2020

ERF Working Papers Series

Foreign Direct Investment and Corruption in Egypt: A Cointegration Analysis

Eman Moustafa

Economic Research Forum

منتدى البحوث الاقتصادية

Working Paper No. 1408

October 2020

FOREIGN DIRECT INVESTMENT AND CORRUPTION IN EGYPT: A COINTEGRATION ANALYSIS

Eman Moustafa[1]

Working Paper No. 1408

October 2020

Send correspondence to:
Eman Moustafa
General Authority for Investment and Free Zones
ema.moustafa.1@gmail.com

[1] General Authority for Investment and Free Zones; Ministry of Investment and International Cooperation, Egypt

First published in 2020 by
The Economic Research Forum (ERF)
21 Al-Sad Al-Aaly Street
Dokki, Giza
Egypt
www.erf.org.eg

Copyright © The Economic Research Forum, 2020

All rights reserved. No part of this publication may be reproduced in any form or by any electronic or mechanical means, including information storage and retrieval systems, without permission in writing from the publisher.

The findings, interpretations and conclusions expressed in this publication are entirely those of the author(s) and should not be attributed to the Economic Research Forum, members of its Board of Trustees, or its donors.

Abstract

This paper uses a time series analysis to estimate the impact of corruption on FDI in Egypt during the period 1970-2019 and to address some of the drawbacks of the empirical literature. Unit root and cointegration tests are used to ensure stationarity and long run relationship among variables of interest. The results show a significant positive relationship between FDI and corruption in Egypt. Since corruption is not found to hinder FDI inflows, treating corruption should be based on sound legal procedures that infringe neither on the freedom of FDI nor on the degree of openness of the economy, which are the real stimulants of FDI in Egypt.

Keywords: Corruption; FDI; growth; VECM; Egypt.
JEL Classifications: F21; D73; O20; H54.

1. Introduction

Since 1980s, foreign capital globalization, particularly foreign direct investment (FDI) inflows increased significantly in developing countries, due to the fact that FDI is the most stable and prevalent component of foreign capital inflows (Adams 2009). Over the last 50 years, FDI has dominated economic literature and policy making circles and has been widely identified as a growth enhancing factor. FDI effects range from influencing production, employment, income, prices, exports, imports, balance of payments, to affecting economic growth and general welfare of the host countries. There are many factors that could affect FDI inflows in developing countries. The level of rent seeking and corruption in the host economies has been introduced as one of the important factors determining FDI location.

Egypt is a developing economy characterized by low per capita income, low levels of savings, high levels of unemployment, inefficient financial intermediation, and high external debt. Egypt is also characterized by persistent corruption, bloated public sector that crowd out the development of private investment. By the second half of 1980s, Egypt suffered from severe economic imbalances and real economic growth decreased from an average of 13 percent in 1977 to 2.5 percent in 1987. In 1991, the Economic Reform and Structural Adjustment Program (ERSAP) started in order to overcome the severe economic imbalances and to revive economic growth to reach a target of 7 percent by 2000. The ERSAP placed a greater emphasis on the key role of FDI in generating economic growth. Over the 1990s, FDI inflows were an average of US$ 805 million, representing only one percent of economic growth. while, domestic investment reached 20 percent of GDP growth. The appointment of a new cabinet in 2004, and its efforts to improve the investment climate and encourage domestic and foreign investment enhanced the attractiveness of Egypt as a business location. Over the period 2000-2009, domestic investment reached an average of 20 percent of GDP. All these factors played a key role in revitalizing investment. Consequently, annual FDI inflows rose to 7.5 percent of GDP over the period 2005-2008. During the same period, Egypt's share in global FDI inflows increased to 0.6 percent, compared to only 0.06 percent in 2001.

In 2008, the financial crisis hit the global economy and FDI inflows to Egypt started to slow down, reversing the surge of the preceding four years. The full impact of the crisis was felt in 2009 as global FDI went down by 37 percent. FDI in Egypt dropped less sharply, by 30 percent. Most recently, the political uncertainty, unprecedented security challenges and widespread labor protests that accompanied the January 25th Revolution have interrupted the trend of FDI. Egypt has made considerable progress over the past ten years in liberalizing its business environment and encouraging FDI. However, Egypt still suffers from excessive bureaucracy, corruption and unstable political and macroeconomic conditions.

Driven by the potentials of FDI discussed above, the determinants of and the impact institutional distortions and corruption on FDI in Egypt have not yet been investigated. This type of study for Egypt is crucial to introduce policies to attract FDI. This paper contributes to the existing literature by exploring the impact of perceived corruption on the regional distribution of FDI to Egypt using time series data. Past studies on country level FDI have not incorporated effects that arise from social, and institutional factors however, this research does.

This paper provides a comprehensive fresh evidence on the effect of perceived corruption on FDI using a country approach. Most notably, this is the first study to use a back-casting technique to provide historical annual estimates. The back-casting methodology extrapolates recent corruption data into the past based on historical relationship with democracy data, to overcome the shortage in corruption estimates. Along with the academic contributions, there are several key policy implications that could be drawn from the results of this paper. The findings of this paper will provide a source of relevant and reliable information for both investors and policy makers.

The next section briefly provides background information on the relevant socioeconomic policy in Egypt. section 3 review the literature on FDI and corruption. Section 4 explains the methodology, data and the model with key hypotheses. Section 5 reports and analyses the main results. Section 6 draws conclusions.

2. Background

2.1 FDI, corruption, and economic growth in Egypt

2.1.1 FDI trends and current status (1970-2019)

Attracting FDI to promote economic growth has been a key objective of the consecutive governments of Egypt since the Open-Door policy in 1971 as well as the ERSAP in 1991. Since then many policy measures and several laws have been formulated and implemented to attract FDI. Although Egypt's economy has been officially open to foreign capital since 1974 (after issuing the investment law no. 43 of 1974), the dramatic change in FDI inflows occurred later in 1979. Over the whole decade (1970-1979), FDI inflows have hovered around an annual figure of US$ 200 million on average, as we can see from table 2.1. The relative decrease of FDI inflows to Egypt during the first half of the 1990s can be explained by the Gulf war crisis, macroeconomic imbalances and a fall in economic growth rate from 7.4 percent in 1983 to 5.7 percent in 1990, resulting in an increase in inflation from 16 percent to 16.8 percent, and an increasing unemployment rate from 6.6 percent to 8.6 percent (table 2.1).

Table 2.1: Realized average macroeconomic statistics in Egypt (1970-2019)

Period/ Series	70-79	80-89	90-99	00-09	10-19
FDI, net inflows (current million US$)	171	860	805	4799	6039
FDI, net inflows (% GDP)	1	3	1	4	2
GDP growth (%)	6	6	4	5	4
GDP per capita (constant 2015 US$)	910	1402	1707	3217	3483
Gross domestic savings (% GDP)	12	16	14	15	14
Gross fixed capital formation (% GDP)	19	28	20	19	18
Trade (% GDP)	50	58	50	54	48

Source: UNCTAD data

In 2001, FDI inflows to Egypt decreased with about 60 percent compared with the year 2000, as we can see from table 2.1, because of September 11th. Conversely, FDI inflows to Egypt increased till it reached 9 percent of GDP in 2007. Most notably, FDI inflows nearly tripled since 2004. In relative terms, Egypt's FDI performance surpasses most of its neighbors. This outstanding performance attributed to the success of the economic reform program, aggressive market reform policies and new cabinet of reformists, decreasing inflation rate, stable local exchange and interest rates, in addition to, an accelerated privatization process.

