

# Export-Led Growth Hypothesis: Empirical Evidence from Sudan

**\*MOHAMED HASSAN IBRAHIM, \*\*ABDELGADIR M. A. ABDALLA\*\***

*School of Management Studies, University of Khartoum  
Khartoum, Sudan.*

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## Abstract:

This paper aims to examine the validity of Export-Led Growth (ELG) hypothesis in Sudan over the period 1980 - 2018. The Autoregressive Distributed Lag model (ARDL) test of cointegration is used to examine the presence of the long-run linear association among the selected variables as well as the short run movement. The empirical results support the (ELG) Hypothesis in the short term. However, the long-run movement reveals an inverse relationship between exports and GDP. Some possible explanations of the results are that the exports do not compromise a large part of the GDP, the deep economic shock in the Sudanese economy caused by South Sudan secession in 2011, the under invoicing of export, the illegal smuggling of gold and lack of attention to export of value-added items. The study suggests that Sudanese authorities and the policy makers have to implement an export reform strategy to stimulate exports and hence economic growth.

**Keywords:** Exports; Economic Growth; ARDL; Sudan

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## 1- INTRODUCTION

The contribution of exports to economic growth has received growing attention as economists attempt to account for the different levels of economic growth between countries (Kalaitzi and Cleeve, 2018). The model of export-led growth is firstly initiated by Feder (1982), assuming that exports have a positive effect on GDP growth. The main argument of Feder is that the export sector generates growth by increasing the aggregate levels of labor and capital.

According to OEC, 2018 ([www.oec.world](http://www.oec.world)), Sudan is ranked as the 110<sup>th</sup> world largest export economy and the 120<sup>th</sup> in term of economic complexity as per the Economic Complexity Index (ECI). In 2017, Sudan exported about 4.7 billion US dollars and imported 9.9 billion US dollars, which led to a negative trade balance of about 5.2 billion US dollars. the GDP of Sudan in the same year was 117 billion US dollars and its GDP per capita was 4.9 thousand US dollars.

Sudan has experienced prolonged civil war and loss of about 70% of its oil production in July 2011, due to the South Sudan secession. The oil sector was the major contributor of Sudan's GDP growth from 1999 to 2010, the boom of the Sudanese economy mainly derived by the rising of oil production. On the other hand, comprehensive sanctions imposed on Sudan, imposed in 1997 and expanded in 2006. In 2017, the sanctions on Sudan were lifted, however, the trade and financial transactions between Sudan and the World economy remain conservative as Sudan continues to be designated by the U.S. as a state sponsor of terrorism (world bank, 2020).

The aim of this study is to investigate the existence of a positive impact of exports on economic growth in Sudan by estimating the short-run and the long-run relationship between economic growth and exports for the period of 1980 to 2018, by employing the Autoregressive Distributed Lag (ARDL) test of cointegration.

The results of this paper will help to evaluate the effectiveness of Sudan's strategy of growth led by exports. This paper raises an important question about the role of the export sector in promoting economic growth in Sudan. The paper's outcomes are expected be useful to policy-makers in developing strategies to promote the economic growth. In addition, it is also useful to researchers and the academic body of knowledge, as the research will enrich the existing theoretical frameworks regarding the export-led growth hypothesis.

The topic of exports and its impact on growth has been discussed by great number of authors in economic literature. However, the literature rarely takes into account sanctioned country that faced significant economic shocks, such as Sudan. The paper provides insights on the potentiality of export sector in Sudan to contribute positively to the economic growth.

The paper is organized into five sections. A brief literature review is discussed section 2. Section 3 describes the model specification and methodology. Section 4 presents the data analysis and the interpretation. Section 5 concludes the paper and provides some recommendations based on the empirical findings.

## 2- LITERATURE REVIEW

The role of exports as an engine of economic growth is a constant subject of the discussion within the economic literature. The association between exports and economic growth has been analyzed by many studies. Most of these studies indicate that export expansion permits the exploitation of economies of scale and increases the rate of employment in labor surplus economies. Kalaitzi and Chamberlain (2020) examined the validity of the export-led growth (ELG) hypothesis in the United Arab Emirates (UAE) over the period

1975–2012. The empirical findings confirmed the existence of a long-run relationship between exports and economic growth. Moreover, the study provided proof to support the the (ELG) hypothesis in the short-run, while no long-run causality is found to exist.

