

## **Impact of Foreign Direct Investment on Domestic Investment in Sudan: “Giving Hope Hypothesis”**

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To interpret the role that FDI plays in promoting domestic investment, this paper proposes and provides an empirical test for “giving hope hypothesis”. The postulated hypothesis states that, along with its widely recognized contributions in augmenting domestic investment in recipient countries, the presence of FDI could also increase growth in domestic investments by giving hope in domestic business environment. To validate this hypothesis, the paper utilizes time series data on Sudan covering the period from 1980 to 2013. The empirical analysis is performed using co-integration and error correction vector (VECM) econometric techniques. The findings indicate the existence of a complementary relationship between FDI and domestic investment in Sudan, supporting the argument of giving hope hypothesis. Moreover, and as expected, the rest of the variables included in the analysis have displayed the anticipated signs.

**Key words:** Sudan, Co-integration, Domestic investment, FDI

### **1. Introduction**

The relationship between foreign direct investment (FDI) and domestic investment often represents a focal point for a huge number of studies. It has been argued in the existing literature that FDI inflows positively influences economic growth and promotes domestic investment through modern technologies diffusion, human capital formation, strengthening back and forward linkages between Multinational Corporations (MNCs) and domestic firms in recipient countries’ underdeveloped sectors. Furthermore FDI has a potentiality to equip workers with managerial skills and connects local industries with foreign markets, etc. Though, a section of literature doesn’t find empirical support for this contention i.e. there is an opposed belief that the expansion in FDI could possibly impede

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domestic investments, rather than promoting them. According to this argument, the presence of FDI in a certain country is likely to seize the domestic markets in which domestic infant industries sell their immature products and, therefore, stop them from acquiring benefits resulting from economies of scales. Moreover, since FDI usually pays higher prices for local inputs, transplanting new FDI projects would raise the costs of production of the local firms and, as a consequence, restrict their ability to expand.

In sum, these debatable views on the relationship between FDI and domestic investment have been professed in the so-called the crowding out and the crowding in hypotheses. Compatible with these conflicting hypotheses, the available empirical literature provides contrasting outcomes. Some studies, for instance, have supported the existence of a complementary relationship between FDI and domestic investment, while others do not. Owing to this disagreeing evidence, the attitudes of recipient countries towards hosting FDI has also become largely varying in accordance to policymakers' recognition to the impact that FDI could have on domestic firms.

Sudan, like other developing countries, is extremely undercapitalized and lacks sources of capital. The domestic savings of the country are far less than to cover the amounts of capital needed to put the economy on the track of sustainable economic growth. It is worth mentioning that the heavy reliance on agriculture, the failure to channel domestic savings into financial institutions and the dominance of customs that encourage luxurious consumption have also contributed in widening the gap between the capital needed by the country and domestic savings. Therefore, new sources of capital need to be attempted so as to supplement these insufficient domestic savings. However, due to unfeasibility of other capital sources (i.e. borrowing, aid and portfolio investment etc.), hosting larger amounts of foreign businesses in the form of FDI becomes representing one of the possible alternatives to fill this capital gap. Recently, after exploiting oil in commercial quantities, many MNCs have competed to establish businesses in Sudan. Consequently, all FDI measurements have seen significant increases. However, the stylized facts pertaining to Sudan economy reveal that domestic investments remain, to a large extent, stagnant and don't grow at speed that consistent with that of FDI. This unsatisfactory outcome in the performance of domestic businesses, combined with controversial theoretical and empirical

literature, makes the question about the impact of FDI on domestic investment in Sudan as one of the most pressing puzzles that need urgent answers. Thus, with these issues in mind, this paper endeavors to analyze the probable influence of FDI on domestic investment in Sudan by utilizing co-integration and vector error correction model (VECM) econometric techniques. Specifically, the study follows the lead of Feldstein (1994), Sun (1998), Lipsey (2000), and Agosin and Mayer (2000) by constructing an empirical model in which FDI has been introduced as one of the predictors for domestic investment in the country. The study is basically driven by the concern that the findings from cross-countries studies are powerless in detecting the nature of the relationship between foreign and domestic investments in each single country. Furthermore, the paper argues that, other than its well documented contributions in augmenting growth of domestic firms, FDI in a country like Sudan has a potentiality to promote domestic investments via tracking hope to domestic investors.

In our opinion, this paper makes several contributions to the existing literature on FDI in general, and to the limited body of evidence concerned with the impact of the FDI on Sudan economy in particular. First, Sudan has a long history in hosting FDI. However, to the best of the author's knowledge there is no a concrete evidence to provide policymakers with accurate information regarding the relationship between FDI and domestic investment. Second, in a country like Sudan, the growth of domestic investments represents one of the alternatives on which the nation depends on to achieve the desired economic transformations. This is because the country is well endowed with natural resources that their exploitation is largely depends on the availability of capital of which FDI represents one of its crucial sources. Finally, Sudan is similar to many developing countries in terms of economic and social characteristics. Accordingly, this study would serve as a mirror that reflecting the correct impact of FDI on domestic investment in these countries.

The rest of this paper proceeds as follows: Section 2 presents a brief overview on FDI in Sudan by emphasizing its potential relationship with domestic investments. Section 3 reviews the related literature. Section 4 constructs the empirical model, while Section 5 discusses methodology, variables and data used. Section 6 introduces empirical results and finally, the conclusion and policy implications are presented in Section 7.