By the 25^{th} January revolution in 2011, FDI came to a virtual standstill. Egypt's FDI inflows were negative 483 US$ million at the end of 2011 leaving the FDI inflows growth rate to be around negative 0.2 percent. FDI inflows came to a halt owing to the protracted political instability. But then it started growing again till 2019. FDI inflows turned back to be positive and it reached around 3 US$ billion by the end of 2012. It increased from US$ 4.3 billion in 2014 to US$ 6.7 billion in 2015. However, the relative ranking of Egypt as a recipient of FDI deteriorated to lost 19 places in the 2016 Doing Business report, published by the World Bank (131th out of 189 countries). As well, corruption, including bribery, raises the costs and risks of doing business. Corruption is often cited by investors as the main impediment to further investment reforms. In the Corruption Perceptions Index (CPI) 2013, Egypt was ranked 114 out of 177 countries.

2.1.2 FDI and corruption in Egypt

Despite the promising successes and the increase in FDI as a percentage of GDP to 9 percent in 2006, Egypt continues to struggle with important challenges confronting its investment policy. Therefore, Egypt should address a number of challenges if it is to maximize its potential as an investment destination. Most importantly, foreign investors identified various obstacles to business establishment and operation. Hence, the overall investment policy framework should be more transparent for investors, and more work could be done to optimize the investment promotion efforts, so that they can compete with other developing countries.

One important reason why Egypt has been slow to achieve its economic objectives is due to the cumbersome and ineffective character of the structural and institutional systems (El-Mikawy and Handoussa, 2001). Bureaucracy is identified as a key constraint by business in Egypt, hindering investment and especially FDI. Starting a new business in Egypt can be extremely difficult when faced with bureaucratic procedures, licenses and paper work. The private investor must submit a detailed feasibility study application to the General Authority for Investment and Free Zones (GAFI); where 47 ministries and government agencies are represented to assess the application. Disapproval from one of those agencies is enough to stop a private company from being established. As such, high degree of corruption, in addition to lack of transparency, exists in Egypt. According to transparency international's CPI, corruption in Egypt, though has been decreasing over the years (table 2.2), is still considered relatively high compared to other countries in the MENA region. Over the time of 1980s and 1990s, Transparency International reported a marked increase in the wasting of public resources, as well as embezzlement, bribery, and forgery. In addition, the parasitic links between the public and private sectors that emerged in the 1970s only intensified.

Table 2.2: CPI[2] for Egypt (1980-2019)

Period	Score	Rank
80-89	1.37	41 out of 41
90-99	2.57	49 out of 99
00-09	3.18	80 out of 180
10-19	3.33	106 out of 168

Source: Transparency International (TI)

The public in Egypt is fully aware of the costs of corruption for the country's political and economic stability. Despite such awareness, corruption still representing the ruling social law and a behavior that governed various aspects of Egyptian life. Corruption has deeply embedded networks in Egypt which follow the same pattern over the period of study (table 2.2). Hence, corruption in Egypt appears to be independent of time for the whole life of the series.

3. The determinants of FDI: A literature review

Political determinants of FDI mainly include political stability, risk of expropriation, and corruption in host countries. Some countries may consider FDI and the dependence on foreign countries as a threat to its sovereignty. In such cases, their political orientation affects FDI inflows (Habib and Zurawicki, 2002). Empirical studies on the political determinants of FDI are much lesser than those on economic determinants, as the former are harder to statistically measure especially in developing countries. However, it is believed that the investor decision is equally guided by both economic as well as political determinants and they cannot be assessed separately.

The empirical studies assessing the impact of corruption on FDI are inconclusive as to whether corruption hinders or enhances FDI. However, there is a fair amount of theoretical research looking at the relationship between FDI and corruption. From a theoretical perspective, corruption may act either as a "grabbing hand" or as a "helping hand" for FDI inflows (Jain, 2001 and Aidt, 2003). The "grabbing hand" image of the state is proposed and developed by Shleifer and Vishny (1993). Per this view, corruption can increase the cost of doing business to the point of making it unprofitable, which reduces FDI. Corruption in that sense falls within the broader negative effects of being a rent-seeking activity that increases transaction costs in the economy. Such costs may be spent instead on collecting information on partners and market conditions.

In addition to transaction costs, corruption entails much higher costs in the form of distortions to the aggregate economy created by the corrupt officials to generate payoffs. Distortions to the economy may take the forms of inefficient privatizations and government contracts, delaying production, giving licenses to low quality goods and services, and illegal activities. In addition, corruption may lead to distributing a large share of a country's wealth to corrupt

[2] Average score and average rank are calculated by the author for each period.

officials in the form of inflated contract prices. Such high costs should be collected later through raising taxes and cutting spending (Rose-Ackerman 1997).

Furthermore, corruption sways capital inflows toward bank loans and portfolio investment at the expense of FDI. Two possible reasons support this finding. First, local officials in a corrupt country have a greater tendency to exploit and manipulate international investors to pay bribery so as not to create obstacles, compared with foreign bank lenders. Second, foreign bank lenders have a greater level of protection for their loans through international institutions than international investors who face the possibility of having their FDI extorted or nationalized by the country without a good government. This makes a country more vulnerable to currency crisis as bank loans and other portfolio flows could be drawn with ease if there are signs of economic problems (Wei and Wu 2002).

On the other hand, corruption can act as a "helping hand" to foster FDI inflows. If corruption substitutes for poor governance, it can lead to economic expansion (Houston 2007). Such argument is based on the Efficient Grease hypothesis (EGH). Through ‘greasing’ the wheels of economic activity, corruption may overcome the obstacles that bureaucracy tends to create. Although most of the studies pinpoint to the negative effects of corruption, some studies have proved the validity of EGH (see for example Sadig 2009). Such studies do not call for retaining corruption but rather strengthening the legal and institutional frameworks of countries in question.

The literature abounds with numerous studies assessing the determinants of FDI in general. While, the empirical research on the relationship between FDI and corruption is relatively small as data on corruption have been available only for a short time. The empirical literature also tends to focus on cross-country rather than inter-country corruption. Several empirical studies have found a negative relationship between corruption and FDI inflows (Busse and Hefeker, 2007; Asiedu, 2006, 2013; Mathur and Singh, 2011). Tosun et al. (2014) report that corruption has a distortive effect on FDI in Turkey both for short and long run periods which indicates that 'helping hand' corruption does not exist in Turkey. Cross sectional study in this regard, conducted by Sadig (2009), on 117 countries finds a negative relationship between corruption and FDI in all the selected countries. In addition, Habib and Zurawicki (2002) analyze the effect of corruption on FDI in 111 countries to reach a conclusion that the negative effect of corruption on FDI is more significant in comparison to its impact on domestic investment. Furthermore, the degree of international openness and political stability of the host country moderate the influence of corruption. Abed and Davoodi (2000) focus on the role of corruption in explaining key measures of economic performance in the transition economies and find that corruption is negatively related to FDI.

On the contrary, the second group of studies proposes that corruption could have a positive impact in an economy suffering from a weak level of protection and property rights. There is a point of view that corruption can benefit MNC’s operations in some situations (Zhou, 2007). Some economists have shown a better side of corruption arguing that corruption is the muchneeded grease for the squeaking wheel of a rigid administration (Kardesler et al., 2009; Rahman et al., 2010; Helmy, 2014).

