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Determinants of Trade Openness in Sudan: An Empirical Investigation (1970-2007)

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ABSTRACT

The purpose of this paper is to investigate the determinants of trade openness in Sudan during the period 1970-2007 using Ordinary Least Square (OLS) technique. Data were obtained from different sources, including: the annual reports of the Central Bank of Sudan, Ministry of Finance and National Economy, and Central Bureau of Statistics. The population size (P), real per capita GDP (Y), real exchange rate (E) and dummy variable of peace (D) were found to be the determinants of trade openness in Sudan. Among these determinants, real exchange rate and population size turned out to be the most important determinants of trade openness in Sudan during the study period.

محددات الانفتاح التجاري في السودان: دراسة تطبيقية (1970-2007)

الملخص

الهدف من هذه الدراسة هو تحديد العوامل المؤثرة على الانفتاح التجاري في السودان خلال الفترة (1970-2007م) باستخدام طريقة المربعات الصغرى (OLS). تم جمع البيانات من تقارير بنك السودان، ووزارة المالية والجهاز المركزي للإحصاء. توصلت الدراسة إلى أن حجم السكان و الناتج المحلي الاجمالي الحقيقي

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للفرد و سعر الصرف الحقيقي و المتغير الوهمي للسلام هي محددات الانفتاح التجاري في السودان. كما خلصت الدراسة إلى ان سعر الصرف الحقيقي و حجم السكان هي أهم العوامل المؤثرة على الانفتاح التجاري في السودان خلال فترة الدراسة.

INTRODUCTION

There is substantial interest among academics and policy-makers in the role of external trade in macroeconomic outcomes. Opening up to trade may nevertheless increase growth in the short run, since the economy will be free to choose a “better” specialization pattern, i.e. a pattern more in line with its comparative advantage, and thus reach a higher steadystate level - as opposed to growth rate - of income per capita. In the context of the new growth theory, Grossman and Helpman (1991) argued that trade openness enables countries to increase their stock of capital and resources which in turn would improve their productivities and utilize their available resources. Also Grossman and Helpman (1992) argued that technological change can be influenced by a country’s openness to trade. Openness to trade provides access to imported inputs, which embody new technology and

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increases the size of the markets facing producers which in turn raises returns to innovation and affects a country's specialization in research intensive production. Thus a country's openness leads to improvements in domestic technology; helps the production process become more efficient and culminates in productivity improvements (DAS, 2002).

In the recent years the world has become integrated. Perhaps the best approach to measuring an economy's openness, the extent of its integration with the rest of the world, is to look for deviations between the prices of goods and services within the economy from those prevailing on world markets. This approach is rarely adopted because of data limitations. As Knetter and Slaughter (1999) note, it is very difficult to obtain comprehensive international data on local prices of products with identical characteristics. The limited data that are available do not point to strong conclusions about the evolution of market integration in recent years. The evidence for developing countries is more mixed, with some seeming to converge in relative prices, while others do not. The quantity data Knetter and Slaughter examine show stronger evidence of product market integration since 1970. The most commonly used measure of openness is the sum of imports and exports divided by gross domestic product.

There is relatively little theoretical or empirical analysis looking at the determinants of the openness of countries, or at least at the variables that can explain openness. This paper takes up that task with an empirical study of openness and its determinants in Sudan during the period 1970-2007 using Ordinary Least Square (OLS) technique. The main results obtained are that, per capita GDP, exchange rate, the population size and dummy variable for peace are the important determinants of trade openness in Sudan.

The remainder of the paper is structured as follows. Section (2) reviews the literature. Section (3) gives a background about the external sector in Sudan. Section (4) explains the empirical model, while section (5) discusses the results. Finally, section (6) concludes the paper.

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LITERATURE REVIEW

As stated before there is relatively little theoretical or empirical analysis looking at the determinants of the openness of countries, although that looks at the impact of trade openness on economic development are more.

Woyteck (2003) analyzed developments in the structure of trade in the Commonwealth of Independent States (CIS) during the transition decade, and found that it changed less than in other transition economies. Trade openness of the CIS increased between 1993 and 1997, but has fallen to a lower-level plateau since then owing to regional and countryspecific factors. These include slower progress in transition, geographic aspects, restrictions on trade, governance and corruption problems, weak infrastructure, lack of regional cooperation, and political conflicts. Regression results show that trade openness of the CIS countries would likely increase substantially if market-oriented reforms were pursued more vigorously.

