor	0.669	0.494	0.804

Source: NBHS and authors' calculation

2.1.2 How should we evaluate these results? An obvious point of reference is the population share of each group. By definition, each quintile has 20% of the population. Thus, the fact that the poorest quintile receives only 4% of the benefits while the richest receives 47% makes this benefit look poorly targeted. A similar argument can be made based on the poor/non-poor population and benefit shares. A less exacting standard compares the distribution of the benefits to the distribution of welfare, or per capita expenditures. The argument here is that if resources to fund this assistance are drawn proportionally to expenditures per capita (through, say, a comprehensive VAT), then the combination of that proportional tax and the transfer would improve the welfare distribution, albeit slightly in this case. For public expenditures that are meant to be pro-poor, this latter standard does not seem sufficiently demanding, and most analysts insist that benefits go disproportionately to the poor on a per capita basis to be considered “progressive” or “pro-poor.” That is, more than 20 percent of the

⁵ We say “income distribution” even though in most developing countries, we measure welfare by consumption per capita, as we do in this report.

benefits should go to the poorest quintile, more than 40 percent should go to the poorest two quintiles, etc. In this report, we will say “per capita progressive” for benefits that meet this criterion, i.e. those that go disproportionately to the poor, and “progressive” for benefits that do not, but that still are more equitably distributed than welfare itself. For analysis of taxes, comparison to the distribution of incomes is more reasonable. We will say taxes that are more concentrated among the rich than is expenditure per capita are “progressive,” while those that are less concentrated among the rich are “regressive.”⁶

- 2.1.3 Another way to evaluate the distributional consequences of a government expenditure or tax is via its concentration coefficient. A concentration coefficient is like a Gini coefficient, except that it summarizes the distribution of the tax or expenditure across the welfare distribution, rather than the distribution of welfare itself. While the Gini coefficient is bound to be between zero (for complete equality) and one (for complete inequality), concentration coefficients lie between negative one and one. Benefits that are disproportionately concentrated among the poor have negative concentration coefficients; those that are disproportionately concentrated among the less poor have positive values. Thus, benefits with concentration coefficients closer to negative one are the most progressive or the most pro-poor, and vice-versa for those with concentration coefficients nearer to one.

⁶ We should note in passing that this is not quite the same definition found in most public finance textbooks, which requires that the marginal tax rate be non-decreasing with income to be “progressive.”

2.2 Average vs. Marginal Incidence

2.2.1 An incidence analysis provides a description of the distribution of costs and benefits *as observed at the time of the survey*. This description may or may not be a good guide the impact of future policy changes. Consider the example in Table 2 which describes the incidence of public primary school students at the time of the survey, averaged over all respondents. For this reason, some authors call it “average incidence.” Suppose that the government decides to spend more money on primary education. The information in Table 2 is a useful guide to the incidence of that additional (or “marginal”) spending only if its benefits are distributed proportionally to the existing benefits described in the table. An example might be a decision to buy a new textbook for each current student. But if the government decides to spend more money by getting more students to study (say, by building schools nearer to their homes), Table 2 is not a good guide to the incidence of that policy. Table 2 describes existing beneficiaries. The new policy is explicitly directed at children who are not currently beneficiaries. In this case, the marginal incidence of the extra spending may be very different from the average incidence observed in the data.

Table 2 - Incidence of Public Primary School Students

Quintile	Share		
	transfer	population	welfare
1	0.143	0.200	0.040
2	0.191	0.200	0.088
3	0.209	0.200	0.144
4	0.230	0.200	0.230
5	0.227	0.200	0.498
poor	0.436	0.506	0.196
non-poor	0.564	0.494	0.804

Source: NBHS 2009 and authors' calculation

2.2.2 It is not that “average incidence” is never a good guide to the incidence of a policy change, but it certainly can be misleading. One must take care to consider the policy proposal at hand and decide how best to capture the marginal beneficiaries of that policy.

2.3 Incidence vs. Coverage

2.3.1 Incidence analysis examines the share of total benefits that go to different groups. This information tells us how well particular expenditures redistribute a fixed amount of resources between groups on the margin. It does not tell us about the size of the expenditure's impact. Coverage rates are an attempt to do that. Coverage measures the share of potential beneficiaries for an expenditure type who actually receive the benefit. For example, the number of children age six to twelve who attend primary school, or the share of households that have access to a health care facility. This information can be stratified by groups, including poor/non-poor or welfare quintiles.

- 2.3.2 To see the difference between the two measures, consider a program that transfers 10 SDG per month to the poorest person in the country and only to that person. The incidence of this program would be perfect – its concentration coefficient would be -1 – but its overall impact would be small because it is a small program. We would see this in the coverage rates, which would be small for the poorest quintile and zero for everyone else. At the other extreme, consider a program that transfers 10 SDG per month to everyone in the population. This would have 100% coverage, but would not be especially well-targeted to the poor – its concentration coefficient would be zero.
- 2.3.3 Both incidence and coverage provide useful information when thinking about how programs affect poverty. We will give both in this report.

2.4 Data Sources

- 2.4.1 Because we want to know how the benefits and costs of expenditures and taxes are spread across the welfare distribution, incidence analysis requires data on individual (or household) incomes or expenditures and benefits. These data must come from a sample that is nationally representative. For this report, we use data from the National Baseline Household Survey (2009), conducted in the entire country of Sudan before separation. In addition, the standard approach to valuing the benefits from public services like schooling or health care requires budgetary information for the services in question, disaggregated as much as possible by area and type of service (Demery 2003). Sudan and South Sudan do not have such detailed budget information, so our analysis will use the simpler 0/1 method, beneficiary incidence, for most of the public services analyzed.⁷

⁷ Note that because proportional changes in the estimated value of benefits do not change the incidence results, if only a national value for a service is available because budgets are not disaggregated by region, the result will be exactly the same as the incidence of beneficiaries, i.e. using zeros and ones.

3. Results – South Sudan

3.1 Social Services

- 3.1.1 Table 3 gives the beneficiary incidence for schooling. Because the NBHS does not distinguish the type of school, this table refers to either public or private schooling. The first three columns give the incidence of current students. We can see that primary schooling is more progressive than secondary, which in turn is more progressive than tertiary schooling, a pattern that is typical in most countries. Thus, funds spent on primary students go more to the poor than to those at higher levels. Nevertheless, none of these services is distributed *disproportionately* to the poor: all have positive concentration coefficients (found in the last row). This is typical of education systems with low enrolment rates, since the better-off households are more likely to send their children to school.
- 3.1.2 The fourth and fifth columns give the distribution of school-age children who are *not* in school. If the government were to encourage more children to attend school, the marginal incidence of such an effort might look more like these distributions than the existing distribution of students, because the new students would be drawn from this group. We can see that for both primary and secondary schooling, the benefits would be per capita progressive, i.e. go disproportionately to the poor.⁸

Table 3 - Incidence of School Attendance – Beneficiary Shares

Quintile	students attending			children not attending		expenditures per capita ¹
	primary	secondary	tertiary	primary	secondary	
1	0.143	0.067	0.078	0.259	0.240	0.040
2	0.191	0.123	0.083	0.213	0.208	0.088
3	0.209	0.185	0.166	0.201	0.210	0.144
4	0.230	0.252	0.102	0.177	0.195	0.230
5	0.227	0.374	0.570	0.150	0.146	0.498
poor	0.436	0.290	0.232	0.579	0.559	0.196
non-poor	0.564	0.710	0.768	0.421	0.441	0.804
cc ²	0.086	0.314	0.450	-0.107	-0.084	0.455

Source: NBHS, 2009 and authors' calculations

Notes: 1/ Expenditures per capita included as a reference for the general distribution of welfare.

2/ Concentration coefficient. This is the Gini in the last column.

⁸ The results for secondary schooling are too optimistic since many children of secondary age could not go to secondary school because they have not finished primary school.

- 3.1.3 Expanding the coverage of schooling is certainly possible in South Sudan. Table 4 gives the gross and net enrolment rates.⁹ These enrolment rates are extremely low, especially at the secondary level. Further, coverage is lower among the poorer quintiles, suggesting that an effort to increase school attendance could benefit the poor disproportionately. But even among the richer quintiles, enrolment rates are low.

Table 4 - Coverage of Schooling - Gross and Net Enrolment Rates

	Primary enrolment		Secondary enrolment	
	Gross	Net	Gross	Net
National	0.678	0.398	0.146	0.048
Quintile				
1	0.462	0.254	0.049	0.013
2	0.641	0.368	0.090	0.025
3	0.683	0.415	0.134	0.045
4	0.776	0.470	0.176	0.053
5	0.853	0.500	0.277	0.103
Poverty				
Poor	0.570	0.328	0.085	0.026
Non-Poor	0.794	0.473	0.206	0.070
Area				
Rural	0.612	0.358	0.101	0.031
Urban	1.074	0.638	0.355	0.129

Source: NBHS, 2009 and authors' calculations

⁹ Gross enrolment is the number of children enrolled in school divided by the total number of school age children. This can be greater than one if children older (or younger) than the "appropriate" age are still enrolled in school. Net enrolment is the number of school-age children enrolled divided by the number of school-age children, and thus cannot be greater than one.

- 3.1.4 Table 5 gives the incidence of access to health facilities.¹⁰ The benefits of primary health care units, the most basic type of facility, are slightly more likely to come from the poorer quintiles, while the opposite is true for hospitals. Nevertheless, the concentration coefficients for these services are better than in many other African countries, indicating that access to health facilities is relatively evenly distributed in South Sudan. An indicator for households who indicate that they have no access to health care is disproportionately concentrated among the poorer quintiles, indicating that expansion of health care services to the unserved might be modestly per capita progressive. We also include an indicator for whether or not respondents own a bed net. This, too, is fairly equitably distributed across the population.

Table 5 - Incidence of Access to Health Facilities

Quintile	PHCU ¹	PHCC ²	Hospital	No Facility	Bed Nets
1	0.208	0.157	0.110	0.256	0.161
2	0.251	0.182	0.134	0.206	0.189
3	0.198	0.207	0.202	0.196	0.202
4	0.192	0.235	0.222	0.180	0.209
5	0.151	0.219	0.333	0.162	0.239
poor	0.565	0.452	0.351	0.563	0.459
non-poor	0.435	0.548	0.649	0.437	0.541
cc	-0.073	0.073	0.220	-0.085	0.073

Source: NBHS, 2009 and authors' calculations

Notes: 1/ Primary health care unit

2/ Primary health care center

¹⁰ These results are somewhat different than those for other countries because the questionnaire does not ask about actual health care visits, but rather "What type of health care facility do members of this household visit most often when sick?"

3.1.5 Table 6 gives the coverage results for health facilities. As with schooling, these are low, with only 60% of the population saying that they have access to any health facility.¹¹ On the other hand, bed net ownership is high relative to other African countries, but far from universal.

Table 6 - Coverage of Health Facilities

	Health Facilities					Bed nets
	PHCU	PHCC	Hospital	Any Facility	No Facility	
National	0.241	0.175	0.179	0.595	0.405	0.590
Quintile						
1	0.249	0.137	0.098	0.484	0.516	0.474
2	0.303	0.160	0.120	0.582	0.418	0.558
3	0.239	0.182	0.181	0.602	0.398	0.597
4	0.231	0.206	0.199	0.636	0.364	0.616
5	0.181	0.192	0.298	0.671	0.329	0.704
Poverty						
Poor	0.269	0.156	0.124	0.550	0.450	0.535
Non-Poor	0.212	0.194	0.235	0.642	0.358	0.646
Area						
Rural	0.271	0.176	0.120	0.567	0.433	0.568
Urban	0.075	0.171	0.501	0.748	0.252	0.707

Source: NBHS, 2009 and authors' calculations

¹¹ The results for individual facilities may be biased downward since the question is asked in such a way as to force respondents to choose only one type of facility as the one they most often visit.

3.2 Infrastructure Services

3.2.1 Table 7 gives the incidence of access to clean water sources and the electricity grid.¹² Access to safe water is very evenly distributed across the population, more so than in other African countries. Connections to the electricity grid, on the other hand, are highly concentrated among the richer quintiles.

Table 7 - Incidence of Access to Infrastructure

Quintile	Access to	
	Clean Water ¹	Electricity
1	0.193	0.026
2	0.195	0.044
3	0.209	0.113
4	0.206	0.196
5	0.196	0.621
poor	0.498	0.102
non-poor	0.502	0.898
cc	0.007	0.589

Source: NBHS, 2009 and authors' calculations

Notes: 1/ Clean water is from a pipe, including standpipes, a borehole, a hand pump well, or a sand filter system.

¹² Unfortunately, the NBHS does not include questions about access to roads, of any type, so we cannot judge their progressivity.

3.2.2 Table 8 gives the coverage rates for clean water sources and electricity. Nationally, about 55 percent of South Sudanese have access to a clean water source, while almost no one, even in the richest quintile and in urban areas, has access to the electricity grid. The coverage for safe water is quite uniform across the expenditure distribution, and even reasonably similar between rural and urban areas.

Table 8 - Coverage of Clean Water Sources and Electricity

	Clean Water	Electricity
National	0.549	0.012
Quintile		
1	0.528	0.002
2	0.537	0.003
3	0.575	0.007
4	0.566	0.012
5	0.539	0.039
Poverty		
Poor	0.541	0.002
Non-Poor	0.557	0.023
Area		
Rural	0.527	0.002
Urban	0.667	0.071

Source: NBHS, 2009 and authors' calculations

3.3 Assistance to Farmers

3.3.1 South Sudan does not have programs aimed at agricultural development yet, but there is keen interest in such programs in government and among donors. The country needs to encourage growth outside the petroleum sector, and farming seems a logical place to start because a large share of the working population is engaged in agriculture. To try to understand the distributional consequences of future support to agriculture, we create an indicator variable for households who declare crop farming (the vast majority) or animal husbandry as their main source of livelihood. For comparison, we also include a similar indicator for households who indicate that wage work is the principal source of livelihood.

Table 9 - Incidence of Farmers

Quintile	Type of Livelihood	
	Wage Work	Farming
1	0.050	0.222
2	0.119	0.219
3	0.152	0.215
4	0.242	0.193
5	0.436	0.151
poor	0.247	0.557
non-poor	0.753	0.443
cc	0.383	-0.072

3.3.2 Farmers are somewhat more likely to be in the poorer quintiles, though not extraordinarily so. Nevertheless, if government could design programs to benefit all farmers equally, those expenditures would be per capita progressive. The same is not true of benefits to wage workers, though surprisingly, they are more equitably distributed than welfare itself.

3.4 Social Assistance

3.4.1 In addition to the standard social and infrastructure services, the NBHS asks households about receipt of transfer payments, or social assistance, in cash and in kind, from different sources. Table 10 gives the incidence of these payments and transfers. The targeting of these transfers, from both public and private sources, is remarkably regressive: all of them have concentration coefficients that are positive, while transfers that are well-targeted to the poor should have negative values. This is explicable for remittances, where we know from experience in other countries that households receiving them, mostly from family members, tend to be better off than their peers. It may also be explicable for “other government benefits” if those include pensions or other payments to (former) public employees, since they will tend to be among the richer households. But we presume that both food aid and transfers from government and NGOs are meant to go to the poor. That is dramatically not the case, especially when such transfers are in cash.

Table 10 - Incidence of Transfer Payments

Quintile	Food Aid ¹		Other Government Benefits		Other NGO/Charity		Remittances	
	cash	in kind	cash	in kind	cash	in kind	cash	in kind
1	0.035	0.031	0.007	0.038	0.024	0.027	0.097	0.080
2	0.030	0.107	0.143	0.146	0.027	0.190	0.123	0.209
3	0.095	0.285	0.225	0.198	0.119	0.169	0.240	0.150
4	0.323	0.198	0.205	0.148	0.276	0.304	0.197	0.226
5	0.518	0.379	0.420	0.470	0.555	0.309	0.343	0.335
poor	0.080	0.256	0.353	0.331	0.125	0.300	0.333	0.359
non-poor	0.920	0.744	0.647	0.669	0.875	0.700	0.667	0.641
cc	0.522	0.336	0.372	0.376	0.550	0.285	0.262	0.247

Source: NBHS, 2009 and authors' calculations

Notes: 1/ Food aid is from public or private (NGO) sources

3.4.2 Table 11 gives the coverage of these transfer payments, where we have counted the number of people living in households that receive any amount from the indicated source. These are small programs, reaching no more than a couple of percent of the population in South Sudan. This is all the more reason that these programs should have large negative concentration coefficients, but they do not. Clearly, targeting of these transfers is failing badly in South Sudan. One reason why this might be the case is that it is easier for food aid programs and NGOs to reach people in urban areas, where households are better off. But the difference in coverage rates is not too great between urban and rural areas, so some other explanation is needed.

