

ECONOMIC
RESEARCH
F O R U M



منتدى
البحوث
الاقتصادية

2016

working paper series

**ALTERNATIVE SIMULATIONS
OF EQUALIZATION TRANSFERS IN SUDAN**

NourEldin A. Maglad and Eisa A.M. Elshwin

Working Paper No. 1029

**ALTERNATIVE SIMULATIONS
OF EQUALIZATION TRANSFERS IN SUDAN**

NourEldin A. Maglad and Eisa A.M. Elshwin

Working Paper 1029

July 2016

Send correspondence to:

Eisa A.M. Elshwin
Peace University, Sudan
elshwin@hotmail.com

First published in 2016 by
The Economic Research Forum (ERF)
21 Al-Sad Al-Aaly Street
Dokki, Giza
Egypt
www.erf.org.eg

Copyright © The Economic Research Forum, 2016

All rights reserved. No part of this publication may be reproduced in any form or by any electronic or mechanical means, including information storage and retrieval systems, without permission in writing from the publisher.

The findings, interpretations and conclusions expressed in this publication are entirely those of the author(s) and should not be attributed to the Economic Research Forum, members of its Board of Trustees, or its donors.

Abstract

Federal transfers in the Sudan are key to reducing regional disparities and addressing marginalization. While more resources have been directed to the sub-national levels since the adoption of the federal system in 1991, the lack of transparency and predictability surrounding these transfers has undermined the role of federal transfers to promote regional convergence and reduce financial inequality. The goal of this study is to suggest alternative simulations of equalization transfers using both fiscal needs and fiscal capacity to fill the fiscal gap so as to mitigate the disparities among states. Therefore, four intergovernmental equalization transfers scenarios were proposed using the fiscal gap approach. The results of the simulation and Lorenz curve ranking and Gini Coefficient index suggest that the government should base the transfer program on the fiscal gap measured by the difference between states fiscal needs, proxied by an augmented state needs index, and the state fiscal capacity, proxied by a poverty index. This recommended scenario would reduce the fiscal inequality among the state to its narrowest.

JEL Classification: H77, D63, H70

Keywords: intergovernmental transfers, inequality, equalization, Sudan

ملخص

التحويلات الفدرالية في السودان هي المفتاح لتقليل الفوارق الإقليمية ومعالجة التهميش. في حين تم توجيه المزيد من الموارد لمستويات دون الوطنية منذ اعتماد النظام الفيدرالي في عام 1991، قوض انعدام الشفافية والقدرة على التنبؤ المحيطة بهذه التحويلات دور التحويلات الفدرالية لتعزيز التقارب الإقليمي والحد من التفاوت في القدرة المالية. الهدف من هذه الدراسة هو اقتراح محاكاة بديلة للتحويلات باستخدام كل الاحتياجات المالية والقدرات المالية اللازمة لملء الفجوة المالية وذلك لتخفيف التفاوت بين الدول. ولذلك، اقترحت أربعة سيناريوهات نقل معادلة دولية باستخدام نهج الفجوة المالية. وتشير نتائج المحاكاة وترتيب منحى لورينز ومؤشر معامل جيني ان الحكومة يجب ان تؤسس برنامج تحويل للفجوة المالية والذي يقاس بالفرق بين الدول الاحتياجات المالية، معامل من قبل الدولة تضاف الى المؤشر، والقدرة المالية دولة، ومعامل من قبل مؤشر الفقر. سيكون هذا السيناريو هو الموصى به للحد من عدم المساواة المالية بين الدولة إلى أضييق مرحلة به.

1. Introduction

The design of intergovernmental equalization transfer mechanism whether as a result of introduction of new transfer scheme or as a part of revision of an existing one is a key element of local governments finance reform all around the world. Developing countries like Sudan often face challenges of designing their transfer's mechanisms in absence of substantial relevant data on states and local level especially fiscal, demographic and socio economic variables. The absence of necessary data to adequately quantify states and local expenditure needs and fiscal capacity in order to allocate formula-based equalization grants in an efficient, equitable and transparent manner, forms an additional hurdle in the implementation intergovernmental fiscal relations in Sudan.

The objective of this the paper is to outline different approaches for constructing different indexes to account for state expenditure needs and measures of state fiscal capacity, and equalization of the fiscal gap, which could be used to estimate the amount of equalization that each state needs.

The rest of the paper is organized as follows. Section 2 reviews the theory of equalization transfers design. Section 3 outlines the Sudan federal system, describing Sudan's experience in fiscal decentralization, the fiscal intergovernmental institutions and how fiscal transfers are allocated. In Section 4 the data sets are described. In section 5 alternative simulations of equalization transfers are provided, proposing expenditure needs, fiscal capacity and suggesting the design of the fiscal gap respectively. Lorenz curve and Gini Coefficient methodology were subsequently used to compare between the four scenarios of equalization transfers proposed to fill the fiscal gap between states. Section six ends with the conclusion and policy implications.

2. The Theory of Equalization Transfers Design

The literature on the implications of economic theory for an optimal design of equalization transfers is quite limited and this literature is heavily influenced by Robin Boadway's views on this subject (Boadway (1980), Boadway and Flatters (1982, 1991), Boadway, Flatters and LeBlanc (1983) and Auld and Eden (1984)). Among others, Boadway has given some thoughts to devising an equalization program based on economic theory. Boadway and Flatters (1982), on efficiency grounds, advocate complete elimination of differences in net fiscal benefits across provinces (Shah, 1994).

The design of systems of intergovernmental fiscal transfer is generally recognized as being one of the most challenging tasks within the field of public finance. The specific manner in which a transfer system is developed is often based on a complex mixture of political choice, economic principles, historical reasons and country contextual factors, including the size and structure of the system of local government (Steffensen, 2010). The design of appropriate allocation criteria and formulas, which is the main subject of this paper, is probably one of the most daunting tasks within the field of fiscal finance (Smoke, 1981).

A common approach allocation of intergovernmental transfers among states and local governments is the formula grant. A formula grant uses some objective, quantitative criteria to allocate the pool of revenues among states and local units. The most common reason why governments move to formula based distribution is to gain transparency and certainty in the distribution of grants. This creates a sense of fairness in that all know the exact criteria by which distributions are made, and there is flexibility in that distributions may change as the needs for public expenditures change.

2.1 Fiscal gap

To address the vertical fiscal gap or to measure for horizontal equalization one needs to account for the gap between the fiscal need (expenditure) and capacity (revenues), that can be identified by the following equation:-

$$\text{Fiscal Gapi} = \text{Fiscal Needsi} - \text{Fiscal Capacityi} \quad (2.1)$$

A vertical fiscal gap is defined as the revenue deficiency arising from a mismatch between revenue means and expenditure needs, typically of lower orders of government. A national government may have more revenues than warranted by its direct and indirect spending responsibilities; regional and local governments may have fewer revenues than their expenditure responsibilities ((Bird and Smart, 2001).

Transfers constitute the principal way in which countries achieve what is called "vertical fiscal balance" ensuring that the revenues and expenditures of each level of government are approximately equal. Such "fiscal gaps" may of course be closed in other ways by transferring revenue-raising power to local governments, by transferring responsibility for expenditures to the central government, or by reducing local expenditures or raising local revenues. In most countries, however, sufficient mismatch in the revenues and expenditures assigned to different levels of government remains for some balancing role to be assigned to intergovernmental fiscal transfers (Boadway and Hobson, 1993).

2.2 Fiscal capacity

Fiscal capacity is defined as the potential ability of the governments to raise revenues from their own sources in order to pay for a standardized basket of public goods and services. Measures of fiscal capacity will be important factors in determining the allocation of intergovernmental grants in order to equalize the amount of resources available. The fiscal capacity of subnational government is defined by its ability to raise revenues from its own resources.

There are two major approaches to measuring fiscal capacity. One is used to equalize tax rates (Representative Tax System, RTS), the second to equalize tax burdens (income approach, sometimes called macro approach) (Bird and Smart, 2001).

Under the RTS, fiscal capacity is defined as the weighted sum of the major tax bases potentially available to the jurisdictions being compared (e.g., Chernick, 1998). Fiscal equality is assumed to be achieved when application of average tax rates to the tax bases of the representative revenue regime produce the same per capita revenues in every jurisdiction. To implement this approach, data is collected on the bases for taxes and other revenues administered by every jurisdiction. Using this information and the national average tax rates, it is possible to compute the amount of revenues that each jurisdiction would collect under the average fiscal effort. This amount measures the fiscal capacity of each jurisdiction.

Alternatively, fiscal capacity may be estimated using regression analysis (Martinez- Vazquez and Boex, 1997). This makes data collection for each separate tax base unnecessary and instead only requires data on total revenue collections and proxies for tax bases. In this approach, jurisdictions' revenue collections are regressed on variables representing proxies for a set of tax bases. The parameter estimates are used to predict the amount of revenue each jurisdiction would collect under average fiscal effort.

