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The impact of trade openness on foreign direct investment in Sudan by sector in the 1990-2017 period: an empirical analysis

Abstract. The impact of trade openness on foreign direct investment (FDI) has been debatable. This study investigates long-run equilibrium relationships between trade openness and FDI in the Sudanese economy by sector within the 1990-2017 period. The study employs Johansson co-integration technique. The findings of the analysis show that there is a long-run equilibrium relationship between trade openness and FDI flow estimated at a negative value of 0.53 for the aggregate economy when using trade openness in terms of exports plus imports over GDP. The current study applies either the export index or export efficiency measurement. The degree of openness was estimated at positive values of 0.17, 0.9, and 0.55 for the aggregate economy, the agricultural sector and the industrial sector, respectively.
The results indicated that for the studied period (1990-2017), the FDI flows for the aggregate economy by sector are determined by the degree of trade openness in terms of their joint measurement. Furthermore, the magnitude of the degree of the industrial trade openness model is robust one and the government should prioritise this sector with regard to exports. Besides, the government should encourage the manufacturing sector, therefore improving infrastructure and promoting concentration of FDI in the country's production sectors, in particular those which support the paradigm that Sudan, like many Sub-Saharan African countries, should promote its primary exports to transform from an underdeveloped country to a developed one.
The study recommends that, according to magnitude of industrial sector trade openness degree, government should exert more effort for its diversify in order to identify this sector as a leading sector utilising trade efficiently and hence prioritize it in the export.
Keywords: Foreign Direct Investment; FDI; Trade Openness; Exports Efficiency; Sub-Saharan African Countries; Sudan
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Вплив відкритості торгівлі на прямі іноземні інвестиції за секторами економіки в Судані (1990–2017 рр.): емпіричний аналіз
Анотація
Роботу присвячено дослідженню взаємозв'язку між відкритістю торгівлі й потоком прямих іноземних інвестицій у довгостроковій перспективі, а також вивченню такого взаємозв'язку відносно економіки держави Судан за секторами за період 1990–2017 рр. Для виявлення такого взаємозв'язку авторами роботи було застосовано коінтеграційний аналіз за методом Йохансена. Результати аналізу показали, що в довгостроковій перспективі спостерігається збалансований взаємозв'язок між відкритістю торгівлі й прямими іноземними інвестиціями. У ході дослідження було визначено негативну величину, що дорівнює 0,53 для показника економіки країни в цілому при наявності відкритості торгівлі з урахуванням впливу експорту та імпорту на ВВП. У тому випадку, коли враховувався показник експорту, або до уваги бралася величина, що визначає ефективність експорту, ступінь відкритості торгівлі мав позитивну величину, яка дорівнювала 0,17; 0,9 і 0,55 для економіки в цілому, сільського господарства та промислового сектора відповідно. Результати дослідження показали, що за період 1990–2017 рр. потік прямих іноземних інвестицій в економіку як у цілому, так і в окремі сектори економіки, визначався ступенем загального показника відкритості торгівлі. Слід зазначити, що величина ступеня відкритості торгівлі для промислового сектора дорівнює одиниці, що вказує на пріоритетність цього сектора економіки для країни з позиції експорту. Уряд повинен розвивати промисловий сектор з огляду на те, що це сприятиме не тільки залученню прямих іноземних інвестицій, але й розвитку інфраструктури. Авторами дослідження було зроблено висновок про те, що державі Судан, як і багатьом іншим країнам Африки на південь від Сахари, слід нарощувати промисловий експорт, що допоможе перейти з категорії країн, що розвиваються, в категорію країн із розвиненою економікою.
Ключові слова: прямі іноземні інвестиції; ПІІ; відкритість торгівлі; ефективність експорту; африканські країни на південь від Сахари; Судан.

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Влияние открытости торговли на прямые иностранные инвестиции по секторам экономики в Судане (1990–2017 гг.): эмпирический анализ

Аннотация
Данная работа посвящена исследованию взаимосвязи между открытостью торговли и потоком прямых иностранных инвестиций в долгосрочной перспективе, а также изучению такой взаимосвязи по отношению к экономике государства Судан по секторам за период 1990–2017 гг. Для выявления взаимосвязи авторами работы был применен коинтеграционный анализ по методу Йохансена. Результаты анализа показали, что в долгосрочной перспективе наблюдается сбалансированная взаимосвязь между открытостью торговли и прямыми иностранными инвестициями. В процессе проведения данного исследования была определена отрицательная величина, равняющаяся 0,53 для показателя экономики страны в целом при наличии открытости торговли с учетом влияния экспорта и импорта на ВВП. В том случае, когда при проведении исследования учитывался показатель экспорта либо принималась во внимание величина, определяющая эффективность экспорта, степень открытости торговли определялась положительной величиной, которая равнялась 0,17; 0,9 и 0,55 для экономики в целом, сельского хозяйства и промышленного сектора соответственно. Результаты исследования показали, что за исследуемый период 1990–2017 гг. поток прямых иностранных инвестиций в экономику в целом и в её отдельные сектора определялся степенью общего показателя открытости торговли. При этом следует отметить, что величина степени открытости торговли в промышленном секторе равна единице, что указывает на приоритетность данного сектора для страны в отношении экспорта. Кроме того, правительство должно развивать промышленный сектор ввиду того, что это будет способствовать не только привлечению прямых иностранных инвестиций, но и развитию инфраструктуры. Авторами исследования сделан вывод о том, что государству Судан, как и многим другим странам Африки к югу от Сахары, следует наращивать промышленный экспорт, что поможет стране перейти из категории развивающихся стран в категорию стран с развитой экономикой.
Ключевые слова: прямые иностранные инвестиции; ПИИ; открытость торговли; эффективность экспорта; африканские страны к югу от Сахары; Судан.

1. Introduction

Foreign investment and international trade are of great interest for researchers due to their enormous impact on aggregate economy and its sectors in any country. Over the past two decades, foreign direct investment (FDI) across countries has increased enormously, which is a sign of globalisation (Busse and Groizard, 2005). Since 1980s, many least developed countries (LDCs) have recognised that FDI contributes to the increase of foreign capital. The post-cold-war political era has necessitated acquiring foreign investment as the flow of aid from the USA to its allies.

In fact, open economies have paved the way for the import of new technologies and ideas from the rest of the world which has lead to a better division of labour, new methods of production and new products by enjoying comparative advantages through trade openness. This also implies export efficiency which creates a conducive environment to ensure better competitiveness of the country (Ros, 2000; Dewan and Hussein, 2001).