Nasrin and Koli (2018) investigated the effects of export and import on GDP of Bangladesh by employing data for the period from 1971 to 2015. The findings indicated that export, import, and economic growth have a long run association. The long term and short term causality findings confirmed the unidirectional causality from export to economic growth and bidirectional causality between import and GDP.

Faisal et al. (2017) examined the association between economic growth, imports and export for Saudi Arabia by using the time series data from 1968-2014, by adopting the ARDL model. The findings indicated that imports, export and GDP are strongly co-integrated. Moreover, the finding reveled that exports have positive impact on the economic growth in the long term. The results of the granger causality supported the (ELG) hypothesis as it found a uni-directional causality running from export to GDP.

Chia (2016) employed panel data approach to examine the validity of Export-Led Growth (ELG) hypothesis in selected Sub-Saharan African (SSA) countries for the period from 1985 to 2014. The empirical results revealed the existence of a long-run relationship between exports and growth and showed a positive impact of investment, government expenditure and exports on the economic growth.

Al-Assaf and Al-Abdulrazag (2015) empirically investigated the validity of the Export-Led Growth hypothesis for Jordan over the period 1980- 2012. Their empirical findings revealed that the exports affect the economic growth positively in both the short-run and in the long-run.

El-Sakka and Al-Mutairi (2000) examined the association between exports and economic growth in some selected Arab countries. The study showed that there is no long-run association between exports and economic growth for all the countries under study. In the short run, no causal relationship is detected between exports and economic growth exists in the case of Kuwait, Qatar, Libya, Tunis and Sudan, while a bidirectional causal relationship is detected between exports and growth in the case of, Jordan, Bahrain Oman, Mauritania, Algeria and Egypt. Their results indicated that exports in most of the Arab countries do not cause economic growth.

Marwan et al. (2013) investigated the role of export, overseas development aid (ODA) and remittance inflows in relation to economic growth in Sudan, for the periods of year 1977-2010, by employing the Johansen Cointegration test. Their findings showed that there is a long run positive association between growth, export and remittance, supporting the (ELG) and remittance-led growth hypotheses for Sudan, while the aid-growth hypothesis is rejected.

However, Kimberly (2011) investigated the validity of the (ELG) hypothesis in Mexico. The study detected a positive relation between export and economic growth in short run while negative relation in the long term. The study's justification of this inverse relation in the long term is that the import contents and domestic supplier have weak links with exporters. Kimberly recommended that Mexico should change its approach of tax-free imports and exports of raw material as raw material prices are too low in international markets.

### 3- METHODOLOGY

According to the empirical literature on import, export and GDP, we use import (current US\$), export (current US\$) and GDP per capita (current US\$) to specify a long run association among the above mentioned variables. We employ time series data for the period from 1980 to 2018, the data has been collected from the World Bank website.

The long run relationship can be written in the form of econometric models as below.

$$Y_t = \alpha + \beta_1 EXP_t + \beta_2 IMP_t + \epsilon_t \tag{1}$$

where  $Y$  denotes the GDP ,  $EXP$  stands for exports,  $IMP$  is imports,  $\alpha$  stands for intercept terms,  $\beta_i$  ( $i = 1,2$ ) signifies coefficients on respective variables, and finally  $\epsilon_t$  denotes error terms. The following ARDL and error correction model (ECMs) is presented:

$$\Delta Y_t = c_1 + \pi_1 Y_{t-1} + \pi_2 EXP_{t-1} + \pi_3 IMP_{t-1} + \sum_{i=1}^p \theta_i \Delta Y_{t-1} + \sum_{i=1}^p \phi_i \Delta EXP_{t-1} + \sum_{i=1}^p \delta_i \Delta IMP_{t-1} + \mu_t \tag{2}$$

where  $\Delta$  denotes the first difference operator.  $c_i$  ( $i = 1...3$ ) indicates constants,  $\pi_i$  ( $i = 1...3$ ) represents the coefficients on the lagged levels,  $\theta_i, \phi_i$  and  $\delta_i$  ( $i = 1...p$ ) denote coefficients on the lagged variables, and finally  $\mu_t$  stands for error terms.  $p$  indicates the maximum lag length.