In practice, applying RTS is difficult because jurisdictions make different choices with respect to tax structures, tax mixes and tax rates (Barro, 2002; Courchene, 1984). In some countries, even statutory bases are not well defined due to the existence of many miscellaneous tax bases. Sometimes, certain tax bases are only used in few jurisdictions. On the other hand,

implementation of the representative tax system in Sudan will not be feasible because of limited tax decentralization, very large vertical fiscal gaps and poor tax administration.

In the income approach macro measures like gross regional product (GRP) or personal income are assumed to be better indicators of the ability of jurisdictions to raise revenue (Barro, 2002; Smart, 2002). The most prominent measures of the approaches following the income approach are the ones developed by Bradbury and Ladd (1985) and Ferguson and Ladd (1986). The income approach measures revenue raising capacity as the per capita amount of revenue a jurisdiction's residents could raise if they imposed a standard tax burden on themselves.

Macro measurement such as State Gross Production do not reflect the ability of subnational governments to raise revenues from own sources. Another difficulty in the use of macro indicators is the availability of accurate and timely data at subnational levels; such macro indicators are not available at all in Sudan.

2.3 Fiscal needs

Fiscal needs may be used as the only determinants of equalization transfers or they may be used in conjunction with fiscal capacity measures. Expenditure is a factor of estimating and determining fiscal needs.

There are two methods used to determine fiscal needs of subnational government (Shah, 1994). The first method is to estimate the cost for each service. The total fiscal need of a subnational government is the sum of the estimated need for all these categories. This method to calculate a local body's fiscal needs requires subnational information on a variety of different factors that affect the costs of providing public services. Unfortunately, Sudan does not have this in depth information, and so this method cannot be employed to estimate expenditure needs in our case. Also, this approach uses actual spending as an indicator of spending needs, which may work in countries where states are financed to a large extent by own revenue. In Sudan states are financed mainly through transfers.

An alternative approach is to estimate a state body's fiscal need on the basis of certain proxies and weights assigned to them. Most common proxies are population, income level, and area. Other variables that can be considered for this formula include population density, and tax effort (revenue/ GDP ratio) etc. This paper utilizes a number of both socioeconomic and demographic variables to calculate different types of expenditure- based formula scenarios.

3. The Sudan Federal System

3.1 Sudan experience in fiscal decentralization

In 1991, Sudan adopted a federal system of governance with three tiers – federal, state and local, whereby Sudan was divided into nine states (Wilayat), each having its own government, legislative body and a number of provinces, and local councils administering the affairs at the local level. The 1998 Constitution reaffirmed the federal system and included within its stipulations a map detailing the names, boundaries and capitals of twenty six states (Hamid, 2002). In 2005, the government of Sudan and Sudan People's Liberation Movement signed the comprehensive peace agreement (CPA). Wealth Sharing Agreement is an integral part of this agreement, and it is a further step towards strengthening fiscal decentralization. The wealth sharing arrangements rest on the main following principles: a) the wealth of the Sudan shall be shared equitably, b) all parts of Sudan are entitled to development and wealth sharing, c) revenue sharing should show a commitment to the devolution of power and decentralization of decision-making, d) development will be transparent and accountable and e) best-known practices for utilizing natural resources. According to the referendum made in 2010, Sudan was divided into two countries, Sudan with fifteen states and South Sudan with ten states.

3.2 Institutional arrangements for intergovernmental fiscal transfers in Sudan

There are two institutions that shoulder the allocation of revenues in Sudan. The National States Support Fund (SSF) (1995 – 2006), the main function of which is to strengthen the fiscal decentralizations through suggesting the principles of fund allocation, that is, the criteria which should govern the grant and transfers and the allocated grants (subsidies) to subnational governments (states). The main objectives of the fund were: a) to suggest a medium term plan to assist the states that receive subsidies from the center to stand on their own feet and b) the introduction of fairness and equity in the sharing of financial resources to ensure balanced growth in the different states, in addition to encouraging the re-allocation of such resources from current to development expenditure.

In 2006 a Fiscal and Financial Allocation and Monitoring Commission (FFAMC) was established by the Government of National Unity (GNU) and Government of Southern Sudan (GOSS) to replace the NSSF. The main function of this commission is to ensure fairness and transparency in the allocation of nationally collected fund to GOSS and to the governments of the states. The FFAMC is considered the most important institution that will enhance the implementation of the CPA clauses regarding the wealth sharing agreement. Of the major terms of the reference of the Commission are ensuring transparency and equity in the allocation of central revenues to the Government of Southern Sudan and to the States, and follow-up of the financial support provided by the National Revenues Fund to ensure its equitable sharing and smooth remittance to the concerned government units

3.3 The allocation of federal transfers

One can distinguish between two types of transfers: firstly, unconditional transfers, which included current transfers, development transfers, Value Added Tax (VAT), which was introduced in 2000 to replace the state sales tax and other similar excise tax, and agricultural compensation transfers to the states, which are intended to replace the agricultural product tax, abolished in 1999. Prior to that time, farmers paid 15 percent of the value of their crops to the state in the form of an agricultural product tax (Bell and Ahmad, 2005); and additional transfers for emergency crises on a needs- basis, not based on any transparent criteria, is also included. Secondly, conditional transfers, which include transfers to cover wages and salaries and purchases of goods and services of national institutions, like the Judiciary and higher education. Also included are the transfers of social subsidy and the cost of free health for care and health insurance of certain categories of people. The CPA added several unconditional transfers such as transfers to oil producing states, transfers to the three areas (Abeyia, Blue Nile and South Kordofan State) and transfers to the reconstruction and development funds for the war affected areas.

In 1995, the NSSF identified nine factors that were adopted with the aim of achieving fair and equitable transfers to the different states. These nine factors represented the first horizontal allocation criteria to distribute the current transfers among states in Sudan as follows: 10 percent of transfer fund is to be allocated in proportion to each state's population and 10 percent of transfer fund given for each one of the following factors: human resource, national resources, infrastructure, education, health, security and per capita income, while the remaining 20 percent of the total fund is assigned in correspondence with financial performance. Each factor is determined by a number of need indicators which have different weights. In 2006, the NSSF developed a transfer formula including ten factors, after introduction of the distance from center and port to the criteria. In 2007, a FFAMC panel of experts developed a new formula containing only four factors and applied in the 2007 central budget. The criteria gives population size and minimum required for government responsibility an equal weight: 40 percent of the fund is to be allocated in proportion to each state's population and 40 percent is to be shared equally between states for government responsibility, while fifteen percent of the fund goes to

development and is allocated in proportion to each state's need for health and education, and the remaining five percent is given to fiscal efforts.

4. Data Sources

The study used socio-economic and demographic variables collected from various sources, important among them are, States Support Fund (SSF), Fiscal and Financial Allocation and Monitoring Commission (FFAMC), reports by Central Bureau of Statistic (CBS), Ministry of Finance and National Economy, Central Bank of Sudan, line ministries of education and health, National Assembly, as well as Sudan Baseline Household Survey (2009), besides World Bank and IMF reports.

5. The Empirical Results

In the following sections different simulation scenarios are presented that estimate expenditure needs and fiscal capacity of the states by modeling the factors that influence expenditure needs and revenue raising capabilities directly. Then, the estimated distributions are compared to actual distribution of transfers to judge the welfare impacts of proposed changes.

5.1 Expenditure needs

A good proxy for expenditure needs is population size, since more people means more services needs to be produced; for example Pakistan formula-based grant system uses population size for distributing grant to provinces. However, the backward provinces are provided with special grants (Steffensen, 2010). Using population size as an index for needs, grant transfers to the fifteen states in Sudan are estimated based on population size shares of the states using last population census conducted in Sudan 2009, and then compared with the formula shares of the years 2008 and 2010 as shown in appendix (1).

Figure 1 shows the population, the formula-based shares for the year 2008. From the figure, eight states enjoyed shares in equalization transfers that exceeded their corresponding population shares: Khartoum, Northern, Nile, Gezira, Blue Nile, Gadarif, White Nile and Sinnar. The states enjoying the highest shares were Gezira, Nile and Northern, respectively, while the remaining seven states, Red sea, Kassala, N. Kordofan , S. Kordofan, N. Darfur, S. Darfur and West Darfur) suffered.

The states with the lowest shares are S. Darfur, N. Kordofan and Red Sea. The South Darfur deficit from population needs share is 7.10%.

Comparison between the 2008 formula shares and actual transfer shares (data in appendix) reveal that Khartoum received in 2008, 25 percent above its approved share, while Gadarif received 24 percent less than approved share in the same year. The table shows that Khartoum, Gezira, North Kordofan and North Darfur received more than 50 percent of total actual transfer in 2008.

Figure 2 shows the hypothesized population size shares and the formula shares for 2010. From the figure five states enjoyed shares in equalization transfers that exceeded their corresponding population shares: Khartoum Northern, Nile, Gezira, and Blue Nile. The states with the highest shares were Gezira, Northern, and Khartoum. The remaining states suffered from having shares less than their population shares: Red Sea, Gadarif, White Nile, Kassala, Sinner, N. Darfur, S. Kordofan, S. Darfur and West Darfur. The lowest shares states were S. Darfur, N. Kordofan and Red Sea.

As the figure shows a 4 percent in 2010 formula shares is denoted for others, which is unexplained, raising concerns about transparency and equity of this formula.