Table 11 - Coverage of Transfer Payments

	Food Aid		Other Govt Benefits		Other NGO/Charity		Remittances	
	cash	in kind	cash	in kind	cash	in kind	cash	in kind
National Quintile	0.016	0.029	0.018	0.013	0.013	0.028	0.048	0.020
1	0.012	0.010	0.009	0.006	0.011	0.014	0.029	0.016
2	0.013	0.024	0.017	0.011	0.007	0.023	0.048	0.020
3	0.015	0.034	0.018	0.016	0.010	0.027	0.063	0.021
4	0.017	0.040	0.022	0.019	0.019	0.046	0.052	0.023
5	0.023	0.039	0.025	0.013	0.017	0.028	0.048	0.020
Poverty								
Poor	0.011	0.020	0.014	0.011	0.010	0.019	0.045	0.018
Non-Poor	0.021	0.039	0.023	0.016	0.016	0.036	0.051	0.022
Area								
Rural	0.015	0.029	0.016	0.013	0.013	0.029	0.046	0.020
Urban	0.020	0.031	0.029	0.011	0.013	0.020	0.060	0.022

3.5 Tax Incidence

3.5.1 The same tools of incidence analysis can be applied to taxes as well as public services and benefits. The only thing that changes is that taxes that fall on goods and services with concentration coefficients near one are progressive, while those with lower concentration coefficients are regressive. The literature consistently uses the Lorenz curve or Gini coefficient as the borderline between progressive and regressive. That is, a tax is deemed “progressive” if it leads to a more equal after-tax distribution, and regressive if not. Unlike benefits, negative concentration coefficients are rare, occurring only in the case of inferior goods.

3.5.2 Given its very significant oil revenues, South Sudan does not have an immediate need to collect other tax revenue. However, at some point, oil revenues may well decline, either absolutely or relative to the size of the economy, so the country will need the capacity to raise tax revenue. In the short- to medium-term, the emphasis should be on establishing a functional revenue authority and an efficient tax system, rather than raising revenues. This could be established by gradually implementing new taxes with very low rates,

allowing the tax authority to develop the necessary procedures and processes without generating significant economic distortions.

- 3.5.3 Given the very limited formal sector activity in South Sudan, income taxes are unlikely to generate much revenue. Indeed, they would fall mostly on public sector employees, so the same effect can be achieved by lowering public sector gross wages while forgoing income taxes on them. A more promising route for taxes is indirect taxes: a value-added tax (VAT) and excises. VAT is in theory the most economically efficient tax, because it creates the fewest distortions. But that theory is less applicable in an informal economy where few producers would actually pay taxes. Indeed, high VAT rates can discourage the creation of formal businesses. A VAT is also demanding of accounting systems for firms and the government. Excise taxes are simpler to collect, and they sometimes have an efficiency justification when the taxed product is associated with a negative externality. In this report, we consider the equity consequences of a VAT and some standard excise taxes on alcoholic beverages, tobacco, petroleum products, and telephones.

3.5.4 VAT Incidence

3.5.4.1 Table 12 gives the distributional information for a VAT in South Sudan. While a VAT is usually considered to be a broad-based tax, in South Sudan, informal activity that would surely fall outside of the tax net is a large share of overall expenditures. We have included in the taxable items only manufactures likely to be provided by the formal sector.¹³ As can be seen from the bottom row of the table, this is a small share of overall household expenditures in South Sudan, largely because agricultural products are not included.

Table 12 - Incidence of VAT

Quintile	VAT	expenditures per capita
1	0.032	0.040
2	0.069	0.088
3	0.107	0.144
4	0.191	0.230
5	0.601	0.498
poor	0.150	0.196
non-poor	0.850	0.804
cc	0.550	0.455
expenditures per month	mean	11.91
	median	3.57
		100.26
		72.11

3.5.4.2 The base for a VAT in South Sudan is thus more narrow than is typical, even for African countries. On the other hand, this makes the VAT relatively progressive, because consumption of formal sector goods and services is more likely among the better off, especially those in urban areas. In particular, the poor have only 15 percent of such expenditures, compared to 20 percent of overall household expenditures (and 50 percent of the population). Thus, a VAT, at least in its initial stages, is likely to be progressive in South Sudan, but it will also have a more narrow tax base and produce less revenue than one might expect.

¹³ Appendix III provides exact variable definitions.

3.5.5 Excise Taxes on Soft Drinks, Alcohol, and Tobacco

3.5.5.1 It is much easier for the tax authorities to impose excise taxes on individual commodities that are produced (or imported) at only a few facilities in the country. Further, some excises such as those on tobacco or alcohol, have an efficiency justification because of the negative externalities associated with these goods. Table 13 gives the distribution of several standard excises, along with one on salt, because such a tax does exist in South Sudan.

Table 13 - Incidence for Standard Excise Taxes

		Soft	Bottled				
Quintile		Drinks	Water	Beer	Liquor	Cigarettes	Salt
	1	0.003	0.008	0.003	0.037	0.027	0.094
	2	0.009	0.033	0.023	0.077	0.060	0.139
	3	0.032	0.052	0.049	0.136	0.135	0.180
	4	0.163	0.124	0.089	0.201	0.231	0.231
	5	0.793	0.783	0.836	0.550	0.547	0.356
	poor	0.025	0.078	0.053	0.189	0.161	0.329
	non-poor	0.975	0.922	0.947	0.811	0.839	0.671
	cc	0.778	0.740	0.756	0.492	0.512	0.265
expenditures	mean /1	0.57	0.33	0.39	0.45	0.34	0.78
per month	median /2	3.37	1.44	6.93	1.97	1.26	0.72

3.5.5.2 Excise taxes on each of these products would be progressive, except for salt. Somewhat surprisingly, the incidence of taxes on liquor (which is distinguished from either traditional or bottled beer in the survey) and cigarettes are not much different from expenditures per capita (see Table 12), while soft drinks, bottled water, and beer consumption are all concentrated among the richest households in the country. Taxing them would be highly progressive.

3.5.6 Excise Taxes on Petroleum Products and Electricity

3.5.6.1 Many countries levy excise taxes on petroleum products, in part because it is easy to tax them, and in part because of the negative externalities associated with their consumption. On the other hand, many oil-producing nations actually subsidize the consumption of petroleum products. The logic for this is something like “these resources belong to all South Sudanese. Why should we pay high world prices for them?” All economists would respond “because the opportunity cost of not selling them to the world is high.” If petroleum products are artificially cheap domestically, consumption is encouraged, and everything that is

consumed domestically cannot be sold abroad. That lessens South Sudan's ability to buy other things, including many public services since much of the export revenues return to the government. Those other things are more valuable on the margin than petroleum products sold at below-market prices.

- 3.5.6.2 Table 14 gives the distribution of taxes or subsidies associated with energy. Taxes on each of these items would be progressive (and consequently, subsidies for them are regressive), some extremely so. Electricity from the grid, gas in cylinders, and generator fuel are consumed almost exclusively by the richest quintile. Even kerosene expenditures are more concentrated among richer South Sudanese than are general expenditures, something that is not usually the case in Africa. We have included transport expenditures for boda-boda and bus services because it is sometimes argued that even though direct expenditure on fuel is concentrated among the rich, taxes on fuel will affect the poor by driving up the cost of other goods and services that require transport. The most obvious proxy that we have for this is in the NBHS transport expenditures. These, too, are concentrated among richer households, though not so much so as fuel expenditures themselves.

Table 14 - Incidence of Energy Taxes or Subsidies

	Quintile	Electricity	Gas	Kerosene	Generator Fuel	Transport	Gasoline
	1	0.000	0.000	0.011	0.001	0.015	0.006
	2	0.000	0.000	0.073	0.004	0.037	0.010
	3	0.003	0.000	0.163	0.020	0.095	0.016
	4	0.105	0.000	0.179	0.059	0.250	0.049
	5	0.893	1.000	0.575	0.916	0.603	0.919
	poor	0.001	0.000	0.138	0.005	0.105	0.023
	non-poor	0.999	1.000	0.862	0.995	0.895	0.977
	cc	0.892	0.919	0.555	0.829	0.590	0.841
expenditures	mean /1	0.11	0.07	0.08	0.10	0.93	0.08
per month	median /2	3.75	10.00	0.75	4.17	3.33	0.75

3.5.7 Excise Taxes on Communications

3.5.7.1 Many African countries also tax communications, especially mobile phone use. While there is not a strong efficiency argument for this tax, the limited number of service providers and their managerial sophistication make this an easy tax handle. Table 15 gives the incidence of taxes on communications. Each of these is highly concentrated among the richest households, though not quite so much as fuel and electricity. Evidently, the wide diffusion of mobile telecoms that has occurred on other African economies has yet to hit South Sudan. As a result, taxing communications would be highly progressive.

Table 15 - Incidence of Excise Taxes on Communications

	Quintile	Mobile	Land Line	Scratch Card
	1	0.002	0.004	0.003
	2	0.001	0.006	0.017
	3	0.032	0.015	0.037
	4	0.170	0.174	0.141
	5	0.796	0.802	0.802
	poor	0.020	0.015	0.036
	non-poor	0.980	0.985	0.964
	cc	0.773	0.768	0.770
expenditures	mean /1	0.44	0.17	0.64
	median			
per month	/2	5.83	5.83	5.00

Source: authors' calculations and NBHS

3.6 Conclusions – South Sudan

3.6.1 Public health and education services clearly need to increase in South Sudan. Coverage rates are extremely low, and there is evidence that the rates of return to these investments are very high (Shimeles and Verdier-Chouchane, 2011). In education, expenditures to benefit current students at primary and secondary levels, but not tertiary, will help to equalize the welfare distribution – they are progressive – but none of these expenditures would go disproportionately to the poor. On the other hand, expenditures designed to expand schooling coverage to children not currently attending would go disproportionately to the poor – they are per capita progressive – so from an equity perspective, the most desirable increases in the education budget would be those that expand coverage to children who are not currently in school. This is true for both primary- and secondary-age children. Because coverage is lower in rural areas and the population is poorer there, targeting expanded school coverage to rural areas is most likely to benefit the poor. However, this equity benefit has to be balanced against the higher cost of providing services in rural areas.

- 3.6.2 For health care, benefits aimed at existing users of PHCUs are per capita progressive. Expanding health care services to those who currently have no access would also benefit the poor disproportionately. Other health expenditures, on PHCCs and public hospitals, help to improve the welfare distribution, but do not go disproportionately to the poor. As with schooling, expanding health services in rural areas will be more pro-poor.
- 3.6.3 Access to clean water is quite equitable in South Sudan, across the welfare distribution and also by area, but coverage remains low, at only 55 percent of the population. Expanding this access would be an equitable public expenditure, as would improvements in the quality of existing safe water sources. Access to the electricity grid is extremely limited, even in urban areas and among the richest households. The economics of electricity grids dictate that these services will have to expand in urban areas first, but such services will not be progressive. Thus, from an equity perspective, it is better to make infrastructure investments in water provision than electricity.
- 3.6.4 There is very little information on agriculture in the NBHS for South Sudan, which is unfortunate because there is considerable interest in providing public support to farming and farmers. The little evidence that we have is households' own declaration of their principal source of livelihood as farming. These households are somewhat more likely to be in the poorer quintiles, indicating that general support to farming households would be per capita progressive. The challenge, of course, is to ensure that such programs benefit all farmers equally, not just the richer ones. (See the discussion of irrigation in Sudan.)
- 3.6.5 Transfer payments, in kind and in cash, are very poorly targeted in South Sudan. This is understandable for remittances from private sources, and perhaps also for government pensions, but it is unacceptable for food aid and transfers NGO. It is not possible to know the source of this poor from the NBHS, but it does not seem to be a simple urban bias.
- 3.6.6 One factor that does not come directly from the work in this report but which is nevertheless important to highlight as South Sudan thinks about how best to expand public services is this: in many developing countries, it is usually the case that programs and policies with limited coverage tend to be less well-targeted to the poor. It seems that the rich manage to capture the first benefits of these programs, with the poor only managing to participate as the programs expand their coverage. To make public services as pro-poor as possible, it thus makes sense for South Sudan to concentrate on providing a few public services with broad coverage, rather than trying to provide a wide range of public services with more limited coverage. This is all the more so given the limits of South Sudan's young bureaucracy. It seems logical that these few services should include schooling, especially primary schooling, basic health care, and perhaps services to farmers, though the evidence for the latter from this report is very limited.
- 3.6.7 As for taxation, almost all of the indirect taxes that the government of South Sudan either imposes or might consider are progressive. The one exception is the tax on salt, which ought to be abandoned. Most economists favor a VAT on

efficiency grounds, but a VAT in South Sudan would have a narrow base in practice, limited to about 10 percent of household expenditures. On the other hand, a VAT in South Sudan would be progressive precisely because the limited consumption of formal sector goods and services is concentrated among better-off households.

- 3.6.8 Excise taxes are somewhat easier to collect in an underdeveloped economy. All the standard excises – on soft drinks, beer, alcohol, and tobacco – would be progressive in South Sudan, as would taxes on electricity and petroleum products, even kerosene. On the other hand, subsidies for these products would be both inefficient and highly regressive. As such, the temptation to subsidize petroleum products should be avoided. South Sudan would do well to charge market prices for petroleum products and use the revenue to provide public services.
- 3.6.9 No matter which taxes the government of South Sudan chooses to impose, the tax bases will be narrow and the potential for revenue generation very limited. This is not an immediate problem because of oil revenues. But should oil production or world prices fall, it will be very difficult, probably impossible, for South Sudan to make up those revenues with taxes of any kind. There is thus a strong argument for saving (abroad) a significant portion of oil revenues.

4. Results – Sudan

4.1 Social Services¹⁴

- 4.1.1 Table 16 gives the beneficiary incidence for schooling. Because the NBHS does not distinguish the type of school, this table refers to either public or private schooling. The first three columns give the incidence of current students. We can see that primary schooling is more progressive than secondary, which in turn is more progressive than tertiary schooling, a pattern that is typical in most countries. Thus, funds spent on primary students go more to the poor than to those at higher levels. Only primary schooling services are distributed *disproportionately* to the poor. Secondary schooling is more progressive than the distribution of welfare (found in the last column), but not per capita progressive. Tertiary schooling is distributed about as unequally as welfare itself.
- 4.1.2 The fourth and fifth columns give the distribution of school-age children who are *not* in school. If the government were to encourage more children to attend school, the marginal incidence of such an effort might look more like these distributions than the existing distribution of students, because the new students would be drawn from this group. We can see that for both primary and secondary schooling, the benefits would be strongly per capita progressive, i.e. go disproportionately to the poor. This is especially true of primary schooling.

Table 16 - Incidence of School Attendance – Beneficiary Shares

Quintile	students attending			children not attending		expenditures per capita ^{1/}
	primary	secondary	tertiary	primary	secondary	
1	0.245	0.129	0.063	0.427	0.322	0.084
2	0.235	0.193	0.129	0.249	0.231	0.133
3	0.216	0.216	0.182	0.176	0.202	0.175
4	0.187	0.234	0.240	0.102	0.139	0.237
5	0.117	0.228	0.385	0.046	0.105	0.371
	0.000	0.000	0.000	0.000	0.000	
poor	0.498	0.338	0.201	0.691	0.567	0.228
non-poor	0.502	0.662	0.799	0.309	0.433	0.772
cc ^{2/}	-0.060	0.171	0.390	-0.321	-0.160	0.353

Source: NBHS, 2009 and authors' calculations

Notes: 1/ Expenditures per capita included as a reference for the general distribution of welfare.

2/ Concentration coefficient. This is the Gini in the last column.