Egger and Winner (2005) find a positive relationship between corruption and FDI in a sample of 73 developed and developing countries over the period 1995-1999. This result suggests that administrative controls and bureaucratic discretion are used to allow government officials to share in the profits from FDI. Later, however, Egger and Winner (2006) consider a longer period (1983-1999) and find that the negative impact of corruption on FDI outweighs its positive impact. On this route, also, a recent empirical work by Bellos and Subasat (2012) lends credence to the assertion that corruption attracts MNC to selected transition countries, rather than dissuading their entry.

Contrary to the above findings, some studies find either insignificant or inclusive relationship between FDI and corruption. Wheeler and Mody's (1992) study of the US firms has not find a significant negative relationship between the size of FDI and the risk factor of the host country, that corruption and all types of judicial and bureaucratic impediments were insignificant. Sadig (2009), Hakkalar et al. (2005) and Dreher and Herzfeld (2005) believe that the evidence on the effect of corruption on FDI is inconclusive depending upon other variables.

3. Model, Data and Methodology

3.1 Model Specifications

In order to examine the effects of corruption on FDI inflows in Egypt, we draw from the following model by Li and Liu (2005):

$$\mathrm{FDI}_{it} = a_0 + a_1 g_{it} + a_2 \ln y_{it} + a_3 \mathrm{SCH}_{i,65} + a_4 \mathrm{Trade}_{it} + \mathrm{AX}_{it} + \varepsilon \qquad (4.1)$$

where FDI is FDI inflows as a percentage of GDP, g is the per capita GDP growth rate, lny is the market size measured by log of real GDP, SCH_{65} is the level of secondary school attainment in 1965 as a proxy for human capital, Trade is the ratio of total trade to GDP, and X is a group of variables that include telephone lines as a proxy for infrastructure in the host economy, inflation rate and interest rates as proxies for the macroeconomic policy. A is a vector of coefficients.

To investigate the effects of corruption on FDI in Egypt, corruption will be added to equation (4.1). Furthermore, SCH_{65} cannot be used for time series as it is a constant figure, which creates multicollinearity. Rather, we use secondary school enrolment (as a percentage of gross enrolment) to proxy for human capital in Egypt[3]. The ratio of domestic investment to GDP is another economic determinant of FDI inflows that is highlighted by some empirical studies (e.g. Sader, 1993 and 1997, Ndikumana and Verick, 2008). The ratio of domestic investment to GDP is used as an indicator of the general investment climate in Egypt. Adding these three

[3] Secondary school enrolment as a percentage of gross enrolment is the proxy with available data on Egypt over our period of interest.

variables to Li and Liu (2005) model and estimating the model over a period of 50 years (1970-2019), yields the following equation:

$$\mathrm{fdi}_t = a_0 + a_1 \mathrm{cor}_t + a_2 g_t + a_3 y_t + a_4 \mathrm{hk}_t + a_5 \mathrm{trade}_t + a_6 \mathrm{inv}_t + a_7 X_t + \varepsilon \qquad (4.2)$$

FDI is concentrated in the oil and gas industry by around two-thirds of total investments (UNCTAD's 2020 World Investment Report), especially after the discoveries of offshore gas reserves in the country's western desert and in the Zohr offshore field in 2018, the largest in the Mediterranean Sea, followed by construction, manufacturing, real estate and financial services sectors. Hence, as a robustness model, we re-estimate the model in equation (4.2) for non-oil FDI inflows, as follows:

$$\mathrm{non-oil\ fdi}_t = a_0 + a_1 \mathrm{cor}_t + a_2 g_t + a_3 y_t + a_4 \mathrm{hk}_t + a_5 \mathrm{trade}_t + a_6 \mathrm{inv}_t + a_7 X_t + \varepsilon \qquad (4.3)$$

With $a_1 \lesseqgtr; a_2 \lesseqgtr 0;\ a_3 > 0; +a_4 > 0\ or < 0;\ a_5 < 0;\ a_6 > 0 > a_7 > 0$

The dependent variables are fdi_t and $\mathrm{non-oil\ fdi}_t$ -the level of FDI and non-oil FDI inflows[4] in US$ received by Egypt, at time-period t. The main independent variable is cor_t, which is the Corruption Perceptions Index (CPI) as a proxy measure of corruption. The other independent variables are: g_t, which is the real GDP growth rate; y_t is the per capita real GDP as a proxy variable to capture the influence of market size in Egypt; hk_t is the secondary school enrolment ratio as a proxy for human capital; trade_t is the value of exports plus the value of imports divided by GDP; inv_t is the fixed capital stock as a percentage of GDP; and X_t is a vector of macroeconomic variables such as infrastructure, as proxied by mobile cellular subscriptions per 100 people; and inflation, as proxied by percentage changes in consumer prices.

3.2 Data

This paper is based on annual time series data over a period of 50 years from 1970- 2019. Data sources are explained in the Appendix A.1.

3.2.1 Back-casting corruption

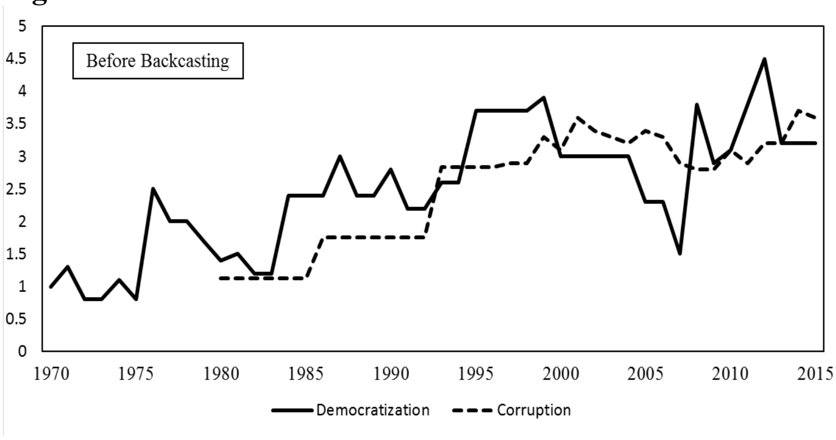
As mentioned above, the data for COR are available from the Transparency International (TI) with annual back runs to 1980. Following the TI, we backward extrapolate (back-cast) the missing COR data from 1970 to 1980 using the Democracy Index (DEM) from the Quality of Government (QoG) Institute[5] and the Economist Intelligence Unit[6] with annual back runs to 1946. The back-casting methodology is ultimately designed to provide historical annual