Thus the population size scenario simulation for the years 2008 and 2010 gives quite similar finding (e.g., Khartoum Northern, Nile, Gezira and Blue Nile having shares more than their population size share in 2008 and 2010, while Red sea, N. Kordofan, N. Darfur S. Kordofan,

S. Darfur and West Darfur had shares less than their population size share). Gezira benefits most from the formula distribution, compared on a population size distribution assumption in 2008 and 2010, receiving 5.61 and 5.08 percent, respectively over its population share. On the other hand, South Darfur and North Kordofan are the losers, receiving less than their population size share; for example South Darfur loses 7.1 and 7.55 percent of an assumed population share, in 2008 and 2010, respectively.

However, since provision of services to sparsely populated areas is not the same as for a population clustered in a densely populated small region, the area size factor is included in the share formula for simulating needs, as it accounts for differences in the cost of providing many public services, such as roads, schools and health facilities. The practice of accounting for population size and area of subnational government to measure expenditure needs is followed by many countries (e.g. Uganda district share is based on 85 percent to population and 15 percent area) (Uganda Local Government Finance Commission Report, 2003).

In constructing an index on size of population and area, 75 percent weight is given for population size, while area size gets 25 percent weight. The population is given three times the weight of area, because of the importance of using the population in expenditure needs criteria. Based on these factors, and as figure 5.3 reflects for the year 2010 (no significant change in population is expected between 2008 and 2010 to change the comparison), Khartoum and Gezira lost in this scenario compared with South Darfur, North Kordofan.

Note that population weighted index transfers may be misleading if taking the migration cross different jurisdiction in the consideration however, in our analysis the time is constant, for the area-based many studies used as a single proxy with others proxies for example (Uganda Local Government Finance Commission Report, 2003).

Secondly, a measure of expenditure needs suggested by Martinez-Vazquez and Boex (2006) is a “local needs index,” similar to Human Development Index, which takes into account the weighted average of three variable needs measures (poverty, water access and infant mortality). The relative weights are arbitrarily assigned an equal one-third for each of the three factors in estimating the local expenditure needs. In our proposed simulations we decided firstly to experiment with a needs index that incorporates poverty and infant mortality, and secondly to expand the index by using water access for the population under fifteen years, since the latter variable may reflect needs more accurately than actual water access, of which a large segments of population may be deprived, particularly in rural settings. The variables are weighted equally in each version of the index. According to this construction, states with a high index should receive a greater share of transfers from the center and vice versa.

The incidence of poverty (population below poverty line) is based on household survey of 2009 (NBHS 2009), and infant under 5 mortality per 1000 live births is based on the study undertaken by Central Bureau of Statistics (2008). Population below the poverty line in 2009 is estimated at 46.5. Incidence of poverty for the different states is shown in Figure 4.

The more beneficial states according to the state’s need index, compared with the other NSSF and FFAMC formulas, are Blue Nile, South Kordofan, Gadarif, West Darfur, North Kordofan, North Darfur, South Darfur, respectively (i.e., regions with marginal development and conflict states) while the central states Khartoum, Nile, Northern and Gezira, respectively, would receive much less.

On the other hand, according to the calculated augmented states need index, South Darfur, Khartoum, North Kordofan, North Darfur, Gezira, Blue Nile received the highest weights, while Northern, Nile and Sinaar have the lowest weights. Only 5.5 percent is the difference between the high index weights (South Darfur) and low index weights (Northern state). All

marginalized states will receive more than 6 percent, and this preference is in line with their needs in highly indispensable areas in social development.

The FFAMC share formula in 2008 gives a difference between high weight (Khartoum) and low weight (Red Sea) state of about 16 percent, while in 2010 the difference between the high and low weighted states is 16.04 percent. Using the state needs index, the difference in 2009 is only 4.6 percent between the high index weight (Blue Nile) and low index weight (Khartoum), a very interesting result, because all the share formulas based on expenditure needs give a high weight to Khartoum and low weight to Blue Nile or Red Sea. These state need indexes reflect the actual needs of those poor states.

5.2 Fiscal capacity

The current intergovernmental transfer system in Sudan does not take difference in fiscal capacity into account. As a result, state governments in rich areas are able to generate considerably more revenue per capita than those in poor areas as has been confirmed by regression analysis (Maglad and Musa, 2014). The following sections try to account for fiscal capacity by proposing different indexes for fiscal capacity.

One measure of fiscal capacity used in many studies employed poverty. For instance Allers and Ishemoui (2010) in Tanzania employed the poverty data to measure fiscal capacity by constructing an index. Sudan is a poor developing country: about 50 percent of the total population is under the poverty line according to the household survey (2009) undertaken by CBS. A suitable indicator of fiscal capacity could be the share of inhabitants with enough income to be able to pay taxes at all at the state level. As a result, people below the poverty line cannot be expected to pay a high tax. The index of fiscal capacity based on this premise is constructed as follows:-

$$FC_i = P_i/p \quad (5.1)$$

Where P_i is proportion of the population above the poverty line in state i and P is the national average of this proportion. The underlying assumption is that inhabitants below the poverty line do not pay tax, and those inhabitants above the poverty line are able to pay the same (positive) amount of tax.

Another suggested measure of fiscal capacity is to obtain an index for every state by calculating per capita revenue divided by average per capita revenue in the country i.e.,

$$FC_i = R_i/R \quad (5.2)$$

Where R_i is per capita tax revenue collected in state i , and R average per capita revenue from this tax (Allers and Ishemoui, 2010). The study employed the formula to calculate a fiscal capacity index per state in Sudan, where R_i is per capita own tax revenue collected in state i , and R average per capita revenue from this tax. The average per capita is calculated and equal to 0.27 SDG and 0.25 SDG in 2008 and 2010 respectively, using the data from Central Bureau of Statistics and Taxation Chamber. The average of fiscal capacity is equal one for the country as a whole, thus states whose per capita index above one should receive no transfer from center, whereas the states whose per capita index is below one should receive transfers from center.

A third measure of fiscal capacity attempts to measure revenue raising ability relative to the state average. The fiscal capacity index is computed by states per capita ability to raise revenue in all areas of the state. The Fiscal Research Center at Georgia State University used three major revenue sources to measure fiscal capacity in counties in Georgia: property taxes, sales total taxes, and other revenues (e.g. business license fees, building permit fees, etc.) (Policy brief report N.O 103, 2005). The potential revenue for each county is divided by the population of the county. Following this methodology, one can measure fiscal capacity at the state level in Sudan by using VAT collection by states. The (VAT) was introduced in Sudan in 2000 to

replace the state sales tax and other similar excise taxes. The other taxes, such as property and business license fees, and building permit fees were not available for several states. The fiscal capacity is therefore constructed as:-

$$FCI_i = AVAT_i / AP_i \quad (5.3)$$

Where FCI_i is the fiscal capacity index, $AVAT$ the average value added tax per state i to the total collection of the taxes and the AP is population size at state i relative to the total population.

Table 5.2 shows calculation of the suggested indexes. Based on the poverty- index of capacity, North Darfur is the lowest fiscal capacity index (0.54.) which is 0.46 percent below the average, while Khartoum (1.38) is the highest state fiscal capacity, which is 0.38 percent above the average. The low fiscal capacity index states should receive a greater share of equalization transfers from center, because low capacity means this state can raise little tax revenues. The table shows that North Darfur, South Darfur, South Kordofan, Red Sea, and North Kordofan have low capacity, and should be the ones receiving more funds from the center, respectively. The high fiscal capacity index states that should receive a smaller share of funds from the center are Khartoum, Nile, Northern, Kassala, and Gezira.

In Canada, regions with below-average capacities receive transfers from the central government, and regions with above-average capacities receive no transfers, but are not required to contribute to the pool for transfers. To apply the Canadian approach, the states with above-average capacities are Khartoum, Nile, Kassala, Northern, and Gazira. Accordingly, those states should receive no transfer from center, while the 10 other states should receive transfers according to their fiscal capacity ratio. The neediest states would be North Darfur, South Darfur, Red Sea, North Kordofan and Blue Nile, respectively. Note that there are ten states whose fiscal capacity is below the average and five states above the average.

From Table 2, Khartoum, Red Sea, Gadarif and Northern would receive no transfer in the 2008 and 2010 as their per capita tax revenue indexes indicate. While the remaining eleven states would receive transfers according to their index ratio. For instance, West Darfur and North Darfur will receive more than White Nile and Sinnar according to the per capita index ratio. These results based on per capita tax index assumption are similar to that of Elbadawi and Suliman (2007), which suggest that fewer transfers will be allocated to Khartoum State but more to Western Darfur.

Table 2 shows also the capacity index of different states based on value added tax in the period 2008-2011. Khartoum and Red sea are the highly extreme cases in VAT collection, because most of the industrial, commercial, and services sectors are located in those two states. Khartoum dominated in VAT collection but the value added tax index decreased from 2.98 in 2008 to 2.31 and 2.27 in 2010 and 2011 respectively, while the value added tax index increased in Red Sea from 6.55 in 2008 to 9.60 in 2010. Khartoum average population to the total population is equal to 17 percent in 2008 to 2011, while the average population in Red Sea equal 4 percent in 2008 to 2011 (as shown in Appendix). This explains why the value of VAT capacity index in the Red Sea is greater than in Khartoum although the collection of VAT tax in Khartoum is second to none. The main reason behind high VAT index value in Red Sea is the existence of the main port of Sudan and collection of transportation VAT. S.Kordofan, North Darfur, South Darfur and West Darfur value added capacity index are less than one as shown in the table.