¹⁴ Unfortunately, the survey data from Sudan did not include information on access to health services, so we analyze only education in this section.

- 4.1.3 Expanding the coverage of schooling is possible in Sudan. Table 17 gives the gross and net enrolment rates.¹⁵ These enrolment rates are typical of those found in East Africa before the recent attempts to expand coverage by eliminating school fees. But coverage rates are now significantly higher in some East African countries, sometimes topping 100% for gross enrolment. Further, coverage is lower among the poorer quintiles in Sudan, especially for secondary schooling suggesting that an effort to increase school attendance could benefit the poor disproportionately.

Table 17 - Coverage of Schooling - Gross and Net Enrolment Rates

	Primary enrolment		Secondary enrolment	
	Gross	Net	Gross	Net
National	0.897	0.669	0.375	0.266
Quintile				
1	0.741	0.529	0.205	0.130
2	0.895	0.651	0.322	0.227
3	0.959	0.709	0.376	0.277
4	1.011	0.796	0.492	0.372
5	1.055	0.831	0.591	0.402
Poverty				
Poor	0.814	0.587	0.266	0.181
Non-Poor	0.999	0.768	0.474	0.343
Area				
Rural	0.813	0.593	0.259	0.172
Urban	1.066	0.821	0.565	0.420

Source: NBHS, 2009 and authors' calculations

¹⁵ Gross enrolment is the number of children enrolled in school divided by the total number of school age children. This can be greater than one if children older (or younger) than the "appropriate" age are still enrolled in school. Net enrolment is the number of school-age children enrolled divided by the number of school-age children, and thus cannot be greater than one.

4.2 Infrastructure Services

4.2.1 Table 18 gives the incidence of access to clean water sources and the electricity grid. Access to safe water is very evenly distributed across the population, more so than in other African countries. Connections to the electricity grid are more concentrated among the richer quintiles, but not extremely so, being roughly comparable to the distribution of welfare itself.

Table 18 - Incidence of Access to Infrastructure

Quintile	Access to	
	Clean Water ¹	Electricity
1	0.212	0.060
2	0.209	0.160
3	0.185	0.205
4	0.201	0.273
5	0.194	0.303
	0.000	0.000
poor	0.433	0.233
non- poor	0.567	0.767
cc	0.048	0.318

Source: NBHS, 2009 and authors' calculations

Notes: 1/ Clean water is from a pipe, including standpipes, a borehole, a hand pump well, or a sand filter system.

4.2.2 Table 19 gives the coverage rates for clean water sources and electricity. Nationally, about 62 percent of Sudanese have access to a clean water source. Electricity coverage shows a strong urban/rural difference, which is to be expected. The coverage for safe water is nearly uniform across the expenditure distribution, while that for electricity connections shows a stronger gradient favoring the richer quintiles.

Table 19 - Coverage of Clean Water Sources and Electricity

	Clean Water	Electricity
National	0.618	0.349
Quintile		
1	0.565	0.091
2	0.606	0.262
3	0.569	0.356
4	0.648	0.496
5	0.733	0.647
Poverty		
Poor	0.583	0.177
Non-Poor	0.648	0.495
Area		
Rural	0.576	0.177
Urban	0.690	0.643

Source: NBHS, 2009 and authors' calculations

4.3 Assistance to Farmers

4.3.1 Sudan remains an agricultural economy with most poor people working as farmers, so it seems logical to consider programs aimed at improving the income of farmers as a pro-poor policy. To try to understand the distributional consequences of support to agriculture, we created an indicator variable for households who declare crop farming or animal husbandry as their main source of livelihood. For comparison, we also include a similar indicator for households who indicate that wage work is their principal source of livelihood. Table 20 shows that farmers are significantly more likely to be in the poorer quintiles in Sudan, so if government could design programs to benefit all farmers equally, those expenditures would be strongly per capita progressive. The same is not true of benefits to wage workers, though surprisingly, they are much more equitably distributed than welfare itself.

Table 20 - Incidence of Farmers

Quintile	Type of Livelihood	
	Wage Work	Farming
1	0.119	0.378
2	0.169	0.246
3	0.215	0.179
4	0.255	0.124
5	0.240	0.074
poor	0.308	0.635
non-poor	0.692	0.365
cc	0.210	-0.242

4.3.3 The NBHS data from Sudan also include information on land and livestock ownership. Table 21 gives results for these variables. “Ownership” is a 0/1 indicator variable; “value” is the household’s estimated value of the land and livestock that it owns. Livestock owners are disproportionately likely to be poor, though on a value basis, livestock holdings are slightly larger in richer households. Nevertheless, agricultural programs aimed at livestock owners, especially those with relatively few animals, would be pro-poor in Sudan. Land holdings are just about equally distributed across the welfare distribution, though on a value basis, this is somewhat less true. Irrigated land holdings are more concentrated among the richer quintiles, but not extremely so. All land holdings are more equitably distributed than welfare itself – they are progressive – but none is per capita progressive.

Table 21 - Incidence of Land and Livestock Ownership

Quintile	Ownership				Value		
	Livestock	Land	Irrigated		Irrigated Land	Livestock	
			Land	Land			
1	0.302	0.227	0.122	0.124	0.077	0.207	
2	0.235	0.215	0.203	0.227	0.224	0.271	
3	0.211	0.197	0.234	0.232	0.254	0.130	
4	0.155	0.184	0.220	0.226	0.231	0.140	
5	0.097	0.177	0.221	0.191	0.213	0.251	
poor	0.553	0.460	0.383	0.369	0.319	0.484	
non-poor	0.447	0.540	0.617	0.631	0.681	0.515	
cc	-0.140	0.004	0.148	0.125	0.194	0.059	

Source: NBHS 2009 and authors’ calculations

4.4 Social Assistance

4.4.1 In addition to the standard social and infrastructure services, the NBHS asks households about receipt of transfer payments, or social assistance, in cash and in kind, from different sources. Table 22 gives the incidence of these payments and transfers. The targeting of these transfers is mixed. Food aid, in cash and in kind, benefits poorer households disproportionately – it is per capita progressive. The same is true, to a lesser extent, for other government benefits in kind (but not cash) and other NGO/charity benefits in kind (but not cash). Cash remittances, on the other hand, are distributed more inequitably than welfare itself, a pattern that is typical in many developing countries where it is the richer households who manage to send members to the city or abroad for more lucrative employment. It is interesting to note that in all categories of transfer payments except food aid, in kind transfers are more progressive than cash. Economists often favor cash transfers because they respect recipients' preferences and their logistics are simpler. But these results suggest that cash transfers may be more subject to capture by wealthier households than are in kind payments.

Table 22 - Incidence of Transfer Payments

Quintile	Food Aid ^{1/}		Other Government Benefits		Other NGO/Charity		Remittances	
	cash	in kind	cash	in kind	cash	in kind	cash	in kind
1	0.246	0.347	0.141	0.179	0.109	0.294	0.075	0.163
2	0.582	0.372	0.211	0.262	0.200	0.379	0.114	0.085
3	0.069	0.125	0.324	0.255	0.236	0.063	0.157	0.372
4	0.054	0.124	0.052	0.178	0.378	0.193	0.238	0.083
5	0.050	0.033	0.271	0.126	0.077	0.071	0.415	0.298
poor	0.827	0.728	0.353	0.470	0.333	0.674	0.198	0.251
non-poor	0.173	0.272	0.647	0.530	0.667	0.326	0.802	0.749
cc	-0.324	-0.307	0.114	-0.037	0.113	-0.200	0.411	0.177

Source: NBHS, 2009 and authors' calculations

Notes: 1/ Food aid is from public or private (NGO) sources

4.4.2 Table 23 gives the coverage of these transfer payments, where we have counted the number of people living in households that receive any amount from the indicated source. These are small programs, reaching no more than a few percent of households in Sudan. Thus, there is room to expand such programs, and that expansion is likely to be pro-poor, especially for food aid and for in-kind transfers.

Table 23 - Coverage of Transfer Payments

	Food Aid		Other Govt Benefits		Other NGO/Charity		Remittances	
	cash	in kind	cash	in kind	cash	in kind	cash	in kind
	National Quintile	0.006	0.039	0.013	0.019	0.011	0.026	0.053
1	0.010	0.078	0.021	0.024	0.014	0.045	0.047	0.013
2	0.013	0.054	0.016	0.023	0.015	0.032	0.052	0.010
3	0.001	0.025	0.013	0.019	0.014	0.018	0.054	0.013
4	0.004	0.016	0.005	0.016	0.005	0.019	0.058	0.011
5	0.001	0.007	0.008	0.009	0.004	0.007	0.059	0.013
Poverty								
Poor	0.011	0.065	0.018	0.024	0.015	0.038	0.049	0.012
Non-Poor	0.002	0.016	0.009	0.015	0.008	0.015	0.057	0.012
Area								
Rural	0.007	0.055	0.016	0.026	0.011	0.033	0.055	0.011
Urban	0.005	0.011	0.009	0.007	0.010	0.014	0.051	0.013

Source: NBHS 2009 and authors' calculations

4.5 Tax Incidence

4.5.1 The same tools of incidence analysis can be applied to taxes as well as public services and benefits. The only thing that changes is that taxes that fall on goods and services with concentration coefficients near one are progressive, while those with lower concentration coefficients are regressive. The literature consistently uses the Lorenz curve or Gini coefficient as the borderline between progressive and regressive. That is, a tax is deemed "progressive" if it leads to a more equal after-tax distribution, and regressive if not. Unlike benefits, negative concentration coefficients are rare, occurring only in the case of inferior goods.

4.5.2 Unfortunately, the data that we received for Sudan include household expenditures at highly aggregated levels, which makes it impossible to estimate the incidence of specific excises that are common in developing countries. We nevertheless report the incidence of expenditures for two of these broad aggregates – utilities and transport and communication – because they are likely candidates for specific excises and/or subsidies in Sudan.

- 4.5.3 Table 24 shows that taxes on utilities would be slightly regressive: expenditures on these items are somewhat more concentrated in the poorer quintiles than is welfare in general. This is consistent with the relatively equal coverage of these services found earlier. For transport and communication, however, the opposite is true. Taxing these items would be strongly progressive. In the context of Sudan, it is perhaps better to make this statement in terms of subsidies, since petroleum products constitute a large part of expenditures in this category, and these products are subsidized in Sudan. *Removing* that subsidy would be progressive, because richer households benefit disproportionately from it: they spend larger shares on transport and communication than do poorer ones. Of course, this conclusion is muddled by the fact that this expenditure category includes some non-petroleum items, including telephones, which are likely to be important. But a best guess given the data that we have is that existing petroleum subsidies are regressive.

Table 24 - Incidence of Expenditures on Taxable Items

Quintile	Utilities	Transport and Comm	Expend per Capita
1	0.115	0.044	0.084
2	0.156	0.099	0.133
3	0.192	0.149	0.175
4	0.227	0.249	0.237
5	0.310	0.459	0.371
poor	0.284	0.154	0.228
non-poor	0.716	0.846	0.772
cc	0.264	0.480	0.353
expenditures per month	mean /1	10.72	12.20
	median /2	8.56	5.91

Source: NBHS 2009 and authors' calculations

4.6 Conclusions – Sudan

- 4.6.1 Coverage of schooling in Sudan is still well below 100 percent, even at the primary level, so there is room to expand schooling services. Such expansion would be highly pro-poor at both the primary and secondary level. In addition, improving services to current primary students would be pro-poor. The incidence of current secondary and post-secondary students is less progressive, but still more so than is typical in other African countries.
- 4.6.2 Access to clean water is reasonably equitable in Sudan, across the welfare distribution and also by area, but there is still room to expand this coverage from the current national rate of 62 percent. Expanding this access would be an equitable public expenditure, as would improvements in the quality of existing

safe water sources. Access to the electricity grid is more limited, with connections concentrated in urban areas and among the richest households. From an equity perspective, it would make sense to expand the electricity grid to rural areas, but the cost of such an expansion may be prohibitive due to low population densities in rural areas.

- 4.6.3 Government expenditures that support agricultural activity are likely to be pro-poor in Sudan, especially those that benefit farmers on a per person basis rather than a per hectare basis. Supporting households with small livestock holdings is also likely to be pro-poor. The challenge for any such program, however, is that if its coverage is limited, richer farmers may be able to “capture” it, so that the benefits are more concentrated than the incidence of farmers or livestock found here. Irrigated land provides an example: land holders who own irrigated land are more concentrated in the richer quintiles than are land holders in general. So it seems that richer farmers have benefited disproportionately from irrigation infrastructure investments in Sudan.¹⁶
- 4.6.4 Food aid, in kind and in cash, is highly pro-poor in Sudan, as are in-kind transfers from other government schemes and from NGOs. Expansion of these services would thus help to improve the overall distribution of welfare. It is interesting to note that in kind transfers are generally more progressive than those in cash. Private remittances are far less progressive, but that is beyond at least the direct remit of the government budget.
- 4.6.5 While we have no disaggregated data with which to analyze tax incidence in Sudan, it does appear as though petroleum subsidies are regressive in that country, as they are in most developing countries. Since these subsidies are large and because the government’s fiscal situation is dire, it would make good economic sense to remove them. Of course, we are aware of the political challenges of doing so.

¹⁶ We should be careful about the causation here. It is possible that the irrigation services have made the landowners richer.

5. Appendix I: Methodology

To do an incidence analysis, we need information on the value of public expenditures to their beneficiaries, and we need a way to describe how those benefits are spread across different groups in the population. We take up these two key questions in turn.

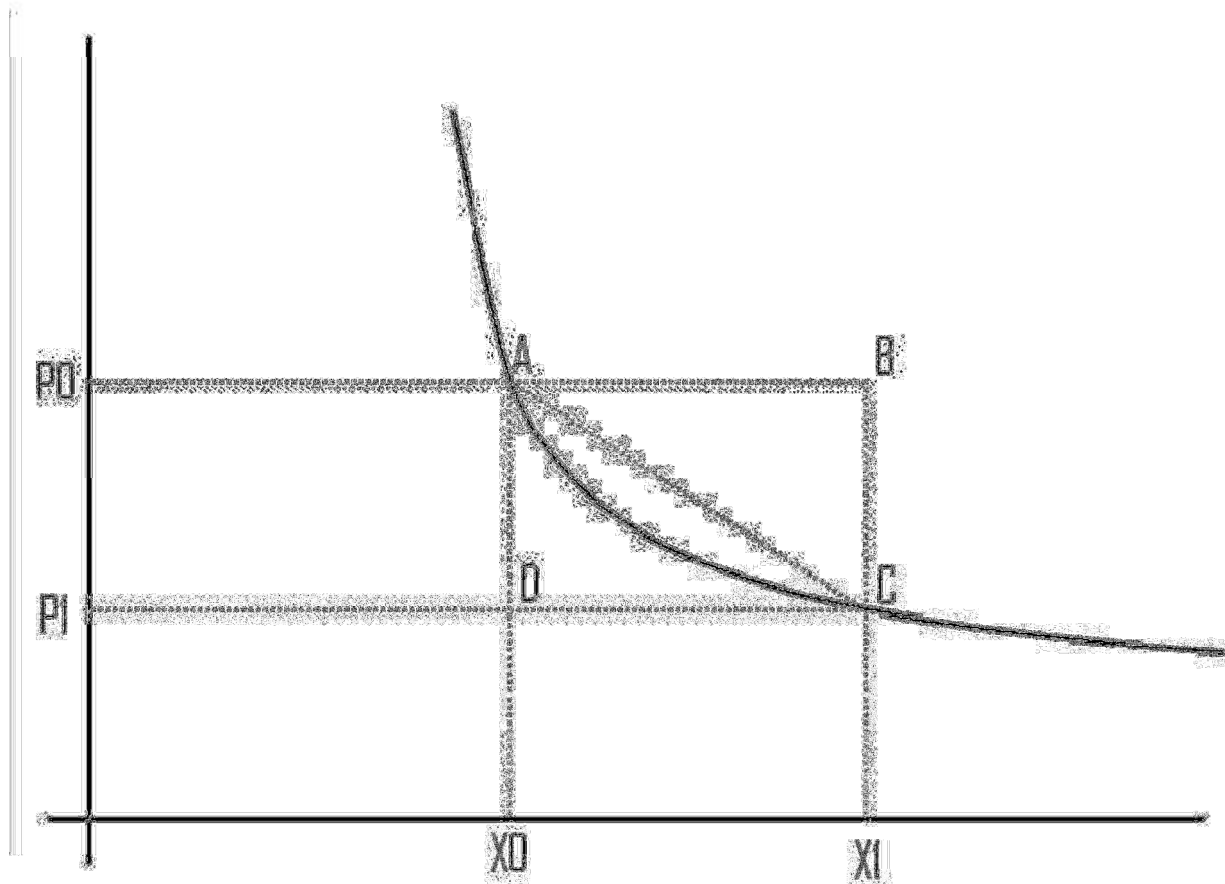
5.1 Calculating the Value of Public Expenditures to Beneficiaries