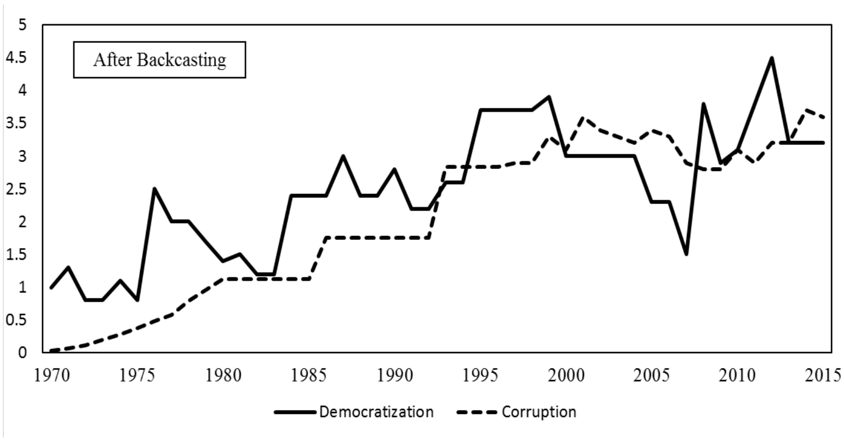
[4] Most of the empirical literature on FDI use inflows rather than stock. Furthermore, an attempt to estimate the above model for FDI stock is carried out; however, the results yielded more diagnostic problems than that with FDI inflows.
[5] The Quality of Government (QoG)-institute is an independent research institute at the University of Gothenburg, Sweden.
[6] The Economist Intelligence Unit is a business within the Economist Group providing forecasting and advisory services through research and analysis, such as monthly country reports, five-year country economic forecasts, country risk service reports, and industry reports.

estimates that are consistent over time. This methodology preserves the broad patterns observed in the published COR estimates.

Figure 4.1 shows that both COR and DEM are highly correlated (64 percent) over the period 1980-2015. Therefore, we use DEM to predict the corruption index values over the period 1970-1980. The COR values from 1970 to 1980 are estimated by extrapolating and back-casting COR-based estimates from the DEM (the benchmark). A clear documentation on how we used DEM to predict COR prior to 1980 is illustrated in Appendix C.[7]

Figure 4.1: COR and DEM correlation





3.3 Methodology

The empirical literature use either cross-sectional or panel data, which might suffer from problems of data comparability and heterogeneity (Tang et al. 2008). This paper uses pure time-series data to overcome these problems. The time series approaches deal with the specificity of an individual country and offer the opportunity to show and analyze the causality pattern between variables. To this end, the unit root tests for stationarity, the cointegration tests, the autoregressive-distributed lag model (ARDL), the Stock-Watson dynamic OLS (DOLS), and

[7] An attempt to estimate the above model for CPI data from 1980 to 2015 was carried out; however, the results yielded more diagnostic problems than that for CPI backcasted data from 1970 to 2015.

the VECM are utilized to estimate the model illustrated in equations (4.2 and 4.3) and to test the direction of causality between FDI and corruption.

Our investigation follows several steps. We begin by testing for non-stationarity in our determined variables. The cointegration technique developed by Johansen and Juselius (1990) is used for the sake of testing a long run cointegration relationship between FDI and corruption as well as other variables defined in equations (4.2 and 4.3). An Error Correction Model (ECM) to uncover the causality in the relationship in the final step of our estimation is used, given the evidence of cointegration in the long run relationship.

4. Empirical results

4.1 Unit root tests and integration order

Table 5.1 reports the results of the Augmented Dickey-Fuller (ADF) as well as the Phillips-Perron (PP) tests for various specifications. The results reveal that the order of integration is not same for all variables.

Table 5.1: ADF and PP tests

Variable	τ_μ		τ_T	
	ADF	PP	ADF	PP
Level				
fdi	-2.740*	-2.354	-2.725	-2.725
non − oil fdi	-3.534***	-3.592**	-3.291*	-3.275*
cor	-1.165	-1.159	-2.066	-2.021
g	-3.621***	-3.621***	-3.814***	-3.814***
y	-0.492	-0.118	-3.071	-2.234
hk	-1.836	-1.836	-1.941	-1.940
trade	-2.284	-2.489	-2.352	-2.364
inv	-1.851	-1.972	-2.931	-2.123
infra	2.639	0.960	2.527	-0.570
inflation	-2.056	-2.547	-2.214	-2.878
1st Difference				
fdi	-4.189***	-8.238***	-4.211***	-8.243***
non − oil fdi	-3.092**	-3.497**	-2.952**	-3.333**
cor	-7.966***	-4.125***	-7.937***	-4.890***
g	-7.615***	-10.675***	-7.554***	-11.826***
y	-4.026***	-3.478**	-3.812**	-3.381*
hk	-5.565***	-4.913***	-6.187***	-6.662***
trade	-5.769***	-5.769***	-5.877***	-5.877***
inv	-5.374***	-5.272***	-5.626***	-5.648***
infra	-4.615***	16.073***	-4.104**	5.591***
inflation	-10.902***	-11.481***	-10.868***	-11.115***

Notes: τ_μ represents the model with an intercept and without trend; τ_T is the model with a drift and trend. *, ** and *** denote rejection of the null hypothesis at the 10 percent, 5 percent and 1 percent levels respectively.

Macroeconomic variables, such as corruption, might be trended, that is nonstationary and exhibit unit roots over time. As previously discussed, corruption has deeply embedded networks in Egypt which follow the same pattern over the period of study. Corruption in Egypt appears to be independent of time for the whole life of the series. Consequently, corruption in Egypt is expected to exhibit a nonstationary trend. At first differences, the ADF and the PP tests statistics exceed their corresponding critical values for all variables. Consequently, the null hypothesis of the unit root in the first differences of all variables is rejected. This result implies those variables are stationary in first differences.

4.2 Cointegration and long run relationship

Table 5.2 reports the results of the lag-length selection criteria to the unrestricted VAR in the levels of: $\mathrm{fdi}, \mathrm{non-oil\ fdi}, \mathrm{cor}, \mathrm{g}, \mathrm{y}, \mathrm{hk}, \mathrm{trade}, \mathrm{inv}, \mathrm{infra}$, and $\mathrm{inflation}$. We usually rely on the SC which is more stable. The SC allows for losing less observations. In this study, we choose the VAR model of order one. Table 5.3 reports the Johansen cointegration test results which reveal that there exist only one cointegrating vector, i.e. there is a long run cointegrating relationship among variables. The estimated model is reported in tables 5.4 and 5.5, normalized on fdi and $\mathrm{non-oil\ fdi}$, respectively.

Table 5.2: VAR lag length selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1191.733	NA	54900000	57.17775	57.55011	57.31424
1	-802.9634	592.4106	25777896	42.52207	46.24564*	43.88690
2	-714.5680	96.81401	31470772	42.16990	49.24470	44.76310
3	-518.0202	131.0318*	815597.6*	36.66763*	47.09365	40.48918*

Note: *indicates lag order selected by the criterion

The results in tables 5.4 and 5.5 are consistent with Helmy (2014) and the EGH, discussed earlier, in the sense that a high level of corruption is associated with a higher level of FDI and non-oil FDI inflows in the long run. Houston (2007), Zhou (2007), and Kardesler et al. (2009) also suggest that particularly in relatively less democratic and less developed countries a rise in FDI inflows is associated with a higher level of corruption. They argue that in such countries, foreign and domestic firms compete to pay bribes to get business contracts. If foreign firms have the flexibility to adjust the local investment environment and get business contracts, the host governments may have weak incentives to eradicate corruption. Therefore, foreign firms can magnify corruption problems.