Since 1980s, FDI inflows in all developing countries have increased from USD 55 billion in 1985 to USD 1,511 billion, with a decrease of USD 573 billion in 2003 (World Bank, 2005). The share of FDI in gross domestic product (GDP) becomes more significant over time in countries with high, middle and low income. In countries with high income, it increased from approximately 0.5 to 1.0 per cent in the 1980s to more than 5% in 2000 and then declined to 1.4% in 2003 (Busse and Groizard, 2005). In countries with middle and low income, the percentage of FDI in GDP has remained at more than 2% after the year 2000, implying higher significance of FDI flows in developing countries during the period (Cantah, Waife & Adams, 2013). Yet, despite the significant increase in FDI inflows, the share of FDI flows remains negligible.

The efficient use of FDI is crucial for LDCs' economies because it represents the lion share of finance for them. Therefore, the past experience shows that developing countries have been unable to take full advantage relating to FDI inflows due to various deficiencies, for instance, fragile infrastructure, market inefficacy, etc. Endogenous growth models have revealed that there is a positive impact of FDI on economic growth. Accordingly, FDI has positive impacts on productivity and positively contributes to trade openness.

The purpose of this study is to empirically prove the impact of trade openness on FDI in Sudan through the 1990-2017 period. To achieve this objective, the study examines the long run relationship between FDI and trade openness for the country's overall economy and its sectors wise in to identify and employ the leading sector in terms of FDI efficiency and hence prioritise and increase its magnitude with regard to trade openness. On the basis of Ros' (2001) argument that the country in its earlier stage of development and growth depends upon a limited number of primary goods, uses the trade orientation index and trade integration as an indicator of trade openness to reflect its growth stage of that country. Trade openness always attracts export-oriented FDI, whereas tariff-jumping FDI are attracted under trade restrictions.

1.1 General Background

Sudan is characterised by its tremendous endowments regarding natural and human resources. Nevertheless, it has suffered from a general slowdown in FDI and GDP growth rate. During the 1960-2017 period, the country's economic activity experienced a drastic decline; the per capita income was low and was growing at an average rate of 0.2%. The per capita income fell and the foreign debt increased to USD 43.200 billion (Bank of Sudan, 2014), which placed Sudan among the poorest countries.

Since the 1980s, the Sudanese economy has been characterised by low and fluctuating activities in general and a low level of FDI in particular. This is due to a series of economic problems that slowed down the economy and resulted in restraint of growth due to continuous deficits in the balance of payments and government budgetary deficit. Osman (2002) and Bior (2000) divided the factors affecting the Sudanese economic performance into exogenous and endogenous. The endogenous factors include unstable policies, ill-conceived planning, project mismanagement and poor implementation, irrational resources allocation, negligence of maintenance of capital stock and FDI, and other macroeconomic factors, such as hyperinflation and diversification. The exogenous factors such as, war, natural disasters, several political, social and natural problems accentuated the economic situation.

During the 1990s, the FDI was growing at an annual average rate of 0.11%, while the annual average growth of GDP was 6.6% and the total for population was about 3.1%.

During the 2000-2010 period Sudan had the fastest growing FDI flows in Africa (World Bank, 2009). After the succession of South Sudan (2011-2015) the positive and negative growth rates of FDI became the characteristic features for the 2011-2017 period.

1.2. Economic Performance: some macroeconomic indicators

This section looks into the economic performance of Sudan based on some macroeconomic indicators to provide a complete FDI and trade profile.

Table 1 depicts the economic performance and shows fluctuated GDP and FDI growth rates for the sub-periods. The output growth slowed down in the 1990-1995 period and was 5.1%. However, it started to improve in the period between 1996 and 2000 to increase substantially until its newly recorded fall of 4.1% in the period between 2011 and 2017. The strong performance of output for the 1996-2000 and 2006-2010 periods were concomitant with the high growth rate of the agricultural sector due to heavy rainfalls

Tab. 1: **Sudan: Economic Performance 1990-2017**

Variable	1990-1995	1996-2000	2001-2005	2006-2010	2011-2017	1990-2017
Growth rate of FDI inflow	11.1	14.1	13.1	-21.5	0.1	5.5
Agricultural FDI growth rate	5.1	-7.4	7.5	-8.4	-3.3	31.3
Growth rate of Industrial FDI flow	1.9	14.6	2.8	-22.6	2.1	0.5
GDP Growth rate	5.1	6.3	5.5	8.0	4.1	4.0
Trade openness	25.9	25.3	26.9	31.4	18.8	26.6
Total export / GDP %	14.2	13.9	23.4	16.8	13.6	14.2
Total Import / GDP %	17.8	20.9	30.6	18.0	17.5	19.1
Population Growth rate	2.3	2.3	2.0	1.0	-0.1	0.2
Inflation rate	105.6	43.8	7.5	11.4	35.8	41.1
Expenditure / GDP %	13.7	8.6	17.1	15.9	14.7	14.0
Deficit / GDP %	-2.5	-1.1	-1.9	12.9	6.1	6.4

Source: Authors' own calculations based on data from Central Bureau of Statistics of Sudan (2018), Central Bank of Sudan, Ministry of Finance of Sudan, Ros (2001), Appendices 2 and 3

through the country, indicating the significant role of rainfall in economic growth and peace period, respectively. Also, the period (2000-2006) experienced high and steady growth in real GDP. Several factors contributed to that trend, including financial stability, the signature and implementation of the Comprehensive Peace Agreement (CPA), oil exports, combat of inflation and increases in domestic and foreign investment. After the 1990-1996 period the implementation of sound fiscal and monetary policies coupled with structural reforms enabling the country to cut down inflation to a single digit rate and restoring confidence of both domestic and foreign investment in the economy.

The aggregate economic performance in Table 1 shows that Sudan had a continuous budgetary deficit excluding the sub-periods of 2006-2010 and 2011-2017. As a result, the government reduced financial deficit by borrowing from the Central Bank. This led to an increase in money supply and, in turn, to a jump of the inflation rate of 31.1% in the 1980-1985 period, 48.9% in the 1986-1990 period, and 105.5% in the period between 1991 and 1995 respectively. That inflation-induced deficit increased the money supply and generated further inflation. Accordingly, the figures for the periods of 1980-1985, 1990-1995 and 2011-2017 show a persistent increase in the general price level, which resulted in a reduction in government expenditure, particularly in the 1996-2000 period, when the government fostered expenditure reduction and privatization measures, particularly in 1995.

According to Table 1, the agricultural sector recorded the highest flow of FDI in the period of 1990-2017 (31.3% out of total amount), however this sector always suffered from climate change through the period.