## **2. The patterns of domestic and foreign investments in Sudan**

In order to get the right picture on the relationship between foreign and domestic investments, it is imperative to glance back at the stylized facts on the FDI and its interactions with domestic investment in Sudan. Table 1 sketches the routes of gross capital formation (GKF) and gross fixed capital formation (GFKF), gross domestic saving (GDS) and FDI as percentages of GDP in Sudan during 1976-2012. As seen in the table, GFKF, GKF and GDS (% of GDP) were almost stagnant over the period from 1976 to 1980. Specifically, GKF (% of GDP) and GFKF (% of GDP) recorded an annual average of 21.16% and 22.04% for GFKF and 27.01% and 25.74% for GKF during the periods of 2001-2005 and 2006-2010, respectively. Putting things together, during that period, the patterns of FDI (% of GDP) did not diverge from that of capital indicators. Precisely, FDI (% of GDP) decreased from an annual average of 0.19% during 1981-1985 to -0.08% during 1986-1990. These facts indicate that over the 1980s, Sudan was not fitted to attract significant amounts of FDI compared to its economic size. Undoubtedly, this disappointing image was corrected after the country had adopted the privatization policies at the beginning of 1990's. Due to the implementation of this policy, FDI (% of GDP) moved up to an annual average of 0.18% during the first half of the 1990s and climbed further to its peak at 5.19% during 2001-2005. In the same vein, the ratio of domestic savings (GDS) to GDP was also negligible during 1970s and 1980s. As conveyed in Table 1, GDS (% of GDP) registered an annual average of 6.71% and 3.53% during 1976 - 1980 and 1981-1985, respectively. However, by the advent of the privatization policy, its annual average increased significantly from 11.55% during 1991-1995 to 23.28% during 2001-2005, to 24.66% in 2006-2010. Table 1 also displays domestic savings (GDS) as ratios to both GKF and GFKF together with FDI as a ratio to GFKF.

**Table 1:** Domestic capital formation, gross domestic saving and FDI in Sudan (1976-2012)

(1) Year	(2) GFKF/ (GDP) (%)	(3) GKF/ (GDP) (%)	(4) GDS/ (GDP) (%)	(5) FDI/ (GDP) (%)	(6) GDS/ (GKF) (%)	(7) GDS/ (GFKF ) (%)	(8) FDI/ (GFKF ) (%)
1976-1980	12.17	15.60	6.71	0.11	42	53	0.80
1981-1985	14.41	14.19	3.53	0.19	24	24	1.12
1986-1990	10.23	10.03	6.03	-0.08	49	54	-0.21
1991-1995	10.86	17.68	11.55	0.18	64	112	1.89
1996-2000	12.02	17.58	11.47	2.16	59	89	15.6
2001-2005	21.16	27.01	23.28	5.19	86	111	32.9
2006-2010	22.04	25.74	24.66	4.46	97	113	23.4
2011-2012	19.40	21.64	17.26	4.00	81	90	20.2
1976-2012	14.95	18.44	12.72	1.87	61	80	11.1

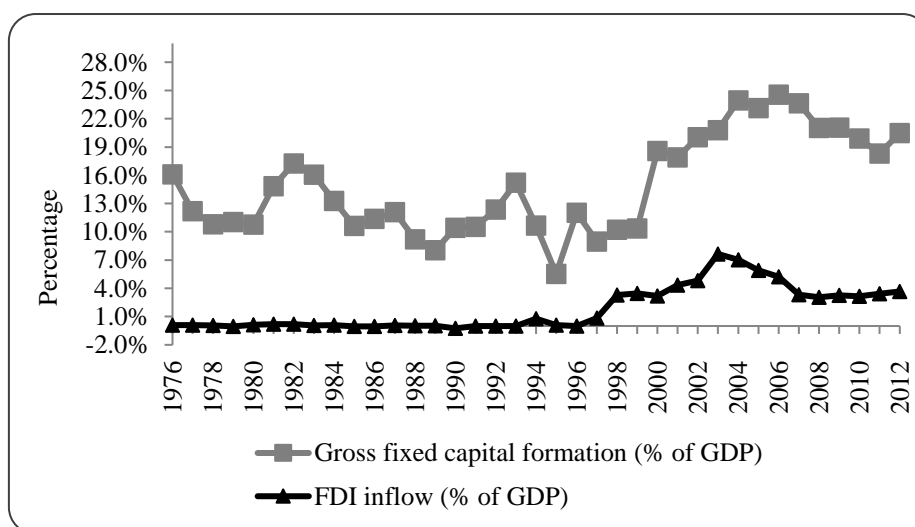
Sources: WB, *World Bank Indicators*, (2014) & UNCTAD, (2014)

From the figures displayed, it can be indicated that during 1976-1980, GDS was far less than to provide fund for domestic investments. Domestic savings covered only 42% from fund needed by investment sector ( $GDS/GKF = 42\%$ ). Moreover, the ratios of GDS to both GFKF and GKF contracted, respectively, from an annual average of 42% and 53% during 1976-1980 to 24% during 1981-1985 (see columns 6 and 7). This indicates that the gaps between domestic savings and both measures of capital formation have widened from -48 % (42-100) and -47% (53-100) during 1976-1980 to -76% (24-100) during 1981-1985. Interestingly, as can be observed in the table, FDI responded positively in filling the reduction in domestic savings during that period. This conclusion can be vindicated by the fact that GDS (% GFKF) increased from an annual average of 0.80% in 1976-1980 to 1.12% in 1981-1985. However, after the 1990s period, the gap between domestic savings and capital indicators began to narrow. As figures in columns 6 and 7 demonstrate, GDS/GKF and GDS/GFKF decreased, respectively, from an annual average of -41% (59-100) and -11% (89-100) during 1996-2000 to an annual average of -14% (86-100) and +11% during 2001-2005. Also, in the 1970s the picture was more dramatic when FDI inflows are compared with indicators of domestic capital. As Table 1 shows, FDI as a portion of GFKF were counted for an annual average of 0.80%, 1.1% and -0.21% during 1976-1980, 1981-1985 and 1986-1990, respectively. However, due to the

adoption of the privatization policy, this ratio improved sharply after the mid of the 1990s and onwards, registering an annual average of 1.89% during 1991-1995. These impressive increases were even more remarkable, reaching 15.6%, 32.9% and 23.4% during 1996-2000, 2001-2005 and 2006-2010, respectively.

