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Oil and Agriculture in the Post-Separation Sudan

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Oil and Agriculture in the Post-Separation Sudan

Khalid H. A. Siddig[1]

Abstract

The Comprehensive Peace Agreement (CPA), which was signed by the government of Sudan and the Sudanese People's Liberation Movement (SPLM) ended more than 20 years of civil war. According to the CPA, the Sudan's government has 50% of the oil exploited from the wells existing in the south in addition to the oil produced from the northern wells. The latter represents about 30% of the total oil production in Sudan. In January 2011, the people in southern Sudan have voted for separation from the Sudan and in July 2011 the Republic of South Sudan was officially announced as Africa's newest state. Now the CPA period is over and the south possesses its entire production of oil, but need to use the export infrastructure that exists in the north to export it. For that the south need to pay fees and customs for which the exact amounts need to be further negotiated. Sudan would lose a huge part of its revenue from oil, which constituted a growing share in its trade, government revenue and GDP during the last decade. This paper tries to investigate the consequences of separation on the Sudan's economy. A regional general equilibrium model with Africa database of the Global Trade Analysis Project (GTAP) is applied. Results show that the entire economy would be hit when a 20% cut in oil output is simulated. The study introduces the non-oil exports of the agricultural sector as an alternative to oil and recommends enhancing the efficiency in agriculture and promoting agricultural exports to gradually bring the economy back on track.

Keywords: oil, agriculture, Sudan, South Sudan, separation, CGE models.

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1   Background and Motivations

Oil, agriculture, and development are complex, interrelated, and overlapped issues in most oil-producing developing countries. The situation becomes even more complicated if politics, peace building, and state building come into play. This could describe the recent situation in Sudan (North Sudan) where a new African state is re-born inheriting many complexities/conflicts with its new neigbouring country (South Sudan) of which oil and borders demarcation are at the top.

The interrelating and overlapping spheres of these different issues are beyond the scope of this paper. However, an attempt will be undertaken to describe how the separation of Sudan and the establishment of the state of South Sudan will affect the Sudanese economy of the Republic of Sudan at large and its agricultural sector in particular.

Oil has taken a corner stone position within the united Sudanese economy since its exploitation started in 1999. This could be demonstrated by its weight in, at least, three major economic variables, namely: the GDP, the foreign trade sector, and the government revenue as depicted in Central Bank of Sudan (CBoS) Reports. Accordingly, its impact has considerably spread over almost all aspects of the economy and society.

The first economic variable that petroleum started to influence to consider is the GDP. As shown in Figure (1), before 1999 and even in 1999, the year which witnessed the beginning of Sudanese exports of oil, the petroleum sector contribution to the GDP was negligible. Prior to that date, the shortage of petroleum products was a permanent handicap impeding the economy's development with all its negative implications especially on production and growth (Gadkarim, 2010).

Figure 1. Composition of the Sudan's GDP 1999 – 2010 (in %)
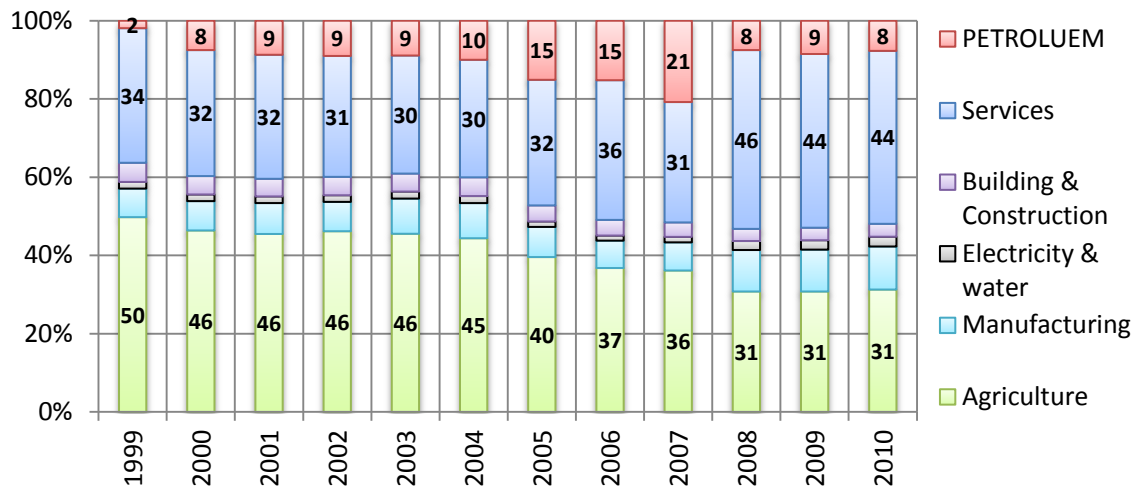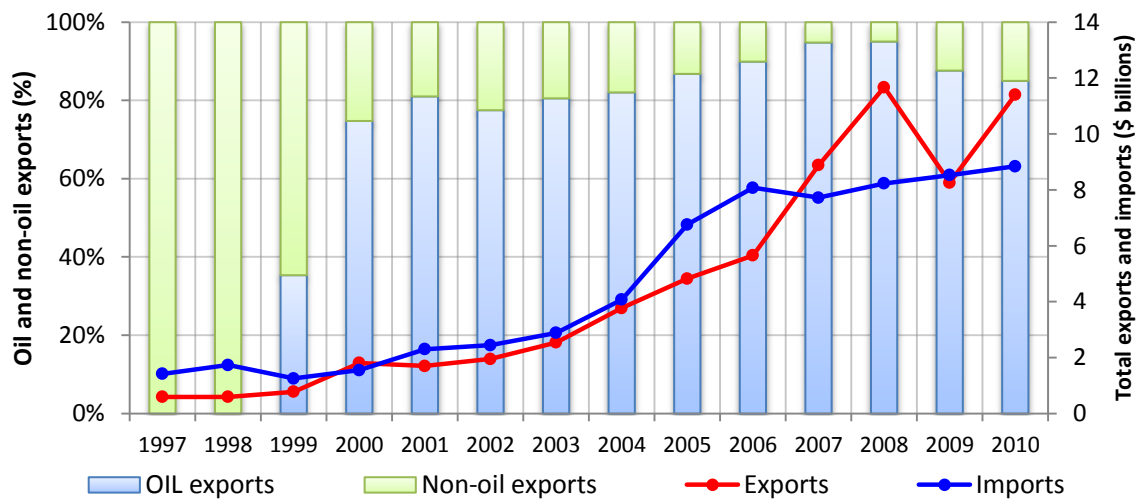