5.3 Measuring the fiscal gap

The most obvious way to reduce fiscal disparities is to provide transfers to states that have a significant fiscal gap. The expenditure needs and fiscal capacity scenarios equalize the differences in needs and capacity separately between states; however using them both would

enable to measure the fiscal gap. The fiscal gap could be defined as the difference between fiscal needs and fiscal capacity. This fiscal gap could be filled by equalization transfers:-

$$FG_i = N_i - C_i \quad (5.4)$$

Where N_i is the fiscal need of the i th state, and C_i is the fiscal capacity of the i th state. $N_i - C_i$ measures the gap between the fiscal need and fiscal capacity (own sources of revenue). This type of formula considers not only the equalization of fiscal capacities, but also adjusts for the expenditure needs of different states. And the $\sum FG$ is equal the equalization transfers to the fifteen states.

To equalize the fiscal gap or to estimate the amount of equalization which could be transfers to each state Martinez-Vazquez and Boex, 2001 constructed mechanism with three steps.

Step 1. Measure fiscal capacity and fiscal (expenditure) needs

Step 2. Define the fiscal gap for each state government:

If fiscal capacity greater than fiscal needs, then fiscal gap = zero

If fiscal capacity less than fiscal needs, then

Step 3. Define the transfer to each state government:

$$\text{Transfer to state government } i = (Fiscal\ gap_i / \sum Fiscal\ gap_i) * Fund \quad (5.5)$$

It is assumed that the state needs and augmented state needs indexes which represent the expenditure side, and the poverty index and per capita tax revenue index, are the most appropriate measures for fiscal needs and fiscal capacity respectively, especially in absence of the relevant data.

For example, in Table 3 for Khartoum in 2009 the fiscal gap scenario (1) should be equal: $86.026 = (3.44/85.71) * 2143.4$, while the Blue Nile fiscal gap should be $214.31 = (8.57/85.71) * 2143.4$.

The central government should fill the fiscal gap by providing more equalization grants to the states that have a weaker fiscal capacity. Thus, the state whose fiscal capacity is less than fiscal needs requires transfers to fill the state's fiscal gap. A negative sign therefore indicated that the state's actual equalization transfers are less than what it should have received, and the positive sign indicted that the state received more than should be transferred.

Accordingly, based on calculated gap difference between "state needs" and "fiscal capacity poverty index" (scenario (1) Table 3), twelve states received less than fiscal gap share and three states received more fiscal gap share. The Red Sea, Gadarif, Kassala, Sinnar, White Nile, Blue Nile, North Kordofan, South Kordofan, North Darfur, South Darfur, West Darfur and Northern, received less than the share based on computed gap -- these twelve states received only about 57% of the equalization transfers in 2009. Khartoum, Gezira, and Nile received more than fiscal gap transfers -- they received about 43% of equalization transfer in 2009.

In scenario (2), based on calculated gap of the difference between augmented state needs index and poverty based index state capacity, eleven states received less than equalization transfers expect Khartoum, Gezira, Nile and Northern (e.g., Khartoum received about one and a half times more than equalization transfers and Gezira received 1 times more than fiscal gap transfers). These four states received about 47% of total equalization transfer in 2009; however, if the fiscal gap approach (2) is applied to the equalization transfer in 2009 those states would have received only 22% of total equalization transfer in 2009.

In scenario (3), based on the calculated gap difference between state needs index and per capita revenue index, Khartoum and Gezira repeatedly are the most benefiting states (e.g., Khartoum

received ten times more than the fiscal gap equalization, while Blue Nile, South Kordofan and West Darfur are most suffering states, Blue Nile received two times less than the fiscal gap).

In scenario (4), based on the calculated gap difference between augmented state needs index, and per capita revenue index, eleven states received less than their equalization transfers fiscal gap transfers except Khartoum, Gezira, Nile and Northern. This result is similar to the results that were obtained in scenario (2) and scenario (3).

5.4 Measuring inequality and disparities of transfers

Measuring states disparities within country is difficult, and various measurements are therefore used in the literature such as economic indicators, state levels and concentration measures, namely, Lorenz curve and Gini coefficients.

Lorenz curve is a popular graphical tool for examining inequality. It is a plot of the cumulative fraction of the population on the X-axis starting from the poorest, against the cumulative fraction of resources (income/expenditure) on the Y-axis. Thus, it gives the shares of total income or per capita expenditure held (consumed) by corresponding fraction of the population. If resources are equally distributed, everyone will be in the 45° line (the diagonal); the greater the level of inequality, the farther away the Lorenz curve is from the diagonal.

Gini coefficient, on the other hand, is defined as an area between the line of equality (the diagonal) and Lorenz curve divided by the area of the triangle below this line (see figure below). Perfect equality occurs when the distribution coincides with the diagonal, and Gini coefficient is therefore zero, and absolute inequality is obtained with a Gini equal to one. Gini Index is the Gini coefficient expressed as percentage.

The Lorenz curves and Gini Coefficients were used to compare between equalization transfers and total transfers for the periods of the study. The preferable curve is the dominating curve, or the nearest curve to the diagonal; Gini Coefficient is used to compare the situation in case of two Lorenz curves crossing each other.

Figure 5 shows the comparisons between two Lorenz fiscal gap scenarios. The Lorenz curve of fiscal gap scenario (1) lies above that of scenario (4); therefore the Lorenz curve of fiscal gap scenario (1) dominates Lorenz curve fiscal gap scenario (4). This result is confirmed with the Gini coefficient, which is less in scenario (1) than in scenario (4). Figure 6 also shows comparisons between two Lorenz fiscal gap scenarios, Lorenz curve of fiscal gap scenario (3) lies below that of scenario (2) so Lorenz curve of fiscal gap scenario (2) unambiguously dominates Lorenz curve fiscal gap scenario (3). This result is confirmed with the Gini coefficient which is less in scenario (2) than in scenario (3). Finally, Figure 7, which compares between the two dominating Lorenz curves fiscal gap in Figure 5 and Figure 6, shows that the Lorenz curve scenario (2) crosses the Lorenz curve of scenario (1) at the bottom 20% of population, and stays above curve 1 up to the share of the top 30% when the two curves coincides; in which case resort is made to Gini coefficient, which indicates a lower inequality of transfers distribution in case of scenario 2.

Accordingly scenario (2) in which the fiscal gap is represented by the divergence of augmented state needs index and fiscal capacity poverty index, is the preferred one in all these scenarios. This result can be compared to the result obtained by Maglad and Musa (2014), which found the value of Gini coefficient is equal 0.29 to the equalization transfers for the year 2009 in Sudan. Also, this result can be compared to the average Gini coefficient to the impact of decentralized redistribution on income inequality by country groups in Sub-Saharan African countries, which lies between 0.30 and 0.35, in a study conducted by IMF (Antonia Goerl and Seiferling, 2014).

6. Conclusion

This study attempted to fill the gap in the empirical literature in public policy in Sudan, by raising the issue of how federal equalization transfers are allocated across state governments, and in proposing different indexes for measuring the allocation of federal transfers between different states in Sudan. Most of the developed countries face difficulties concerning how to measure both states' fiscal capacity and their spending needs. Due to these difficulties, some of these countries allocate intergovernmental transfers to state governments on an ad hoc basis and usually these allocations are largely dependent on expert opinions. As result, intergovernmental transfers may lead to inequality in the provision of public services across sub-national jurisdictions.

Sudan equalization transfers aim to compensate states with higher spending needs. However, no attempts have been made before to incorporate fiscal capacity measures in the allocation of resources to states, so the study outlined some of the indexes to measure the expenditure needs and fiscal capacity, then proposed four intergovernmental equalization transfers scenarios using fiscal gap approach. The scenario which is recommended is the one that accounts for both fiscal capacity, measured by a poverty index, and expenditure needs, measured by an augmented state needs index, and is found to reduce the fiscal inequality among states to narrowest, as shown by Lorenz curve and Gini coefficient analysis.