Estimation of unit root for each variable means to examine the stationarity of the variables, it is a prerequisite for the right choice of cointegration model. We select an Augmented Dickey-Fuller test (ADF) (Dickey and Fuller 1979, Brooks 2014) to test for a unit root. There are other alternatives methods for determining the stationary of a variable such as the Phillip-Perron (PP) test.

The ADF test is a regression analysis based on equation 3 where  $\beta$  is a constant,  $P$  the chosen lag,  $\phi$  and  $\alpha$  are the coefficients of the regression,  $\lambda_t$  is a trend term and  $\mu_t$  is the white noise. Note that if  $\lambda_t = \beta = 0$  the equation is modelling a unit root test without trend and drift while if only  $\lambda_t = 0$  the equation is a model with drift. The final possible case is if there are no constraints, then the test tries to assess if  $y_t$  has a unit root with drift and a deterministic time trend.

$$\Delta y_t = \beta + \lambda t + \phi y_{t-1} + \sum_{i=1}^P \alpha_i \Delta y_{t-i} + \mu_t \tag{3}$$

The unit root test is then conducted by investigating the following hypothesis test:

$H_0 : \phi = 0$ , unit root is present, i.e. the time series is non stationary

$H_1 : \phi < 0$ , no unit root is present, i.e. the time series is stationary

Furthermore, as the choice of the lag  $P$  affect the model, it is important to determine the optimal lag (Brooks 2014). There exist several methods for determining the optimal lag length  $P$  and a common method is to minimize the value of information criteria using the AIC (Akaike 1974) and/or the Schwarz-Bayesian (SIC) (Schwarz et al. 1978) criteria defined by equation 4 and equation 5

$$AIC = -2\ln(LH) + 2k \tag{4}$$

$$SIC = -2\ln(LH) + k\ln(n) \tag{5}$$

The variable  $n$  is the number of observations and  $k$  is the number of regression parameters to be estimated partly defined by the lag  $P$  (see equation 2,  $\alpha_i, \phi$ ).  $LH$  is the maximum likelihood of the model. According to Brooks (2014) no criteria is superior to another.

#### 4- EMPIRICAL ANALYSIS AND DISCUSSION

##### 4.1. Descriptive Statistics

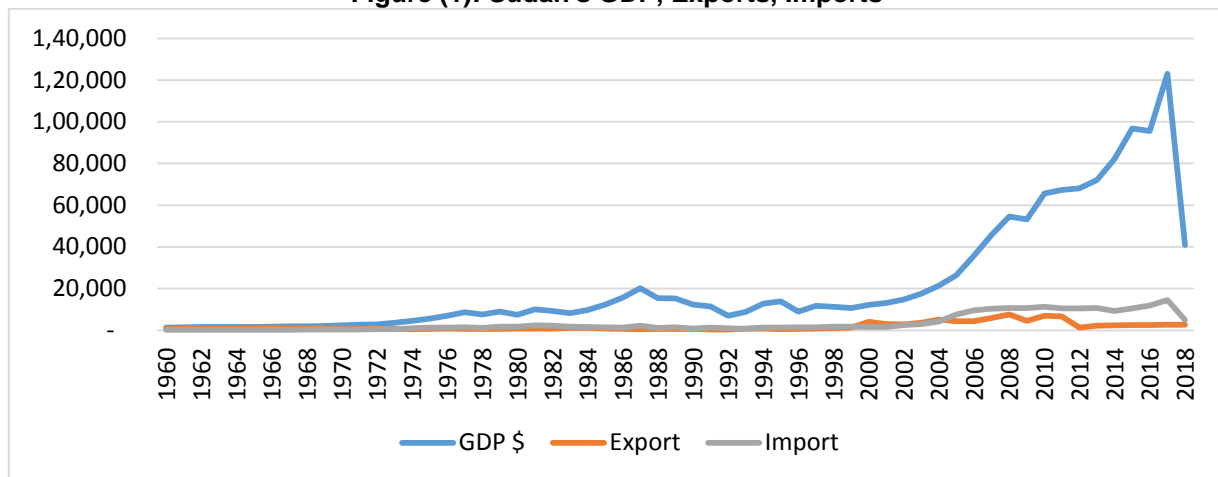
Table (1) reports the descriptive Statistics for the sample of the variables under investigation. The mean Median, Maximum, Minimum, Skenewness, Kurtosis and JB values are reported.