Source: CboS Report (various issues).

Figure (1) clearly illustrates three trends in the composition of the GDP, namely: a) an increasing contribution of the oil sector to the GDP from 2% in 1999 to 21% in 2007 and to an average of 9% afterwards, b) a declining significance of the agricultural sector from half the GDP in 1999 to about 31% in 2010, and c) there was no or only a slight change in the other sectors' - the services, building and construction, and electricity and water – contributions, other than services taking over the lead after the deterioration of oil revenue after 2008 (CBoS Reports - various issues).

The structure of the economy has been changing from dominance of the agricultural sector towards that of the petroleum sector. However, the petroleum sector has not contributed largely to the development of the other sectors. In the contrary, it facilitated the continuation of neglecting the productive sectors -agriculture and manufacturing (Gadkarim, 2010).

The second economic variable influenced by the petroleum sector is the foreign sector. Figure (2) shows total Sudanese exports during the period between 1997 and 2010 according to their classification as oil and non-oil sectors. It also shows the country's total imports during the same period. Total exports and imports in US$ Billions are shown in the right vertical axis while the oil and non-oil exports are represented in percentages- scaled in the left vertical axis. The decline in

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significance of non-oil exports (from comprising 100% of the export earnings to less than 10%) is incomparable with the relatively lower drop in its earnings, especially during years like 2006 and 2007, which could be attributed to the alluded to escalation in the revenues from oil exports.

Figure 2. Oil and foreign Trade ($ Billions and %) in 1997 – 2010

Source: CBoS Report (various issues).

The contribution of the petroleum sector was more than 90% of exports during the last five years implying that the economy is becoming highly dependent on the exports of one product. Moreover, this, as well, indicates that oil has not played a positive role in the development of non-oil exports and particularly agricultural products exports (Gadkarim, 2010).

The third economic variable, which is used in this study to demonstrate the growing role of the petroleum sector in the Sudanese economy, is government revenue. Figure (3) below portrays that government revenue has also witnessed radical changes due to oil production and exportation. Government revenue has nearly witnessed the same distribution ratio between non-tax and tax revenues during the period 1997-1999, where non-tax revenues constituted about one quarter of the government revenue. However, after oil exploitation, the share of the non-tax revenue has expanded at the expense of tax proceeds.

Figure 3. Government Revenue (1997-2010) - in Percentage
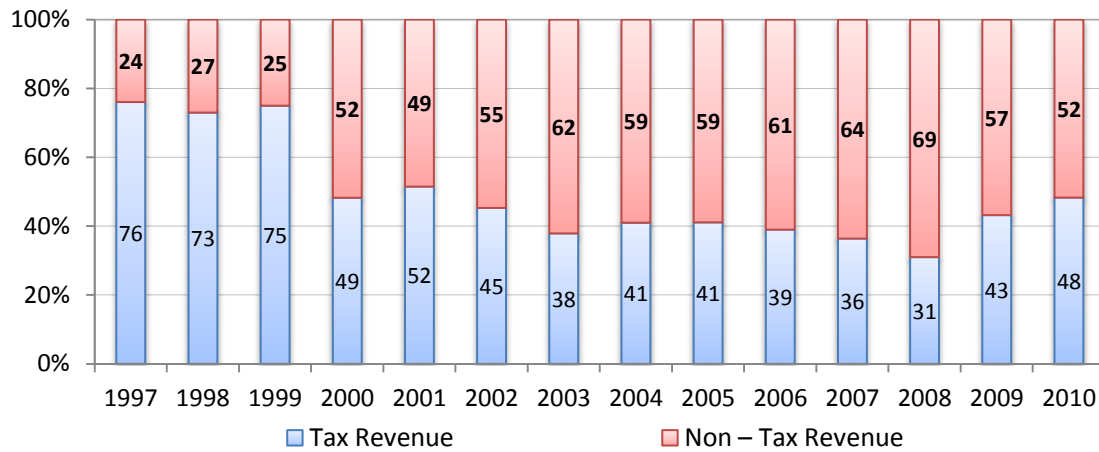
Source: CBoS Report (various issues).

This background manifests the reliance of the Sudanese economy on oil as a major source of foreign exchange and government revenue. The petroleum sector also represents a growing contributor to the GDP.

The share of the government in the southern wells was about 50% according to the Comprehensive Peace Agreement[2] (CPA), which was the reference for revenue distribution during the transitional period from 2005 to 2011 (CPA, 2005).However, after the establishment of the Republic of South Sudan (RSS), the Sudanese government of the North lost its share in the southern oil.