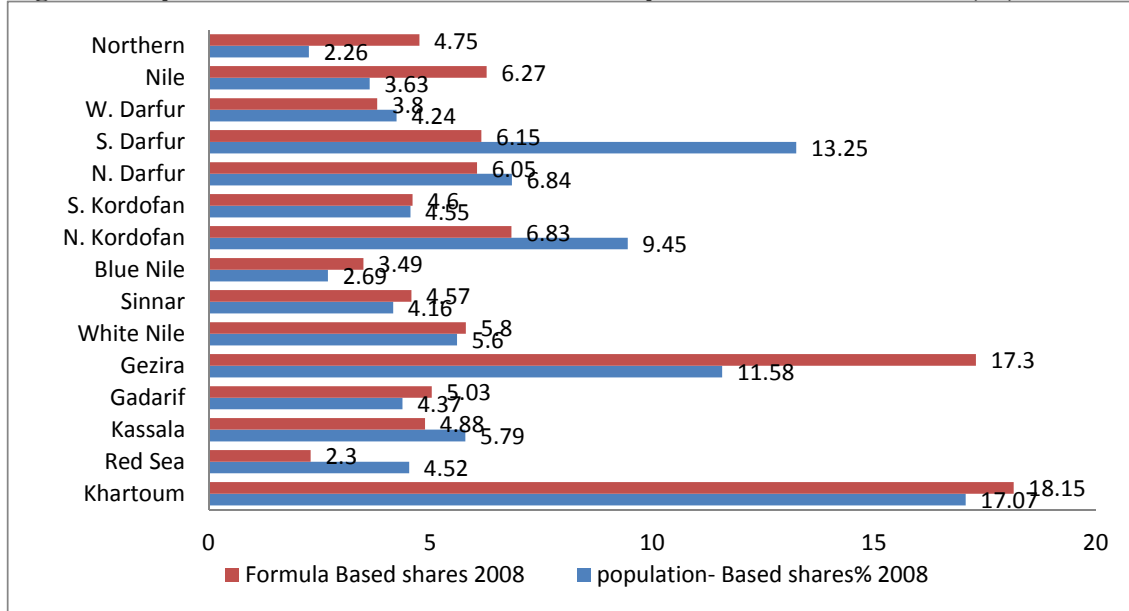
In conclusion the reform of the system of transfers may not be effective if carried without regard to the necessary reforms of other important elements of intergovernmental fiscal relations, in particular revenue and expenditure assignments.

References

- Allers, M. and L. Ischemia, (2010).“Fiscal Capacity Equalization in Tanzania.” *Local Government Studies*, 36(5).
- Antonia, Goerl. C and S. Mike. (2014). “Income Inequality and Fiscal Decentralization and Transfer Dependency.” IMF Working Paper No. 14/64.
- Barro, S., 2002, Macroeconomic Versus RTS Measures of Fiscal Capacity: Theoretical Foundations and Implication for Canada. (Kingston: Institute of Intergovernmental Relations, Queen’s University).
- Bell, M. and M. M. Ahmed (2005),”The Government of Sudan: Intergovernmental Policies and Issues,” Working Paper Number 11, George Washington Institute of Public Policy (GWIPP), The George Washington University, Washington DC 20052.
- Bird, Richard. M. and Smart, Michael (2001) Intergovernmental Fiscal Transfers: Some lessons from International Experience. University of Toronto.
- Boadway, Robin and P. Hobson (1993) “Intergovernmental Fiscal Relations in Canada. Toronto: Canadian Tax Paper No 96 Toronto Canada Tax Foundation.
- Chernick, H., 1998, ‘Fiscal Capacity in New York: The City Versus the Region’, *National Tax Journal*, 51/3, 531-40.
- Courchene T., 1984, Equalization Payments: Past, Present and Future (Toronto: Ontario economic council).
- Comprehensive Peace Agreement (CPA) (2005).
- Elbadawi, I., and K. Suliman, (2007), “Toward an Equitable Inter-Governmental Transfer System for Sudan”; Unicons, Khartoum.
- Hamid, Gamal M. (2002) Ph.D. “Reflections on the Experience of Local Authorities in Sudan.” Arab Urban Development Institute Riyadh Saudi Arabia.
- Household Survey (2009), Central Bureau of Statistics.
- Interim National Constitution of the Republic of Sudan (INC) (2005).
- International Monetary Fund (2012) “Sudan: Selected Issues Paper” Country Report No. 12/299. Washington, D.C.
- Maglad A. NourEldin and E. Musa (2014), “Are Intergovernmental Transfers in Sudan Equalized?.” Arab Council for the Social Sciences, Second conference March 2015.
- Martinez-Vazquez, J. J. and Boex, 1997, Fiscal Capacity: An Overview Concepts and Measurement Issues and Their Applicability in the Russian Federation (Atlanta: Andrew Young School of Policy Studies, Georgia State University).
- Martinez- Vazquez, Jorge, and Boex, Jameson (2001) “Russia’s transition to a new federalism”. World Bank Institute Working Paper, Washington, Dc.
- Martinez-Vazquez, Jorge and Boex, Jameson (2006). “Designing Intergovernmental Equalization Transfers with Imperfect Data: Concepts, Practices, and Lessons.” Unpublished Manuscript, Andrew Young School for Policy Studies, Georgia State University.
- Shah, Anwar. (1994) “A Fiscal Needs Approach to Equalization Transfers in a Decentralized Federation” Policy Research Department, World Bank Paper N.O 1289, April 1994.

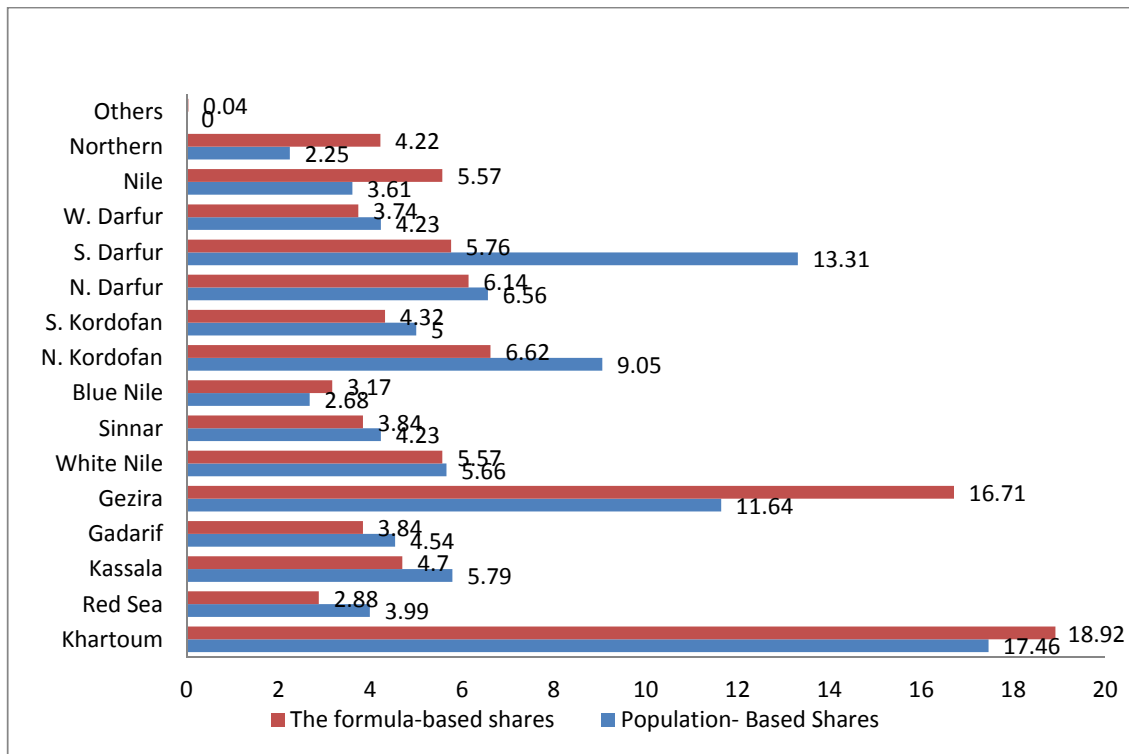
- Smoke, Paul, (2001) "Fiscal Decentralization in Developing Countries." A review of Current Concepts and Practices, United Nations Research Institute for Social Development, Democracy, Governance and Human Rights Programme Paper Number 2.
- Steffensen, Jesper, (2010) "Introduction to the Principle for Design of Intergovernmental Fiscal Transfers. Sudan Permanent Constitution of 1998.
- The Tennessee Advisory Commission on Intergovernmental Relations (2013) "Fiscal capacity for Fiscal Year 2013" www.tn.gov/tacir.
- Uganda Local Government Finance Commission "Allocation Principles, Formulae, Modalities and Flow of Central Government Transfers", Commission Recommendations No.9, 2003.
- World Bank (2011) "Public Expenditure Tracking Survey (PETS) For Northern Sudan, Case Study of Health Sector", Poverty Reduction and Economic Management Unit, Africa Region.
- World Bank (2007) "Sudan Public Expenditure Review (PER)" Volume 2 Background Paper, Poverty Reduction and Economic Management Unit, Africa Region.