Nicoletti *et* (2003) assessed the importance of certain border and non-border policy measures for global economic integration. Their empirical results suggested that eliminating remaining tariff and non-tariff barriers could increase significantly exports of goods within the OECD. The removal of border barriers in existing free-trade areas, such as the European Union (EU) Single Market or the North American Free-Trade Agreement (NAFTA), is estimated to have boosted both goods trade and overall FDI flows among participating countries. Likewise, simulations suggest that prospective EU membership may be associated with increasing trade flows and booming inward FDI positions for new EU members. By contrast, free- trade areas do not seem to have increased significantly cross-border supply of services.

The most common framework for explaining observed trading patterns is the gravity model (see, for example, Frankel 1997, Rose 2000, and Anderson and van Wincoop 2003). The underlying premise of the gravity model is that bilateral trade is a function of the

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geographic distance between two countries (which is a proxy for transport costs), and the two countries' combined economic size, measured as product of the two GDPs. Along the same line Guttman and Richards (2004) in their paper seeks to understand Australia's low openness by analyzing the empirical determinants of aggregate country trade. They begin by estimating a standard gravity model of bilateral trade. Although the model appears to fit the bilateral data very well, it does a relatively poor job at fitting countries' aggregate trade levels, with different methodologies sometimes providing highly conflicting results. They estimated an equation for country openness. Their equation explained a substantial amount of the variation in how much countries trade using a small number of explanatory variables. They found that the most important determinants of openness are population and a measure of distance to potential trade partners. Countries with larger populations trade less, as do countries that are relatively more remote. Furthermore, after controlling for trade policy there is little evidence of a positive correlation between openness and economic development.

Al-Qudair (2005) examined the long run equilibrium relationship between trade openness and government size in the Kingdom of Saudi Arabia using Cointegration technique and the direction of causality relationship in the long run and short run utilizing the Vector Error Correction Model (VECM). The Cointegration test indicated the existence of the long run equilibrium relationship between trade openness and government size. The causality test indicated that there is a uni-directional causal relationship that runs from trade openness to government size in the long run not vice versa. In addition, the causality test indicates the absence of short run causality between trade openness and government Size. Over all, it may be concluded that the results provide support to the compensation hypothesis that entails a positive causality that is running from the trade openness to the government size in the log run only.

The abundance of theoretical models have argued that trade openness and financial development may be linked. Several empirical studies, which applied cross-section method

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and panel data method, support also a positive relationship between the two. It is, however, surprising that no empirical work has been realized in the case of a specific country until the work of Pham (2008) who attempts to fill the gap by econometrically investigating the trade openness – financial development nexus in the case of Vietnam for the period 1992 – 2007. He employed Granger causality tests in a co-integration framework, where the order of lags for each variable is selected by Akaike Information Criterion (AIC) and Schwarz Bayesian Information Criterion (SBIC). His major finding, which is consistent with previous theoretical studies, supports evidence that trade openness and financial development strongly associated in Vietnam.

Yucel (2009) examined the causality relations between financial development, trade openness and economic growth (GDP) for the Turkish economy over the period 1989-2007. He used Augmented Dickey-Fuller (ADF) for unit root, Johansen and Juselius (JJ) for cointegration and Granger causality test for causal relationships. The findings of the study showed that while trade openness has a positive effect, financial development has a negative effect on growth. Moreover, the Granger causality test results revealed the presence of bicausal relationship between financial development, trade openness and growth indicating that economic policies aimed at financial development and trade openness have a statistically significant impact on economic growth.

External Sector in Sudan: A Background:

Sudan is the largest country in Africa and the ninth largest country in the world with an area of 2.5 million square kilometers of which 12 percent is arable land, 18 percent forests and the remainder being mainly desert. Like many other countries in Sub-Saharan Africa, Sudan has experienced many years of political tension and civil war since it became independent in 1956 until a comprehensive peace agreement (CPA) was signed on January 9, 2005 with the Sudan People's Liberation Movement/Army (SPLM/A), ending the conflict in Southern Sudan (Saber, 2009).

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Sudan's population is estimated at about 40 million in 2008. Though well endowed with natural resources in relation to its population, Sudan's economic performance has been substantially below its potential. Accordingly, Sudan is classified as one of the poorest Sub-Saharan African countries (World Bank, 2006). The vast majority of the population is poor, with an average per capita GDP estimated at US\$ 753 in 2005 and US\$ 970 in 2006 (IMF, 2007).