Also, as shown in Table 1, the balance of trade is mostly deficit, reflecting the fact that Sudan's imports often exceed its exports both through the sub-periods and the whole period between 1990 and 2017. In this regard, Sudan has faced a series of problems such as the a general decline in terms of trade, a general decline in export-oriented production, as well as a high needed for public desirability for capital goods and sector development requirements.

The FDI grew at 5.5% during the 1990-2017period. However, its growth rate is averaged at 11.1% for the 1990-1995 period. However, the FDI growth rate improved up to 14.0% during the 1996-2000 period and decreased to around 13.1% for the 2001-2005 period. The investment growth, however, continued its decline (-21.5%) during the period between 2006 and 2010 and took an upward trend in 2011-2017 with a positive value of 0.1%.

The average annual rate of population growth was approximately 2.3 percent for the periods of 1990-1995, 1996-2000 and 2001-2005, which is very close to the average growth rate in Africa. The rate of population growth for the sub-period of both 2006-2010 and 2011-2017 showed that the population was increasing at a slower pace and was even negative within the period of 2011-2017.

2. Brief Literature Review

The impact of trade openness on FDI is controversial. Nations endeavour to attract more FDI for a number of reasons relating to beliefs that FDI has a variety of positive effects such as technology transfer, employee training, backward and forward linkages, labour mobility, increased productivity, technical assistance and provision of access of local firms to international markets. Many empirical studies advocate the arguments that FDI has a positive impact on trade openness in recipient countries. Hence, the transfer and adoption of relevant technologies enhances productivity and helps countries to create labour-intensive activities. Hence, large empirical studies should support the argument that FDI exerts a positive impact on trade openness in the host countries. The transfer of advanced technologies increases the demand of productive labour and supports countries by enhancing labour generation activities besides training managers and workers to increase their productivity in order to get long-run benefits from their services. This would generate new jobs which might be seen as a short-run impact. It is suggested that an increase in the demand plays a pivotal role in trade and the country's policy to support innovation, education and provision of infrastructural facilities.

It seems a paired effect in terms of FDI trade showing a robust relationship between FDI and trade. Past experience provides an ample explanation that FDI promotes exports and helps local firms to get access to global markets as well as operate efficiently by adopting new technologies and try to be competitive, which highlights the value of economic freedom to attract FDI (Apergis, et al, 2008) and confirms that the cause and effect mechanism for exports. The major determinants of foreign direct investment are trade openness, market size, labour force growth and infrastructure growth. FDI also relies upon the rate of return that an investor receives from the host country. In general South- Asian nations must attain more openness in trade in order to improve FDI (Sahoo, 2006). Trade openness boosts up export-oriented FDI inflows, while trade restrictions attract FDI tariff-jumping. Consequently, we can say that trade openness of developing economies is positively related to the size of export-oriented capital inflows. Other than trade liberalisation, FDI also depends upon political stability, exchange rate stability and market size of economy. Developing countries must stabilise their exchange rate and political situation along with trade openness in order to attract more FDI (Liargovas & Skandalis, 2010).

Another group of scholars favors outward looking-oriented economic strategies. Also, there are exponents of export promotion, arguing that free trade between nations of the world equally benefits least developed countries (LDCs) by expanding their activities via trade that would be possible from their domestic economies alone. It is also seen as a means of helping them through specialisation and technology transfer and, as a result, increases their citizens' welfare through the enhancement of their aggregate national income (Adjasi, 2006; Lim, 2001). Trade is crucial to any economy because of differences in technology, proportion of potentially mobile resources (capital and labour) and availability of specific non-mobile factors. Therefore, trade gains have two forms: production gains and consumption gains. According to this, perspective degree of a nation's openness to trade is believed to enable the nation to reap the benefit of economics of scale in addition to external economics of scale associated with information and knowledge transmission as well as spillover effects that trickle to productive sectors of the economy in the long run. It is believed that this leads to better performance of the economy.

Trade openness can be described as the increasing integration of economic activities of human societies around the world. It could also accelerate the process of denationalisation of better economic activities in addition to political and

social activities that allows the flow of capital across national boundaries (Igudia, 2004). Thus, it involves the growing economic interdependence of countries worldwide through the increasing volume and varieties of cross-border transactions, international capital flows as well as rapid and widespread technological change.

Moreover, globalisation and technology transfer have changed the world into a global village via the intensification of economic, political, social and cultural relations across national borders (Felipe, 1997; Kokko, Tansini & Zejan, 1996). This is also due to the search for cheaper labour, raw materials and less government intervention.

Ashgar (2016) examined the relationship between FDI inflows and trade openness in South-Asian economies. He examined the relationship of seven countries for the 1998-2010 period based on panel data using random effects estimation. Trade openness was measured by three indicators, in terms of imports, exports and a joint combination of both factors. His results suggested that there is a significant relationship between trade openness and foreign direct investment inflows. Trade openness has a positive and significant impact on FDI inflows in South-Asian countries.

Mohammed Rahman (2011) aims at empirical search to find whether FDI and international trade bolster or hinder growth of each other, or not using data relevant to Bangladesh imports, exports and FDI within the period (1972-2007) by applying a cointegration technique. He found that no cointegration exists among variables.

Adeel Ahmad Dar, Taj Muhammad and Bilal Mehmood (2016) specifically examined the relationship between economic growth with foreign direct investment, human capital, and trade openness for Pakistan over the period between 1980 and 2013 by employing the Johansen cointegration test. The obtained results indicate that there is a long-run relationship between the variables. In addition, the vector error correction model (VECM) confirms the long-run relationship between variables. Also, diagnostic tests show normality and the absence of autocorrelation in the model. They found that, in order to encourage FDI projects, Pakistan should promote domestic exports and upsurge the local production capability terms of trade.

Boukilia and Zatala (2001) attempted to identify the impact of determinants of FDI on economic growth in South-East Mediterranean countries. They used the Paul panel data for the variables such as per capita income, GDP, investment in infrastructure, trade openness as a ratio of GDP, inflation rate, budget deficit as a ratio of GDP for the period between 1976 and 1997. The study reveals that the trade openness variable was an influential factor affecting the FDI flow in Sudan through the period between 1976 and 1997.

Although both the theoretical and empirical applications reviewed above have been incorporated worldwide, there must have been several attempts to analyse the impact of trade openness on FDI in Sudan economy. However, there have been no attempts to address the impact of trade on FDI in Sudan either in general or by sector in particular.

Omran Abbas Yousif Abd Alla, et al. (2015) attempted to investigate some economic determinants of FDI in Sudan in the period between 1990 and 2013. The regression results suggest that the exchange rate, transportation and communication, and oil exploration are the major determinants of FDI in Sudan through the period, while the growth rate of real gross domestic product and openness have an insignificant impact on FDI.