The demonstrated importance of petroleum in the Sudanese economy during the last ten years raises many questions about the performance of the economy in the post-separation period. This paper tries to investigate the implications of the establishment of the Republic of South Sudan (RSS) exemplified by a drop in the oil revenue of the Sudanese government (of the North). This will influence the entire economy and necessitates additional measures by the northern government, of which enhancing the non-oil exports could be a recommended option.

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[2] Comprehensive Peace Agreement (CPA) is an agreement that was signed by both the Sudanese government and the Sudanese people's liberation movement (SPLM) in Nifasha, Kenya in 2005, which mark the end of the civil war that last for more than 20 years.

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2   Objectives and Scenarios

In addition to returns from the output of southern wells, the total revenue from oil, during the pre-separation period, included the output of the northern wells which accounted for about 20 – 30% of the total output. Until the establishment of the RSS the north was receiving 50% from the oil produced by wells in the south according to the CPA. Therefore, the total revenue of the government of Sudan from oil comprised total production in the north (20-30%) plus 50% of the southern oil, which equaled about 65% of total production.

After the establishment of the RSS, the southern oil would need to be exported through the north, at least in the short run. This is due to the fact that oil infrastructure including pipelines, refineries, and Red Sea ports, exist in the Sudanese (North) territory. Needless to say that the RSS is a closed country and has no direct access to the sea. That being the case, the RSS would need to pay fees and customs to the Sudanese government for processing, transporting and exporting its oil. The exact amount to be paid is still subject to many political and economic negotiations which involve several other issues including border demarcation (in the oil rich zone of Abyei and other border areas), nationality, and foreign debts.

In setting up a hypothetical scenario aiming at investigating the possible implications on the economy of Sudan, this paper assumes a reduction by 20% in oil revenue to quantify the loss in the oil income to Sudan. This 20% seems to be realistic, as it is approximated by taking into account what Sudan was receiving lately and what could be the revenue after considering the customs and fees which she will earn.

Population is another variable that needs to be considered in quantifying the post separation implications. According to the last census, the total population of Sudan is estimated at 40.1 million person in 2009 (CBS, 2009), while the RSS population is estimated at 8.3 million in 2010 (SSCCSE, 2010). However, a considerable fraction of this southern population wasn't originated in Sudan and composed of citizens from neighboring countries. Moreover, many northerners who were residing in the south are expected to depart to the north. Therefore, it is found plausible, for the purpose of this paper, to assume a loss of 10% in the Sudanese population.

Accordingly, a separation and a recovery scenario are simulated in this paper, namely:

a) *Separation: in this scenario oil output is cut by 20% and the total population by 10%. Other factors such as land, labour, and natural resources are assumed non-determinants in the entire production process, at least in the short run.*

b) *Recovery: in this scenario the updated database that was obtained after the separation scenario is used as a baseline and some efficiency improvement is applied to help the economy at the GDP level to recover.*

The motivation behind the recovery scenario is to provide alternatives to the policymakers in Sudan instead of oil as the main contributor to exports and to the economy at large. The scenario focuses on the agricultural sector as a major contributor to the GDP and as a likely substitute in the export markets.

3   Model and Data

This study uses the global Computable General Equilibrium (CGE) modeling framework of the GTAP (Global Trade Analysis Project) as a tool for the analysis. GTAP model is multi-regional model for analyzing the impact of regional economic policies. The rationale of applying a regional model to this study is to facilitate the comparison to other researches which are currently conducted on regional implications of the separation on the economies of other neighboring countries. The focus of this paper targets the national impact of the separation with particular emphasis on introducing the agricultural sector as a sensible substitute to petroleum. Another reason for applying this model is that it has a special version of its comprehensive database on Africa, namely: the GTAP Africa database which includes the Sudanese Input/output Table (IOT) for the year 2004 (Siddig, 2009).

The GTAP model is a comparative static, global CGE model based on neoclassical theories. It is a linearized model; assuming perfect competition in all markets, constant returns to scale in all production and trade activities, and profit and utility maximizing behavior of firms and households respectively, and it is solved by using GEMPACK software.[3]

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[3] For more details about Gempack and its related software packages, see Harrison & Pearson (1996).

Each region in the GTAP model has a single representative household named the regional household, the income of whom is generated through factor payments and tax revenues net of subsidies. Expenditure categories include private household expenditure, government expenditure, and savings according to a Cobb-Douglas per capita utility function. The private household buys commodities to maximize utility subject to his expenditure constraint represented by a Constant Difference of Elasticity (CDE) as an implicit expenditure function. He spends his income on consumption of both domestic and imported commodities and on paying taxes. This consumption is a Constant Elasticity of Substitution (CES) aggregate of domestic and imported goods, where the imported goods are also CES aggregates of imports from different sources (regions). Taxes paid by the private household are commodity taxes for domestically produced and imported goods and the income tax net of subsidies. The government also spends its income on domestic and imported commodities and pays taxes. For the government, taxes consist of commodity taxes for domestically produced and imported commodities. Like the private household, government consumption is a CES composition of domestically produced goods and imports, but a Cobb-Douglas sub-utility function is employed to model the behavior of government expenditure (Hertel, 1997).

Producers receive their income from selling consumption goods and intermediate inputs to consumers in the domestic market and/or to other regions. This income must be spent on intermediate inputs, factor payments, and taxes paid to the regional household in order to satisfy the zero profit assumption employed in the model. For production, a nested production technology is employed assuming that every industry produces a single output, that constant returns to scale (CRS) prevail in all markets, and that the production technology is Leontief. Producers maximize profits by mixing a composite of factors and composite intermediate inputs. Value added itself is a CES function of labor, capital, land, and natural resources, while the intermediate composite is a Leontief function of material inputs, which are in turn a CES composition of domestically produced goods and imports. Imports are sourced from all regions according to a CES function (Brockmeier, 2001).