The trade balance had suffered progressively large gaps, as a result of increase of imports at higher rates than exports. The gap rose from US\$ 188.5 million during 1982-1985, to US\$ 417.4 million during 1986-1989 (see table (1)). The average growth rate of exports during the 1980s was 1.8 percent as compared to 7 percent for imports. Export earnings, fluctuated due to their dependence on primary goods of unstable international demand and low prices. The scant response of exports from that period had protracted devaluation from achieving one of its most important objectives of boosting exports. It is also observed that the rate of increase in export proceeds were not proportionate to the progressive increases in export volume insinuating a worsened terms of trade. The slow down of foreign aid associated with political conditionality during the second half of the 1980s had exacerbated the problem of external balance. Instead, financing became closer to trade than development. Likewise, the problem of foreign debt and debt payment obligations have resurfaced and constitute a heavy burden to the balance of payments as well as the national budget.

Since the mid-1990s merchandised imports have risen faster than export. The composition of exports changed as agriculture production has improved. Food imports fell from 18 percents of total imports to 14% during 1994 - 98, while the import of manufactured goods rose from 29% to 41%. However, due to severe shortages, import of foodstuff products rose again to a level of nearly 20% of total imports, while petroleum represented about 13%. For 2001 the ratios are estimated to be 23% for foodstuffs, but less

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than 2% for import of petroleum, while imports of manufactured goods would represent about more than 75% of total imports.

Export volumes grew in line with overall GDP during the 1990's. Non-oil export volume grew at an average rate of about 11% during 1990-2000, though not for all commodities. Cotton and Gum Arabic, for example, declined. Over the years, there has been a change in the composition of non-oil exports. Traditionally, cotton was most important, but in 1996 it was overtaken by sesame, which remains the leading non-oil export.

Table (1) Sudan's Trade Balance, 1982-2007 (In Millions US Dollar)

Year	Exports	Imports	Trade Balance
1982-1985	531	1138.6	-188.5
1986-1989	478.4	912	-417.4
1990	374	618.5	-244.5
1991	305	890.3	-585.3
1992	319.3	820.9	-501.6
1993	417.3	944.9	-527.6
1994	524	1161.5	-637.5
1995	555.7	1184.5	-628.8
1996	620.3	1504.4	-884.1
1997	594.2	1579.7	-985.5
1998	595.7	1924.6	-1329

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1999	780.1	1414.9	-634.8
2000	1808	1553	255
2001	1698	1585	113
2002	1949.1	2152.8	-203.7
2003	2542.2	2536.1	6.1
2004	3777.8	3586.2	191.6
2005	4824.3	5946	-1121.7
2006	5656.6	7104.7	-1448.1
2007	8879.2	7722.4	1156.8

Source: Bank of Sudan Annual Reports (various issues) and Ministry of Finance and National Economy (1995-2007).

Figure (1(

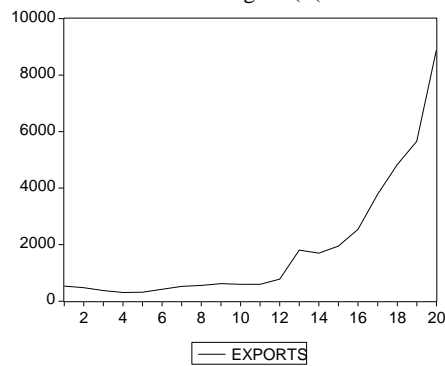
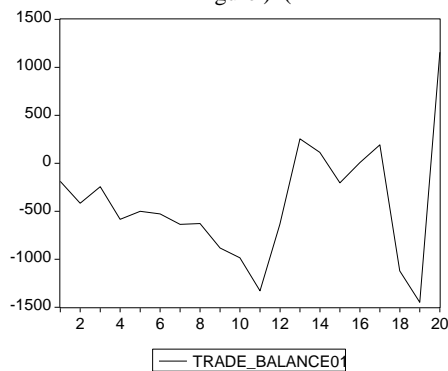
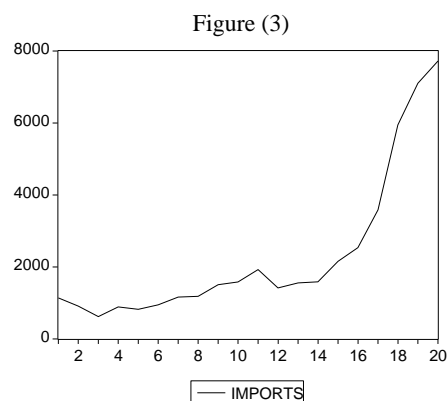