To make the picture clear, Figure 1 illustrates the pathway of FDI and fixed capital formation (% GDP) in Sudan throughout 1976 - 2013. As can be observed, the fixed capital formation (% GDP) was relatively stagnant over the 1970s and the 1980s. In the second half of the 1990s, however, FDI inflows and gross fixed capital formation (both as percentages of GDP) rose dramatically compared to 1970s and 1990s. This might support the argument that FDI presence in Sudan encourages growth in domestic investments.

**Figure 1:** Gross fixed capital formation (% of GDP) and FDI flow (% of GDP) in Sudan (1976-2013)



Source: UNCTAD (2014)

On the whole, it can be inferred that both gross domestic capital and gross fixed capital formation in Sudan have, to some extent, positively influenced by FDI. However, concluding that FDI has a complementary relationship with domestic businesses based on the above descriptive facts

would provide uncertain conclusion. Therefore, the modern econometric techniques need to be utilized to ascertain this relationship.

### **3. Literature review**

Researchers paid a great attention to the impact of FDI on domestic investment. Yet, those researchers did not come to a solid agreement regarding the nature and magnitudes of this impact. A large body of literature, for instance, confirms the positive role of FDI in stimulating growth in domestic investment, while, in contrast, there are countless empirical evidence of the view that the opposite is true. That is FDI presence has a possibility to exercise a crowding-in effects on domestic firms in recipient countries. Regardless of optimistic or pessimistic views, the literature proposes several channels through which FDI impact could be conveyed to domestic firms. First, FDI possesses a potentiality to create backward and forward linkages with domestic firms and, thus, boosting growth in domestic investment beyond the levels have been maintained before its entry (Van Loo, 1977; Lall, 1980; Martin S. Feldstein, 1995; Chen et al., 1995; Rodriguez, 1996; Markusen and Venables, 1999; Aitken and Harrison, 1999; Blomstrom et al., 1999; Agosin and Mayer, 2000 (cited by Quader, 2009); Lin and Saggi, 2004, and Isabel Faeth, 2006). The second possible channel through which FDI effect can be trickled to domestic sectors is embodied in the so-called the horizontal (intra-firm) and vertical (inter-industry) spillover effects (Borensztein E. et al., 1998; Hejazi and Safarian, 1999; Djankov and Hoekman, 2000, and Lin and Zhang, 2009). Third, the influence of FDI on domestic investment can be also viewed from market structure perspective as the presence of foreign firms causes changes in the levels of competition in domestic markets. According to the argument of market stealing hypothesis, which represents the core argument of market structure, the crowding-in effects occur if and only if MNCs construct new investments in downstream or upstream production that cannot take place in their absence (Caves, 1971; Jansen, 1995; De Mello, 1999; Apergis et al., 2006, and Sala and Trivin, 2014).

Summing up, the existing literature agreed that the probable impact of FDI on domestic investment can be mostly materialized through the physical contributions. Nevertheless, this literature has turned a blind eye to the psychological effects that could be diffused by FDI presence. That is to say FDI has a potentiality to encourage domestic investors to conduct new businesses, giving birth to further expansion in domestic firms.

Therefore, with this consideration in mind, this study proposes that the positive impact of FDI on domestic investment can also be channeled through psychological effects. This channel can be assembled in the hope, inspiration and enthusiasm that FDI gives to domestic investors by assuring that the national economy is promising and deserve launching new business ventures. This motivation to conduct new businesses can be stated in what is this study calls: “giving hope hypothesis”.

### **3.1 Giving hope hypothesis**

As stated above, there is a wide range of disagreements in the evidence on the probable relationship between FDI and domestic investments in recipient countries. Against these questionable outcomes, this paper seeks to investigate this debatable issue in the context of Sudanese business environment. The paper argues that in a country like Sudan, it is reasonable to think about the relationship between FDI and domestic investment in a manner and context that differ from attempts done for other countries. Alternatively stated, the paper proposes that the ambiguous results obtained by previous studies might be caused by ignoring the subjective sides of investment decisions. In this regard, the study suggests that FDI presence in Sudan will possibly elevate native investors' confidence in domestic business environment and, therefore, triggers expansions in domestic firms. It is well known that Sudan has been characterized by prolonged political instability, wars, ethnic tensions and vulnerability in international relations. These impediments block FDI entry and discourage domestic investments by local investors. This is what can be usually expected in the presence of such unfriendly business environment for potential domestic investment in general and FDI in particular. However, as discussed before, the stylized facts on Sudan reveal that both domestic and foreign investments have seen significant increases in spite of all these difficulties. Therefore, two questions may emerge here: (1) why does domestic investment expand in such unfriendly environment? (2) Does FDI stimulate native investors to increase investment spending? Providing accurate answers for these two questions is not an easy task in the light of the deficiencies in data needed to conduct a reliable empirical investigation. However, a precise motivation for the occurrence of a complementary relationship between FDI and domestic investment in Sudan can be advocated. Explicitly, this study argues that, along with its potential positive impacts on domestic firms, FDI can also



encourage growth in domestic investments through what can be called "giving hope hypothesis".

The proposed hypothesis states that the presence of FDI, especially in an unfriendly business environment such as that prevailing in Sudan, will give a hope to local investors to execute new investments. In other words, seeing foreigners who come cross political, social and economic borders to run businesses with a full hope in acquiring profits in the future will motivate native businesses to compete for getting share in the national economic pie. Furthermore, it could be argued that as a result of FDI presence, the capital flight undertaken by native investors is likely to stop and instead, a wide range of domestic investments will emerge. Definitely, this can intensify the benefits arising from agglomeration effects and, thus, restoring growth in domestic investments.