In the multiregional setting, the model is closed by assuming that regional savings are homogenous and contributes to a global pool of savings (global savings) and that the demand for investment in a particular region is savings driven. These savings are then allocated among regions for investment in response to the changes in the expected rates of return in different regions. If all other markets in the multiregional

model are in equilibrium and all firms earn zero profits while all households are on their budget constraint, such a treatment of savings and investment will lead to a situation where global investment must equal global savings, and Walras' Law will be satisfied (Kelali, 2006).

The GTAP Africa Database (GAD) is a special version based on the GTAP 6 Database[4]. It includes data of the 57 sectors of the GTAP 6 Database for 39 regions. The Sudanese Input/output Table (IOT) is one of the new Tables IOTs contributions, among six other African countries, that have been contributed by African economists. Detailed documentation of the Sudanese IOT is available in Siddig (2009). The missing bilateral trade flows for the African regions have been econometrically estimated, using the gravity approach, which is documented in Villoria (2008)

For the purpose of this paper, the database has been aggregated in a special way to meet the intended objectives of this research project. Regions are aggregated from the 39 regions of GAD to two so as to have Sudan on one side, while all the regions other that Sudan are treated as one region. Sectors (commodities) aggregation is also undertaken to reflect the relevance of the objectives of the paper in terms of their contributions to the country's production, consumption, and trade. Petroleum, agricultural exports, and the country's major imports are setup to have their components distinguished in the final aggregation of sectors. Therefore, The 57 sectors of GAD are aggregated into 14 as shown in Table (1).[5]

Table 1. Names and codes of the aggregated sectors of the study

No.	Sectors' (Commodities) names	Codes*
1	Oilseeds	Oilseeds
2	Wheat	Wheat
3	Other cereals	OtherCereals
4	Other crops	OtherCrops
5	Meat and livestock	MeatLstk

[4] For details about GTAP database version 6, see Dimaranan (2006).

[5] The detailed mapping between the standard GTAP Africa database sectors and the aggregated version of Table 1 is shown in Appendix 1.

No.	Sectors' (Commodities) names	Codes*
6	Forests and fisheries	ForestFish
7	Petroleum	Petroleum
8	Processed food	ProcFood
9	Textile and wearing apparel	TextWapp
10	Light manufacturing	LightMnfc
11	Heavy manufacturing	HeavyMnfc
12	Utilities and constructions	Util_Cons
13	Transports and communications	TransComm
14	Other services	OthServices

* Note that, the codes of the sectors in Table (1) would be used throughout this paper instead of the long names.

4   Results Discussion

Figure (4) shows the results of the two scenarios (separation and recovery) on the GDP and its expenditure components. The 2010 GDP is introduced here as update of the database based on the shares revealed by the model results. The GDP would decline by -19.97% due to the separation scenario, which would be the target to be recovered by the recovery scenario. Hence, the increase in the GDP from the new baseline due to the recovery scenario is 19.74%. The idea of the recovery scenario is to increase the efficiency parameters of the negatively affected sector by separation scenario in order to boost their output, and hence push the GDP to recover. Accordingly, the similar percentage changes due to the separation and recovery scenarios are step forward in this direction. However, this does not imply any similarity in the structure of the economies of the ex-ante and ex-post separation.

Figure 4: GDP from the expenditure Side before and after separation
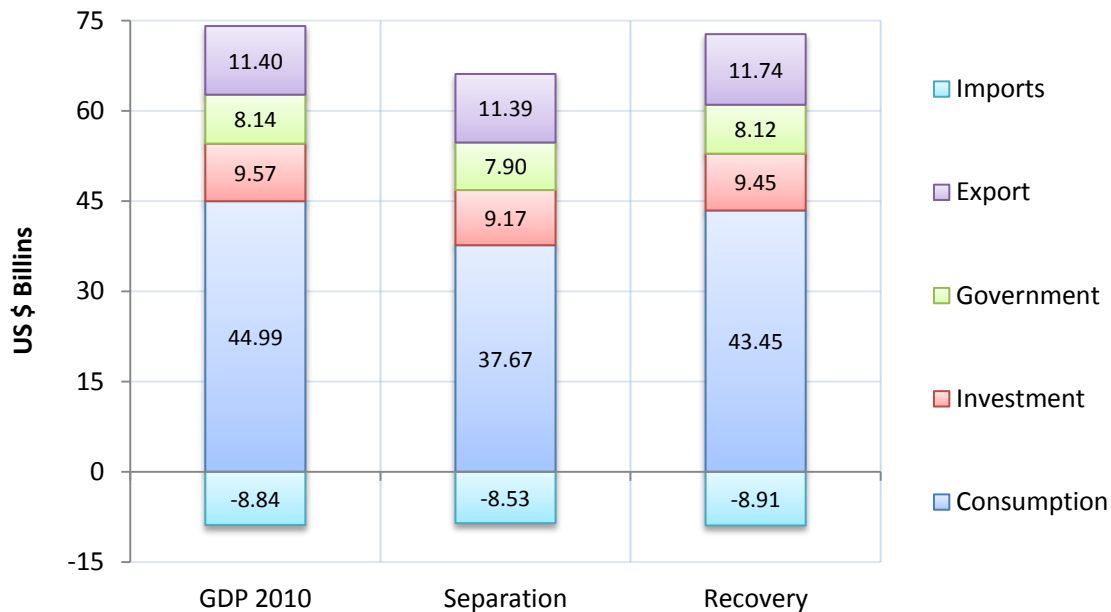
All the components of the GDP from the expenditure side were moving back /forward almost similarly due to the two scenarios, respectively except exports and imports. Consumption seems to be the only and most hit by the separation scenario, reflected on higher domestic prices and lower purchasing power of the households. While total exports would deteriorate by only 0.15% due to the separation; they would increase by 3.54% due the recovery scenario. Similarly, import would decline by 3.51% due to the separation and would increase by 4% due to the recovery scenario. This is justified by the improvement of the efficiency of the factors in the non-oil export-oriented such as sesame and livestock, hence increasing exports and providing sufficient foreign exchange to enhance imports.