Abdel Raheem (2011) investigates the impact of foreign direct investment on economic development and sustainable development. The study was aimed at evaluating the benefits of FDI in the host country in general with special reference to Sudan in elevating its economic growth and supporting sustainable development. He found that FDI positively affected the host country's economic growth and development.

Unlike the previous studies, the study is different because it deals with the impact of trade openness on FDI by sector and focuses on not only FDI distribution but also on its impact on the degree of openness.

3. Methodology and Data

This study attempts to investigate the impact of trade openness and FDI on the Sudanese economy by sector during the 1990-2017 period by using Ros' (2001) argument.

3.1. Model Building

The methodology we followed in the analysis comprises two steps.

Firstly, we will specify the models based a certain measurement for trade openness for the economy and the relevant sectors covering the period between 1990 and 2017 with a focus on the agricultural and the industrial sectors respectively.

Secondly, we will try to employ a cointegration analysis for the whole economy and the main productive sectors, namely the agricultural and the industrial sectors. This is because, in the case of Sudan, we think these sectors would be the drivers of growth for three reasons:

1) the agricultural and the industrial sectors are producing sectors and they should lead economic growth to be one of the main pillars of the poverty reduction strategy;
2) like many Sub-Saharan African countries (we regard Sudan as a part of Sub-Saharan Africa region, nevertheless, it is also regarded as a part of the Northern Africa, for example, by the UN Development Programme), Sudan failed to substitute primary exports with manufacturing exports to transform its economy from an underdeveloped one into a developed one;
3) it is essential to know to what extent these sectors can absorb FDI and hence state the priorities according to the share of each sector with regard to trade openness.

However, trade openness exposes the economy to further adoption of foreign technology and increases the competitive ability of these sectors, which ultimately encourages rapid FDI.

This study employs different proxies for trade openness as relevant to the economy and the sectors under investigation. They are as follows.

- Trade openness for the whole economy:

$$FDI = F(EOP), \quad (1)$$

where, following the literature, we use convenient trade openness which is measured by exports plus imports over the GDP. We use total exports divided by total imports which we call «export efficiency» as a proxy for trade openness or exports index for the whole economy (for further details see, for instance, Ros (2001) and Ashgar (2016).

- Trade openness for agriculture:

$$AFDI = F(EOPA), \quad (2)$$

where:

$AFDI$ indicates agricultural foreign direct investment;

OPA stands for agricultural trade openness measured by export efficiency or export index.

Since Sudan heavily depends on exports of primary agricultural products, this study uses primary exports as a ratio of total exports to measure trade openness for agriculture. In this we follow Ros (2001) who, for a particular developing country that depends upon one or a limited number of primary goods, uses the trade orientation index and trade integration as an indicator of trade openness to reflect the growth stage of that country.

- Trade Openness for Industrial Sector:

$$IFDI = F(EOPI), \quad (3)$$

where:

$IFDI$ indicates industrial foreign direct investment;

OPI stands for industrial trade openness measured by export efficiency or export index.

Like many Sub-Saharan African countries, Sudan has failed to promote the primary exports into manufacturing exports to transform its economy from an underdeveloped one to a developed one.

The export of manufacturing products as a ratio of total import is used as a proxy of trade openness in the industrial sector. This is also based on the theoretical view of the integration index. Increases in manufactured exports impose exposition to foreign technology and competition encourages a rapid rate of FDI.

- Trade openness for the whole economy using conventional measurement:

$$FDI = f(TOP), \quad (4)$$

where:

FDI indicates foreign direct investment;

TOP indicates trade openness, measured by conventional measurement on term of total export plus import over GDP. Most of the empirical literature uses trade openness in terms of exports plus total imports divided by GDP.

3.2. Data Testing

A conventional measurement of trade openness alone does not lead to the desired measure of trade and transformations in the economy. The study puts more emphasis on the use of the trade orientation index and trade integration as an indicator of trade openness.

Based on equations (1), (2), (3) and (4), we will apply the Johansson cointegration technique to estimate the impact of FDI on the overall economy and the relevant sectors.

The cointegration concept is a relatively new statistical technique introduced by Engle and Granger (1969). It is used as an explicit statistical model for the analysis of the relationship between integrated series. In particular, it allows individual time series to integrate, and it is suitable for linear combination of the series to be stationary. To qualify this, and to estimate the long-run combination, the Johansen and Julius (1990) procedures and the Johansen (1988; 1991) methodology of cointegration of a long-run equilibrium relationship are applied. They proposed maximum likelihood estimation that helps researchers to make simultaneous estimation of the model involving two or more variables. This procedure is independent of the choice of the endogenous variables, and it allows researchers to estimate and test the presence of more than one cointegrating vector (s) by imposing linear restrictions in order to determine the long-run behavioural parameters. Once a co-integration has been established, the short-run dynamics of this relationship can be depicted by estimating an error correction model.

Based on the above, the error correction mechanism is based on the following vector error correction model (VECM):

$$\Delta Z_t = \sum_{i=1}^{k-1} \Gamma_i \Delta Z_{t-i} + \mathrm{P}_0 Z_{t-1} + \mu + \varepsilon_t, \quad (5)$$

$$\Gamma_i = -\sum_{j=i+1}^{k} \Pi_j \; and \; \mathrm{P}_0 = \sum_{i=1}^{k} \Pi_i - 1, \quad (6)$$

where:

Z_t is the $P \times 1$ vector time series;

Γ_i is the $P \times P$ coefficient matrix;

P_0 is the $P \times P$ matrix;

μ is the $P \times 1$ vector deterministic variables;

ε is the vector of Gaussian error terms.

The existence of cointegration is based on the rank of P_0:

- If rank $(P_0) = r = P$ (full rank), the vector time series is stationary and no long-run relationship exists among the variables.
- If rank $(P_0) = r = 0$, there is no co-integration vector and (VAR) based purely on the first difference of Z_t is appropriate.
- If rank $(P_0) = r < P$, then time series are non-stationary and there exist r cointegration vectors. Under this condition, the matrix P_0 can be expressed as the product of two $P \times r$ matrices α and β both of full column rank:

$$P_0 = \alpha\beta' . \quad (7)$$

With β' being the matrix of cointegration vectors, and α representing the error correction coefficient (which reflects the speed of adjustment to the long-run equilibrium).