Figure 1: Equalization Transfer: Formula and Population Shares for 2008 (%)



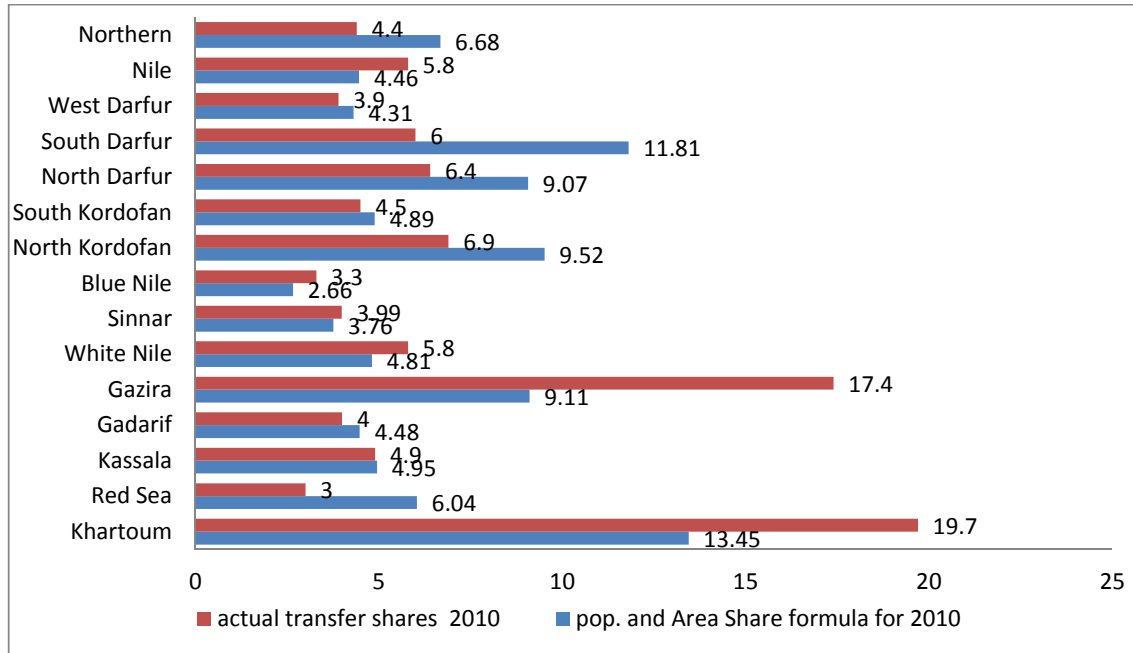
Source: own construction based on data in the appendix, table 1.

Figure 2: Equalization Transfer: Formula and Population Shares for 2010 (%)



Source: own construction based on data in appendix.

Figure 3: Proposed Population and State Area Share (%), 2010



Source: Own construction based on data in appendix.

Figure 4: Incidence of Poverty and Infant Mortality Under 5 Years in 2009

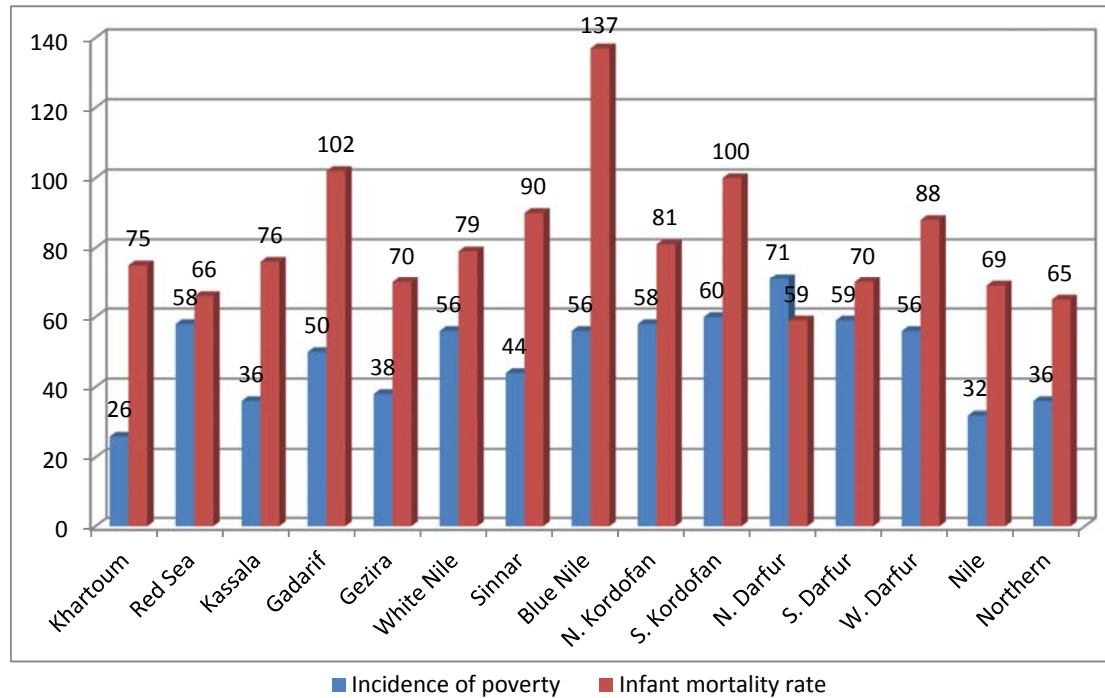
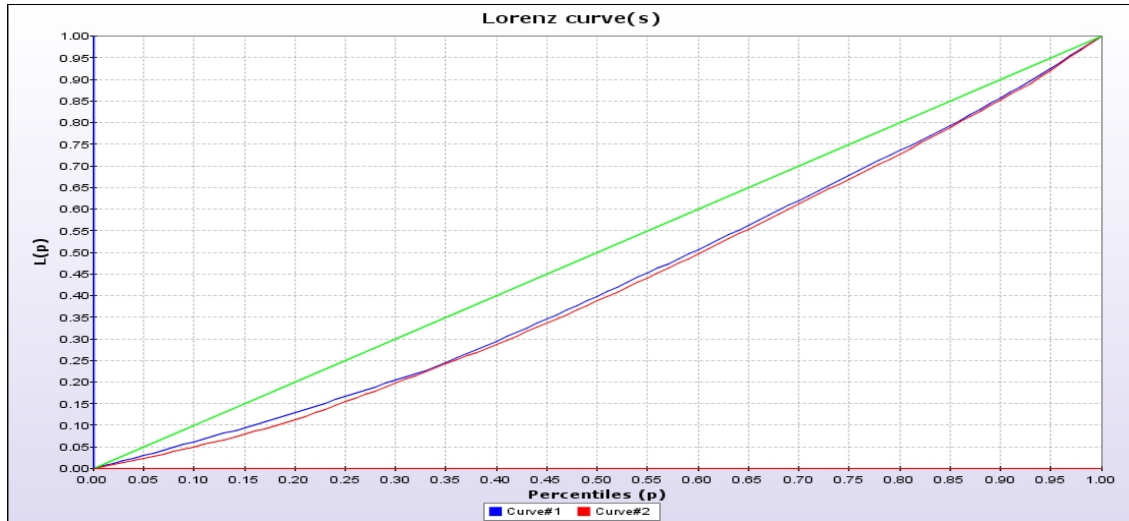
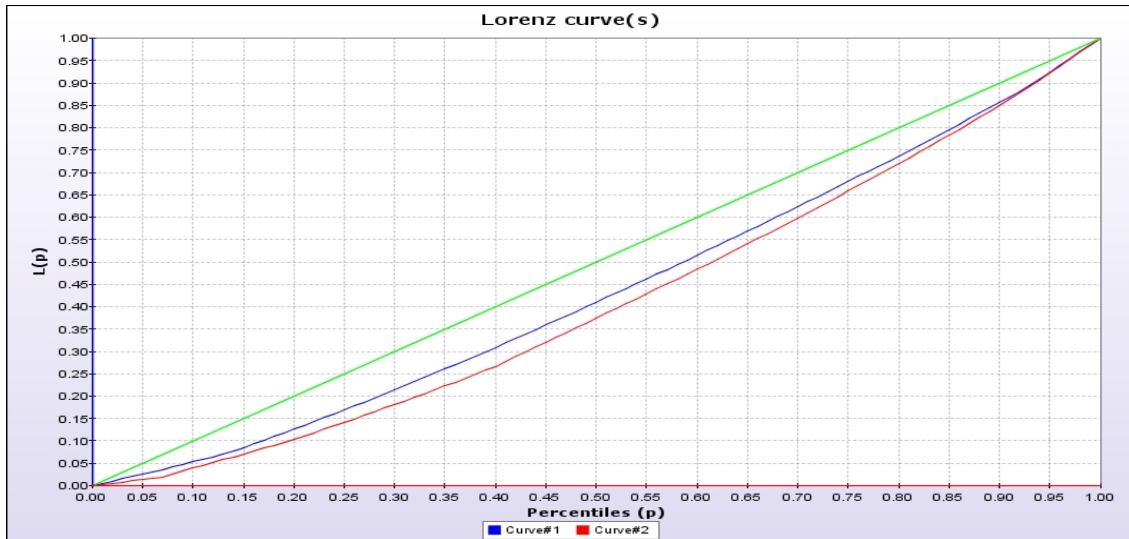


Figure 5: Lorenz Comparison between Scenario (1) and Scenario (4)