Table 5.3: Johansen cointegration tests

Part A: LR test based on Maximal Eigenvalue of the stochastic matrix (λ_{max})

Null	Alternative	Statistic	95 percent C.V.	Eigenvalues
r = 0	r = 1	229.644*	197.371	0.821
r ≤ 1	r = 2	155.454	159.531	0.636
r ≤ 2	r = 3	111.966	125.615	0.531
r ≤ 3	r = 4	79.445	95.754	0.438
r ≤ 4	r = 5	54.632	69.819	0.407
r ≤ 5	r = 6	32.162	47.856	0.333
r ≤ 6	r = 7	14.727	29.797	0.171
r ≤ 7	r = 8	6.685	15.495	0.115
r ≤ 8	r = 9	1.438	3.841	0.033

Part B: LR test based on Trace of the stochastic matrix (λ_{trace})

Null	Alternative	Statistic	95 percent C.V.	Eigenvalues
r = 0	r ≥ 1	73.933*	58.434	0.821
r ≤ 1	r ≥ 2	43.488	52.363	0.636
r ≤ 2	r ≥ 3	32.521	46.231	0.531
r ≤ 3	r ≥ 4	24.813	40.078	0.438
r ≤ 4	r ≥ 5	22.471	33.877	0.407
r ≤ 5	r ≥ 6	17.435	27.584	0.333
r ≤ 6	r ≥ 7	8.042	21.132	0.171
r ≤ 7	r = 8	5.247	14.265	0.115
r ≤ 8	r = 9	1.438	3.841	0.033

Notes: * indicates rejection of the null hypothesis at 5 percent level. H_0, and H_1 are the null and alternative hypotheses, respectively. C.V. is the critical values of the λ_{max} and λ_{trace} at the 5 percent level.

Table 5.4: Normalized cointegrating vector, coefficients normalized on fdi

fdi	cor	g	y	hk	trade	inv	infra	inflation
-1.000	3.371 (1.332)**	0.679 (0.170)***	8.084 (3.545)**	0.711 (0.092)***	-0.027 (0.046)	0.107 (0.121)	0.608 (0.221)**	-0.353 (0.093)***

Notes: Standard error in parentheses. *, ** and *** denote rejection of the null hypothesis at the 10 percent, 5 percent and 1 percent levels respectively.

Table 5.5: Normalized cointegrating vector, coefficients normalized on non − oil fdi

non − oil fdi	cor	g	y	hk	trade	inv	infra	inflation
-1.000	13.817 (5.793)**	1.012 (0.741)*	-0. 571 (15.413)	1.696 (0.402)***	-0.248 (0.201)	1.324 (0.526)**	2.287 (0.959)**	-2.000 (0.404)***

Notes: Standard error in parentheses. *, ** and *** denote rejection of the null hypothesis at the 10 percent, 5 percent and 1 percent levels respectively.

Our empirical results reveal that economic growth, market size of Egypt (proxied by y), human capital, domestic investment, and infrastructure have statistically significant and positive impact on FDI and non-oil FDI inflows in the long run. Inflation is significant and negatively affects FDI. The market size of the recipient country is crucial as the target economies can provide larger economies of scale and spill-over effects. Market-oriented FDI establishes/facilitates enterprises that can supply goods and services to the local markets (Kinoshita and Campos, 2004; Li and Liu, 2005; Brada et al., 2006; Hisarciklilar et al., 2006; and Mottaleb et al., 2010). Egypt's human capital indicators are more than exceptional, particularly for a developing country with less achievement in other facets. Egypt has a high rating in human capital index in terms of literacy rate and schooling rates (Duma, 2007; the World Bank, 2011; UNDP Egypt, 2012). FDI apparently complementing existing domestic investment in Egypt. This effect can be justified by FDI incentivize domestic investors to shift their production towards capital intensive mode. The existence of adequate physical infrastructure affects the location decision of FDI. Infrastructure in Egypt has experienced a remarkable improvement over the last five decades, the matter that helps increase FDI inflows. One would also expect that poor macroeconomic management, as reflected by high inflation rates, would negatively affect FDI inflows.

In Appendix B, we add further experiments to the cointegration modelling. These experiments provide comparisons and robustness checks to our main model as well as improving its degrees of freedom. Fortunately, the information on causation is embodied in the VECM. So, we move to estimate the VECM for equations (4.2 and 4.3), after determining the optimal number of lags, the suitable mode for testing the VAR models and the number of cointegrating vectors the VECM should have.

4.3 Vector error correction model (VECM)

The VECM is applied in tables 5.6 and 5.7 with one lag, a deterministic intercept, and no trend. The results in tables 5.6 and 5.7 are consistent with the results in tables 5.4 and 5.5 in the sense that a high level of corruption is associated with a higher level of FDI inflows in the short run as in the long run for both FDI inflows and non-oil FDI inflows.

From tables 5.6 and 5.7, we can see the existence of a long-term equilibrium connection between FDI in Egypt and all the control variables. The empirical results of the estimated VECM indicate the significance of the error correction term (ECT_1) which assures the long run relationship. From both tables, the value of the (ECT_1) coefficient indicates that the adjustment speed is slow in the case of Egypt. The deviation between current FDI and the long run relationship will be corrected by about 30 percent in the following year. In other words, adjustment to the long run relationship takes a long time in Egypt.

Table 5.6: Error correction estimation, dependent variable, fdi

Variables	Coefficients	Std. Error
Constant	-0.640	0.770
Δ fdi(-1)	-0.468**	0.151
Δcor (-1)	0.007*	0.008
Δg (-1)	0.042	0.089
Δy (-1)	0.004*	0.003
Δhk (-1)	-0.100	0.091
Δtrade (-1)	-0.192	0.238
Δinv (-1)	-0.007	0.099
Δinfra (-1)	-0.124***	0.018
Δinflation (-1)	-0.096	0.159
ECT_1	-0.290**	0.148
R-squared	0.810	
Adjusted R-squared	0.400	
F-statistic	2.460***	
Prob. (F-statistic)	0.008	
Diagnostic Problems[a]: None		

Notes: *, ** and *** signify 10 percent, 5 percent and 1 percent significance levels respectively. a: Diagnostic problems refer to the 4 diagnostic tests for Serial Correlation (SC), Functional Form (FF), Normality (NM), and Heteroscedasticity (HSC). The EC_{t-1} were generated from the Johansen cointegration test.

Table 5.7: Error correction estimation, dependent variable, non-oil fdi

Variables	Coefficients	Std. Error
Constant	-0.646	0.783
Δnon $-$ oil fdi(-1)	-0.002	0.006
Δcor (-1)	0.003*	0.002
Δg (-1)	-0.000	0.022
Δy (-1)	0.001	0.001
Δhk (-1)	0.018	0.023
Δtrade (-1)	-0.083	0.059
Δinv (-1)	0.007	0.025
Δinfra (-1)	-0.032***	0.004
Δinflation (-1)	-0.075**	0.038
ECT_1	-0.298**	0.149
R-squared	0.722	
Adjusted R-squared	0.464	
F-statistic	2.865***	
Prob. (F-statistic)	0.009	
Diagnostic Problems[a]: None		

Notes: *, ** and *** signify 10 percent, 5 percent and 1 percent significance levels respectively. a: Diagnostic problems refer to the 4 diagnostic tests for Serial Correlation (SC), Functional Form (FF), Normality (NM), and Heteroscedasticity (HSC). The EC_{t-1} were generated from the Johansen cointegration test.