Figure)2(



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Sudan has witnessed increased foreign trade activity in recent years, as a result of the rising aggregate domestic demand and vibrant economic activity over time, as well as the recent rise in worldwide oil prices. Exports grew by 29.8% to US\$ 4.8 billion in 2005, boosted by oil exports, while imports progressed by a slightly higher 30.9% to US\$ 5.9 billion. Subsequently, a trade deficit was recorded in 2005, standing at US\$ 1.1 billion, breaking from a trend of more modest deficits or very small surpluses over the previous five years to 2005 (see table (1)). Also in 2006 a sizable trade deficit of US\$ 1.45 was recorded, which was 30% larger than its level in 2005. But in 2007 a trade surplus of US\$ 1.16 was recorded.

The significant widening of the deficit in 2005 and 2006 could be attributed to a number of reasons resulting from economic policies or sector-related structural obstacles. The important appreciation of the local currency and increased trade openness, part of the market liberalization reforms currently under implementation, have cheapened imports and made exports more expensive. Trade policy measures were mainly revolving around the elimination of all restrictions like commodities' export monopolies and tariff cuts.

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In addition, Sudanese export competitiveness has been suffering from other noneconomic policy weaknesses, such as supply bottlenecks due to the old and rundown transport network. The civil conflicts that hit mainly areas, where most agrarian production takes place, also damaged major cash crops.

The negative effect of the above mentioned factors on the trade balance was, nevertheless, toned down, with oil exports making up the bulk of Sudan's exports. Oil exports grew at an average annual rate of 32% during the period 2001-2007, as a result of both increased production and higher international oil prices.

In contrast, imports (composed mainly of manufactured goods, machinery and equipment, means of transport, and chemicals) have increased at an average annual rate of 31 percent between 2001 and 2007. Although such industrial imports are expected to be of benefit for the development and industrialization of a resource-rich country like Sudan, they also place a burden on short-term economic performance and the trade balance.

The trade deficit constituted a burden to the current account deficit throughout the 2001-2006 periods. In an attempt to bolster its trade potential and create opportunities with other nations, Sudan has recently entered into a number of regional agreements. For instance, it joined the Common Market for Eastern and Southern African (COMESA). Sudan is also working on the process to join the World Trade Organization (WTO).

The increased trade openness and abounding primary products attracted foreign direct investment (FDI), targeting mainly the oil, telecommunication, industrial, transport and banking sectors. The flow of FDI led to capital account surplus, more than offsetting the current account deficits. As such, Sudan has been registering positive balance of payments, with the latter's surplus registering an average annual growth rate of 13% over the 2001-2005 period to account for around 3% of GDP in 2005 (Bank of Sudan).

The current account deteriorated in 2006 as import demand far outstripped exports, including lower-than-expected oil exports. The current account deficit is approaching 13

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percent of GDP in 2006. Major imports include machinery and equipment which are part of an ongoing investment boom. Foreign direct investment inflows more than covered the current account deficit, helping foreign reserves grow to roughly 3 months of imports by end 2006.

Due to the problems that faced the economy and the external sector in Sudan since the mid 1970, many strategies and reforms are undertaken. Trade policies during the period 1960-1977 aimed at diversifying the economy by developing new lines of production in industry and introducing new cash crops (e.g. oil seeds like groundnuts and sesame) other than cotton, which was the major source of foreign exchange earnings (contributing 46-62 per cent to Sudan's total export revenues). Although exports did not require a license (except for essential products) they were subject to an export duty. Imports competing with local produce were prohibited. Imports of most non-essential commodities were limited by a tight credit policy and ceilings imposed on import licenses. The foreign sector became the central policy target over the period 1978-1985 when the government launched a stabilization program with financial assistance from the IMF. The program involved a more liberal foreign trade and exchange regime. In 1987 the government launched a four-year Salvation, Recovery and Development Programme (1988/89-1991/92) to address the major inherited economic problems. In many respects, it revived the standard IMF stabilisation measures aiming to create a more conducive environment for the private sector.

Since February 1992 the state launched a reform and free market policy, as laid out in the National Economic Programs for 1990–1993 and 1992–2002. The programs aimed at encouraging economic and commercial activities by freeing prices and removing administrative restrictions on import and export. The reform program included the following: removing and lowering taxes on exports, orienting finance (credit) policy to support the export sector, simplifying export and import procedures and abolishing licenses on exports and imports, opening of new market, Development of the export sector in

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industrial goods, paying more attention to quality control, and customs reform policy and abolishing export duties on various items.