#### 4. The model

To predict the level of domestic investment in Sudan and to test for giving hope hypothesis, the paper pursues the lead of Lipsey (2000), Sun (1998) and Agosin and Mayar (2000) by building a general model in which most of the variables included are vindicated by economic theory. According to those scholars, the domestic investment function in which FDI is used as an explanatory variable can be depicted in the following identity:

$$I_t = I_{d,t} + I_{f,t} \quad 4.1$$

$$I_{f,t} = FDI \quad 4.2$$

Where  $I$  represents total investment,  $I_d$  is domestic investment,  $I_f$  is investment conducted by foreign investors and  $t$  represents time. According to Agosin and Mayar (2000), domestic investment is represented by the stock adjustment variable that acts in response to the difference between the anticipated (desired) capital stock ( $K^*_d$ ) and the actual capital stock ( $K_d$ ). Hence, the basic investment model takes the following form:

$$I_{d,t} = \lambda(K^*_{d,t} - K_{d,t}) \quad 4.3$$

Where  $\lambda$  represents the coefficient of adjustment to the difference between the two types of investments.

In the model tackled by this study, the stock of capital depends on GDP growth ( $GDPG$ ), domestic credit ( $CRD$ ), real exchange rate ( $REXR$ ),

inflation rate ( $INF$ ), and trade openness ( $OPEN$ ). These variables enter domestic investment function as follows:

$$K^*_{d,t} = \psi_0 + \psi_1 GDPG_t + \psi_2 CRD_t + \psi_3 REXR_t + \psi_4 OPEN_t + \psi_5 INF_t \quad 4.4$$

Now let us consider the law of motion of the capital stock:

$$K_{d,t} = (1 - \delta)K_{d,t-1} + I_{d,t-1} \quad 4.5$$

Where  $\delta$  denotes the rate of annual depreciation in domestic capital. By plugging 4.4 and 4.5 into 4.3 yields:

$$I_{d,t} = \lambda(\psi_0 + \psi_1 GDPG_t + \psi_2 CRD_t + \psi_3 REXR_t + \psi_4 OPEN_t + \psi_5 INF_t - ((1 - \delta)K_{d,t-1} + I_{d,t-1})) \quad 4.6$$

$$I_{d,t} = \lambda\psi_0 + \lambda\psi_1 GDPG_t + \lambda\psi_2 CRD_t + \lambda\psi_3 REXR_t + \lambda\psi_4 OPEN_t + \lambda\psi_5 INF_t - \lambda((1 - \delta)K_{d,t-1} + I_{d,t-1}) \quad 4.7$$

$$I_{d,t} = \beta_0 + \beta_1 GDPG_t + \beta_2 CRD_t + \beta_3 REXR_t + \beta_4 OPEN_t + \beta_5 INF_t + I_{d,t-1} \quad 4.8$$

Where  $\beta_0 = \lambda(1 - \delta)K_{d,t-1}$ ,  $\beta_2 = \lambda\psi_2$ ,  $\beta_3 = \lambda\psi_3$ ,  $\beta_4 = \lambda\psi_4$  and  $\beta_5 = \lambda\psi_5$

By substituting 4.2 and 4.8 into 4.1 (i.e. adding FDI to domestic investment model it will be transformed into total investment model) and taking the log will produce the following:

$$\log DI_t = \beta_0 + \beta_1 GDPG_t + \beta_2 CRD_t + \beta_3 \log RFDI_t + \beta_4 REXR_t + \beta_5 OPEN_t + \beta_6 INFL_t + \beta_7 PRIV_t + \varepsilon_{8t} \quad 4.9$$

Where  $\log DI_t$  is the natural logarithm of domestic investment; the subscript  $t$  represents time; the intercept value  $\beta_0$  represents the expected value of domestic investment when each predictor is zero and  $PRIV_t$  is a dummy variable employed to deliver the impact of adopting privatization policy on domestic businesses. It takes a value of 1 for the year 1992 and onward and 0 otherwise. The error term, which is supposed to be normally distributed, is denoted by  $\varepsilon_{8t}$ . The rest of the variables remained as defined before. The  $\beta$  is  $1 \times K$  vector of unknown parameters

( $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$  and  $\beta_7$ ) are the coefficients to be estimated. The log-log measurement is employed for variables in level in order to reveal the elasticity of the dependent variable with respect to each of the variable on the right hand side.

It is worth to mention that GDP growth has been included in the model to account for the so-called the principle of accelerator effect. According to this principle, changes in GDP are expected to induce changes in investment, but at more rapid rates than the rates of increases in GDP. Thus, the coefficient which conveys the effect of GDP growth on domestic investment ( $GDPG_t$ ) is expected to carry a positive sign ( $\beta_1 > 0$ ). Also, the model incorporates the effect of domestic credit availability on domestic investment. A financial system that supplies a credit at lower interest rates is predicted to promote domestic capital since the high accessibility to credit stimulates growth in domestic firms. Accordingly, the sign of domestic credit variable ( $CRD_t$ ) is anticipated to be positive ( $\beta_2 > 0$ ).

Turning to the variable of interest, the FDI stock, the empirical literature did not come to a complete consensus about the relationship between domestic investment and FDI. Thus, the impact of FDI on domestic investment remains indeterminate ( $\beta_3 = ?$ ). However, and as discussed before, FDI may influence domestic investment in a different manner than that described in previous literature. Specifically, FDI may stimulate native investors who were previously hesitated, due to the vulnerability of business environment, to run new businesses based on the argument of "Giving hope hypothesis". According to this hypothesis, the presence of FDI in a certain country, particularly the most disturbed and politically unstable one like Sudan, would trigger growth in domestic investments. The hypothesis argues that the positive effect of FDI on domestic investment is likely to occur due to many reasons, including the psychological assurance imposed by the presence of foreign firms, stopping capital flight from recipient countries and agglomeration effects. Therefore, a positive sign for the coefficient associated with FDI variable can be projected ( $\beta_3 > 0$ ). In the same vein, since the level of domestic investment is highly affected by the price of intermediate imports through its direct effect on firms' profitability, real exchange rate is included as a proxy for the price of non-tradable goods in relation to imports (Fry, 1993). Thus, considering the volatility of exchange rate in Sudan, any

depreciation in real exchange rates is likely to be negatively correlated with domestic investment ( $\beta_4 < 0$ ).