- 5.1.1 The value of some public expenditures is straightforward, while others require more work. The simplest case is transfer payments, when government simply gives cash to beneficiaries. Examples might be income support to poor families or pensions paid to retirees or veterans. The value to each recipient is just the amount of cash received. Similarly, for in-kind transfers like food aid or free medicines, we can establish the monetary value using market prices for the goods in question.
- 5.1.2 Another common public policy is to subsidize certain products, e.g. bread, with the aim of helping the poor. Here, the value of the benefits is somewhat less direct. Conceptually, we would like to know how much the change in price is worth to buyers. A good theoretical measure of this is the “compensating variation,” the amount that income would have to decrease to leave a buyer’s utility unchanged when the price declines due to the subsidy. As an example, Figure 1 shows the effect of a subsidy that reduces the market price from P_0 to P_1 . This increases demand from X_0 to X_1 . Because the demand curve shows a buyer’s willingness to pay for a good, it is the correct measure of how much the good is worth to the buyer on the margin. But since that worth changes as the quantity consumed changes, we have to integrate all the values of the demand curve from P_0 to P_1 .¹⁷ This yields the area to the left of the demand curve from P_0 to P_1 , i.e. area P_0ACP_1 .
- 5.1.3 Estimating the compensating variation requires estimating a demand curve, which is difficult in a simple cross-sectional dataset. However, if we multiply the difference in prices ($P_0 - P_1$), which is also the amount of the ad valorem subsidy, times the quantity consumed, either X_0 or X_1 , we can get a first-order approximation to the compensating variation.¹⁸ This is possible without any knowledge of the demand curve. We only need to know the amount of the subsidy, ($P_0 - P_1$), and the quantity consumed. In fact, because virtually all incidence measures look at *shares* of benefits received or taxes paid, any value that is proportional to $(P_0 - P_1)X_j$ is suitable. In particular, the observed expenditure, P_0X_0 or P_1X_1 , is proportional to $(P_0 - P_1)X_j$, so an incidence analysis can work with observed expenditures, not even requiring knowledge of the physical quantities consumed or the value of the subsidy.¹⁹

¹⁷ The integration is along the vertical axis since it is the price that is changing exogenously.

¹⁸ Sahn and Younger (2003) derive this explicitly using a Taylor expansion of the compensating variation. A second-order approximation equal to the trapezoid P_0ACP_1 is possible if both P_0 and P_1 and X_0 and X_1 are observed, but that would not be common in a single cross-section. If the subsidy exists, we will observe only X_1 . If it is hypothetical, we would observe only X_0 .

¹⁹ This is because shares are not affected by proportional changes to the numerator, an individual’s benefit, and the denominator, the sum of all beneficiaries’ benefits.

Figure 1 - Compensating Variation for an Ad Valorem Subsidy

- 5.1.4 While transfer payments and subsidies are important public policies, the most common public expenditures examined in incidence analyses are those for publicly provided services like health and education which are often provided free of charge. In theory, we could treat this as a subsidy, with the subsidized price set at zero, but because we do not observe a market price either with or without the subsidy, we cannot treat these services quite so easily. It is possible to estimate demand functions for public health services or schooling (Gertler and Glewwe, 1990, Gertler, Locay, and Sanderson, 1987, Younger, 2003) and thus calculate compensating variations, but that requires rather sophisticated econometrics with questionable identification assumptions. Instead, most practitioners use the cost to the government of providing the service as an estimate of its value to recipients. Demery (2003) discusses this in detail. Thus, if it costs the government 30 SDG to provide a year of schooling for a rural primary student, we say that the value of that education to the student is also 30 SDG.
- 5.1.5 We do not think that this standard approach is desirable. All we can tell from revealed preference is that the value the education to the student is more than the school fees paid, which may be zero. The fact that a student chooses to attend school does not mean that it is worth to her what it cost the government to provide it. Note that the error could go either way: students might value the schooling very little and still attend if it is free. But they might also value it very

highly, much more than the cost of provision. An obvious example of such a public service is vaccinations. These are very cheap to provide, but extremely valuable because they are life-saving. In addition, budget data, which are the easiest to obtain, do not necessarily reflect actual expenditures. Actual expenditures in South Sudan, for example, have varied dramatically from budgeted amounts. Further, it is well known that expenditures budgeted for schools may not actually reach them or their students (Reinikka and Svensson, 2004).

- 5.1.6 A simpler alternative to either of the above methods is to count *beneficiaries* rather than monetary *benefits*. That is, beneficiaries get a value of one, non-beneficiaries get zero. This is clearly incorrect as a monetary value, but it often produces incidence analyses that are similar to standard approaches or those based on demand estimates. In particular, if each beneficiary is assigned the same monetary benefit, the incidence results will be identical to results using ones and zeros, because benefits are calculated as *shares* of total benefits: proportional changes in the benefit value do not change the results.²⁰ Apart from being a rough approximation, the main problem with this approach is that we cannot aggregate across expenditure types: the benefit of one primary education may be very different from the benefit of one post-secondary education, so adding participation indicators across services would not be appropriate.

5.2 Aggregating Benefits Among Groups

- 5.2.1 Once we have estimated the value of each beneficiary's benefits, we then aggregate those values into groups to ask how much of a particular benefit each group gets. For example, if the government chooses to subsidize bread, how much of the benefit goes to the poor vs. the non-poor? The groups could be any mutually exclusive and comprehensive categories: area or district of residence, ethnicity, gender, sector of employment. But the vast majority of incidence analyses are interested in the distribution of benefits by income or welfare. A simple way to do this is to group by poor/non-poor. A slightly more detailed approach is to group beneficiaries by their quintile or decile in the income distribution.²¹ Thus, we could ask "what share of the benefits of public secondary schooling does the poorest quintile receive? The richest?", etc.

²⁰ Younger (2003) applies all of these methods to public schooling incidence in Perú and finds that the results are quite similar.

²¹ We say "income distribution" even though in most developing countries, we measure welfare by consumption.

5.2.2 Table 25 gives an example for the value that households report receiving in kind (i.e. actual food, not cash) from government non-food aid programs in the past year. The second column shows that the poorest quintile received 3.8% of such transfers, while the richest quintile received 47.0%. The poor received 33.1% of the benefits, while the non-poor received 66.9%. How should we evaluate these results? An obvious point of reference is the population share of each group. By definition, each quintile has 20% of the population. Thus, the fact that the poorest quintile receives only 4% of the benefits while the richest receives 47% makes this benefit look poorly targeted.²² A less exacting standard compares the distribution of the benefits to the distribution of welfare, or per capita consumption. The argument here is that if resources to fund this assistance are drawn proportionally to expenditures per capita (through, say, a comprehensive VAT), then the combination of that proportional tax and the transfer would improve the welfare distribution, albeit slightly in this case. For public expenditures that are meant to be pro-poor, the Gini coefficient standards does not seem sufficiently demanding, and most analysts insist on a negative concentration coefficient for “progressivity.” In this report, we will say “per capita progressive” for benefits that have a negative concentration coefficient, i.e. those that go disproportionately to the poor, and “progressive” for benefits that have a concentration coefficient that is less than the Gini coefficient for the Lorenz curve. For analysis of taxes, use of the Lorenz curve and Gini coefficient is more reasonable, with taxes that have a smaller concentration coefficient being regressive (because we are now considering reductions in welfare rather than benefits) and those with a larger concentration coefficient being progressive.

Table 25- Example of Incidence Table – In-kind food aid in South Sudan

Quintile	Share		
	transfer	population	welfare
1	0.038	0.200	0.040
2	0.146	0.200	0.088
3	0.198	0.200	0.144
4	0.148	0.200	0.230
5	0.470	0.200	0.498
poor	0.331	0.506	0.196
non-poor	0.669	0.494	0.804

Source: NBHS and authors' calculation

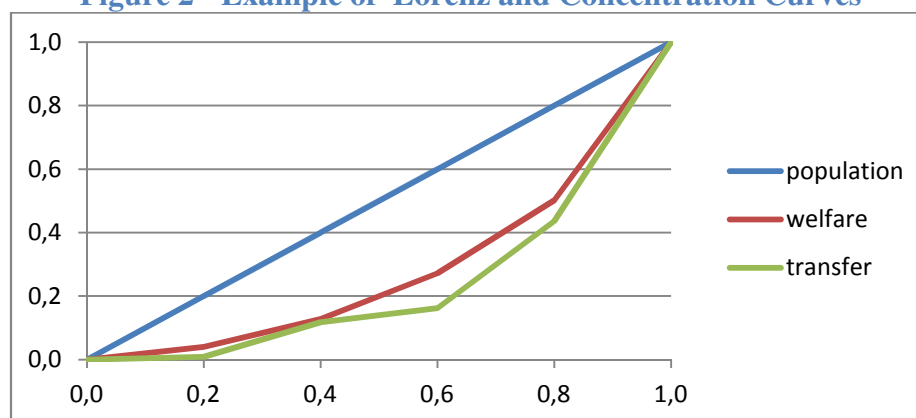
²² A similar argument can be made based on the poor/non-poor population and benefit shares.

5.2.3 Another way to display incidence results requires cumulating the benefits across the income distribution, from poorest to richest. The results are in Table 26, where the left block repeats Table 25 and the right block shows the cumulative values. Figure 2 graphs the results. The “welfare” curve is known as the Lorenz curve, graphing the cumulative share of the population on the horizontal axis against the cumulative share of expenditures per capita on the vertical axis. Since the data are ordered from poorest to richest, the Lorenz curve must be convex. If each person had exactly the same expenditures – perfect equality – the Lorenz curve would be equal to a 45-degree line, the “population” curve in the graph. If on the other hand one person has all of the expenditures – perfect inequality – then the Lorenz curve has a rotated L-shape, following the x-axis up to 1 and then jumping to 1 for the last person (who has 100% of the expenditures). Thus, the degree of convexity of the Lorenz curve shows the degree of inequality in the population.

Table 26 - Example of Cumulative Incidence Table

Quintile	share			cumulative share		
	transfer	population	welfare	transfer	population	welfare
1	0.038	0.200	0.040	0.038	0.200	0.040
2	0.146	0.200	0.088	0.184	0.400	0.128
3	0.198	0.200	0.144	0.382	0.600	0.272
4	0.148	0.200	0.230	0.530	0.800	0.502
5	0.470	0.200	0.498	1.000	1.000	1.000

Figure 2 - Example of Lorenz and Concentration Curves



5.2.4 The “transfer” curve is called a concentration curve. This is similar to the Lorenz curve in that we have cumulative shares of benefits received on the vertical axis, but we maintain the ordering of poorest-to-richest on the horizontal axis. That is, we do not order people by how much of the transfer they receive, but by welfare. The curve thus shows us where in the welfare distribution the benefits are “concentrated.” In this example, the distribution of benefits is similar to the distribution of welfare.

5.2.5 Unlike Lorenz curves, concentration curves can be concave. In fact, a perfectly targeted benefit that goes only to the poorest person would be a rotated L-shape following the y-axis up to 1 at 0 on the x-axis, and then following the top of the

graph to the right. This is the most pro-poor transfer possible. As the concentration curve moves down and to the right, the distribution of benefits becomes less progressive, or less pro-poor.

- 5.2.6 There is an intuitive and useful link between Lorenz/concentration curves and social choice and welfare theory. It can be shown that if one concentration curve is everywhere above another, then its distribution is preferred by any social welfare function that meets a few unobjectionable criteria. This is sometimes called stochastic dominance since the distribution of the benefit with the higher concentration curve is more concentrated amongst the poor. We present a complete set of Lorenz and concentration curves in Appendix II and stochastic dominance results in a web appendix to this report.
- 5.27 One way to summarize the Lorenz curve in a single numerical value is the Gini coefficient, which is equal to the area between the 45-degree line and the Lorenz curve, multiplied by 2. This has a value of 0 for perfect equality (because the area between the 45-degree line and the Lorenz curve is nil in this case) and 1 for perfect inequality. Similarly, the concentration coefficient is the area between the concentration curve and the 45-degree line. This has a minimum value of *negative* 1 for the most progressive transfer and positive 1 for the most regressive transfer.
- 5.2.8 In reporting results, we will use tables like Table 25 and concentration coefficients. A full set of concentration curves is provided in Appendix II, with stochastic dominance tests in a web appendix.

5.3 Interpreting Incidence Results

5.3.1 Average vs. Marginal Incidence

- 5.3.1.1 An incidence analysis provides a description of the distribution of costs and benefits *as observed at the time of the survey*. This description may or may not be a good guide to the impact of future policy changes. Consider the example in Table 27 which describes the incidence of public primary school students at the time of the survey, averaged over all respondents. For this reason, some authors call it “average incidence.” Suppose that the government decides to spend more money on primary education. The information in Table 27 is a useful guide to the incidence of that additional (or “marginal”) spending only if its benefits are distributed proportionally to the existing benefits described in the table. An example might be a decision to buy a new textbook for each current student. But if the government decides to spend more money by getting more students to study (say, by building schools nearer to their homes), Table 27 is not a good guide to the incidence of that policy. Table 27 describes existing beneficiaries. The new policy is explicitly directed at children who are not currently beneficiaries. In this case, the marginal incidence of the extra spending may be very different from the average incidence observed in the data.

Table 27 - Incidence of Public Primary School Students

Quintile	Share		
	transfer	population	welfare
1	0.143	0.200	0.040
2	0.191	0.200	0.088
3	0.209	0.200	0.144
4	0.230	0.200	0.230
5	0.227	0.200	0.498
poor	0.436	0.506	0.196
non-poor	0.564	0.494	0.804

Source: NBHS 2009 and authors' calculation

- 5.3.1.2 It is not that “average incidence” is *never* a good guide to the incidence of a policy change, but it certainly can be misleading. One must take care to consider the policy proposal at hand and decide how best to capture the marginal beneficiaries of that policy.

5.3.2 Incidence vs. Coverage

- 5.3.2.1 Incidence analysis examines the share of total benefits that go to different groups. This information tells us how well particular expenditures redistribute resources between groups on the margin. It does not tell us about the size of the expenditure's impact. Coverage rates are an attempt to do that. Coverage measures the share of potential beneficiaries for an expenditure type who actually receive the benefit. For example, the

number of children age six to twelve who attend primary school, or the share of households that have access to a health care facility. This information can be stratified by groups, including poor/non-poor or welfare quintiles.

- 5.3.2.2 To see the difference between the two measures, consider a program that transfers 10 SDG per month to the poorest person in the country. The incidence of this program would be perfect – its concentration coefficient would be -1 – but its overall impact would be small because it is a small program. We would see this in the coverage rates, which would be small for the poorest quintile and zero for everyone else. At the other extreme, consider a program that transfers 10 SDG per month to everyone in the population. This would have 100% coverage, but would not be especially well-targeted to the poor – its concentration coefficient would be zero.

5.4 Data Sources

- 5.4.1 Because we want to know how the benefits and costs of expenditures and taxes are spread across the welfare distribution, incidence analysis requires data on individual (or household) incomes or expenditures and benefits. These data must come from a sample that is nationally representative. For this report, we use data from the National Baseline Household Survey (2009). In addition, the standard approach to valuing the benefits from public services like schooling or health care requires budgetary information for the services in question, disaggregated as much as possible by area and type of service.²³ South Sudan does not yet have such detailed budget information, so our analysis will use the simpler 0/1 method, beneficiary incidence, for most of the public services analyzed.