The main objective of Sudan 2001-2010 Program is to improve export performance by increasing oil production and exports and exploration of other mineral resources, increasing exports of animal resources, agriculture and wildlife products, increasing meat and fisheries export.

In spite of all these reforms the non-petroleum exports showed a systematic decrease in its share of export and this is due to the high production costs and deterioration in productivity and quality, which reduces competitiveness of these goods, high cost of financing, poor export services, particularly transport, storage and port handling, limited resources earmarked for marketing and advertising, lack of information on external markets among businessmen and exporters, and a low level of experience and general knowledge, a lack of stability and peace as a result of war and conflicts, leading to decreasing levels of investment in addition to the fact that most of Sudanese export goods are primary products and raw materials and than their international prices are generally low.

The Empirical Model:

The main purpose of this study is to investigate the main determinants of trade openness in Sudan. More specifically, trade openness is regressed on population size, per capita GDP, and real exchange rate. In addition to these variables, we introduce a dummy variable which takes the value of one for the peace years (from 1971 to 1983 and also from 2005 to 2007), and the value of zero for the other (war) years. The time period for study is 1970-2007. To test the hypothesis empirically, the model used can be specified in Log format as:

$$T = F(P, Y, E, D) \quad (1)$$

Where:

T : trade openness (total export + total import-to- GDP ratio).

P : population size.

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Y : real per capita GDP.

E : real exchange rate (domestic price of foreign currency).

D : Dummy variable.

A country's level of trade will clearly be influenced by a variety of factors, which are included in the above equation. It is possible to assess the relationship between such factors and openness through regression.

Many theoretical and empirical results suggest that a country's population, which serves as the usual proxy for country size, is the most significant determinant of openness, with a negative correlation between the two variables. In other words, countries with smaller populations have higher levels of external trade (relative to their GDP) and vice versa. These results intuitively appealing: countries with smaller populations have fewer opportunities for trade within their own borders and are therefore likely to trade more externally. In the case of Sudan, because of the supply rigidities that characterize the economy due to political instability and environmental factors, demands for imports increased with an increase in population growth. Accordingly, we expect a positive relationship between the population size and the openness.

The second expected determinant of openness is per capita GDP, which used as a proxy for the stage of development and economic diversity. Interestingly, there is evidence that openness and stage of development are negatively correlated, after controlling for other effects. That is, richer countries tend to be relatively less open. This is contrary to the conventional wisdom that much trade is intra-industry or in differentiated products, that rich countries do more of such trade, and so rich countries should trade more. Further analysis, however, suggests that the relationship between openness and per capita GDP is relatively complex. For example, there is some evidence that the relationship between the variables may be non-linear (approximating an inverse U-shape) and the relationship may also be influenced by the impact of country price levels on the measure of openness.

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Accordingly, the relationship between the two variables is debatable i. e the relationship may be positive or negative, but we expect it to be positive.

A third factor explaining openness is the exchange rate, which used as a proxy for a country's trade policy. According to economic theory depreciation in domestic currency encourages export by lowering the foreign price of exports and also encourages the flow of foreign direct investment which in turn increases the demand for imported inputs, accordingly, trade openness will increase. Then, depreciation in domestic currency, which means an increase in the exchange rate (defined as the number of units of domestic currency against US Dollar), will increase the trade openness. Accordingly, we expect a positive relationship between the two variables.

Peace stimulates investment, economic growth and development; hence foreign economic and political relations are strengthened leading to an increase in trade openness. Thus the coefficient of the dummy variable is expected to be positive.

Annual time series data covering the period 1970-2007 were collected to estimate the model in equation (1). Data were obtained from different sources, including: the annual reports of the Central Bank of Sudan, Ministry of Finance and National Economy, and Central Bureau of Statistics. All data are available on request from the author. The next section is about the empirical results.

The Empirical Results:

The purpose of our empirical investigation is to analyze the effect of population size, real per capita GDP, real exchange rate and dummy variable of peace on trade openness in Sudan during the period 1970-2007. Ordinary Least Squares (OLS) method is used to estimate the relationship in equation (1).

Before estimating the model we test for whether each individual series has a unit root to check out its level of integration. Augmented-Dickey-Fuller (ADF) unit root tests are

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used to determine the stationarity of the value of series. Table (2) below summarizes Unit Roots test results which show that all the variables are stationary in their first differences.