The impact of the two scenarios on the sectorial output is depicted by figure (5). It shows that the separation scenario would pronouncedly increase the output of many exports and imports substitutes. The production of oilseeds, the first Sudanese agricultural export, would increase by 30.2%, while that of wheat, which represents about 7% of the total imports in the baseline data, would increase by 15.5%. The rise in the production of both commodities seems to be the result of the automatic reallocation of factors of production from the oil and oil-constrained sectors to substitutes, which is governed by the factor mobility assumption of the model.

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**Figure 5. Changes in the domestic output due to the two scenarios**
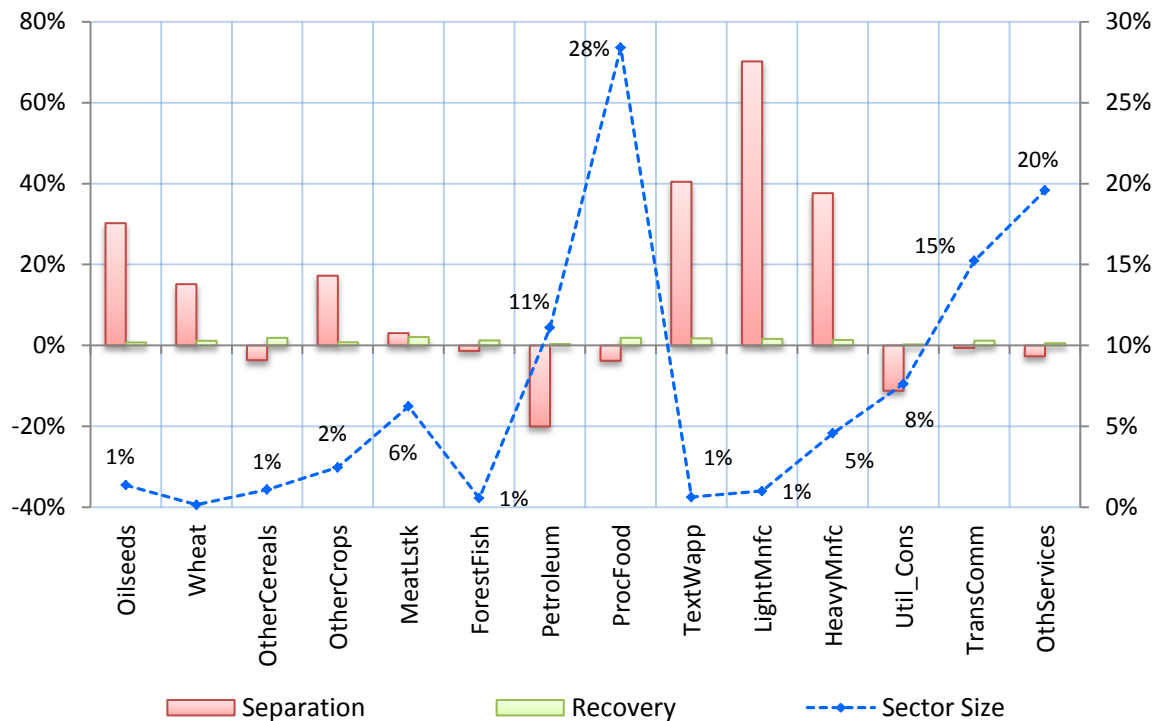
It is important to observe the disconnected line, which depicts the percentage share of each sector in the total output value of the baseline data (pre-separation) i.e. it reflects the importance of each sectors' contribution to the total output. The sector size (in percentage of total size) is measured at the right axis of the figure. Scenarios results are measured in percentage at the left axes. Results of the two scenarios must be read in relation to the relative importance of each sector. For example, the 40% increase in the textile output due to the separation scenario is less important than the drop in the output of processed food by 4% because the relative sizes of the two sectors are 1% and 28%, respectively.

The percentage changes on exports of the different commodities due to the two scenarios are shown in Figure (6). Commodities with less that 1% share in the total exports are excluded. Similar to figure 5, the relative importance of the sector's contribution to total exports (pre-separation) is measured according to the right axis percentages. Results of the two scenarios are measured by the percentages scale of the left axis. Results show that, the exports of oilseeds, other crops and livestock would increase. This is an automatic response of the model governed by its factor mobility assumption. The factor mobility assumption expects mobile factors

to automatically allocate away from sectors paying lower wages to those paying higher wages. The latter sectors are the default alternatives for oil as an export. They consist of the major agricultural exports, with oilseeds alone accounting for about 8% of the total Sudanese exports[6].