Unit Root Tests

Before turning to the test for cointegration, we must determine the order of integration of the variables by using the Augmented Dickey-Fuller (ADF) test. The unit-root hypothesis is tested at the constant and linear trend as well as in the first difference. The lag length in the ADF regression is selected striking a balance between the lag length chosen by the Akaike information criterion (AIC) and the t-test of the lags. The ADF is a test used for time series properties because any empirical work based on time-series data should first be tested for stationarity before running any estimation in order to avoid the problem of spurious regression and misleading results. The most popular ones are the ADF based on Dickey and Fuller (DF). The ADF test relies on rejecting a null hypothesis of the unit root (testing for the unit root with constant and linear trend) in favour of the alternative hypothesis of stationarity. The ADF consists of the following:

- Testing unit roots (the ADF test with the constant) as follows:

$$\Delta y = \mu + (\beta - 1) y_{t-1} + \sum_{i}^{s} \lambda \Delta y_{t-1} + \varepsilon_t, \quad (8)$$

where:

y indicates the variable under study;

Δ is the first difference operator;

μ is an error term, or indicates stationarity random error;

$\mu_t = iid(0, \sigma^2)$;

ε_t is a white noise disturbance;

t is a time period;

s is the number of lags for the dependent variable which is chosen to ensure that the residuals are white-noise.

The t-statistic of $(\beta - 1)$ is used to test the null hypothesis indicating that this coefficient is equal to zero, i.e. $\beta = 1$. To determine the proper lags for each variable, the lag length is chosen according to the Akaike information criterion and the t-test of lag.

- Testing for unit roots (the ADF with the constant and linear trend) by:

$$\Delta y = \mu + \alpha T + (\beta - 1) y_{t-1} + \sum_{i}^{s} \lambda \, \Delta y_{t-1} + \varepsilon_t, \quad (9)$$

where:

λ indicates trace statistics.

With reference to what has been stated, since there are more than one method of conducting cointegration tests, this study uses Johansen's cointegration technique (1990; 1992). This technique is preferred to the Engle-Granger (1969) method for the following reasons:

1) it depends on the normalisation of the variables in the cointegrating equation. Thus, it is possible that the arbitrary choice of one variable as a dependent variable and the other as an independent variable may lead to the conclusion that the variables are cointegrated, whereas reversing the choice of dependent and independent variables may indicate no cointegration;
2) it relies on a two step estimator, in which the first step is to generate the residuals from the cointegration regression and the second step is to use the residual generated from step one to test for unit roots; any error introduced in the first step also affects the second step;
3) the Johansen-Jueslius method applies the maximum likelihood procedure to determine the presence of cointegrating vectors in non-stationary time series.

3.3. Sources of Data

Data pertaining to the dependent variables and the explanatory variables were compiled from different sources. Times series on FDI and trade openness were obtained from the Central Bureau of Statistics (CBS), the Ministry of Finance and the Bank of Sudan, while the time series data on

exports and imports were obtained from the Central Bureau of Statistics.

4. Estimation and Finding Results

Before we run the cointegration test we test the stationarity of data using unit root tests, namely the augmented Dickey-Fuller test for each time series variable.

4.1. The Stationarity of Data: Augmented Dickey-Fuller Tests (ADF)

As mentioned before, we test the stationarity of data in order to avoid spurious regression by using the Augmented Dickey-Fuller Test (ADF). As we have outlined in the methodology, the presence of the unit root justifies the estimation of the functions within the cointegration framework. The ADF results are shown in Table 2.

Tab. 2: **Results of ADF (s) with Constant and Linear Trend**

Variables	ADF at the First Difference	Lag-length
Aggregate Foreign direct investment (FDI)	-5.64	1
Trade Openness as ratio of total import (EOP)	-5.52	1
Agricultural Foreign Direct investment (AFDI)	-7.35	1
Industrial foreign direct investment (IFDI)	-5.37	1
Agricultural Trade openness (EOPA)	-8.06	1
Industrial Trade openness (EOPI)	-6.59	1
Conventional Trade openness (TOP)	-7.86	1

Note: All the variables are tested at the first difference within intercept and trend and have been stationary at 5% level.

Source: Compiled by the authors

Using the (ADF) test, the unit root test hypothesis tested the variables at their level and the first difference as shown in Table 1. The null hypothesis is the presence of the unit root. The lag length in the ADF regression is selected striking a balance between the lag length chosen by the Akaike information criterion (AIC) and the t-test of the lags. All the variables are tested to be stationary in the level and the first differences respectively. According to the obtained results, we conclude that all variables are integrated at order (1).

4.2. Cointegration Results

The presence of unit-root tests in Table 2 justifies the estimation of trade openness and FDI for the economy and its sectors within a co-integration framework.

Since the cointegration test critically depends on the choice of the lag-length, we base the lag selection on the likelihood ratio test of model reduction, moving from two to four lags. In this representation, for estimating the long-run function in equations (1), (2) and (3) we use the Johansen and Jueslius (1990) and Johansen (1988; 1991) methodology of cointegration, as a long-run equilibrium relationship between conventional trade openness and FDI series over the 1990-2017 period. The cointegration test implies that there is a stable relationship between the two series for economy as a whole in the sense that in the long-run they tend to move together rather than wandering away from each other. Table 3 shows the estimation results.

From the above table, the cointegration results can be summarised as follows:

- The cointegration equation by conventional measurement is:

$$Ln(FDI) = -11.1.trend + \underset{(14.6)}{53.3}\ln TOP. \quad (10)$$

- The cointegration results for aggregate economy based export efficiency are:

$$Ln(FDI) = \underset{(2.9)}{-20.6}trend + \underset{(-3.5)}{0.17}\ln EPD. \quad (11)$$

- The cointegration results for the agricultural sector export efficiency are:

$$Ln(AFDI) - \underset{(-0.26)}{0.9}\ln AOP. \quad (12)$$

- The normalised cointegration results for the industrial sector based on the Ros Index (2000) are:

$$Ln(IFDI) = \underset{(0.13)}{-0.53}\ln OPI. \quad (13)$$

Consequently, the results of testing the number of cointegrating vectors are reported to have both the likelihood ratio and the maximum Eigen value statistics. In the trace test, the null hypothesis is that the number of cointegrating vectors is less than or equal to r (r = 0, 1); while in the maximum Eigen value test, the alternative for r = 0 is r = 1. For the overall economy, we have found that both of the tests reject the null hypothesis of no cointegrating vector at a 5 percent or less level in favour of one cointegrating vector. The normalised cointegration vector corresponding to the long-run cointegration as shown in Table 3. The results yield the following normalised cointegration equation of the aggregate.