²³ Note that because proportional changes in the estimated value of benefits do not change the incidence results, if only a national value for a service is available because budgets are not disaggregated by region, the result will be exactly the same as the incidence of beneficiaries, i.e. using zeros and ones.

6. Appendix II – Concentration Curves and Stochastic Dominance Tests

6.1 Stochastic Dominance Tests

6.1.1 This appendix presents concentration curves for all of the expenditures and taxes considered in the report, for South Sudan and Sudan, by country. We report the associated stochastic dominance tests in a [web appendix](#) available at because the tables are too large for a standard sheet of paper.

6.2 South Sudan Concentration Curves

Figure 3 - Education Incidence, South Sudan

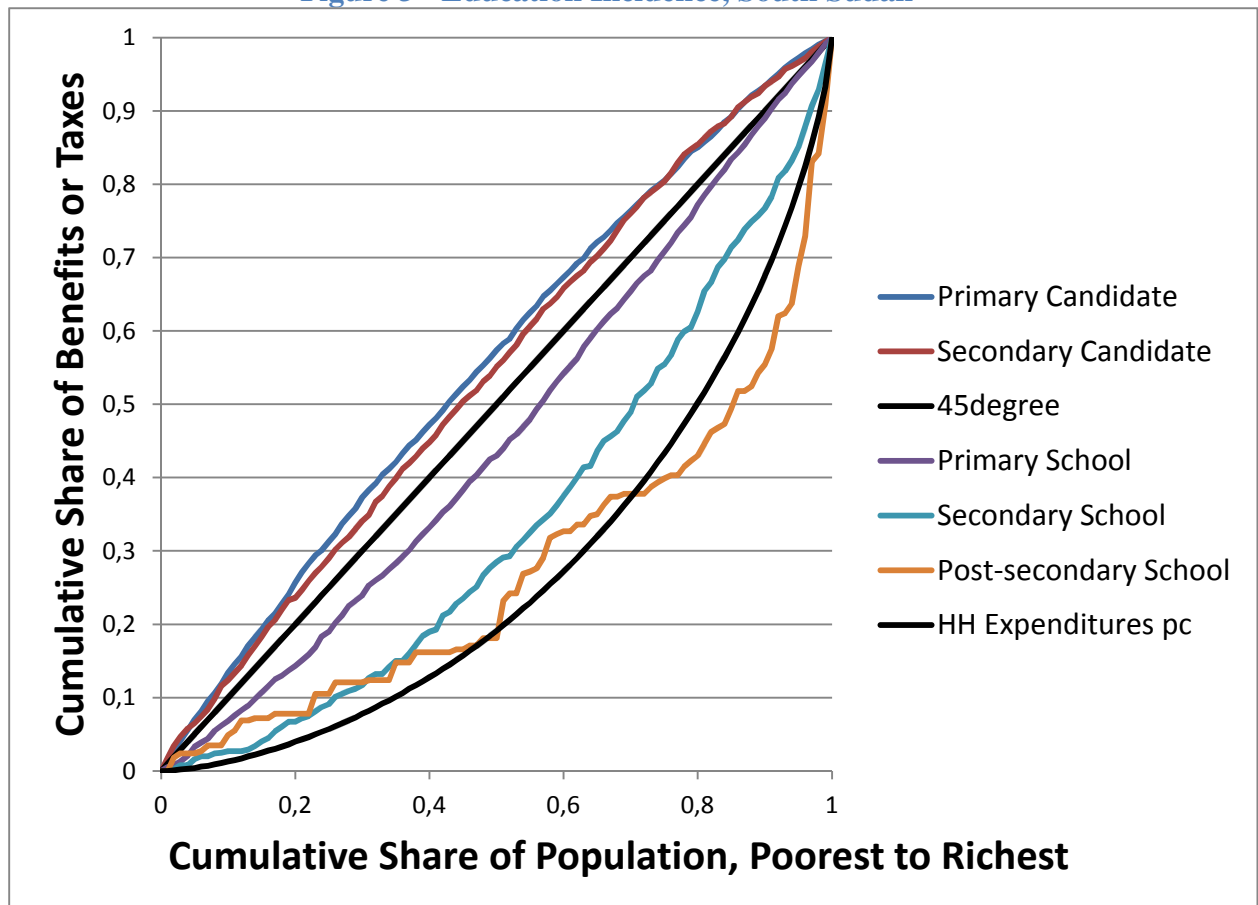


Figure 4 - Health Incidence, South Sudan

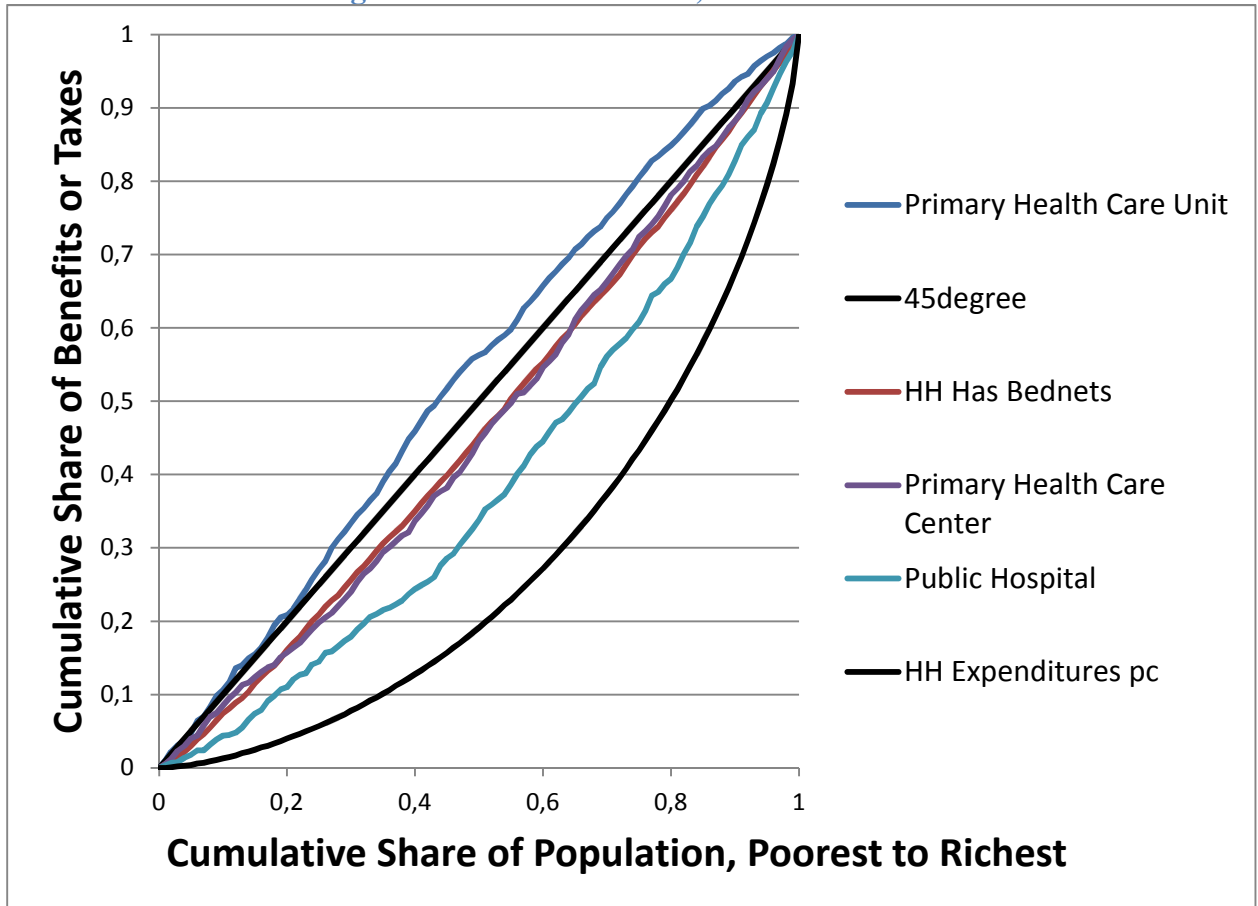


Figure 5 - Infrastructure Incidence, South Sudan

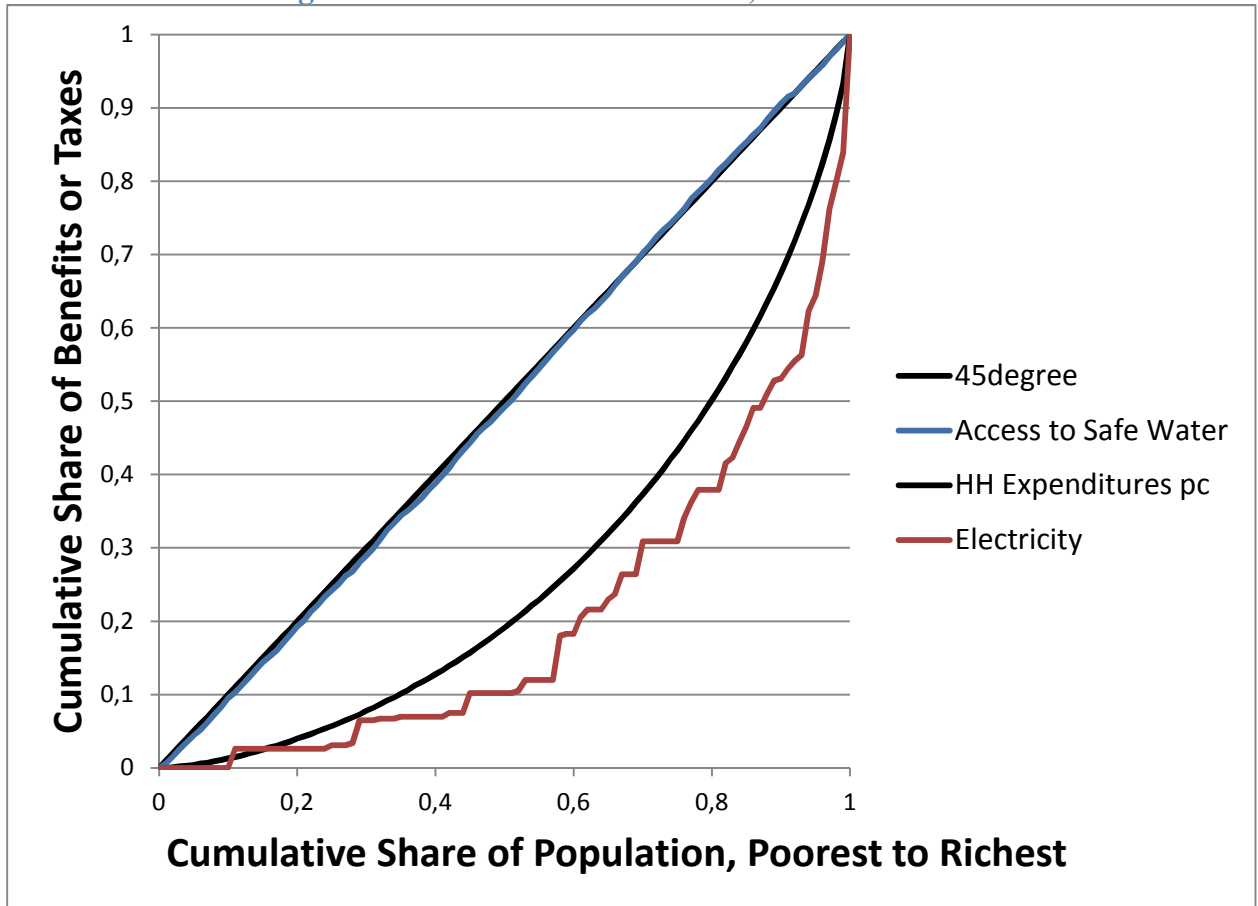


Figure 6 - Livelihoods Incidence, South Sudan

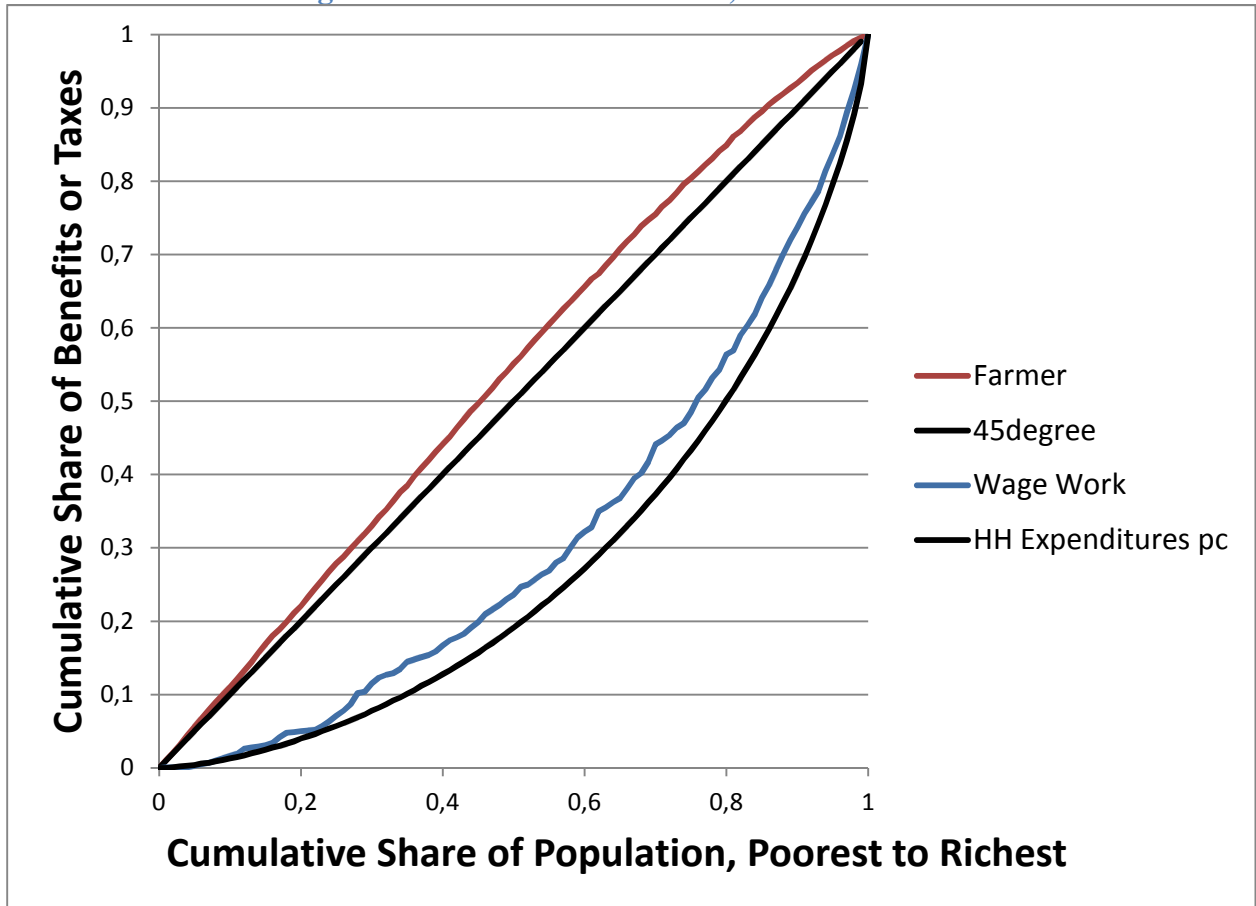


Figure 7 - Social Assistance (Cash) Incidence, South Sudan

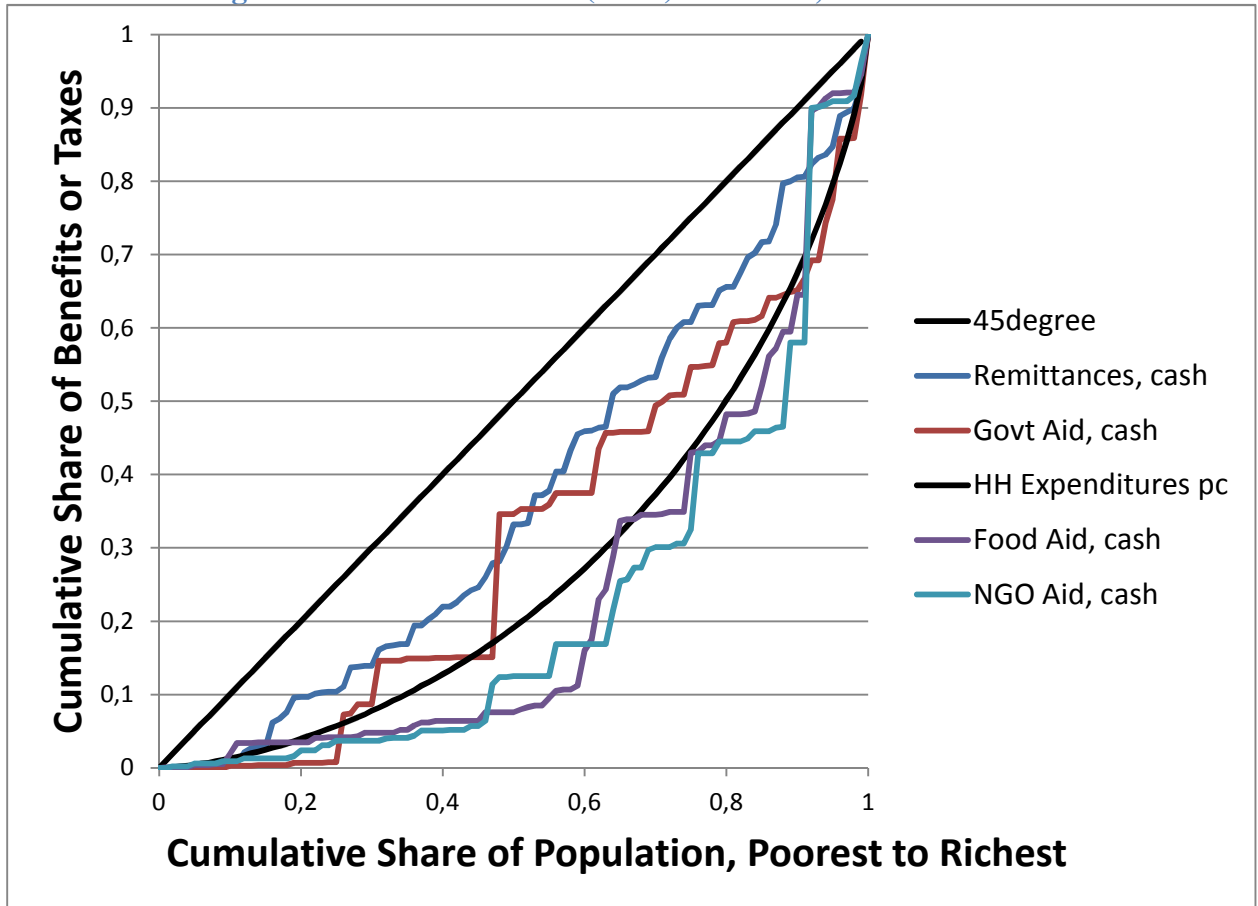


Figure 8 - Social Assistance (in Kind) Incidence, South Sudan

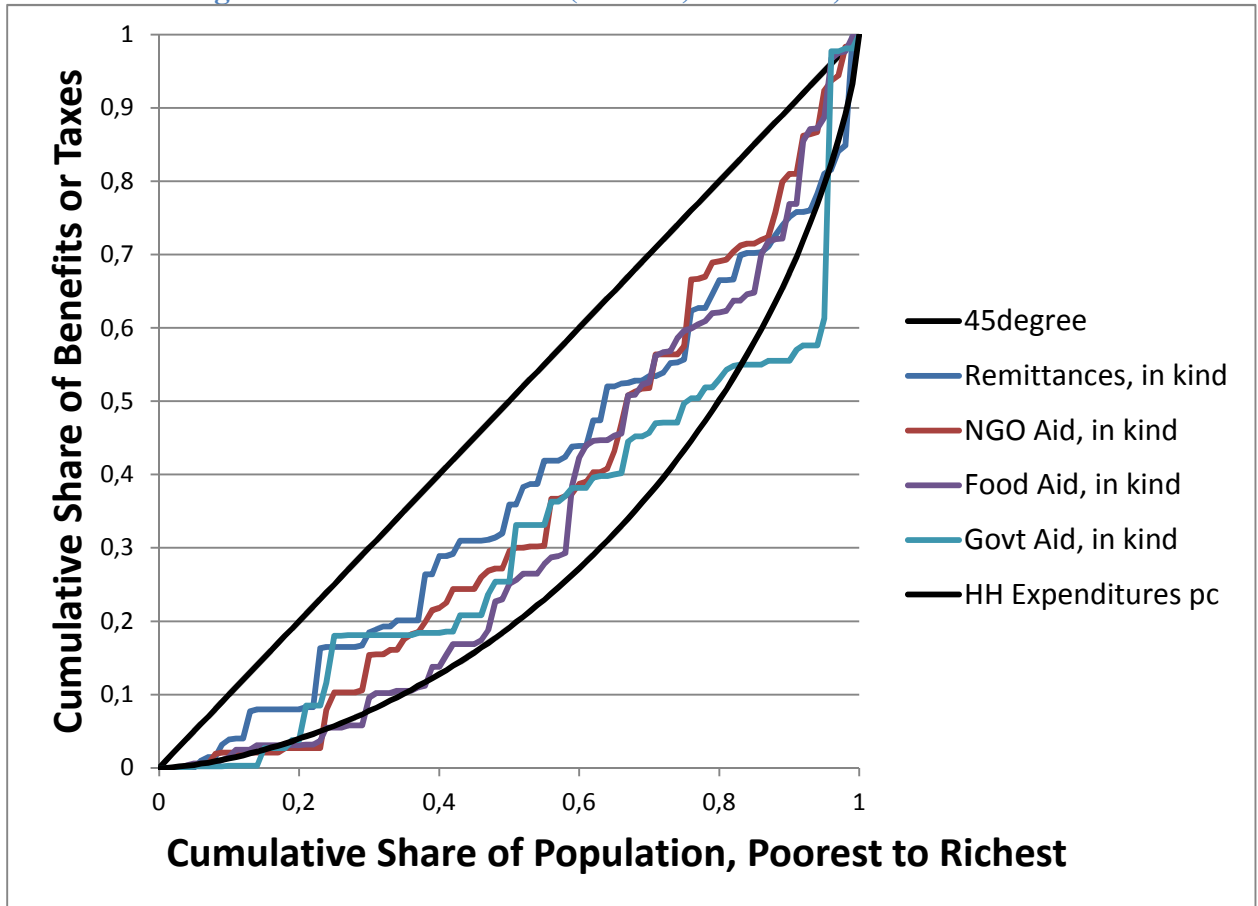


Figure 9 - Tax Incidence, South Sudan

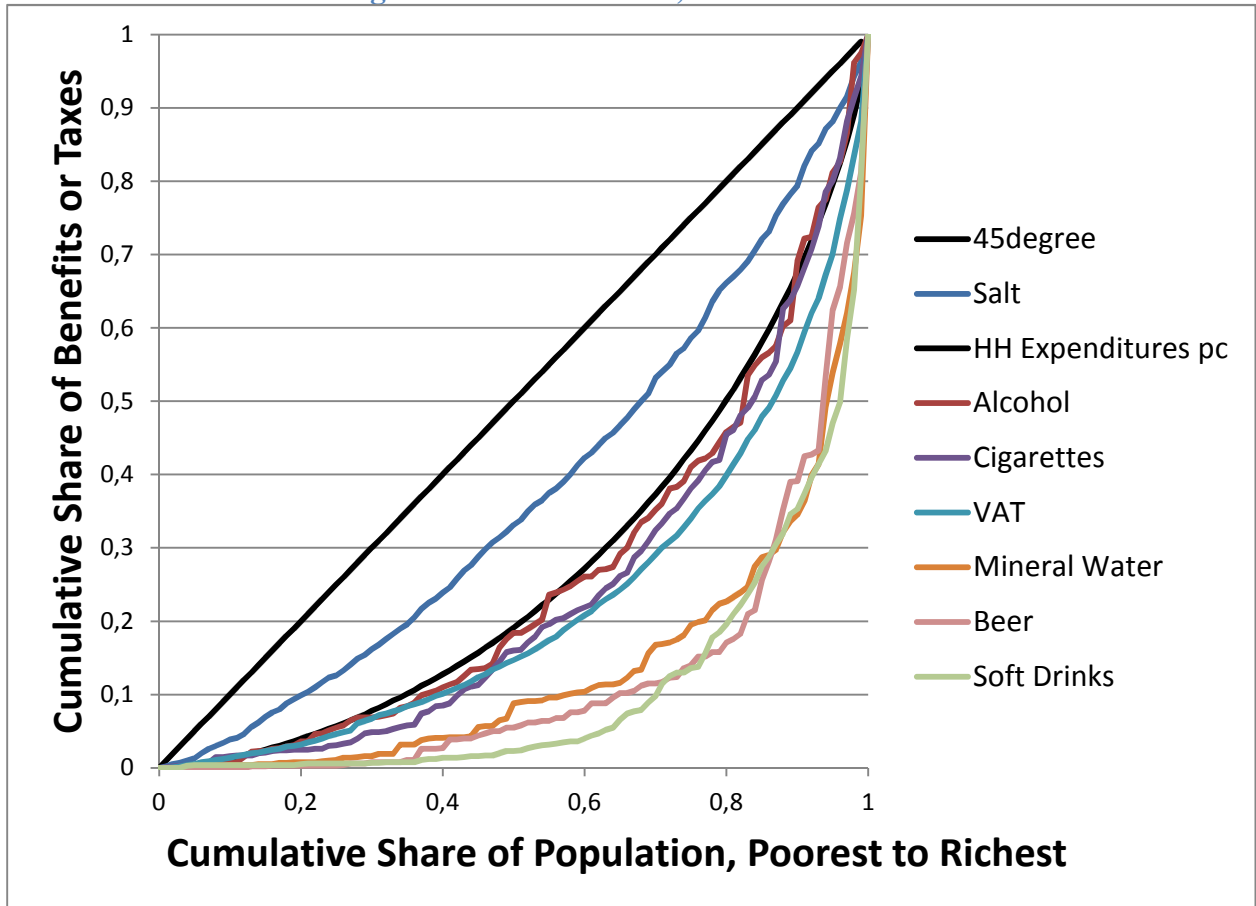


Figure 10 - Energy Tax/Subsidy Incidence, South Sudan

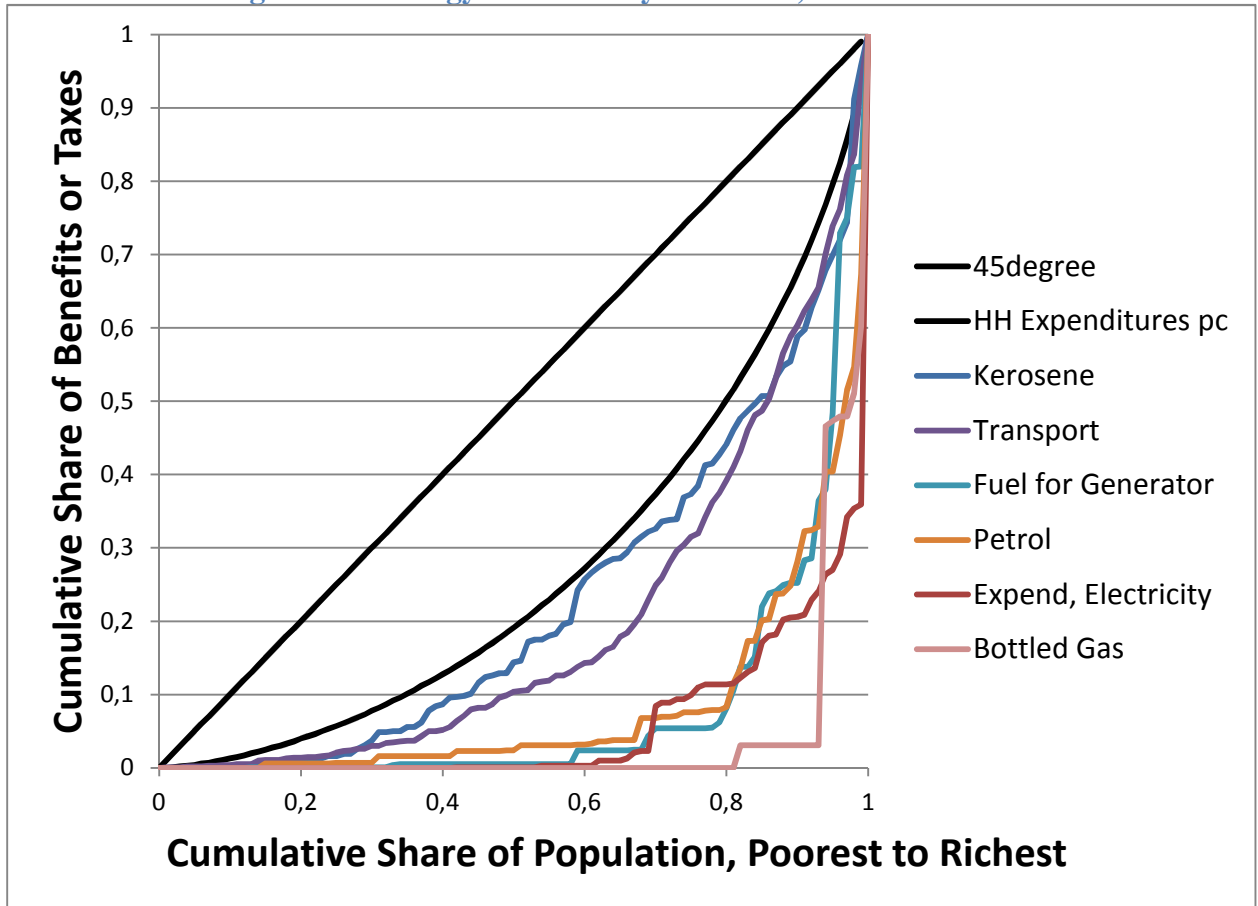
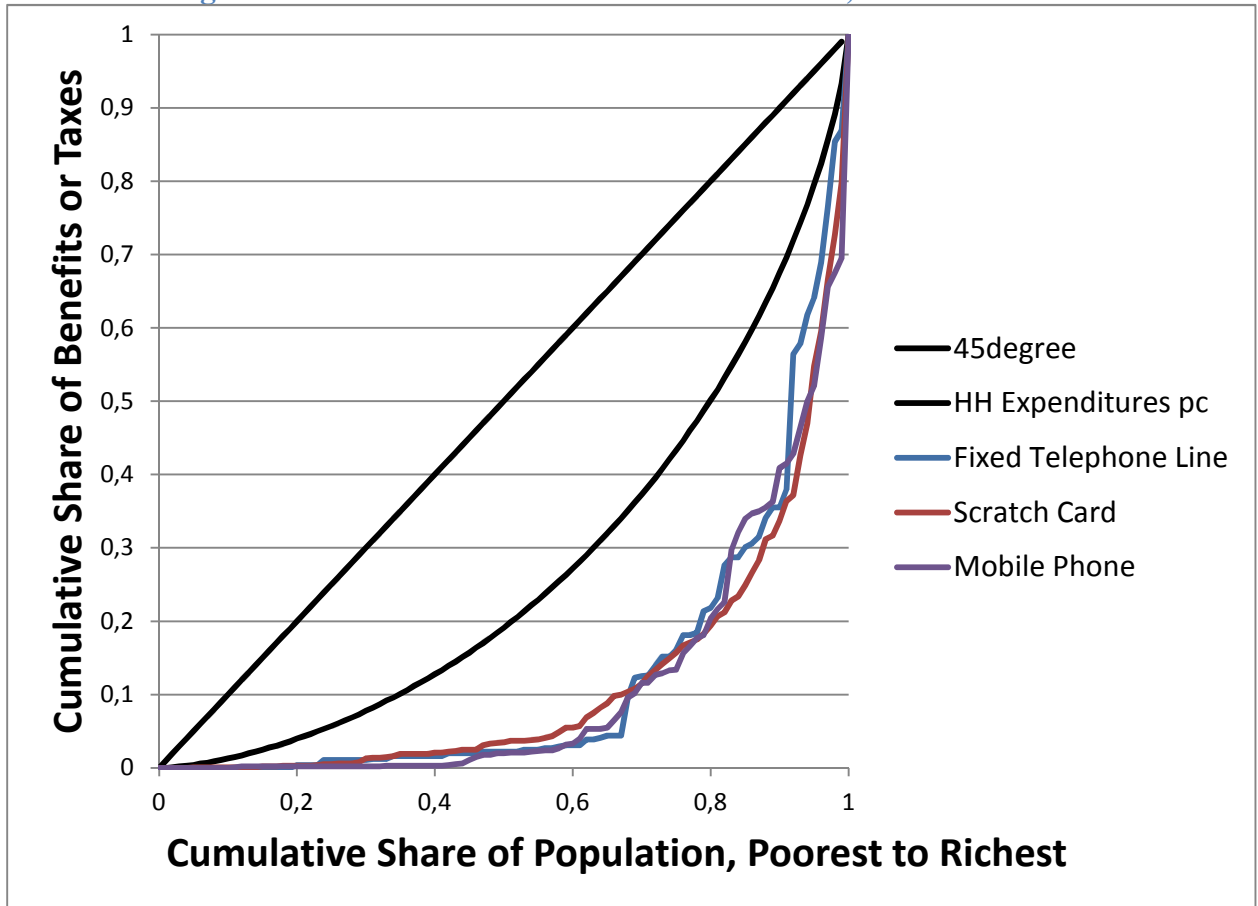