5. Conclusion

The effects of corruption on economic activities have received attention in recent literature. The level of corruption in the host country has been introduced as one factor among the determinants of FDI location. Some empirical studies provide evidence on a negative relationship between corruption and FDI inflows, while others fail to find such a relationship. Most existing studies are largely based on a cross-sectional analysis that cannot account for unobserved country specific effects with which the corruption level is correlated. In addition, the simultaneity between corruption and FDI is ignored. This paper has sought to answer the following question: controlling for other determinants of FDI inflows, does a corrupt Egypt receive less or more FDI inflows? To test this hypothesis, we employ time series data for Egypt over the period 1970-2019.

In Egypt, corruption is found to be positively related to FDI and non-oil FDI inflows in both the short run and the long run. This result suggests that foreign investors might be willing to bribe the regional authorities to save their time and to move in front of the bureaucratic lines. Therefore, it is possible that regions with high levels of perceived corruption attract more FDI. While higher extent of perceived corruption appears to be associated with more direct investment into Egypt's economy, these results, should not be interpreted as support for corrupt regimes. As Aidt (2003) points out, the socially most beneficial policy is eliminating rather than circumventing corruption.

The paper finds support for the importance of economic factors (namely, market size and domestic agglomeration). The empirical results also confirm that income or wealth (per capita GDP) is significantly positively related to FDI inflows. In addition, the empirical model provides a strong support to the view that FDI could be a key source of capital accumulation for Egypt.

In short, our results reveal that corruption in Egypt does not discourage investors. Thus, the government of Egypt should consider one or both following implications: (i) corruption is a means of economic expansion by overcoming restrictive laws or behavior such that the value of economic expansion surpasses the extra costs of corruption, thereby supporting the EGH; (ii) the other FDI determinants are influential. Hence, even if the relationship between FDI and corruption is not causal but merely coincidental, the rise in other factors raises FDI even if corruption is increasing. In both cases, the rise of corruption does not negatively influence FDI.

References

Abed, G. T. and Davoodi, H. R., 2000, “*Corruption, structural reforms and economic performance in the transition countries*”, Fiscal Affairs Department. Washington: International Monetary Fund, IMF Working Paper WP/00/132.

Adams, J., 2009, “Will 'Red Money' Tame Taiwan”, *Far Eastern Economic Review*, vol. 172, no. 5, pp. 37-40.

Aidt, T. S., 2003, “Economic analysis of corruption: A survey”. *The Economic Journal*, vol. 113, no. 491, pp. F632–F652.

Asiedu E., 2013, “*Foreign Direct Investments, Natural Resources and Institutions*”, Working Paper, International Growth Centre.

Asiedu, E., 2002, “On the determinants of foreign direct investment to developing countries: is Africa different?”, *World Development*, vol. 30, no. 1, pp. 107-118.

Asiedu, E., 2003, “Debt Relief and Institutional Reform: A Focus on Heavily Indebted Poor Countries”, *Quarterly Review of Economics and Finance*, vol. 43, no. 4, pp. 614-626.

Asiedu, E., 2005, “Policy Reform and Foreign Direct Investment in Africa: Absolute Progress but Relative Decline”, *Development Policy Review*, vol. 22, no. 1, pp. 41-48.

Asiedu, E., 2006, “Foreign direct investment in Africa: the role of government policy, institutions and political instability”, *World Economy*, vol. 29, no. 1, pp. 63-77.

Brada, J. C., Kutan, A. M., and Yigit, T. M., 2006, “The effects of transition and political instability on foreign direct investment Inflows-Central Europe and the Balkans”, *Economics of Transition*, vol. 14, no. 4, pp. 649-680.

Busse, M. and Hefeker C., 2007, “Political risk, institutions and foreign direct investment”, *European Journal of Political Economy*, no. 23, pp. 397-415.

Campos, and Y. Kinoshita, 2002, “FDI as Technology Transferred: Some Panel Evidence from Transition Economies”, *The Manchester School*, vol. 70, no. 3, pp. 398-419.

Campos, N., and Kinoshita, Y., 2004, “*Foreign Direct Investment and structural reforms: Evidence from Eastern Europe and Latin America*”, IMF Working Paper, no.26.

Dreher, A. and T. Herzfeld., 2005, “*The Economic Costs of Corruption: A survey and New Evidence*”, Mimeo, University of Konstanz and University of Kiel.

Duma, N., 2007, “*Sri Lanka's Sources of Growth*”, International Monetary Fund, IMF Working Papers: 07/225.

Egger. P and H. Winner, 2005, “Evidence on Corruption as an Incentive for Foreign Direct Investment”, *European Journal of Political Economy*, vol. 21, pp.932-952.

Egger. P and H. Winner, 2006, “*How corruption Influences Foreign Direct Investment: A Panel Data Study*”, Economic Development and Cultural Change no.54.

El-Mikawy, M., A. E. Mabdy and H. Handoussa., 2001, “*Foreign Direct Investment in Egypt. Investment Strategies in Emerging Markets*”, Economic Research Forum, pp. 51-87”. Available at: < http: //www. enf.0 Tg,> [Accessed 30 October 2014].

Habib, M. and Zurawicki, L., 2001, “Country Level Investments and the Effect of Corruption-Some Empirical Evidence”, *International Business Review*, vol. 10, no. 6, pp. 687-700.

Helmy, H. E., 2014, “The impact of corruption on FDI: is MENA an exception?”, *International Review of Applied Economics*, vol. 27, no. 4, pp. 491-514.

Hisarciklilar, M., Kayalica, O., and Kayam, S. S., 2006, "*Locational Drivers of FDI in MENA Countries: A Spatial Attempt*", Munich Personal RePEc Archive (MPRA) Paper Institution: Istanbul Technical University Faculty of Management ID Code: 2085, pp.1-20

Houston, D. A., 2007, "Can Corruption Ever Improve an Economy?", *CATO Journal*, vol. 27, no. 3, pp. 325-342.

Jain, A. K., 2001," Corruption: A review", *Journal of Economic Surveys*, vol. 15, no. 1, pp. 71-121.

Jensen, N. M., Li, Q. and Rahman, A., 2010, "Understanding Corruption and Firm Responses in Cross-National Firm-Level Surveys", *Journal of International Business Studies*, vol. 41, no. 9, pp. 1481-1504.

Johansen, S., and Juselius, K., 1990, "Maximum Likelihood Estimation and Inference on Co-Integration with Application for the Demand for Money", *Oxford Bulletin of Economics and Statistics*, vol. 52, pp. 169-210

Kardesler, E., and Yetkiner, I. H., 2009, "*The Impact of Corruption on FDI: An Application of Efficient Grease Hypothesis to EU Countries*", Working Paper no. 0902, Izmir University of Economics.

Li, X. and Liu, X., 2005, "Foreign Direct Investment and Economic Growth: An increasingly endogenous relationship", *World Development*, vol. 33, no. 3, pp. 393-407.

Mathur, A., and Singh, K., 2011, "Foreign direct investment, corruption and democracy", *Applied Economics*, vol. 45, no. 8, pp. 991-1002.

Mathur, A., and Singh, K., 2013, "Foreign direct investment, corruption and democracy", *Applied Economics*, vol. 45, no. 8, pp. 991-1002.

Mottaleb, K. A. and Kalirajan, K. 2010, "Determinants of Foreign Direct Investment in Developing Countries: A Comparative Analysis", *The Journal of Applied Economic Research*, vol. 4, no. 4, pp. 369-404.

Murphy, K. M., A. Shleifer, and R.W. Vishny, 1993, "Why is Rent-Seeking So Costly to Growth?", *American Economic Review*, pp. 409-414.