As expected, equations (10), (11), (12) and (13) show that there is a long-run relationship between trade openness in terms of joint measurement in general. The degree of openness was estimated at 0.55 for the aggregate economy using conventional measurement. This value is negative, and it is in line with the share of this factor in other studies, as we have shown in the literature review. The value is negative and is in line with the share of this factor in other studies, for instance by Seim (2009) who explores a negative as well complex relationship between trade openness and FDI inflows and argues that the result depends on research and needs some careful explanation. As expected, there is a long-run relationship between trade openness measured by the export efficiency or the Ros (2001) index. Equations (11), (12) and (13) show that there is a significant relationship between trade openness and foreign direct investment inflows. These findings are similar to those by Ashgar (2016). His results suggest that there is a relationship between trade openness and foreign direct investment inflows. Trade openness has positive and significance effects on FDI inflows in South Asian countries.

4.3. The error-correction model (ECM) tests

Next, employing the error correction model we look into the short-run dynamics of labour efficiency growth for the economy. In the case at hand, the error correction model is applied for the overall level (using their series data of labour

Tab. 3: **Cointegration test results**

A cointegration of aggregate economy in terms of Export Plus Import over GDP		
Eigen Value	0.53	0.35
Null Hypothesis on Rank = r	$r = 0$	$r \leq 0$
95% Critical Values	19.3	12.5
Normalized cointegration vectors	53.3 (14.6)	
A cointegration for Trade Openness for aggregate economy in terms of Export Efficiency or Exports Index		
Eigen Value	0.30	16.31
Likelihood Ratio	0.13	4.7
Null Hypothesis on Rank = r	$r = 0$	$r \leq 0$
95% Critical Values	15.41	3.46
Normalized cointegration vectors	-0.17	
Likelihood ratio is -213.50	(-0.04)	
Cointegration Result for Agricultural Sector in terms of Export Index		
Eigen Value	0.30	16.31
Likelihood Ratio	0.13	4.7
Null Hypothesis on Rank = r	$r = 0$	$r \leq 0$
95% Critical Values	15.41	3.46
Normalized cointegration vectors	-0.9	
Likelihood ratio is -213.50	(0.26)	
Cointegration Result for Industrial Sector Using Export Efficiency		
Eigen Value	0.30	16.31
Likelihood Ratio	0.13	4.7
Null Hypothesis on Rank = r	$r = 0$	$r \leq 0$
95% Critical Values	15.41	3.46
Normalized cointegration vectors	-0.55	
Likelihood ratio is -213.50	(0.17)	

Source: Compiled by the authors

quality growth) represents the disequilibria from the long-run states. The error term coefficient has negative values. Therefore, the short-run dynamics is modelled by estimating the capital labour quality ratio in the first difference. The model is fitted by applying the ordinary least square method. The error correction model results are given in Table 4.

The estimated coefficient of the error correction model is significant and has a negative value compatible with the theory and consistent with the empirical literature. The R^2 values suggest that 89 of the variations in FDI in Sudan is explained by the joint trade openness contribution and measurement.

The vector error correction results in Table 4 show how the economy and its sectors adjust or return back into their equilibrium state and also show the speed of adjustment of the variables to the long-run equilibrium.

Tab. 4: **Error-Correction Models, Cointegration Vector and Adjustment Coefficients 1990-2017**

Variable	Constant	Coefficient	t-Statistics	Prob.
Δ (TOP)		-2.2	2.3	0.00
Δ (EOP)		-3.4	3.5	0.00
Δ (EOPA)		-0.5	3.4	0.00
Δ (EOPI)				
Cointegration Vector and Adjustment Coefficients				
	FDI	EOP	Constant	Adjustment Coefficient
Cointegrating Vectors				
Trade Openness (TOP)	1	-0.53	-2.3	
Trade openness (EOP)	1	-0.15	1.0	
Agricultural Trade Openness (EOPA)	1	-0.9		-0.3
Industrial Trade Openness (EOPI)	1	-0.55		-0.5

Note: The error correction and adjustment coefficients model is significant at 1 percent level. All signs attained are negative and compatible with the economic theory.

Source: Compiled by the authors

5. Conclusions

Trade and FDI have been very important areas of research. Hence, large bodies of literature review have enhanced the knowledge on the impact of trade on FDI inflow.

This paper focuses on long-run relations between trade openness and FDI in Sudan at the national and the sectoral levels.

As noted in this paper, the cointegration technique has never been used in previous studies. The Johansson cointegration was applied to the whole sample period of 1990-2017 for both the Sudanese economy as a whole and its sectors. The cointegration analysis indicated that FDI for the overall and sectoral level was mainly driven by the degree of trade openness during the 1990-2017 period.

The results indicated that for the period under study, the FDI for the Sudanese economy and its key sectors has been attracted by trade openness measured either in terms of exports plus imports or export efficiency/ the Ros (2001) index. However, the long-run relationship for the Sudanese economy was estimated to be value of 0.53 by using the conventional measurement, which is in agreement with findings by Seim (2009) and Dunning (2003) who argue that the relationship between trade openness and FDI inflows is complex and can be negative, which depends on the features of each case separately, because the impact of trade openness on FDI inflow may change according to the inspiration for appealing FDI activities. The linear combination of FDI and the degree of trade openness measured by using export index indicate positive values of 0.17, 0.9 and 0.55 for the whole economy, the agricultural sector and the industrial sector, respectively. Furthermore, the degree of trade either being negative or positive supports the widely known view that the resources in Sudan are allocated for non-productive projects.

Appendix 1: **Sudan population size, Trade Openness and FDI structure in USD thousands, 1990-2017**

Year	Population size by (000) (1)	Trade openness (2)	Aggregate FDI (3)	Agricultural FDI (4)	Industrial FDI (5)
1990	26, 066, 123	7.5	6943.0	1223.0	4000.0
1991	26, 666, 061	9.3	7482.5	1142.5	4500.0
1992	27, 303, 051	35.9	17500.4	9037.6	4589.5
1993	27, 970, 525	31.1	18200.8	10380.8	2212.7
1994	28, 656, 671	35.8	43733.4	4761.9	30101.9
1995	29, 352, 022	36.0	63947.8	8796.6	47611.8
1996	30, 058, 483	29.6	78398.8	36825.3	29327.9
1997	30, 777, 679	23.1	115141.0	61861.8	36453.8
1998	31, 499, 341	27.2	149412.5	49322.7	70416.1
1999	32, 210, 343	20.9	130382.1	31114.5	64652.3
2000	32, 902, 415	25.6	116795.0	10312.6	74359.7
2001	33, 568, 336	25.7	104122.5	32988.0	42852.8
2002	34, 213, 147	24.1	150540.0	59634.0	56564.4
2003	34, 855, 802	24.7	352980.7	39099.0	276677.0
2004	35, 522, 988	28.6	191211.7	35014.0	118952.0
2005	36, 409, 188	31.2	313770.8	90784.0	207725.0
2006	37, 318, 188	28.0	48010.4	16689.5	11471.0
2007	38, 280, 987	31.8	221761.2	30368.4	160250.0
2008	38, 998, 903	35.9	495574.9	82885.6	395182.0
2009	39, 998, 200	27.5	288719.4	84590.0	191884.0
2010	38, 221, 210	33.8	303929.5	45796.0	248348.0
2011	36, 997, 100	27.3	451181.0	19471.0	421101.0
2012	35, 100, 200	19.5	214425.1	76211.0	118540.0
2013	34, 250, 213	20.4	176277.2	80082.8	88775.8
2014	35, 450, 340	16.4	179552.1	43190.0	117502.1
2015	36, 560, 789	26.3	196120.5	48749.5	127771.0
2016	36, 765, 216	26.3	170619.8	38858.9	113531.6
2017	33, 554, 575	26.3	170619.8	38858.9	113531.6