Additionally, this paper extends previous models by including trade openness and inflation rate in domestic investment function. For a variety of reasons, the connection between these two variables and domestic investment is quite evident. Based on the argument of free trade proponents, increases in exports represent a key factor in elevating economic growth. Therefore, domestic investment is anticipated to be an increasing function in trade openness ( $\beta_5 > 0$ ). Likewise, a high inflation rate affects the cost of finance in the economy. Hence, the unpredictable rates of inflation are likely to exert a strong disincentive effect on domestic investors. In contrast, the high inflation rates may stand as an indication that government spends more on infrastructures and, thus, contributes in intensifying investments. Accordingly, the aggregate effect of inflation rate remains undecided ( $\beta_6 = ?$ ). The privatization, which indicates the increase of private sector share in GDP, is also considered a crucial factor in shaping the path of domestic investment. The initiation of such policy can possibly enhance the levels of accountability in business environment by decreasing the role of public sector. Being a transfer of public capital to private sector, privatization acts as an obvious signal for domestic and foreign investors that the country is committed to the private ownership. Accordingly, the anticipated sign of the dummy variable conveying the effect of privatization policy is likely to be positive ( $\beta_7 > 0$ ).

## 5. Econometric procedures

To make the objectives of this study achievable, the empirical analysis adopted co-integration and VECM econometric techniques. The estimation procedures begin with testing for the presence of unit roots in the data used. Two popular tests for the unit roots are applied: Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) tests. Accordingly, if the variables are found to be integrated of order one  $I(1)$ , then the next step is to make sure whether they are co-integrated or not. This step will be carried out by using Johansen's co-integration procedures (Johansen, 1988 and Johansen & Juselius, 1992). Following this step, if the co-integration relationships are detected among variables, the study goes forward to estimate the long run relationships in VECM framework after adding an error correction term to correct for the short run deviations from the outcomes of long run. Based on this methodological procedure, the

VECM that is appropriate to the variables incorporated in the model illustrated by equation 4.9 can be written as follows:

$$\begin{aligned} \Delta \log DI_t = & \psi_{01} + \sum_{i=1}^n \psi_{11} \Delta GDPG_{t-1} + \sum_{i=1}^n \psi_{12} \Delta CRD_{t-1} \\ & + \sum_{i=0}^n \psi_{13} \Delta \log RFDI_{t-1} + \sum_{i=0}^n \psi_{14} \Delta REXR_{t-1} \\ & + \sum_{i=0}^n \psi_{15} \Delta OPEN_{t-1} + \sum_{i=0}^n \psi_{16} \Delta INF_{t-1} + \psi_{17} PRIV_t \\ & + \delta_{11} ECT_{t-1} + \mu_{1t} \end{aligned} \quad (5.1)$$

Where  $\psi_{0i}$  represents the constant growth in each independent variable,  $\mu_{1t}$  are the white noise disturbance terms with mean zero and finite covariance,  $t$  denotes years,  $n$  is the lag order,  $\Delta$  is the first difference operator required to induce stationarity for corresponding variable in the system, and the estimated coefficients of  $\psi_{ji}$  represent the short-run causality between the variables under consideration.  $ECT_{t-1}$  represents the error correction term lagged one period, whereas the coefficients  $\delta_{ji}$ , measure the long run causality relationships in the co-integration framework ( $-1 < \delta < 0$ ).

It is worth to mention that the error correction coefficient is very decisive in error correction model estimation because the greater coefficient represents a higher speed of adjustment towards the long-run equilibrium. Additionally, if  $(\delta_{11})$  is statistically significant in equation (5.1) but not significant in the other equations of the system, it means that  $GDPG_t, RFDI_t, CRD_t, EXR_t, OPEN_t, INF_t, and PRIV_t$  are granger cause domestic investment in Sudan ( $DI_t$ ). If the opposite takes place for any of the predictors variables, it means that the predictors variables among them is  $DI_t$  granger cause that variable. However, since the main purpose of this study is to identify whether FDI has a positive impact on domestic investment or not, the concern is directed to unidirectional relationship that run from FDI to domestic investment. This choice is driven by the aim to test the validity of giving hope hypothesis as proposed by this paper.

## 5.1 The data

Annual data spanning from 1980 to 2013 has been used to estimate the model under consideration. Part of this data is sourced from world development indicators (WDI) released by World Bank (2014). In addition, the basic source of data on FDI is the statistics published by United Nation Conference on Trade and development (UNCTAD). All monetary variables are converted to constant prices. The description of the variables and data sources is summarized in Table 2.

**Table 2:** Summary of variables' description and data sources

Variable	Description	Period	Source
DI	Real gross fixed capital formation	1980-2013	World Bank
GDPG	GDP growth	1980-2013	World Bank
CRD	Domestic credit	1980-2013	World Bank
REXR	Real exchange rate	1980-2013	World Bank
INF	Inflation rate	1980-2013	World Bank
OPEN	The sum of exports and imports (% of GDP)	1980-2013	World Bank
RFDI	Real foreign direct investment stock	1980-2013	UNCTAD

## 6 The empirical results

### 6.1 Testing the order of integration

The results reported in Table 3 are based on the ADF and PP unit roots tests for all variables included in the model under investigation. On the whole, the tests indicate that the null hypothesis, the series in their levels contain unit roots, with an intercept but without trend, cannot be rejected with exception of GDP growth (GDPG) and real exchange rate (REXR) series. This outcome implies that the rest of the series are all nonstationary. However, after differencing the data once, the tests statistics reject the null hypothesis for all series. Specifically, the results of the ADF and PP tests suggest that all variables are I(1) at level and log level but I(0) at first difference.