Ndikumana L. and Verick S., 2008, "The linkages between FDI and domestic investment: unravelling the developmental impact of foreign investment in sub-Saharan Africa", *Development Policy Review*, vol. 26, no. 6, pp. 713-726.

Rose-Ackerman, S., 1997, "Corruption and government: Causes, consequences and reform", Cambridge: Cambridge University Press.

S. Bellos, T. Subasat, 2012, "Corruption and Foreign Direct Investment: A Panel Gravity Model Approach", *Bulletin of Economic Research*, vol. 64, no 4, pp. 565-574

Sader, F., 1993, "*Privatisation and Foreign Investment in the Developing World: 1988-1992*", Policy Research Working Paper No. 1202, World Bank, USA.

Sader, F., 1997, "*Privatizing Public Enterprises and Foreign Investment in Developing Countries, 1988-1993*", FIAS Occasional Paper 5, Foreign Investment Advisory Service, World Bank, USA.

Sadig, A., 2009, "The Effects of Corruption on FDI Inflows", *Cato Journal*, vol. 29, no. 2, Spring/Summer.

Tang, S., Selvanathan, E. A. and Selvanathan, S., 2008, “Foreign Direct Investment, Domestic Investment and Economic Growth in China: A Time Series Analysis”, *World Economy*, vol. 31, no. 10, pp. 1292-1309.

Tosun, M., Yurdakul, M., Varol İyidoğan, P., 2014, “The Relationship between Corruption and Foreign Direct Investment Inflows in Turkey: An Empirical Examination”, *Transylvanian Review of Administrative Sciences*, no. 42, pp. 247-257.

United Nations Development Project, 2012, "Human development in Egypt". Available at:<http://www.undp.org.eg/workshops/2002/Nov/Post_wssd/Documents/Energy/report.p df.> [Accessed 30 October 2014].

Wei, S-J. and Wu, Y., 2002, “*Negative alchemy? Corruption, composition of capital flows, and currency crises*”, in Edwards, S. and Frankel, J. (Eds.): Preventing Currency Crises in Emerging Markets, pp.461-501, University of Chicago Press, Chicago.

Wheeler, D., and Mody A., 1992, “International investment location decisions: the case of U.S. firms”, *Journal of International Economics*, vol. 33, pp. 57-76.

World Bank (various issues), World Investment Report, World Bank, Washington, USA.

World Bank, 1993, “*Egypt’s Privatization Program: Experience, Issues, and Lessons*”, Development in Practice, World Bank, Washington, D.C.

World Bank, 1997, Arab Republic of Egypt: Country Economic Memorandum (4 volumes), World Bank Resident Mission in Egypt.

World Bank, 2002, World Development Indicators, CD-ROM.

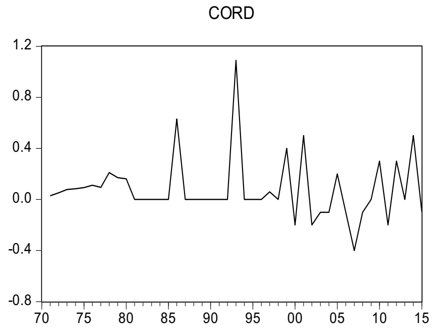
Zhou, W., 2007, “Changing Lanes in China: Foreign Direct Investment, Local Governments, and Auto Sector Development”, *Administrative Science Quarterly*, vol. 52, no. 1, pp. 148-151.

APPENDIX (A)

Table A.1: Description and sources of data

Variable	Description	Measure	Units	Source
fdi_t	The natural logarithm of FDI inflows	FDI	rate	UNCTAD of the UN Group
$non-oil\ fdi_t$	The natural logarithm of non-oil FDI inflows	FDI	rate	GAFI
cor_t	Corruption Perception Index (CPI)	Corruption	Index – ranges from 0 to 10	TI
g_t	The real GDP growth rate (GDP deflator with base year 2005 is used as a deflator)	Market dynamics	Percentage per annum	WDI of the WB Group
y_t	The natural log of per capita real GDP	Market size	US$	WDI of the WB Group
hk_t	The natural logarithm of secondary school enrolment to gross enrolment ratio	Human capital	Percentage per annum	WDI of the WB Group
$trade_t$	Exports and imports of goods and services to real GDP	Openness	Percentage per annum	WDI of the WB Group
inv_t	Gross fixed capital stock to real GDP	Private domestic investment	Percentage per annum	WDI of the WB Group
X_t	Mobile cellular subscriptions per 100 people ($infra_t$) Percentage changes in consumer prices ($inflation_t$)	Infrastructure Inflation rate	Percentage per annum	WDI of the WB Group

Figure A.1: Plots of first difference series of variables



A.1 Descriptive statistics

Figure A.2 shows the trends of fdi and cor over the period (1970-2015). Both series appear to have an increasing trend over the period of study with lesser fluctuations in the corruption index (CPI). This result is consistent with the discussion in chapter three on the deeply embedded corruption networks in Egypt which follow the same pattern over time. In addition, these weak fluctuations in cor series is expected due to the nature of the variable itself (an index ranging between 0 and 10) compared to fdi (percentage of real GDP).

Figure A.2 shows that FDI inflows as a percentage of real GDP increased slowly during the period from 1980 to 2003. As we discussed in chapter three, FDI inflows increased significantly post 2003, due to the adoption of the openness policy and the ERSAP. There is also an increase of about 64 percent per annum in FDI inflows to Egypt from 1980 to 2006. Figure A.2 also expects a positive relationship between fdi and cor in the long run. The cor series in figure A.2 gives the impression of the non-stationarity, the matter which will be further examined later in this chapter.

Table A.2 summarizes the descriptive statistics for the variables used in our study. The first look at the dataset reveals a considerable variation over time in all our variables. The high standard deviation observed for all variables with respect to their means emphasizes the high volatility of the Egypt's economy over the studied period. This result is consistent with the discussion of strong pro-cyclicality of Egypt's economy discussed in chapter three. Table A.2 also indicates that all the variables are positively skewed, except for cor and hk. This result indicates that corruption and human capital are asymmetrical variables. Values of kurtosis are deviated from 3. This result indicates that the variables are not normally distributed.

Figure A.2: Trends of fdi and cor in Egypt

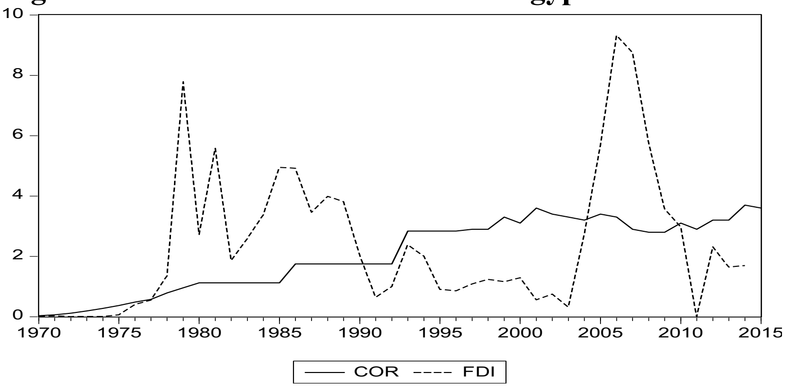


Table A.2: Descriptive statistics

Statistical Indicator	fdi	cor	g	y	hk	trade	inv	infra	inflation
Mean	2.403	2.026	5.052	929.445	67.050	51.838	20.701	5.527	10.662
Median	1.694	1.750	4.685	887.316	74.893	51.956	19.429	3.474	10.146
Maximum	9.321	3.700	14.627	1475.130	87.697	82.177	34.433	15.700	23.864
Minimum	0.000	0.033	0.705	440.541	28.436	32.482	11.160	0.645	2.102
Std. Dev.	2.369	1.173	2.876	325.291	18.239	12.563	5.705	5.041	5.827
Skewness	1.277	-0.284	1.271	0.189	-0.687	0.349	0.299	0.718	0.352
Kurtosis	4.087	1.624	5.023	2.037	2.151	2.497	2.480	2.031	2.266