**Table (1): Descriptive Statistics**

	GDP per Capita (\$)	EXPORT (millions \$)	IMPORT (millions \$)
Mean	892.9483	2330.742	4787.984
Median	552.9744	1245.524	2244.167
Maximum	3015.024	7531.769	14539.16
Minimum	260.5102	338.6613	642.6566
Std. Dev.	715.3820	2025.267	4354.824
Skewness	1.419264	1.099704	0.754299
Kurtosis	3.966159	3.132616	1.887738
Jarque-Bera	14.60990	7.889353	5.708611
Probability	0.000672	0.019357	0.057596
Observations	39	39	39

The average of export during the study period is substantially low compared to the average of import, reflected in growing trade deficit. The pattern of the variables is shown in figure (1), the exports have been declining since 2011, due to South Sudan secession, which led to loss of three quarter of oil export. Moreover, the figure reflects that the ratios of exports and imports are relatively low compared to GDP.

**Figure (1): Sudan's GDP, Exports, Imports**



**4.2. Econometric Model Results**

The results of unit root test included in table (2) indicate all variables are random walk (non-stationary) at levels, but at the first difference they reject the null-hypothesis of random walk which indicates all variables are integrated of order one (I(1)).

**Table (2): ADF test statistic (with intercept)**

Variables	Level	First Difference
Y	0.445935	-3.015331**
EX	-1.809072	-8.333733***
IMP	-0.992994	-3.970993***

Note: \*\*\*, \*\* indicates significant at 1% and 5% level, respectively.

The calculated F-statistic for the cointegration test is displayed in Table (3); The F-statistic (13.44682) is above than the upper bound critical value at the 1% and 10% level of significance. This implies that the null hypothesis of no cointegration is rejected; which indicates that at least one co integration relationship exists among economic growth, exports and imports in Sudan. In order to obtain further evidence of the existence of the long run relationship among economic growth and exports, the ARDL approach estimates the long-run coefficients along with the short run dynamics and then the Error correction model (ECM) is estimated to confirm the presence of the relationship.

**Table (3): F-Statistics Test for Long Run Co-integration**

1% Level		10% Level		Calculated F Statistics
1(0)	1(1)	1(0)	1(1)	
5.15	6.36	3.17	4.14	13.44682

In table (4) below the long-run coefficients of the ARDL estimations are presented. The appearance of ECM with a negative sign and significance make sure the long-run relationship can be attained among the variables included in the model. The coefficient on exports is -0.145, and is highly significant, suggesting that GDP decreases by the 14.5 percent of the increase in exports in the long run. In contrast, the long-run impact of imports on GDP is positive and significant.

**Table (4): Long Run Coefficients**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXPORT	-0.145079	0.032201	-4.505465	0.0001
IMPORT	0.232396	0.012649	18.372603	0.0000
C	245.579198	58.499652	4.197960	0.0003

However, the short-run impact of exports on GDP is positive and significant as shown in table 5, while the role of imports in the error-correction model is insignificant. The error-correction term is negative as expected and significant.

**Table (5): Error correction model (ECM) estimations**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-0.004876	0.019786	-0.246452	0.8073
D(GDP(-2))	0.062987	0.020520	3.069584	0.0051
D(GDP(-3))	0.166985	0.012966	12.878971	0.0000
D(EXPORT)	-0.075522	0.042444	-1.779332	0.0873
D(EXPORT(-1))	0.052346	0.042615	1.228340	0.2308
D(IMPORT)	-0.101442	0.031434	-3.227178	0.0035
D(IMPORT(-1))	-0.639513	0.120255	-5.317995	0.0000
D(IMPORT(-2))	-0.004876	0.019786	-0.246452	0.8073
D(IMPORT(-3))	0.062987	0.020520	3.069584	0.0051
CointEq(-1)	0.166985	0.012966	12.878971	0.0000

$$\text{Cointeq} = \text{GDP} - (-0.1451 \cdot \text{EXPORT} + 0.2324 \cdot \text{IMPORT} + 245.5792)$$

Our results are consistent with results obtained by Kimberly (2011) who discusses growth policies for Mexico. He finds positive relation in short run while negative relation in the long run. However, these results opposite are contrary to those obtained by Kalaitzi and Cleeve (2018); Shahbaz et al. (2011), Michaely (1977); Balassa

(1978); Tyler (1981); Grossman and Helpman (1989); Fosu(1990); Tybout (1991); Edward (1998); Frankel and Romer, (1999); Ram, (1987).