The existence of unit roots emphasizes the presence of non-stationarity in the variables and, consequently, legitimates the use of variables' first differences in estimating the model. However, the series that are integrated in the same order are likely to cointegrate in the long run. Thus, the Johansen-Juselius procedure of multivariate cointegration has been

justifiably used to determine the existence of the long run relationships between these series.

**Table 3:** Summary of ADF and PP unit roots tests for variables at both levels and first differences:

ADF test			PP test		
Variables	Test-Statistic		Variables	Test-Statistic	
	With intercept but without trend	With intercept and trend		With intercept but without trend	With intercept and trend
Log DI	-0.542	-2.629	Log DI	-0.299	-2.613
GDPG	-4.331***	-4.277***	GDPG	-4.345***	-4.281***
CRD	-1.634	-0.605	CRD	-1.465	-1.012
Log RFDI	-2.939	-2.525	Log RFDI	-1.586	-0.961
REXR	-2.984**	-2.917	REXR	-3.004**	-2.934
OPEN	-1.471	-1.609	OPEN	-1.666	-1.817
INF	-2.199	-2.298	INF	-2.253	-2.313
First difference			First difference		
$\Delta$ Log DI	-6.629***	-6.596***	$\Delta$ Log DI	-6.897***	-7.192***
$\Delta$ GDPG	-7.537***	-7.438***	$\Delta$ GDPG	-10.90***	-11.14***
$\Delta$ CRD	-8.245***	-8.521***	$\Delta$ CRD	-8.225***	-8.521***
$\Delta$ Log RFDI	-2.599	-3.066	$\Delta$ LogRFDI	-2.601*	-3.016*
$\Delta$ REXR	-6.975***	-6.923***	$\Delta$ REXR	-8.090***	-9.258***
$\Delta$ OPEN	-5.506***	-5.370***	$\Delta$ OPEN	-5.600***	-5.481***
$\Delta$ INF	-8.133***	-8.047***	$\Delta$ INF	-7.968***	-7.905***

Note:  $\Delta$  denotes first difference operator. \*\*\*, \*\*, \* denotes the rejection of null hypothesis of unit root at the 1%, 5% and 10% significance levels, respectively.

## 6.2 Co-integration test results

After verifying that all variables are integrated of order one, the data series are further examined by using the Johansen and Juselius (1990) co-integration test. Both the trace ( $\lambda_{trace}$ ) and maximum eigenvalue ( $\lambda_{max}$ ) tests statistics are used to determine the presence as well as the number of co-integration relationships among variables. However, before conducting co-integration test, it is necessary to determine the appropriate lag length to be used. Six lag selection criteria have been used to identify the suitable lag length. Table 4 displays the lag length each criterion suggests. As can be seen, the used criteria suggest setting a lag length at 1. In the next step, the multivariate co-integration techniques are applied to detect the number of co-integrating vectors which bind the variables together.

**Table 4:** Lag Selection Criterion Tests

Lag length test	LogL	LR	FBE	AIC	SC	HQ
0	-486.76	NA	92416.0	31.298	31.93	31.510
1	-354.95	189.48*	581.63*	26.121*	29.007*	27.078*

Note: \* indicates lag order selected by the criterion, (each test at 5% level).

The results for co-integration tests are reported in Table 5. These results suggest that the trace ( $\lambda_{trace}$ ) test statistics rejects the null hypothesis for  $r = 0$  at five percent level of significance. In particular, the hypothesis that  $r = 0$  is rejected as the computed value of trace test statistic (298.2187) is greater than the critical value (125.6154). Similarly, the null hypotheses that  $r = 1, r = 2, r = 3, r = 4, r = 5, r = 5, r = 6, r = 7$  are also rejected. In the same way, the null hypotheses that  $r = 0, r = 1, r = 2, r = 3, r = 4$  are also rejected by the maximum eigenvalue ( $\lambda_{max}$ ) test as the computed values of the test statistic are greater than the critical values for the number of vectors suggested.

**Table 5:** Johansen tests for the number of co integrating (1980-2013)

Results of Trace co integration test				Results of the Maximum Eigenvalue test			
H <sub>0</sub>	H <sub>1</sub>	Test Stat.	5%	H <sub>0</sub>	H <sub>1</sub>	Test Stat.	5%
r = 0	r = 1*	298.2	125.6	r = 0	r = 1*	104.5	46.2
r <= 1	r = 2*	193.6	95.7	r <= 1	r = 2*	79.2	40.0
r <= 2	r = 3*	114.3	69.8	r <= 2	r = 3*	43.8	33.8
r <= 3	r = 4*	70.59	47.8	r <= 3	r = 4*	34.7	27.5
r <= 4	r = 5*	35.79	29.7	r <= 4	r = 5*	16.9	21.1
r <= 5	r = 6*	18.88	15.4	r <= 5	r = 6	10.6	14.2
r <= 6	r = 7*	8.196	3.8	r <= 6	r = 7	8.1	3.8

Note: \* denotes rejection of the hypothesis at the 0.05 level; Trace and Maximum eigenvalue tests indicate 7 and 4 co integrating equations at the 0.05 level, respectively

On the whole, the results of trace tests indicate that there are seven co-integrating vectors in the system in which the privatization has been treated as an exogenous variable. In contrast, the maximum eigenvalue test, the more influential test in small samples, suggests the existence of only 4 co-integrating vectors. This highlights an important point that the results of maximum eigenvalue and trace tests can disagree and, therefore, provide an evidence for different number of cointegrating vectors. In this



case, as Enders (1995) suggests, the maximum eigenvalue test is preferable since it has a precise alternative hypothesis. Accordingly, it can be concluded that there are at least 4 co-integrating relationships in the system.