Table (2) Augmented-Dickey-Fuller (ADF) Unit Roots Test

Variable	levels	First difference
openness	-1.23	-4.11*
Real per capita GDP	-1.17	-4.23*
Real exchange rate	-2.62	-5.45*
Population size	-1.34	-3.77*
Dummy variable	-1.49	-3.18**

Note: (1) Critical values follow McKinnon (1991)

(2) One, two and three asterisks indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Two regression models are estimated, in the first one total exports are included in the measurement of trade openness while in the second non-oil exports only are included in trade openness measurements.

The results reported in table (3) below represent the first regression results, where the figures in parentheses are the t-ratios of the estimated parameters.

Table (3) First Regression of Explanatory Variables on Trade Openness, 1970-2007

	Coefficient				R ₂	F	D.W
Constant	P	Y	E	D			
-17.0	1.77	0.64	0.99	0.36	0.60	15.1	1.39
(-4.06)	(4.07)	(1.40)	(3.18)	(1.30)			

Source: Owen Estimation.

The results in table (3) suggest that the estimated relationship is statistically significant, as indicated by the high value of the F-ratio (it is statistically significant at 1% level). The coefficient of determination R² suggests that 60% of the variation in trade openness (T) is explained by the variations in population size (P), real per capita GDP (Y), real exchange

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rate (E) and the dummy variable (D). The Durbin-Watson statistic for the equation falls in the inconclusive region. Furthermore, only the coefficients (elasticities) of population size and real exchange rate are highly statistically significant as indicated by the t-ratios while the coefficients of real per capita GDP and the dummy variable are statistically insignificant. All coefficients have the expected signs. The magnitudes of the coefficients (elasticities) suggest that increasing population size, real per capita GDP and real exchange rate each with one percentage points associated with a 1.77, 0.64 and 0.99 percentage point's increase in the openness, respectively. Furthermore, during the peace time trade openness is enhanced. Accordingly, this result provides strong evidence that population size and real exchange rate have played more important roles in determining trade openness in Sudan.

The results reported in table (4) below represent the second regression results, in which the oil exports are excluded from the measurement of trade openness from 1999 to 2007 (notice that in 1999 Sudan began exporting oil). The figures in parentheses are the t-ratios of the estimated parameters.

Table (4) Second Regression of Explanatory Variables on Trade Openness, 1970-2007

Coefficient					R ₂	F	D.W
Constant	P	Y	E	D	0.50	6.9	1.1
-10.5 (-2.70)	1.27 (3.07)	0.29 (0.67)	0.97 (3.29)	0.38 (1.38)			

Source: Owen Estimation.

The results in table (4) suggest that the estimated relationship is statistically significant, as indicated by the value of the F-ratio. The coefficient of determination R² suggests that 50% of the variation in trade openness (T) is explained by the variations in above mentioned explanatory variables. The most important difference between the two estimated models is that the responsiveness of trade openness with respect to real per capita GDP has

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decreased after the exclusion of the oil exports from the measurement of trade openness during 1999-2007.

CONCLUSION

Motivated by the catalytic role that trade openness could play in the development and growth of a market-oriented economy, this paper examines the effect of population size, real per capita GDP, real exchange rate and dummy variable of peace on trade openness in Sudan over the period 1970-2007 using Ordinary Least Square (OLS) technique. Data were obtained from different sources, including: the annual reports of the Central Bank of Sudan, Ministry of Finance and National Economy, and Central Bureau of Statistic. We run two regressions, in the first one total exports are included in the measurement of trade openness while in the second non-oil exports only are included in trade openness measurements.

In both estimated models we found that population size (P), per capita GDP (Y), real exchange rate (E) and dummy variable of peace (D) are the determinants of trade openness in Sudan. Furthermore, only the coefficients (elasticities) of population size and real exchange rate are highly statistically significant as indicated by the t-ratios while the coefficients of real per capita GDP and the dummy variable are statistically insignificant. All coefficients have the expected signs. Accordingly, these results provide strong evidence that real exchange rate and population size have played more important roles in determining trade openness in Sudan.

The most important difference between the two estimated models is that the responsiveness of trade openness with respect to real per capita GDP has decreased after the exclusion of the oil exports from the measurement of trade openness during 1999-2007.

This study recommends the designing and adoption of effective exchange rate policy, improving infrastructure to increase competitiveness of exports and to realize peace in all parts of the country.

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