**4.3. Diagnostic Testing**

The diagnostic tests (tables 6 and 7 and figure 2) reveal that the residuals are homoscedastic, normally distributed and there is no evidence of serial correlation. In addition, the model is dynamically stable as shown in table (8) of (Ramsey RESET Test).

**Table (6): Heteroskedasticity Test: Breusch-Pagan-Godfrey**

F-statistic	0.558851	Prob. F(9,25)	0.8171
Obs*R-squared	5.862136	Prob. Chi-Square(9)	0.7536
Scaled explained SS	2.009509	Prob. Chi-Square(9)	0.9913

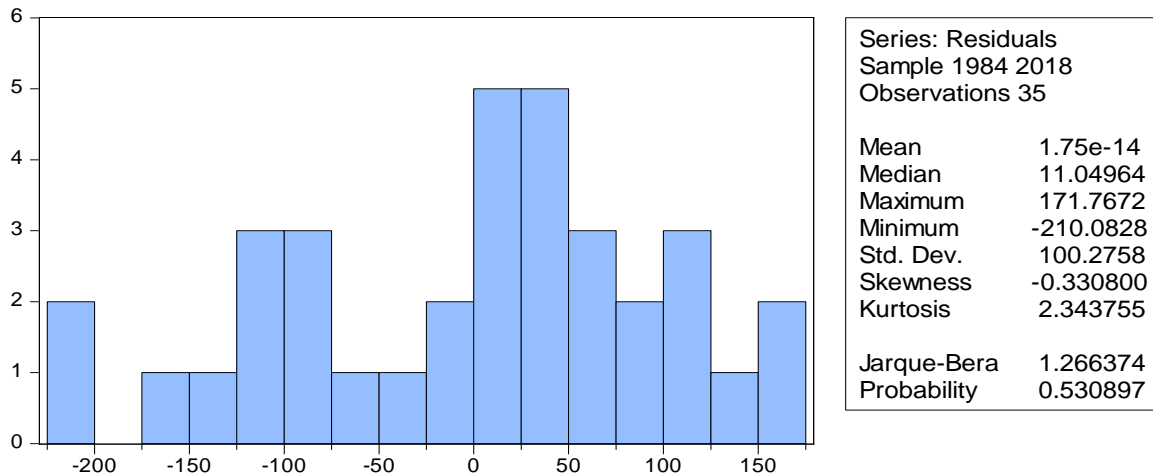
**Table (7): Breusch-Godfrey Serial Correlation LM Test:**

F-statistic	0.157955	Prob. F(2,23)
Obs*R-squared	0.474218	Prob. Chi-Square(2)

**Table (8): Ramsey RESET Test:**

	Value	df	Probability
t-statistic	1.242239	24	0.2262
F-statistic	1.543157	(1, 24)	0.2262