### 6.3 VECM model results

After having verified the co-integration relationships among variables, the VECM is applied to determine the long run and the short run relationships between these variables. Table 6 summarizes the results pertaining to Johansen and Juselius (1990) long run normalization outcomes. As can be read from the table, the majority of variables coefficients are accompanied with theoretically expected signs. For instance, the coefficient of FDI (RFDI), the variable of interest, is positive and statistically significant (t-ratio = 4.98212). This result suggests the crucial contributions of FDI in promoting domestic investments in Sudan. That is, with other things being equal, an increase in FDI stock by a one percent will correspond to, approximately, a 0.16 percent rise in domestic investment in the long run. This result confirms that investment by MNCs complements domestic investment in Sudan during the period studied. Furthermore, in the light of inhospitable business environment, such result demonstrates the validity of giving hope hypothesis. In line with accelerator principle, increases in GDP growth rates are found to be positively correlated with domestic investment. The variable has a positive and significant effects (t-ratio = 3.89732) on the dependent variable with estimated coefficient of 0.013285. Moreover, it is interesting to observe that the FDI, compared the GDP growth, has a larger elasticity with respect to domestic investment. Specifically, a one percent increase in GDPG boosts domestic investment by, approximately, 0.01 percent while, a one percent increases in RFDI elevates domestic investment by 0.16 percent.

Surprisingly, the results reveal that the availability of domestic credit (CRD) has no long run impact on domestic investment. However, this insignificant outcome can be justified based on many reasons. First, the size of credit offered by Sudanese banks is limited and mainly concentrated in trading activities. In other words, domestic banks are mostly restrict fund to businesses characterized by quick and secured returns and at the same time avoid granting loans to the long terms investments. Second, the majority of banks loans are devoted to consumption purposes. A related conclusion is that due to the exploitation

of oil in commercial quantities, Sudan economy has undergone through huge transformations in consumption patterns. Therefore, driven by these developments, a significant portion of credit granted by domestic banks has been directed mainly to satisfy consumption from luxurious goods.

**Table 6:** Long-run co integrating equation

Dependent variable: $\Delta \text{Log}(\text{DI})$				
Variable	Coefficient	t-statistic	Standard Error	P-value
Intercept	16.87			
GDPG(-1)	0.013***	[3.897]	(0.003)	0.0003
CRD(-1)	-0.004	[-0.534]	(0.008)	0.2989
LogRFDI(-1)	0.158***	[4.982]	(0.031)	0.0007
REXR(-1)	-0.180***	[-13.24]	(0.013)	0.0000
INF(-1)	-0.010***	[-20.96]	(0.000)	0.0000
OPEN(-1)	0.011***	[3.941]	(0.002)	0.0002

. Note: \*\*\*, \*\*, and \* indicate significance at the 1, 5 and 10 percent levels, respectively

As expected, the long run coefficient on trade openness variable (OPEN) is found to be positive and statistically significant at 1 percent level, indicating that increases in trade openness stimulate growth in domestic firms. Keeping everything else constant, a one percent increase in the degree of trade openness will generate 0.01 percent increases in domestic businesses. In contrast, the reported results show a negative long run co-integrating relationship between real exchange rate (REXR) and domestic investment. The coefficient of the variable is negative and statistically significant. This negative and significant effect may attributed, in part, to the fact that the imports from both capital and intermediate goods become more expensive for domestic investors due to the deteriorated value of local currency. The results also show that the long run relationship between domestic investment and inflation rate (INF), as an indicator for financial risk and macroeconomic instability, is negative. The coefficient associated with the variable is large and statistically significant (t-ratio = -20.9630), demonstrating that the occurrence of inflationary pressures exercises adversative influences on domestic firms. In particular, a one percent increase in inflation rate reduces domestic investments by a 1.0% percent (0.010707), given that all else is same. This result agrees the profit's theory of investment which argues that the uncertainty created by hyperinflation in prices and costs reduces investment spending.

The estimation results of equation 4.9 as dynamic short run relationships are provided in Table 7. As can be noted, the short run results for most of the variables are diverging from the long run outcomes. For instance, the coefficient on the FDI turns out to be negative advocating that FDI presence has a discouraging short run effect on domestic investments. Yet, this short run negative outcome has many justifications. First, the potential spillovers effects of FDI such as innovations through workers mobility, forward and backward linkages and the transmission of managerial skills need a minimum incubation period to diffuse into domestic sectors. Second, to internalize the "hopefulness" offered by FDI, native investors need a recognition period that exceeds the short run. Thus, one can be able to conclude that the motivating psychological impact of FDI, as assembled in giving hope hypothesis, cannot be materialized in the short run.

**Table 7:** The VECM results (the short run relationships)

Dependent variable	$\Delta\text{Log}(\text{DI})$			
Variable	Coefficient	t-statistics	S. Error	P-value
Intercept	-0.732***	[-3.660]	(0.199)	0.0015
$\Delta\text{Log}(\text{DI})(-1)$	0.088	[ 0.483]	(0.181)	0.6336
$\Delta\text{GDPG}(-1)$	-0.006	[-0.761]	(0.007)	0.4546
$\Delta\text{CRD}(-1)$	0.033	[ 0.994]	(0.033)	0.3311
$\Delta\text{LogRFDI}(-1)$	-0.375***	[-2.766]	(0.135)	0.0064
$\Delta\text{REXR}(-1)$	0.074*	[ 1.798]	(0.040)	0.0742
$\Delta\text{INF}(-1)$	-0.007	[-0.381]	(0.001)	0.7065
$\Delta\text{OPEN}(-1)$	0.0025	[ 0.257]	(0.009)	0.7994
PRIV	1.103***	[ 4.044]	(0.272)	0.0006
ECT(-1)	-0.692***	[-4.109]	(0.168)	0.0005
R-squared	0.61			
Adjusted R-squared	0.45			
S.E. of regression	0.201			
Sum squared resid	0.846			
Log likelihood	11.83			
F-statistic	3.701***			
Prob(F-statistic)	0.006			

Note: \*\*\*, \*\*, and \* indicate significance at the 1, 5 and 10 percent levels, respectively.