Source: (1) was obtained from Central Bank of Sudan; (2), (3), (4) and (5) were obtained from Ministry of Finance and Central Bureau of Statistics, respectively

Appendix 2: **Growth rate of GDP, FDI structure and inflation rate, 1990-2017, %**

Year	Growth rate of aggregate FDI	GDP Growth rate	Growth rate of Agricultural FDI	Growth rate of industrial IFDI	Inflation rate
1990	0.0	-5.5	0.0	0.0	67.4
1991	83.1	7.5	688.2	12.5	123.7
1992	41.6	6.6	344.1	2.0	117.6
1993	-26.6	4.6	-95.2	-51.8	101.3
1994	24.5	1.0	-86.3	-9.3	115.4
1995	-1.6	6.0	104.9	58.2	68.4
1996	22.6	11.6	5.9	-38.4	132.7
1997	46.9	6.1	68.0	24.3	47.7
1998	29.8	8.2	-20.3	93.2	17.1
1999	-12.7	4.2	-36.9	-8.2	16.0
2000	-10.4	8.4	-66.9	15.0	8.0
2001	-10.9	10.8	-0.7	-42.4	4.9
2002	44.6	6.0	80.8	32.0	8.3
2003	13.4	6.3	-34.4	6.9	7.7
2004	-45.8	5.1	-10.4	-57.0	8.5
2005	64.1	5.7	2.1	74.6	8.5
2006	-84.7	9.9	-81.6	-94.5	7.2
2007	8.1	8.1	82.0	1.8	8.1
2008	5.4	7.8	1.4	1.8	14.3
2009	-41.7	6.1	2.1	-51.4	11.2
2010	5.3	5.2	-45.9	29.4	13.0
2011	48.4	1.9	-57.5	69.6	18.1
2012	-52.5	1.4	-1.4	-71.8	35.1
2013	-17.8	4.4	5.1	-25.1	37.1
2014	1.9	3.6	-46.1	32.4	36.9
2015	9.2	5.6	12.9	8.7	41.4
2016	5.5	5.6	31.3	0.5	41.4
2017	5.8	5.6	32.5	0.5	40.4

Source: Authors' calculations based on Appendix 1

Appendix 3: **Imports, exports, manufacturing exports, agricultural exports (%); exports efficiency, agricultural exports efficiency and manufacturing exports efficiency, 1990-2017**

Year	Total imports (1)	Total Exports (2)	Manufacturing exports (3)	Agricultural Exports (4)	Exports efficiency (5)	Efficiency of Agricultural exports (6)	Efficiency of Manufacturing export (7)
1990	5.1	3.1	0.1	2.3	1.6	2.2	1.7
1991	13.4	4.6	0.4	3.3	2.9	4.1	13.4
1992	109.0	42.4	0.1	19.1	2.6	5.7	17.9
1993	204.1	90.1	2.4	48.7	2.3	4.2	0.85
1994	464.6	209.6	39.9	112.0	2.2	4.1	0.12
1995	992.6	465.7	41.6	243.2	2.1	4.1	0.24
1996	2196.4	905.5	221.5	507.6	2.4	4.3	0.10
1997	2704.5	1017.2	312.6	506.2	2.7	5.3	0.09
1998	4561.4	1411.9	482.7	638.7	3.2	7.1	0.09
1999	3646.3	2010.2	354.8	677.1	1.8	5.4	0.10
2000	3996.0	4649.6	80.8	706.1	0.9	5.7	0.49
2001	6015.4	4440.9	75.6	565.3	1.4	10.6	0.80
2002	6401.7	5100.4	61.7	561.2	1.3	11.4	1.04
2003	7497.6	6613.7	47.3	664.9	1.1	11.3	1.59
2004	102013.7	9468.2	58.1	986.3	10.8	103.4	17.56
2005	15577.2	11121.9	62.0	842.2	1.4	18.5	2.51
2006	16254.4	11388.4	56.0	661.1	1.4	24.6	2.90
2007	18012.5	18225.5	60.6	544.4	1.0	33.1	2.97
2008	20423.8	25488.4	83.1	718.5	0.8	28.4	2.46
2009	21720.3	18990.9	41.7	539.9	1.1	40.2	5.21
2010	25154.6	29739.8	46.3	598.3	0.8	42.0	5.43
2011	25363.7	25694.5	86.3	1025.0	1.0	24.7	2.94
2012	32986.3	14532.4	78.4	1256.1	2.3	26.3	4.21
2013	47150.5	22770.4	579.5	4133.1	2.1	11.4	0.81
2014	52677.4	25501.1	1262.1	4324.2	2.1	12.2	0.42
2015	16645.7	9595.5	165.4	835.4	1.7	19.9	1.01
2016	16645.7	9595.5	165.4	835.4	2.1	18.1	3.34
2017	16645.7	9595.5	165.4	835.4	2.1	18.1	3.3

Source: (1), (2), (3) and (4) were obtained from Central Bureau of Statistics and Central Bank of Sudan respectively, while (5), (6) and (7) were calculated by the authors based on Ros (2001)

Since the study found that, there is a long-run equilibrium relationship between trade (joint measurement) and FDI for the economy and its sectors, government policies should focus not only on promoting the level of trade openness in the economy but also on the magnitude of the degree of openness in the agricultural and the industrial sectors. Besides, the industrial sector should be prioritised in order to promote its export efficiency, taking into consideration that it should attract finance to key productive sectors as well as the fact that investment in the industrial sector will improve the country's infrastructure.