**Figure (2): Normality Test**

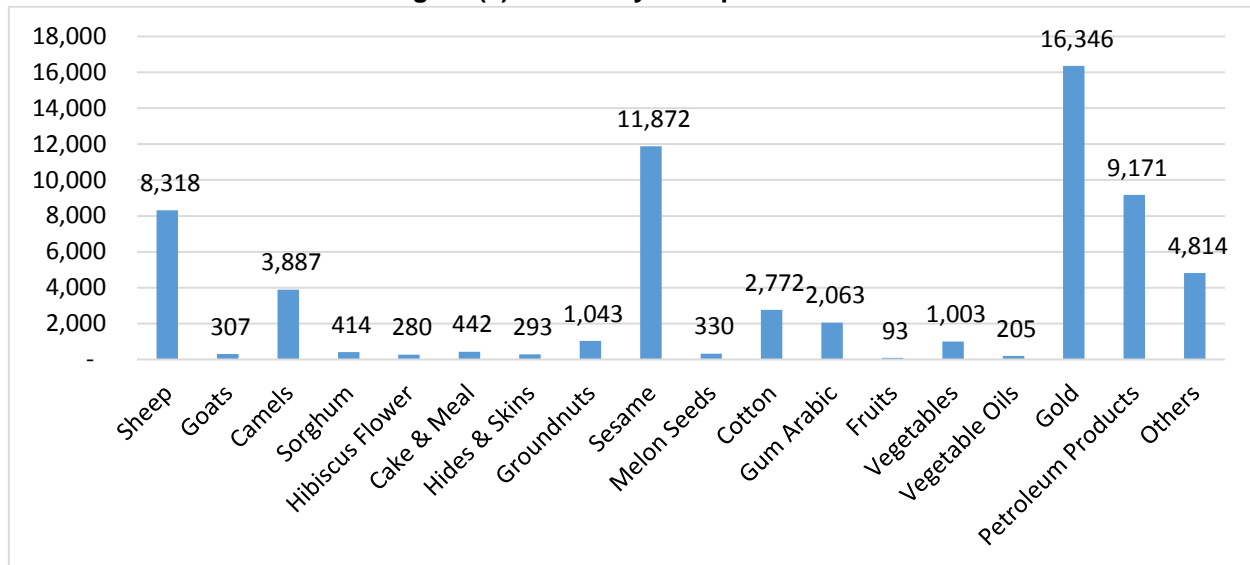


A possible explanation of the long-run inverse impact of export on the economic growth is that the exports do not compromise a large part of the GDP. For instance the export to GDP ratio in 2018 was only 10.2% which is very low compared to international levels (see: [www.data.worldbank.org/indicator/NE.EXP.GNFS.ZS](http://www.data.worldbank.org/indicator/NE.EXP.GNFS.ZS)). Another reason is due to the deep economic shock in the Sudanese economy caused by South Sudan secession in 2011, as the contribution of the oil sector was more than 90% to export revenues during the period between 2003 and 2010, implying that the economy was becoming highly dependent on the export of one product (Gadkarim, 2010).

Moreover, during the study period, Sudan experienced economic instability and high inflation, which lead under invoice transactions due to instability of currency, and consequently to adverse impact on export revenue. Onour and Cameron, (1997), mentioned that the rising premium of the parallel market rate over the official rate will increase under invoice of export which will reduce the official export revenue.

A major obstacle in the Sudanese export system is the illegal smuggling of gold products, as the instability of Sudanese currency encourage the smuggling process to neighboring countries. Onour (2018), investigated the issue of gold smuggling in Sudan, the findings of his paper revealed that about 34% of the artisanal gold production in Sudan is smuggled.

According to the Central Bureau of Statistics in Sudan, the portfolio of Sudanese products exported in the year of 2018 (value, in millions of Sudanese pounds) is shown in figure (3) below: -

**Figure (3): Summary of Exports – 2018**

Source: Central Bureau of Statistics in Sudan

The top 5 products are Gold with around 26% from total export, followed by Sesame (19%), Petroleum Products (14%), Sheep (13%) and Camels (6%). Noteworthy that some products such as the Gum Arabic has a small percentage; notwithstanding, Sudan is the world's largest producer of gum Arabic. The gum Arabic market is fuelled by rising demand in end-user industries, especially food & beverages, pharmaceuticals, and textiles. Despite this fact its share in the export market, does not reflect this advantage. For most of these products, Sudan is not giving much attention to export of value-added items because it simply exports them as raw materials.

#### 5- CONCLUDING REMARKS AND IMPLICATIONS

In this paper the long-run relationship between exports flows and economic growth investigated empirically. The Autoregressive Distributed Lag model (ARDL) to cointegration approach was used to ensure the existence of the long-run linear combination among variables over the study period (from 1980 to 2018) as well as the short run dynamics. The results of the cointegration bound test showed that the calculated F-statistic is 18.86, which is above than the upper bound critical value at the 1% and 10% level of significance. This implies that the null hypothesis of no cointegration is rejected. Then, the long-run coefficients along with the short run dynamics were estimated to confirm the presence of the relationship. In particular, we have confirmed the fact that exports play a significant role in enhancing the economic growth in Sudan in the short run, while there is an inverse relationship between export and economic growth in the long-run. Some possible explanations of the results are that the exports do not compromise a large part of the GDP, the deep economic shock in the Sudanese economy caused by South Sudan secession in 2011, the under invoicing of export, the illegal smuggling of gold and lack of attention to export of value-added items. In the light of our findings, it is strongly suggested that Sudanese authorities to implement an export reform strategy to stimulating exports and hence economic growth.

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