Figure 6. Changes in sectorial exports due to the two scenarios
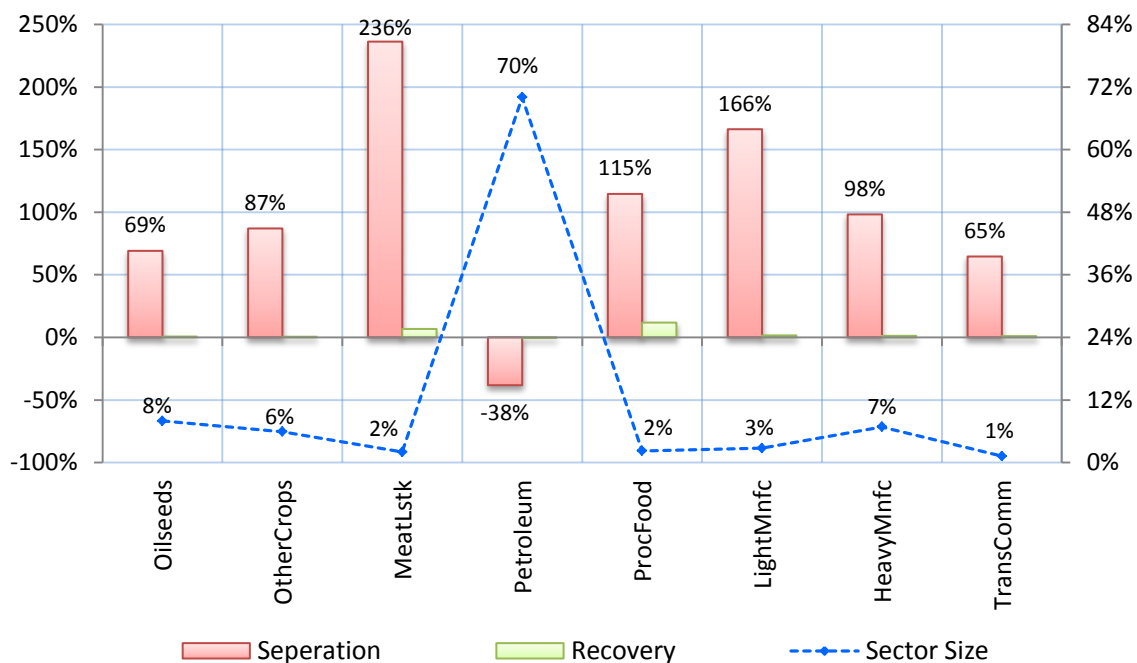
The separation scenario would also lead to the expansion in processed food and light manufacturing exports. This is also related to the changes witnessed in the agricultural sector as both sectors (processed food and light manufacturing) rely on agricultural raw materials as inputs. The recovery scenario has minimal impact on the export side because it uses the updated data (results of the first scenario) which has already shown a rise in the production of most of the agricultural and manufacturing sectors.

The heavy manufacturing and transport sectors would also benefit from the production factors and intermediate inputs being cheaper after the cut in the petroleum output. This is also motivated by the expected decline in competing

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[6] 2004 is the baseline year of the model database. See Siddig (2009) for further details.

imports (manufacturing and transport). The model offers import substitution possibilities which might not be feasible in reality, at least in the short run.

Imports of all commodities other than petroleum (petroleum represents about 2% of total Sudanese imports in the base data) would decline as (Figure 7) [7]below portrays. This is generally driven by the huge loss in foreign exchange earnings which is generated by the approximately 40% decline in oil exports. Hence, the ability of the entire economy to import declines and total imports deteriorates.

Figure 7. Changes in sectorial imports due to the two scenarios
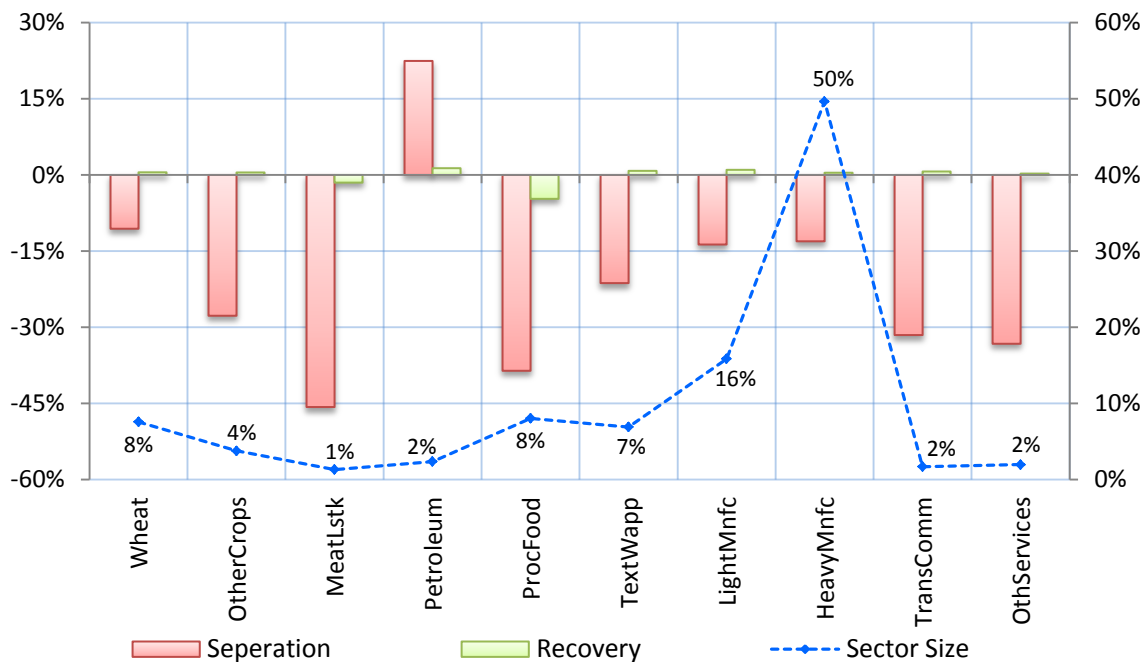
The manufactured sectors would be the main losers in terms of imports, with heavy manufacturing imports alone accounting for about half of total imports value according to the baseline data. Light manufacturing, textiles, and processed food follow with 16%, 7%, and 8% shares in the baseline imports respectively. In this context, any changes in the imports of the processed food due to the separation scenario need more attention if plans for the agricultural sectors performance and

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[7] Commodities contributing less than 1% to the total sudanese imports in the baseline data are excempted.

agricultural-based industries to be developed due to their connectivity and therefore they would move together.