References

1. Abd Alla, O. A. Y., Mohamed, A. A. A., Abdelmawla, M. A., & Mudawi, S. K. M. (2015). Evaluation of Foreign Direct Investment Inflow in Sudan: An Empirical Investigation 1990-2013. *Journal of Business Studies Quarterly, 7*(2), 149-168. Retrieved from http://jbsq.org/wp-content/uploads/2015/12/December_2015_10.pdf
2. Asghar, A. (2016). Foreign Direct Investment and Trade Openness: The Case of South Asian Economies. *International Journal of Innovation and Applied Studies 17*(2), 513-517. Retrieved from http://www.ijias.issr-journals.org/abstract.php?article=IJIAS-16-113-01
3. Banerjee, A., Dolado, J. J., Galbraith, J. W., & Hendry, D. (1993). *Co-Integration, Error Correction and Econometric Analysis on Non-Stationary Data.* Oxford University Press.
4. Bior, I. B. D. (2000). *Some Reflections of Economic Liberalization in the Sudan. Discussion Paper 32.* Sudan Economy Research Group, University of Bremen.
5. Busse, M., & Groizard, J. L. (2005). Foreign Direct Investment, Regulations, and Growth. Policy Research Working Paper Series 3882. *The World Bank, Wiley Blackwell, 31*(7), 861-886. Retrieved from http://documents.worldbank.org/curated/en/709031468178144612/pdf/wps3882.pdf
6. Cantah, W. G., Wiafe, E. A., & Adams, A. (2013). *Foreign direct investment and trade policy openness in Sub-Saharan Africa.* MPRA, Munich Personal Re PEc Archive. Retrieved from https://mpra.ub.uni-muenchen.de/58074/1/MPRA_paper_58074.pdf
7. Central Bank of Sudan (2002-2016). *Annual Report.* Retrieved from https://cbos.gov.sd/en/publication-type/annual-reports
8. Central Bureau of Statistics of Sudan (2018). *Official web-site.* Retrieved from http://cbs.gov.sd/index.php/en
9. Cooper, D. R., & Shindler, P. S. (2013). *Business Research Methods* (12th edition). McGraw-Hill Education.
10. Dar, A. A., Muhammad, T., & Mehmood, B. (2016). Is there a relationship between foreign direct investment, human capital, trade openness and economic Growth of Pakistan economy. *Science International (Lahore), 28*(1), 715-719. Retrieved from http://www.academia.edu/22936686/IS_THERE_A_RELATIONSHIP_BETWEEN_FOREIGN_DIRECT_INVESTMENT_HUMAN_CAPITAL_TRADE_OPENNESS_AND_ECONOMIC_GROWTH_OF_PAKISTANI_ECONOMY
11. Dunning, J. H. (1993). *Multinational enterprises and the global economy.* Addison, Wesley, New York.
12. Felipe, J. (1997).Total Factor Productivity Growth in East Asia: A Critical Survey. *Economics and Development Research Center Report Series No. 65.* Asian Development Bank. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.196.6490&rep=rep1&type=pdf
13. Johansen, S. (1991). Estimation and Hypotheses Testing of Cointegration Vector in Causation vector Autoregressive Models. *Econometrica, 59*(6), 1551-1580. doi: https://doi.org/10.2307/2938278
14. Johansen, S., & Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Cointegration - with Applications to The Demand for Money. *Oxford Bulletin of Economics and Statistics, 52*(2), 169-210. doi: https://doi.org/10.1111/j.1468-0084.1990.mp52002003.x
15. Kokko, A., Tansini, R., & Zejan, M. (1996). Local Technological Capability and Spillovers from FDI in the Uruguyan Manufacturing Sector. *Journal of Development Studies, 34*(4), 602-611. doi: https://doi.org/10.1080/00220389608422430
16. Liargovas, P. G., & Skandalis, K. S. (2010). Foreign Direct Investment and Trade openness: The case of developing countries. *Social Indicators Research, 106*(2), 323-331. doi: https://doi.org/10.1007/s11205-011-9806-9
17. Lim, E.-G. (2001). Determinants of, and the Relation Between, Foreign Direct Investment and Growth: A Summary of the Recent Literature. *International Monetary Fund. Working paper No. 01/175.* Retrieved from https://www.imf.org/external/pubs/ft/wp/2001/wp01175.pdf
18. Markusen, J. R., & Maskus, K. E. (2002). Discriminating among alternative theories of the multinational enterprise. *Review of International Economics, 10*(4), 694-707. doi: https://doi.org/10.1111/1467-9396.00359
19. Ministry of Finance and Economic Planning of Sudan (2018). *Official web-site.* Retrieved from http://grss-mof.org
20. Ministry of Investment of Sudan (2018). *Official web-site.* Retrieved from http://www.sudaninvest.org/English/Sudan-Invest.htm
21. Mohammad, Z. R (2011). An Empirical Study on the Relationship between Foreign Investment and International Trade in Bangladesh. International *Journal of Financial Research, 2*(2), 33-39. doi: https://doi.org/10.5430/ijfr.v2n2p33
22. Moosa, I. A., & Cardak, B. A. (2006). The determinants of foreign direct investment: An extreme bounds analysis. *Journal of Multinational Financial Management, 16*(2), 199-211. doi: https://doi.org/10.1016/j.mulfin.2005.07.002
23. Ros, J. (2001). *Development Theory and Economics Growth.* The University of Michigan Press.
24. Sahoo, P. (2006). Foreign Direct Investment in South Asia: Policy, trends, Impact and Determinants. *ADB institute discussion Paper, No. 56.* Retrieved from https://www.adb.org/sites/default/files/publication/156693/adbi-dp56.pdf
25. Seim, L. T. (2009). *FDI and Openness: Differences in Response across Countries.* Chr.Michelsen Institute, Working Paper.
26. United Nations Conference on Trade and Development (2012). *World Investment Report.* Geneva: United Nations Publication. Retrieved from https://unctad.org/en/PublicationsLibrary/wir2012_embargoed_en.pdf
27. World Bank (2000). *World Development Indicators 2000.* Washington, D.C.: World Bank. Retrieved from http://documents.worldbank.org/curated/en/462341468766204683/World-development-indicators-2000
28. World Bank (2005). *World Development Indicators 2005.* Washington, D.C.: World Bank. Retrieved from http://documents.worldbank.org/curated/en/947951468140975423/World-development-indicators-2005
29. World Bank (2009, December). *Sudan - Toward Sustainable and Broad-Based Growth.* Report No. 52514-SD. Poverty Reduction and Economic Management Unit, Africa Region. Retrieved from https://openknowledge.worldbank.org/handle/10986/3169

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