Figure 11 - Communication Excise Tax Incidence, South Sudan



6.3 Sudan Concentration Curves

Figure 12 - Education Incidence, Sudan

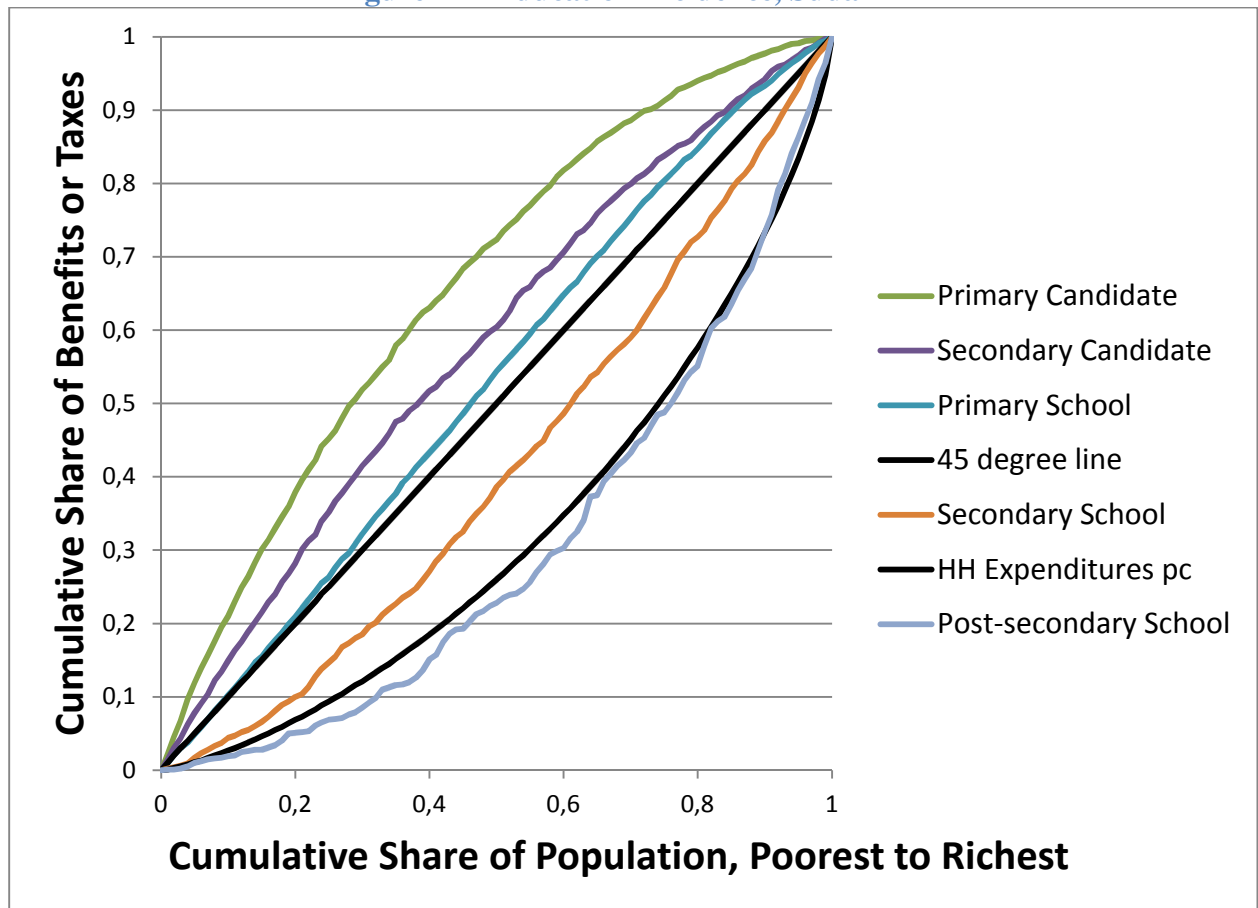


Figure 13 - Infrastructure Incidence, Sudan

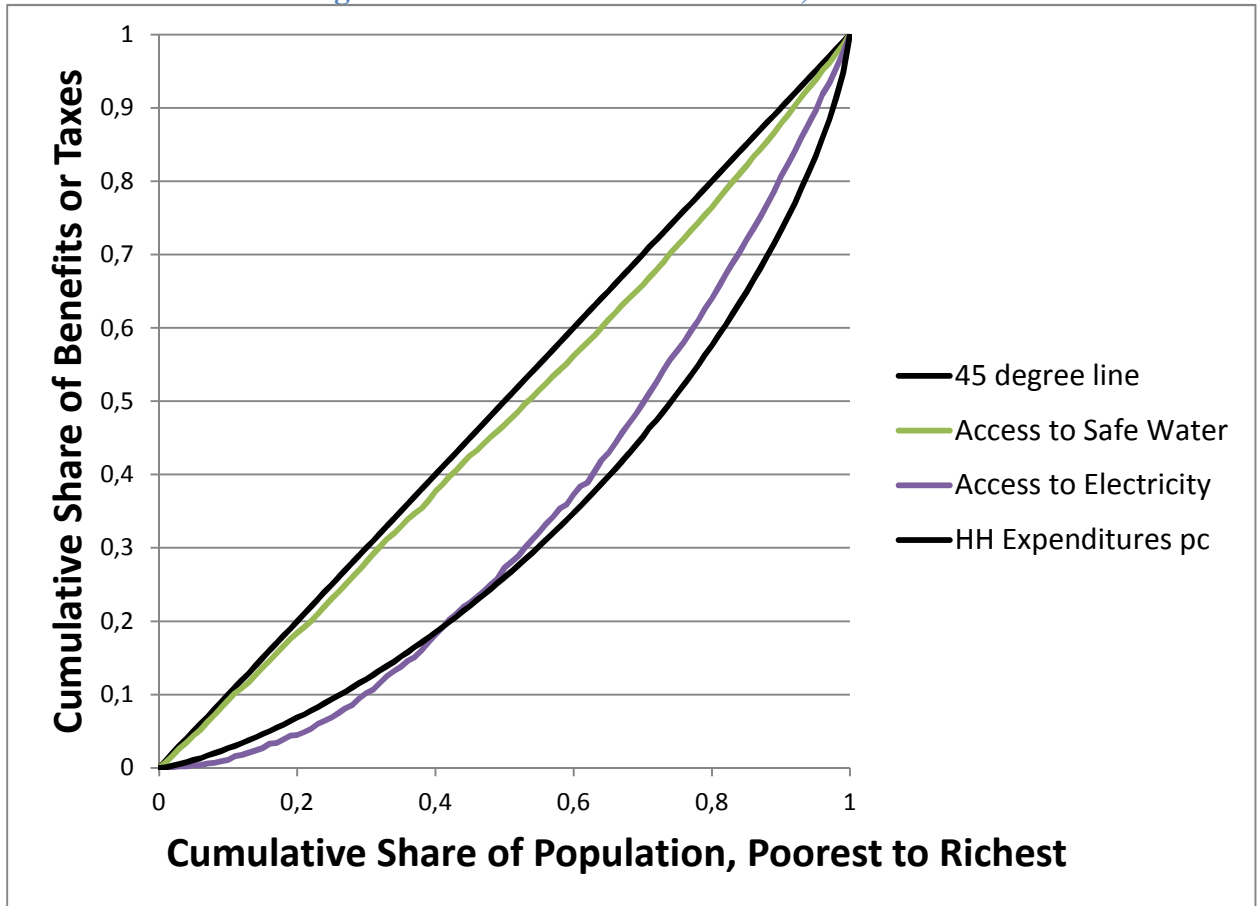


Figure 14 - Livelihoods Incidence, Sudan

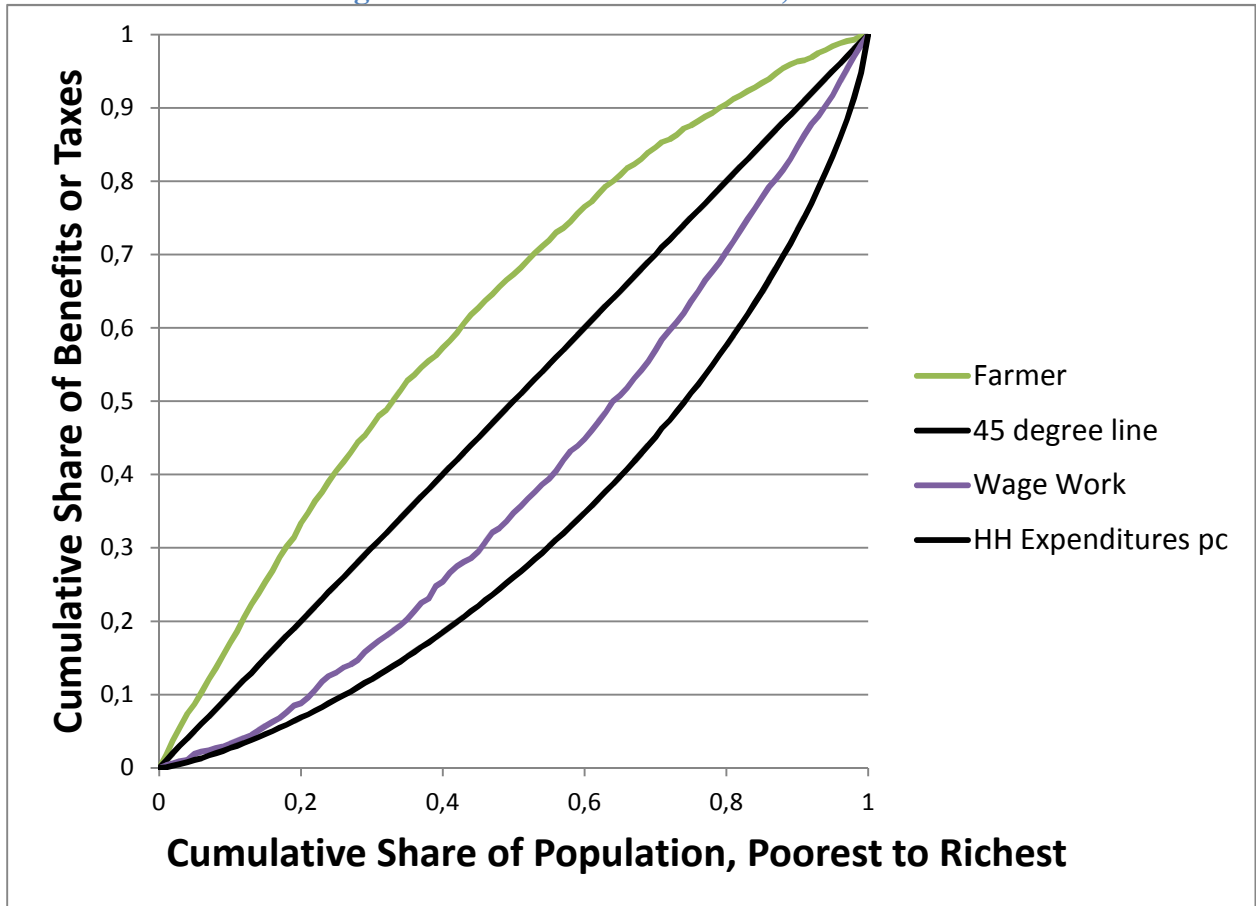


Figure 15 - Land and Livestock Incidence, Sudan

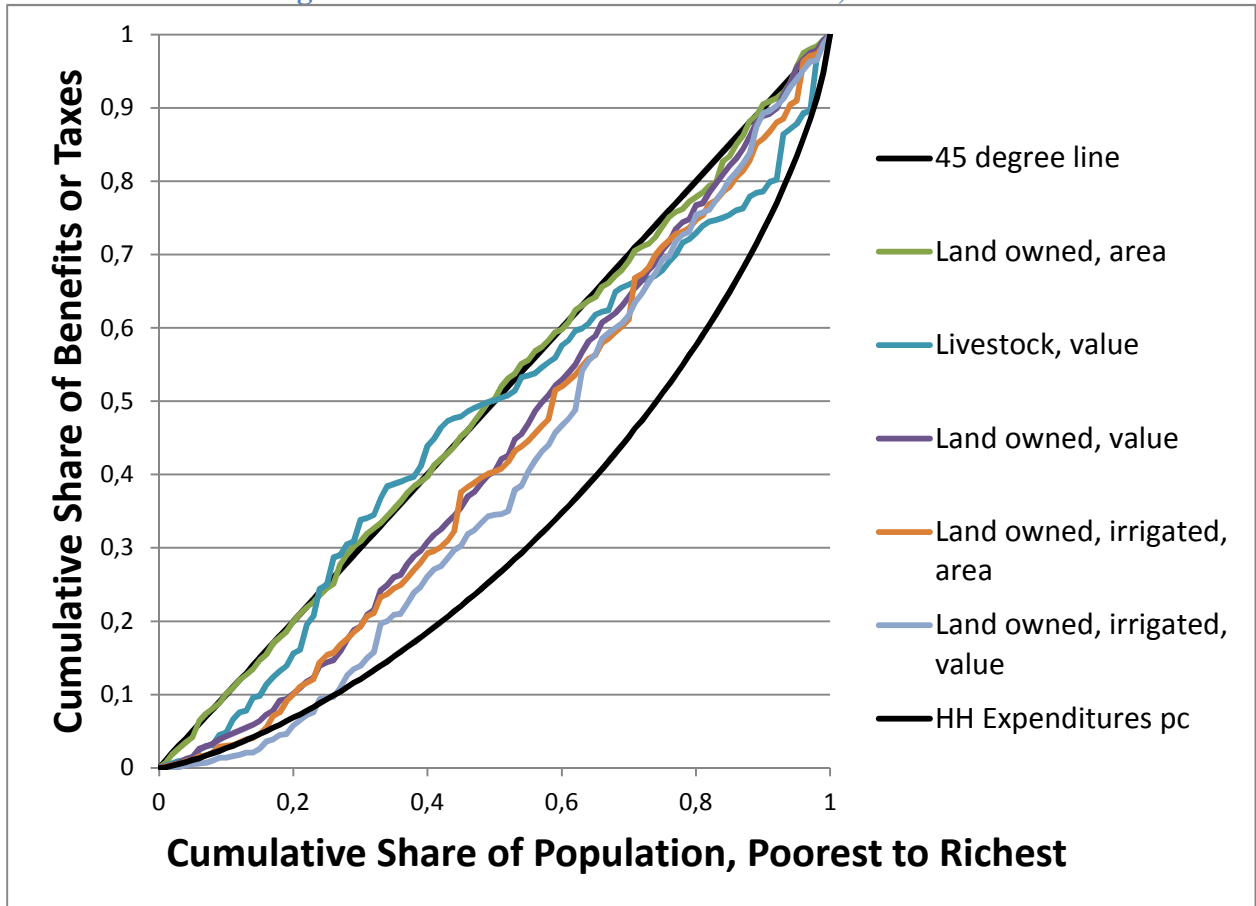


Figure 16 - Social Assistance (Cash) Incidence, Sudan

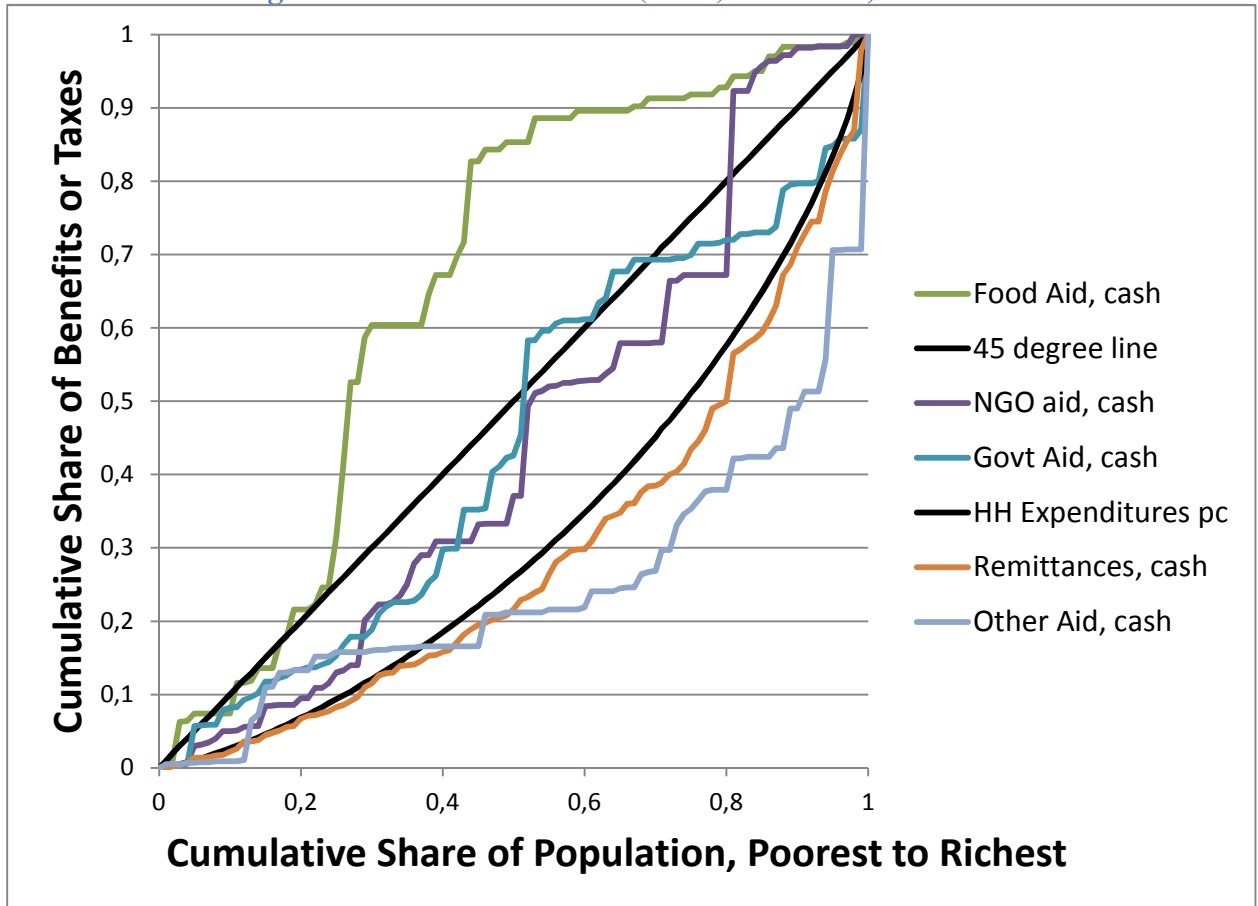


Figure 17 - Social Assistance (in Kind) Incidence, Sudan

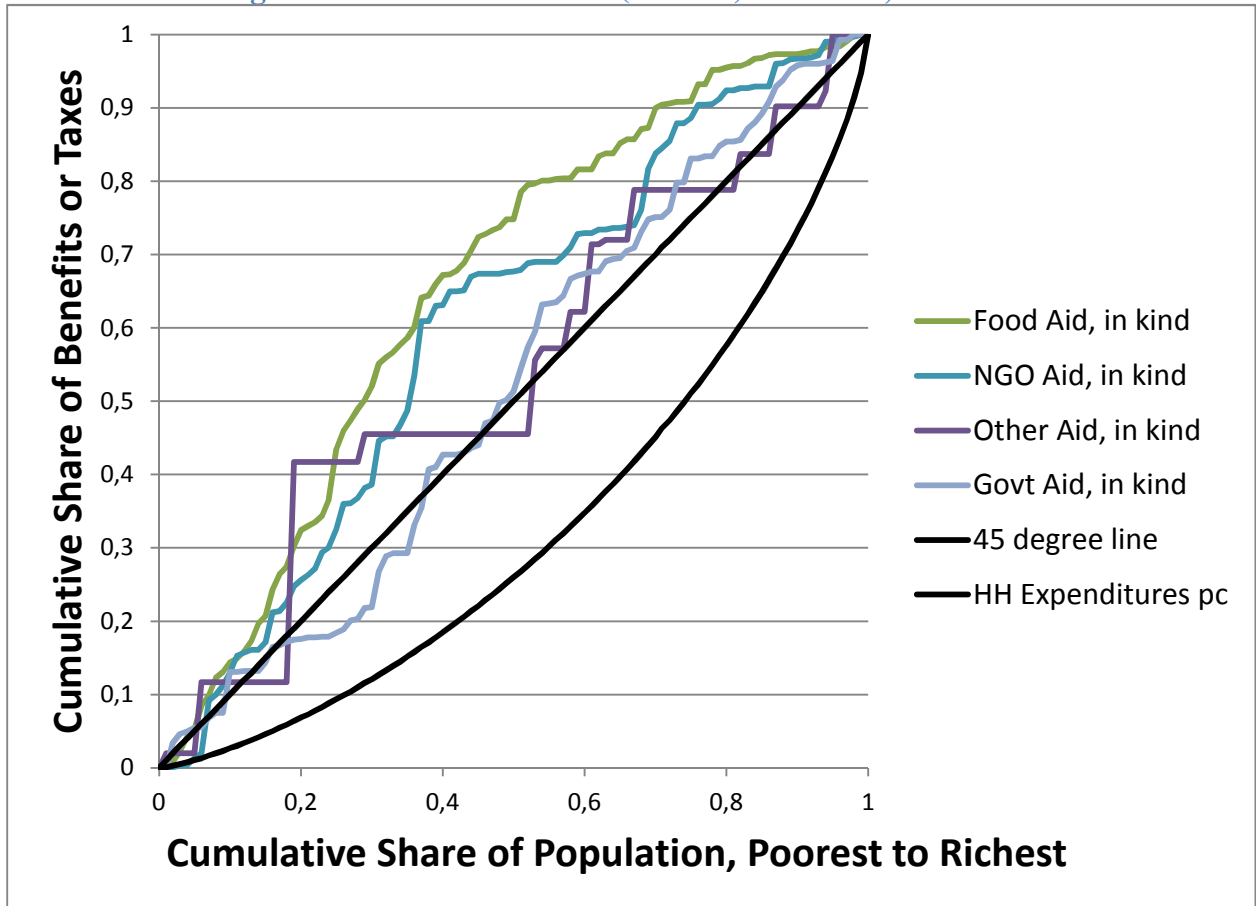
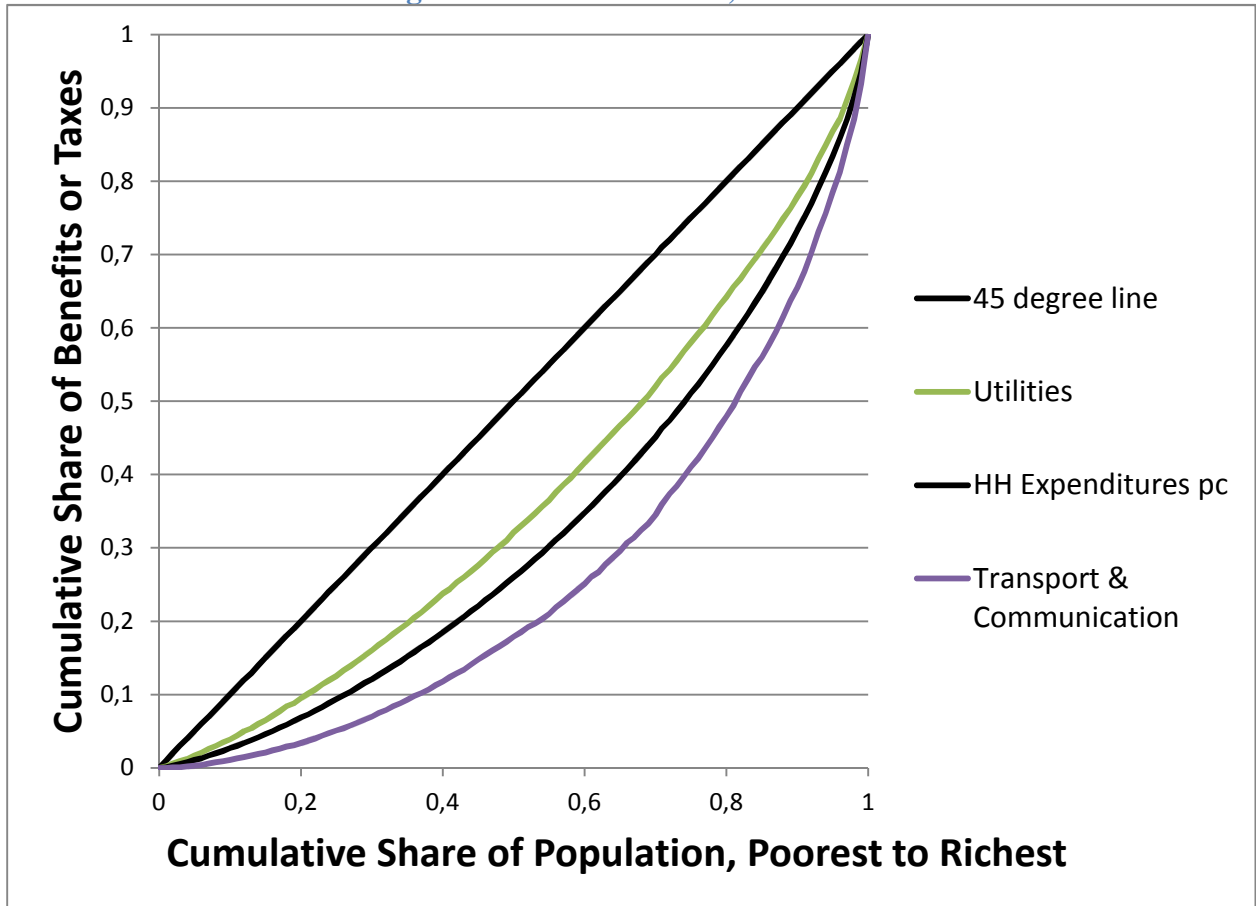


Figure 18 - Tax Incidence, Sudan



7. Appendix III – Variable Definitions

HH Expenditures pc	Total household per capita expenditure in real terms, monthly. This is the standard welfare measure for this survey.
Post-Secondary School	Percentage of household member's enrolled in post-secondary school.
Primary School	Number of household members enrolled in primary school.
Secondary School	Percentage of household members enrolled in secondary school.
Primary Candidate	Number of children in the household who are the appropriate age (between 6 and 13 years old) to be in primary school but are not.
Secondary Candidate	Number of children in the household who are the appropriate age (between 14 and 19 years old) to be in secondary school but are not.
Access to Safe Water	Variable indicating whether or not household has access to safe water. This variable is equal to one if the survey variable H5 is equal to 1, 2, 3, 4, 5, or 6.
Primary Health Care Unit	When sick, household members most often visit a Primary Health Care Unit as their healthcare facility.
Primary Health Care Center	When sick, household members most often use a Primary Health Care Center as their healthcare facility.
Public Hospital	When sick, household members most often use a Public Hospital as their healthcare facility.
HH Has Bednets	Variable indicating whether or not household has bednets as determined by survey variable J6. This variable is equal to one if J6 is equal to one.
HH has Bednets (i)	Variable indicating whether or not household has bednets as determined by survey variable I3. This variable is equal to one if the variable i310-1 is equal to one.
HH Got Free Bednets	Variable indicating whether or not the household has received free bednets. This variable is equal to one if the survey variable J10 is equal to one.
Wage Work	At least one household member's main source of livelihood is in wage or salary work.

Public Wages	Household's average monthly wages, per capita, from public employment. This variable is generated by converting the wages reported in survey variable D8 to monthly wages for individuals for whom the survey variable D6 is equal to 18, 19, 20, or 21.
Farmer	At least one household member's main source of livelihood is farming. This variable is equal to one if the survey variable I1 is either equal to one or two.
Rural Resident	Variable indicating whether the household resides in a rural location.
HH Uses Cash	Variable indicating whether or not any household member has used cash in the past seven days.
Food Aid, cash	Household's monthly average of food aid, per capita, received in the form of cash.
Food Aid, in kind	Value of household's monthly average of food aid, per capita, received in kind.
Govt Aid, cash	Household's monthly average of aid, per capita, received in the form of cash from the government.