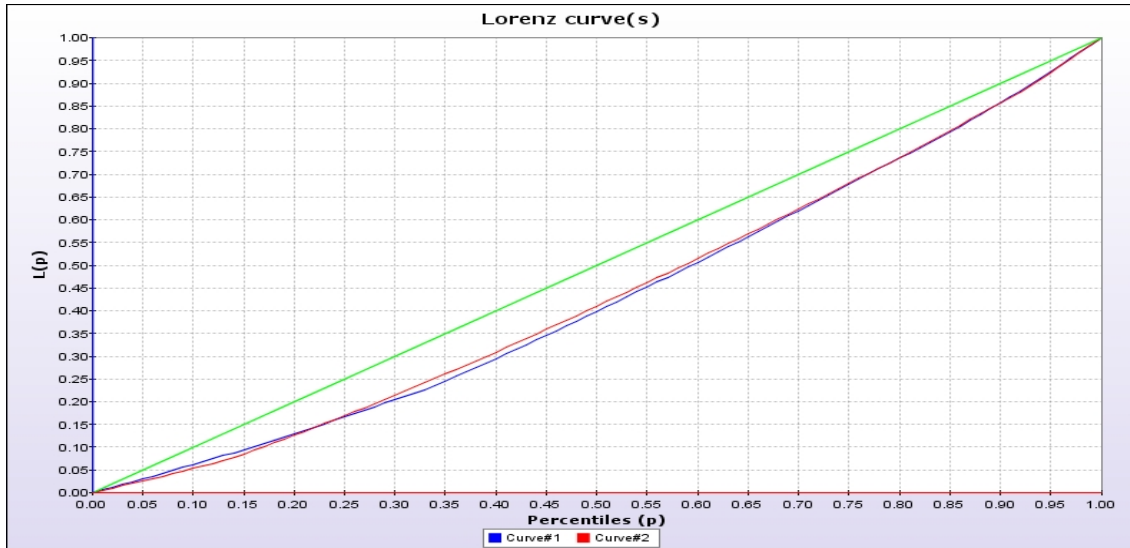
Notes: Curve (1): shows distribution of fiscal gap transfers of difference between state needs and poverty based fiscal capacity. Curve (2): shows distribution of fiscal gap transfer of difference between augmented state needs and per capita tax revenue fiscal capacity.

Figure 6: Lorenz Comparison between Scenario (2) and Scenario (3)



Notes: Curve (1): shows distribution of fiscal gap transfers of difference between augmented state needs and poverty based fiscal capacity. Curve (2): shows distribution of fiscal gap transfer of difference between state needs and per capita tax revenue fiscal capacity.

Figure 7: Lorenz Comparison between Scenario (1) and Scenario (2)



Notes: Curve (1): shows distribution of fiscal gap transfers of difference between state needs and poverty based fiscal capacity. Curve (2): shows distribution of fiscal gap transfers of difference between augmented state needs and poverty based fiscal capacity.

Table 1: State Needs Index and the Augmented State Needs Index in 2009

State	State needs index	Augmented State needs index
Khartoum	4.82	8.02
Red Sea	6.63	6.09
Kassala	5.54	6.08
Gadarif	7.55	6.42
Gezira	5.43	7.26
White Nile	7.02	6.48
Sinnar	6.66	5.76
Blue Nile	9.39	7.07
N. Kordofan	7.24	7.75
S. Kordofan	8.15	6.88
N. Darfur	7.23	7.31
S. Darfur	6.86	9.55
W. Darfur	7.39	6.72
Nile	4.99	4.46
Northern	5.10	4.15
Total	100	100

Source: Own calculation using data of Central Bureau of Statistics, household survey 2009

Table 2: Measures of Fiscal Capacity

State	Poverty-based Fiscal capacity index 2009	Per capita Tax Revenue Fiscal capacity 2008	Per capita Tax Revenue Fiscal capacity 2010	VAT capacity index 2008	VAT capacity index 2009	VAT capacity index 2010	VAT capacity index 2011
Khartoum	1.38	3.312	3.313	2.98	2.88	2.31	2.27
Red Sea	0.79	3.021	3.036	6.55	8.09	9.60	8.18
Kassala	1.20	0.501	0.512	0.19	0.18	0.24	0.36
Gadarif	0.93	1.782	1.436	0.38	0.38	0.31	0.51
Gezira	1.16	0.915	0.863	0.57	0.52	0.58	0.68
White Nile	0.82	0.590	0.602	0.60	0.41	0.56	0.66
Sinnar	1.05	0.740	0.590	0.22	0.19	0.18	0.26
Blue Nile	0.82	0.460	0.534	0.09	0.08	0.11	0.25
N. Kordofan	0.79	0.556	0.610	0.18	0.17	0.30	0.43
S. Kordofan	0.75	0.378	0.427	0.02	0.02	0.03	0.05
N. Darfur	0.54	0.189	0.203	0.05	0.03	0.05	0.08
S. Darfur	0.77	0.347	0.592	0.06	0.05	0.07	0.08
W. Darfur	0.82	0.119	0.187	0.03	0.03	0.03	0.06
Nile	1.27	0.595	0.664	0.42	0.32	0.59	0.77
Northern	1.20	1.486	1.422	0.26	0.29	0.31	0.38
Average	1	1	1	1	1	1	1

Source: Own calculation using data of Central Bureau of Statistics and Taxation Chamber reports.

Table 3: Calculated Fiscal Gap Scenarios of Equalization Transfers in 2009

State	Actual equalization in 2009 in million SDG	Fiscal gap Scenario (1)	Divergence	Fiscal gap Scenario (2)	Divergence	Fiscal gap Scenario (3)	Divergence	Fiscal gap Scenario (4)	Divergence
Khartoum	422.5	3.44	336.47	6.64	256.44	1.507	384.5	4.70	303.81
Red Sea	64.2	5.84	-81.84	5.30	-68.34	3.594	-26.43	3.05	-12.81
Kassala	105	4.34	-3.53	4.88	-17.03	5.028	-21.79	5.56	-35.41
Gadarif	85.7	6.62	-79.85	5.49	-51.59	6.114	-68.47	4.98	-39.98
Gazira	373.1	4.27	266.31	6.10	220.55	4.567	257.94	6.39	211.79
White Nile	124.3	6.20	-30.74	5.66	-17.24	6.418	-37.54	5.87	-23.92
Sinnar	85.7	5.61	-54.592	4.71	-32.08	6.07	-67.36	5.17	-44.67
Blue Nile	70.8	8.57	-143.51	6.25	-85.49	8.856	-152.5	6.53	-94.01
N.Kordofan	147.8	6.45	-13.49	6.96	-26.25	6.63	-19.39	7.14	-32.25
S.Kordofan	96.4	7.40	-88.65	6.13	-56.89	7.723	-98.35	6.45	-66.32
N.Darfur	137.1	6.69	-30.21	6.77	-32.20	7.027	-40.1	7.10	-42.11
S.Darfur	128.6	6.09	-23.69	8.78	-90.96	6.268	-29.46	8.95	-97.29
W.Darfur	83.6	6.57	-80.69	5.90	-63.94	7.203	-98.03	6.53	-81.14
Nile	124.4	3.72	13.02	3.19	44.62	4.326	15.314	3.79	28.67
Northern	94.2	3.90	-3.32	2.95	20.42	3.678	1.4538	2.728	25.40
Total	2143.4	85.71	0	85.71	0	85.71	0	85.71	0

Notes: Details of calculation of Fiscal Gap scenarios are shown in the Appendix Tables (4), (5), (6) and (7). Divergence is difference between actual equalization transfers in 2009 and proposed equalization transfers based on calculated Fiscal Gap.

Source: Own calculation using data of Central Bureau of Statistics and Taxation Chamber Reports.

Table 4: The Corresponding Computed Gini Coefficients of Proposed Fiscal Gap Scenarios

Scenario	Scenario (1)	Scenario (2)	Scenario (3)	Scenario(4)
Gini Coefficient	0.14	0.13	0.17	0.16

Appendices

Appendix 1: Transfer Shares Based on Population Size Compared with the Formulas of 2008 and 2010

States	population- Based shares% 2008	Formula Based shares 2008	actual Transfer shares 2008	Population- Based Shares% 2010	The formula shares% 2010	actual transfer shares% 2010
Khartoum	17.07	18.15	22.73	17.46	18.92	19.70
Red Sea	4.52	2.30	3.42	3.99	2.88	3.00
Kassala	5.79	4.88	4.84	5.79	4.70	4.90
Gadarif	4.37	5.03	3.79	4.54	3.84	4.00
Gezira	11.58	17.30	17.70	11.64	16.71	17.40
White Nile	5.60	5.80	5.18	5.66	5.57	5.80
Sinnar	4.16	4.57	3.74	4.23	3.84	3.99
Blue Nile	2.69	3.49	2.96	2.68	3.17	3.30
N. Kordofan	9.45	6.83	6.03	9.05	6.62	6.90
S. Kordofan	4.55	4.60	4.14	5.00	4.32	4.50
N. Darfur	6.84	6.05	6.58	6.56	6.14	6.40
S. Darfur	13.25	6.15	5.86	13.31	5.76	6.00
W. Darfur	4.24	3.80	3.77	4.23	3.74	3.90
Nile	3.63	6.27	5.03	3.61	5.57	5.80
Northern	2.26	4.75	4.23	2.25	4.22	4.40
Others	-	-	-	-	4.00%	-
Total	100	100	100	100	100	100