In contrary to prior expectations, the short run coefficient of the GDP growth variable fails to preserve the same sign similar to that seen in the long run. By the same token, the insignificant coefficient associated with trade openness variable indicates that domestic investment is less

responsive to the temporary short run changes in trade policies. Surprisingly, the coefficient in front of real exchange rate variable shows that the domestic investment is positively and significantly affected by depreciation in national currency. Therefore, together with its negative long run impact, the depreciation in real exchange rates seems to be playing a significant role in shaping the path of domestic investment in Sudan.

The PRIV dummy variable captures the desirable effects of adopting privatization policy on domestic investment in Sudan. The coefficient of the variable is positive and significant (t-ratio = 4.04468), indicating that the implementation of this policy has contributed significantly in augmenting growth in domestic investments. Moreover, one should note that the value of the coefficient exceeds one which implies that the reinforcement of private sector generates significant increases in domestic investments.

As displayed in Table 7, the adjustment coefficient of the error correction term is -0.69, that is statistically significant and negative (t-ratio = -4.10941). It suggests that if disturbance from domestic investment long run equilibrium occurs, the error correction returns it to the equilibrium position with 69% speed of adjustment per year.

Last, the estimated model indicates a good fit to the data since the estimated value of Adjusted  $R^2$  shows that 45% of the short run variations in domestic investment are explained by variables incorporated in the model. More importantly, the results on the diagnostic tests indicate that the model is well specified. Specifically, the results show that the residuals are normally distributed since Jarque-Bera statistics don't reject the null hypothesis of normality. The result also reveals the absence of serial correlation since the Lagrange-Multiplier F-test (LM) show p-value of 0.2272. The model is also free from heteroskedasticity given that the results of Breusch-Pagan-Godfrey, ARCH, Harvey and White are strongly rejecting the null hypothesis of homoskedasticity. Finally, the model convincingly passes Ramsey Reset test for residuals stability.

**Table 8:** The residuals diagnostic tests

Diagnostic test	Estimated Value	P-value
Normality Test(Jarque-Bera)	0.182588	[0.9127]
Breusch-Godfrey Serial Correlation LM Test	[1]:F(01,20) = 0.350	[0.5607]
	[2]:F(02,19) = 1.279	[0.3012]
	[3]:F(03,18) = 0.833	[0.4928]
	[4]:F(04,17) = 0.897	[0.4869]
	[5]:F(05,16) = 1.560	[0.2272]
ARCH heteroskedasticity test	[1]:F(01,28) = 0.922	[0.3451]
	[2]:F(02,26) = 1.950	[0.1625]
	[3]:F(03,24) = 1.260	[0.3102]
Breusch-Pagan-Godfrey heteroskedasticity test	[1]:F(15,15) = 1.657	[0.1693]
White Heteroskedasticity test (with no cross terms)	F(09,21) = 0.9392	[0.9392]
Residuals stability test(Ramsey RESET Test)	[1]:F(01,24) = 1.640	[0.2126]

Based on this good performance of the model and the quality of diagnostic tests, it can be said that FDI exercise a positive impact on domestic investment in Sudan. The results, therefore, strongly support the argument of giving hope hypothesis.

## 7. Conclusion and policy implications

This paper argues that the role of FDI in boosting domestic investment in recipient countries should not be restricted to the traditional contributions such as establishing new plants, diffusing sophisticated technologies and transferring modern managerial skills to firms. This is because, beyond its widely recognized contributions, FDI may also lift growth in domestic businesses by motivating native investors to launch new investment in home land. The paper resembles this FDI's intangible contribution in what can be called "Giving hope hypothesis". To give validity to this hypothesis, the paper formulates domestic investment function for Sudan incorporating, along with FDI stock, all the variables that their inclusion is theoretically and empirically justified. A time series data set on Sudan economy covering the period from 1980 to 2013 has been used to carry out the empirical analysis. The paper adopts the methodology of co-integration and vector error correction model (VECM) to overcome the econometric problems (i.e. endogeneity, imprecise estimates, and spurious regression) that could possibly come with the application of OLS method.

The empirical findings show that, most of variables' coefficients are statistically significant, accompanied with correct signs, and are of interpretable magnitudes. Specifically, the findings indicate that FDI presence exercises a positive impact on domestic investment in Sudan. Obviously, such result supports the argument suggested by giving hope hypothesis proposes. Alternatively stated, the presence of FDI in a hostile business environment like the one prevailing in Sudan is likely to offer hope for domestic investors to execute businesses and, as a result, boosts growth in domestic firms. Expectedly, the findings show that there is a positive long run relationship between GDP growth and domestic investment. Similarly, in a full agreement with the beliefs of free trade proponents, trade openness is found to play a positive role in increasing domestic investments. Most importantly, the findings indicate the decisive role of privatization policy in furthering growth in Sudanese domestic firms. In contrast, and as expected, the findings demonstrate that increases in inflation rate and the depreciation in real exchange rate exert a significant negative impact on the performance of domestic businesses.

Based on these findings, policymakers in Sudan might find it beneficial to encourage the integration between domestic and foreign investments. This goal can be accomplished by taking up many policy actions. First, the interdependence between foreign and domestic businesses can be well-maintained by stimulating inflows of MNCs that supplement domestic firms with raw materials, bring in sophisticated technologies and increase accessibility to foreign markets. Second, the desirable complementary relationship can be also reinforced by promoting domestic investment that have a wide range of forward and backward linkages with FDI projects. In the end, adopting such policy action would lower the costs of production for both domestic and foreign firms, giving birth to multiple increases in domestic investments. Finally, a third policy option could be added. In particular, this option embodies in attracting the type of MNCs that supports growth in domestic firms and at the same time have a potentiality to stimulate inflows of diversified FDIs.

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