Generally speaking, the recovery scenario has proven that while boosting the efficiency of individual sectors would stimulate their output, it has limited impact in influencing their tendency toward trade. This confirms that there is a need for other trade-encouraging measures, particularly in the export side. Some of these measures, although not covered here, could be related to the exchange rate policy.

The impact of the two scenarios on households demand for goods is shown in Figure (8)[8] below. The relative demand for each commodity is shown in the right axis of the figure. Processed food constitutes about 50% of households demand, followed by livestock products, transports and other services.

Figure 8. Changes in the households' demands for goods due to the two scenarios

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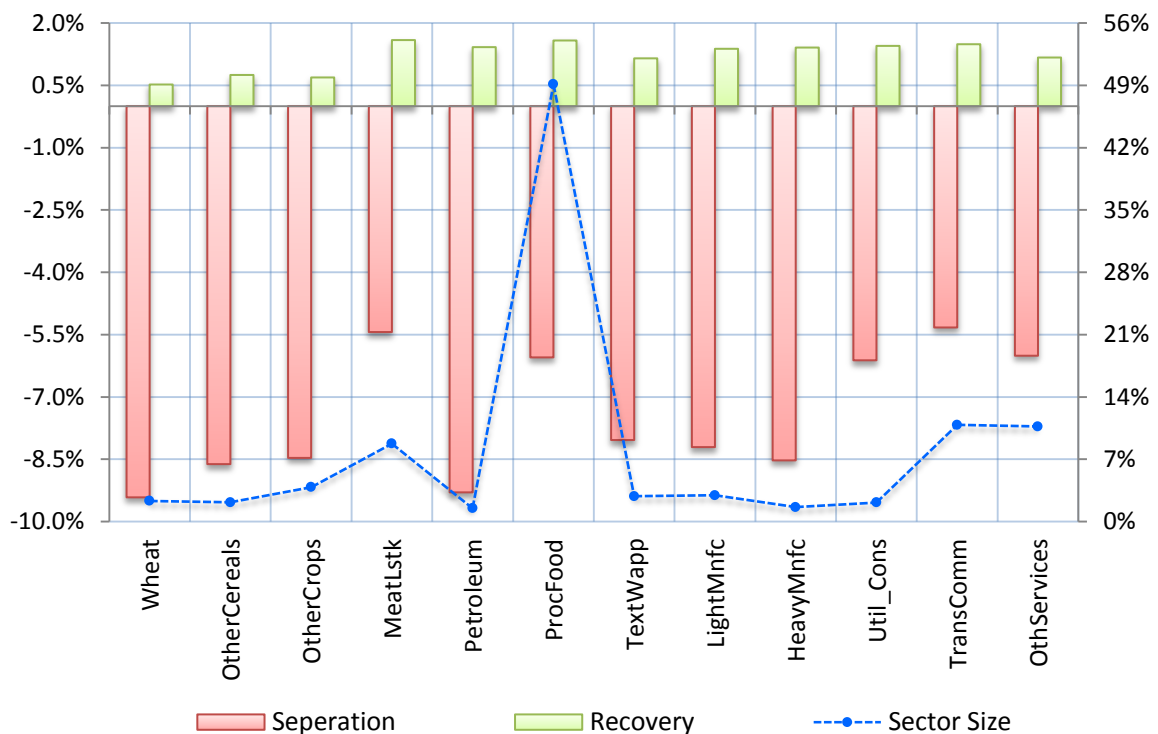
[8] Commodities contributing less than 1% to the total households goods demand in the baseline data are excempted.

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Contrary to those on production and trade, the impact of the two scenarios on the demand of households seems straight forward. The separation scenario reduces demand while the recovery scenario regains some parts of the lost demand. However, the magnitude of change is always higher for the separation scenario and smaller for the recovery scenario. In addition, commodities responses to the two scenarios also differ based on several factors. These factors include elasticities of demand for each commodity and their sensitivity to changes in market variables.

The total welfare loss due to the separation scenario is estimated at US$ million 3703, of which only 16% would be restored by the recovery scenario. This implies that policy makers in Sudan need to carefully consider the negative implications of the separation, as depicted in this scenario, on the livelihood of the people. Recently, substantial increases in prices have been noticed and the negative implications, of the separation, on food prices have already become visible.

5   Conclusions

In this paper, an attempt has been made to investigate the implications the separation of Sudan and the establishment of the RSS may have on the Sudanese economy. The paper is motivated by the fact that Sudan (North) will lose a significant part of its revenue from oil. Oil has been contributing considerably to the economy as represented in its GDP, exports, and government income during the last decade. The objectives of the study include evaluating the impact of the separation, estimating the expected loss, and proposing recovery scenarios which may consider regaining some of the expected losses.