Source: Own calculation using data of Central Bureau of Statistics and FFMAC Reports

Appendix 2: State Tax Collection in Percentage from 2006 – 2010(in SDG)

State	2006	2007	2008	2009	2010	Average
Khartoum	49.12	47.13	47.91	45.98	48.15	47.66
Red Sea	10.77	14.23	11.57	11.85	10.09	11.70
Kassala	2.05	2.18	2.46	2.49	2.47	2.33
Gadarif	7.82	6.54	6.59	6.57	5.42	6.59
Gazira	7.14	7.37	8.98	8.47	8.38	8.07
White Nile	2.92	2.97	2.80	2.91	2.84	2.89
Sinnar	2.39	2.36	2.61	2.78	2.08	2.44
Blue Nile	1.14	0.86	1.05	1.29	1.19	1.11
North Kordofan	4.35	4.47	4.46	4.29	4.60	4.43
South Kordofan	1.52	1.77	1.46	1.61	1.78	1.63
North Darfur	0.82	0.95	1.10	1.08	1.11	1.01
South Darfur	5.12	3.67	3.90	4.87	6.57	4.83
West Darfur	0.43	0.53	0.43	0.59	0.66	0.52
Nile	2.17	2.2	1.83	2.53	2.00	2.14
Northern	2.24	2.77	2.85	2.69	2.66	2.64
Total	100	100	100	100	100	100

Source: Own calculation using data of Central Bureau of Statistics and Taxation Chamber Reports

Appendix 3: The Socio-Economic and Demographic Variables Used in Measured Need Indexes

States	Population size 2008	Population size in 2010	Actual Transfer 2008 in million SDG	Actual current transfers 2010 in million SDG	Incidence of poverty	population below poverty line	Infant mortality rate	Under 15s
Khartoum	5274	5758	427.49	489.46	26	1433.9	75	110094
Red Sea	1396	1317	64.25	74.51	58	758.64	66	37459
Kassala	1789	1910	91.05	121.58	36	655.56	76	54379
Gadarif	1348	1495	71.38	99.34	50	709.5	102	31223
Gezira	3575	3845	333.01	432.29	38	1409.8	70	82900
White Nile	1730	1867	97.53	144.1	56	1005.76	79	40539
Sinnar	1,285	1396	70.39	99.34	44	589.6	90	30003
Blue Nile	832	882	55.6	82.01	56	480.48	137	18308
N. Kordofan	2,920	2986	113.44	171.26	58	1713.32	81	66260
S. Kordofan	1,406	1649	77.96	111.76	60	958.8	100	32580
N. Darfur	2,113	2163	123.76	158.84	71	1519.4	59	55689
S. Darfur	4,093	4392	110.23	149.02	59	2484.49	70	113283
W. Darfur	1,308	1393	70.96	96.76	56	755.44	88	40567
Nile	1,120	1192	94.54	144.1	32	370.56	69	25824
Northern	699	741	79.61	109.18	36	259.56	65	16759
Total	30888	32986	1881.2	2483.55	465	14832.57	82	755867

Source: Own calculation using data of Central Bureau of Statistics, household survey 2009

Appendix 4: The Calculation Fiscal Gap from Actual Transfers in 2009

State	State needs index	Fiscal capacity Poverty Index	Fiscal Gap	Fiscal gap (transfers)	Actual equalization transfers in 2009	The difference
Khartoum	4.82	1.38	3.44	86.02	422.5	336.47
Red Sea	6.63	0.79	5.84	146.04	64.2	-81.84
Kassala	5.54	1.20	4.34	108.53	105	-3.53
Gadarif	7.55	0.93	6.62	165.55	85.7	-79.85
Gazira	5.43	1.16	4.27	106.78	373.1	266.31
White Nile	7.02	0.82	6.20	155.04	124.3	-30.74
Sinnar	6.66	1.05	5.61	140.29	85.7	-54.592
Blue Nile	9.39	0.82	8.57	214.31	70.8	-143.51
North Kordofan	7.24	0.79	6.45	161.29	147.8	-13.49
South Kordofan	8.15	0.75	7.40	185.05	96.4	-88.65
North Darfur	7.23	0.54	6.69	167.31	137.1	-30.21
South Darfur	6.86	0.77	6.09	152.29	128.6	-23.69
West Darfur	7.39	0.82	6.57	164.29	83.6	-80.69
Nile	4.99	1.27	3.72	93.02	124.4	13.02
Northern	5.10	1.20	3.90	97.52	94.2	-3.32
Total	100	14.26	85.71	2143.4	2143.4	0

Source: Own calculation using data of Central Bureau of Statistics, household survey 2009

Appendix 5: The Calculation of Fiscal Gap from Actual Transfers in 2009

State	Augmented State needs index	Fiscal capacity Poverty Index	Fiscal Gap	Fiscal gap (transfers)	Actual equalization transfers in 2009	The difference
Khartoum	8.02	1.38	6.64	166.05	422.5	256.44
Red Sea	6.09	0.79	5.30	132.54	64.2	-68.34
Kassala	6.08	1.20	4.88	122.03	105	-17.03
Gadarif	6.42	0.93	5.49	137.29	85.7	-51.59
Gazira	7.26	1.16	6.10	152.54	373.1	220.55
White Nile	6.48	0.82	5.66	141.54	124.3	-17.24
Sinnar	5.76	1.05	4.71	117.78	85.7	-32.08
Blue Nile	7.07	0.82	6.25	156.29	70.8	-85.49
North Kordofan	7.75	0.79	6.96	174.05	147.8	-26.25
South Kordofan	6.88	0.75	6.13	153.29	96.4	-56.89
North Darfur	7.31	0.54	6.77	169.30	137.1	-32.20
South Darfur	9.55	0.77	8.78	219.56	128.6	-90.96
West Darfur	6.72	0.82	5.90	147.54	83.6	-63.94
Nile	4.46	1.27	3.19	79.77	124.4	44.62
Northern	4.15	1.20	2.95	73.77	94.2	20.42
Total	100	14.26	85.71	2143.4	2143.4	0

Source: Own calculation using data of Central Bureau of Statistics, household survey 2009

Appendix 6: The Calculation of Fiscal Gap from Actual Transfers in 2009

state	State needs index	Per capita tax revenue Index	Fiscal Gap	Fiscal gap (transfers)	Actual equalization transfers in 2009	The difference
Khartoum	4.82	3.313	1.507	38.00	422.5	384.5
Red Sea	6.63	3.036	3.594	90.62	64.2	-26.43
Kassala	5.54	0.512	5.028	126.78	105	-21.79
Gadarif	7.55	1.436	6.114	154.17	85.7	-68.47
Gazira	5.43	0.863	4.567	115.16	373.1	257.94
White Nile	7.02	0.602	6.418	161.83	124.3	-37.54
Sinnar	6.66	0.59	6.07	153.06	85.7	-67.36
Blue Nile	9.39	0.534	8.856	223.31	70.8	-152.5
North Kordofan	7.24	0.61	6.63	167.18	147.8	-19.39
South Kordofan	8.15	0.427	7.723	194.74	96.4	-98.35
North Darfur	7.23	0.203	7.027	177.19	137.1	-40.1
South Darfur	6.86	0.592	6.268	158.05	128.6	-29.46
West Darfur	7.39	0.187	7.203	181.63	83.6	-98.03
Nile	4.99	0.664	4.326	109.08	124.4	15.314
Northern	5.1	1.422	3.678	92.74	94.2	1.4538
Total	100	15	85	2143.4	2143.4	0

Source: Own calculation using data of Central Bureau of Statistics, Taxation Chamber Reports

Appendix 7: The Calculation of Fiscal Gap from Actual Transfers in 2009

State	Augmented State needs index	Per capita tax revenue Index	Fiscal Gap	Fiscal gap (transfers)	Actual equalization transfers in 2009	The difference
Khartoum	8.02	3.31	4.70	118.6	422.5	303.81
Red Sea	6.09	3.03	3.05	77.0	64.2	-12.81
Kassala	6.08	0.51	5.56	140.4	105	-35.41
Gadarif	6.42	1.43	4.98	125.6	85.7	-39.98
Gazira	7.26	0.86	6.39	161.3	373.1	211.79
White Nile	6.48	0.60	5.87	148.2	124.3	-23.92
Sinnar	5.76	0.59	5.17	130.3	85.7	-44.67
Blue Nile	7.07	0.53	6.53	164.8	70.8	-94.01
North Kordofan	7.75	0.61	7.14	180.0	147.8	-32.25
South Kordofan	6.88	0.42	6.45	162.7	96.4	-66.32
North Darfur	7.31	0.20	7.10	179.2	137.1	-42.11
South Darfur	9.55	0.59	8.95	225.8	128.6	-97.29
West Darfur	6.72	0.18	6.53	164.7	83.6	-81.14
Nile	4.46	0.66	3.79	95.7	124.4	28.67
Northern	4.15	1.422	2.728	68.7	94.2	25.40
Total	100	15	85	2143.4	2143.4	0

Source: Own calculation using data of Central Bureau of Statistics, Taxation Chamber Reports