Govt Aid, in kind	Value of household's monthly average of in kind aid, per capita, received from the government.
NGO Aid, in kind	Value of household's monthly average of in kind aid, per capita, received from NGOs.
NGO Aid, cash	Household's monthly average of aid, per capita, received in the form of cash from NGOs.
Other Aid, in kind	Value of household's monthly average of in kind aid, per capita, received from other groups (i.e. groups not included in the categories NGO, Government, Food Aid, and individuals outside the household).
Other Aid, cash	Household's monthly average of aid, per capita, in the form of cash from other groups (i.e. groups not included in the categories NGO, Government, Food Aid, and individuals outside the household).
Remittances, in kind	Value of household's monthly average of in kind remittances, per capita, received from individuals outside the household.
Remittances, cash	Household's monthly average of cash remittances, per capita, received from individuals outside the household.

Alcohol	Household's average monthly per capita expenditure on alcohol.
Cigarettes	Household's average monthly per capita expenditure on cigarettes.
Salt	Household's monthly per capita expenditure on salt.
VAT	Household's average monthly per capita expenditure on VAT-taxable goods and services (the sum of VAT, manufactures and VAT, Energy).
VAT, manufactures	Household's monthly average per capita expenditures on manufactured goods and services that are most likely VAT-taxable. This includes goods produced mostly in the formal sector, such as manufactures and processed foods.
VAT, Energy	Household's average monthly per capita expenditure on VAT-taxable fuels.
Kerosene	Household's average monthly per capita expenditure on kerosene.
Official Documents	Household's average monthly per capita expenditure on processing official documents.
Electricity	Household's average monthly per capita expenditure on electricity.
Transport	Household's average monthly per capita expenditure on transportation.
Water	Household's average monthly per capita expenditure on water.
Mineral Water	Household's average monthly per capita expenditure on mineral water.
Fixed Telephone Line	Household's average monthly per capita expenditure on fixed-line phone fees.
Beer	Household's average monthly per capita expenditure on beer.
Scratch Card	Household's average monthly per capita expenditure on mobile phone scratch cards.
Mobile Phone	Household's average monthly per capita expenditure on mobile phones and their repair.
Soft Drinks	Household's average monthly per capita expenditure on soft drinks.

Fuel for Generator	Household's average monthly per capita expenditure on generator fuel.
Petrol	Household's average monthly per capita expenditure on fuels, oils and lubricants for personal transport.
Expend, Electricity	Household's average monthly per capita expenditure on electricity.
Bottled Gas	Household's average monthly per capita expenditure on bottled natural gas for cooking.
Livestock	Household owns livestock (0/1 indicator).
Livestock, value	Monetary value of all livestock owned by the household.
Land	Feddans of land that the household owns
Land, irrigated	Feddans of irrigated land that the household owns
Land, value	Monetary value of the land that the household owns
Irrigated land, value	Monetary value of the irrigated land that the household owns

8. References

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