GTAP CGE model with its Africa database is used as the tool for analysis. The database and closure assumptions have been modified to match the objectives of the analysis. The separation scenario is exemplified by 20% cut in the petroleum output and 10% reduction in the total population. The recovery scenario uses the updated data as a baseline and simulates efficiency improvements in the negatively affected sectors as an approach to boost the GDP. The effectiveness of enhancing the efficiency of the agricultural sector in Sudan is covered in Siddig et el., (2011), where they found it having several positive implications at the national and regional levels.

Results show that separation would be costly to the economy at large and to households at most. Despite the restoration of the GDP value by the recovery scenario, many variables of the economy would remain unrecovered. The GDP would decline by -19.97% due to the separation scenario, which became the target to be recovered by the recovery scenario that increases the efficiency parameters of the negatively affected sector by separation scenario in order to boost their output, and hence push the GDP to recover. However, this does not imply any similarity in the structure of the economies of the ex-ante and ex-post separation.

The impact of the two scenarios on the sectorial output is shows that the separation scenario would pronouncedly increase the output of many exports and imports substitutes. They are led by oilseeds, which is a major Sudanese agricultural export and wheat, which is a major import, where both have shown increases in their production. It is also found that the exports of oilseeds, other crops and livestock would increase in response to the loss in the foreign currency earning caused by the separation.

At the household level, the separation scenario reduces demand while the recovery scenario regains some parts of the lost demand. However, the magnitude of change is always higher for the separation scenario and smaller for the recovery scenario. This is translated in a huge welfare loss due to the separation, which cannot be recovered by the described recovery settings. This implies that policy makers in Sudan need to carefully consider the negative implications of the separations as reflected in the recent substantial increases in prices.

In this regards, it is important to note that the simulated cut in the output of oil in this study is in the optimistic side. This means that the loss in oil revenue could be higher. Furthermore, many other implications are not incorporated in this simulation such as the currency issues, inflation, and other measures taken by the government. The latter embraces the increase in the price of oil in the domestic market and the removal of subsidies in some sectors. These policies and procedures could lead to further aggravation of the situation in the post separation era.

Moreover, other fiscal policies which have been announced recently by the National Assembly may aggravate the situation in the post-separation era. The announced policy package includes: reduction of public expenditures (mostly on goods and services), enhancement of revenues through reducing subsidies on petroleum

products and on sugar and the removal of several safety net measures. However, the implementation status/seriousness of some of these measures is not clear yet. The World Bank recommends that authorities in Sudan would need to look across at revenue and expenditure measures and to revisit 2011 budget based on new fiscal environment. According to a World Bank study, which simulates several oil sharing scenarios, the fiscal shock to Sudan's government will be large and permanent (Battaile, 2011).

Therefore, it is vital to focus on non-oil revenues to reduce the high dependency on oil. Measures to enhance efficiency in both the production and expenditure sides are fundamental to that end. Other measure would also be needed to protect pro-poor spending and divert investment towards non-oil growth promotion and rural development. The latter could help in promoting peace and political stability which are highly required to sustain economic growth.

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7 Annex

A1. Sectorial mapping used to aggregate GTAP Africa database for this study

No.	New code	Sector name	Comprised standard sector
1	Oilseeds		Oil seeds
2	Wheat		Wheat
3	OtherCereals		Paddy rice; Cereal grains nec
4	OtherCrops	Grains and Crops	Vegetables, fruit, nuts; Sugar cane, sugar beet; Plant-based fibers; Crops nec; Processed rice.
5	MeatLstk	Livestock and Meat Products	Cattle, sheep, goats, horses; Animal products nec; Raw milk; Wool, silk-worm cocoons; Meat: cattle, sheep, goats, horse; Meat products nec.
6	ForestFish		Forestry; Fishing
7	Petroleum		Coal; Oil; Gas; Petroleum, coal products.
8	ProcFood	Processed Food	Vegetable oils and fats; Dairy products; Sugar; Food products nec; Beverages and tobacco products.
9	TextWapp	Textiles and Clothing	Textiles; Wearing apparel.
10	LightMnfc	Light Manufacturing	Leather products; Wood products; Paper products, publishing; Metal products; Motor vehicles and parts; Transport equipment nec; Manufactures nec.
11	HeavyMnfc	Heavy Manufacturing	Minerals nec; Chemical, rubber, plastic prods; Mineral products nec; Ferrous metals; Metals nec; Electronic equipment; Machinery and equipment nec.
12	Util_Cons	Utilities and Construction	Electricity; Gas manufacture, distribution; Water; Construction.
13	TransComm	Transport and Communication	Trade; Transport nec; Sea transport; Air transport; Communication.

14	OthServices	Other Services	Financial services nec; Insurance; Business services nec; Recreation and other services; Public administration/ Defense/Health/Education; Dwellings.

A2. The components of the recovery scenario

Shock afeall   ("Land",   "OtherCereals"   ,"Sudan")   = 9.13;

Shock afeall   ("Land",   "MeatLstk"   ,"Sudan")   = 10.17;

Shock afeall   ("UnSkLab",   "OtherCereals"   ,"Sudan")   = 2.95;

Shock afeall   ("SkLab",   "OtherCereals"   ,"Sudan")   = 1.56;

Shock afeall   ("Capital",   "OtherCereals"   ,"Sudan")   = 1.87;

Shock afeall   ("Land",   "ProcFood"   ,"Sudan")   = 21.22;

Shock afeall   ("UnSkLab",   "ProcFood"   ,"Sudan")   = 8.31;

Shock afeall   ("SkLab",   "ProcFood"   ,"Sudan")   = 1.93;

Shock afeall   ("Capital",   "ProcFood"   ,"Sudan")   = 3.38;

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