Table A.3 presents the correlation matrix for all the explanatory variables and FDI as the dependent variable. The correlation matrix provides a first crude expectation of the relationship between the variables. Table A.3 shows that fdi has a positive correlation with cor as anticipated in some of the empirical literature discussed in chapter two. This positive correlation is confirmed by chapter three analysis of FDI and corruption trends in Egypt. Chapter three shows that despite the strong legal framework to prevent and stifle corruption in Egypt, there is a glaring increase in corruption. At the same time, FDI trends show an increasing trend over the period of study.

Table A.3: Correlation matrix

	fdi	cor	g	y	hk	trade	inv	infra	inflation
fdi	1								
cor	0.200	1							
g	0.137	-0.303	1						
y	0.283	0.900	-0.265	1					
hk	0.314	0.949	-0.272	0.890	1				
trade	0.534	-0.138	0.453	-0.074	-0.007	1			
inv	0.400	-0.222	0.439	-0.219	-0.045	0.581	1		
infra	0.335	0.818	-0.189	0.872	0.785	-0.013	-0.336	1	
inflation	0.293	-0.192	0.187	-0.073	0.016	0.434	0.638	-0.270	1

APPENDIX (B)

B.1 Robustness checks

In this subsection, we add further experiments to the cointegration modelling. These experiments provide comparisons and robustness checks to our main model as well as improving its degrees of freedom.

B.1.1 ARDL model

The above ADF and PP unit root tests show that all variables are nonstationary at level and stationary at first difference, except the economic growth, denoted g, which is stationary at level. Thus, all variables are I(1), while g is I(0). The combination of I(0) and I(1) gives us a chance to apply the ARDL approach of cointegration as suggested by Pesaran et al. (2001). The ARDL test results reveal that the calculated F-statistics (1.05) is less than upper critical bound as indicated in the Narayan (2005) table. Thus, we can't conclude that the variables have a long run relationship. Yet, we rely on Johansen cointegration results as the ARDL model comes with an insignificant F-statistics, a small R^2 (38 percent), and a serial correlation problem.

B.1.2 Johansen cointegration tests

First, we repeat the cointegration analysis applied to all specified variables with the economic growth variable, denoted g, excluded. This is because this variable is stationary at level I(0). Table B.1 reports the Johansen cointegration test results and critical values of the maximum eigenvalue(λ_{max}) and trace statistics (λ_{trace}). The Johansen cointegration test is applied with one lag and with the deterministic terms (intercept and no trend in cointegration equation and test VAR). The Johansen cointegration results indicate that the null hypothesis of no cointegration can be rejected at a 5 percent significance level. There exist only one cointegrating vector and there is a long run cointegrating relationship among all the variables in our model, with g excluded.

Table B.1: Johansen cointegration tests, with g excluded

Part A: LR test based on Maximal Eigenvalue of the stochastic matrix (λ_{max})

Null	Alternative	Statistic	95 percent C.V.	Eigenvalues
r = 0	r = 1	65.112	52.363	0.780
r ≤ 1	r = 2	33.240	46.231	0.538
r ≤ 2	r = 3	31.090	40.078	0.515
r ≤ 3	r = 4	18.021	33.877	0.342
r ≤ 4	r = 5	16.015	27.584	0.311
r ≤ 5	r = 6	10.943	21.132	0.225
r ≤ 6	r = 7	4.757	14.265	0.105
r ≤ 7	r = 8	1.205	3.841	0.028

Part B: LR test based on Trace of the stochastic matrix (λ_{trace})

Null	Alternative	Statistic	95 percent C.V.	Eigenvalues
r = 0	r ≥ 1	180.384*	159.530	0.780
r ≤ 1	r ≥ 2	115.272	125.615	0.538
r ≤ 2	r ≥ 3	82.031	95.754	0.515
r ≤ 3	r ≥ 4	50.941	69.819	0.342
r ≤ 4	r ≥ 5	32.920	47.856	0.311
r ≤ 5	r ≥ 6	16.905	29.797	0.225
r ≤ 6	r ≥ 7	5.961	15.495	0.105
r ≤ 7	r = 8	1.205	3.841	0.028

Notes: * indicates rejection of the null hypothesis at 5 percent level. H_0, and H_1 are the null and alternative hypotheses, respectively. C.V. is the critical values of the λ_{max} and λ_{trace} at the 5 percent level.

Table B.2 presents the normalized coefficients of the cointegrating vector and their statistical significance, with g excluded. According to table B.2, the estimated cointegrated vector, with g excluded indicates the same results as table 5.4. All the variables have significant effects on FDI in Egypt in the long run, except for corruption. Given that the estimates of our both models in tables 5.4 and B.2 yield the same results, this support the reliability of the econometric methods used and the fact that our estimates are robust.

Table B.2: Normalized Cointegrating Vector, with g Excluded

fdi	cor	y	hk	trade	inv	infra	inflation
-1.0000	4.6272 (2.3530)	0.1266 (0.0143)	1.1857 (0.1604)	-0.0981 (0.0527)	1.4173 (0.1677)	0.4280 (0.0509)	-1.4694 (0.1942)

Note: Standard error in parentheses

Second, we apply further cointegration analysis to all specified variables with both economic growth and the per capita real GDP excluded. We may exclude the level of GDP because it is usually used to proxy market size in models applied to cross-sectional data for comparison reasons. Table B.3 reports the Johansen cointegration test results and critical values of the maximum eigenvalue(λ_{max}) and trace statistics (λ_{trace}). The Johansen cointegration test is applied with one lag and with the deterministic terms (intercept and no trend in cointegration equation and test VAR). The Johansen cointegration results indicate that the null hypothesis of no cointegration can't be rejected at a 5 percent significance level. There is no long run cointegrating relationship among all the variables in our model, with g and y excluded.

Table B.3: Johansen cointegration tests, with g and y excluded

Null	Alternative	Statistic	95 percent C.V.	Eigenvalues
Part A: LR test based on Maximal Eigenvalue of the stochastic matrix (λ_{max})				
r = 0	r = 1	36.413	46.231	0.571
r ≤ 1	r = 2	31.748	40.078	0.522
r ≤ 2	r = 3	24.899	33.877	0.440
r ≤ 3	r = 4	15.462	27.584	0.302
r ≤ 4	r = 5	8.1715	21.132	0.173
r ≤ 5	r = 6	4.918	14.265	0.108
r ≤ 6	r = 7	1.681	3.841	0.038
Part B: LR test based on Trace of the stochastic matrix (λ_{trace})				
Null	Alternative	Statistic	95 percent C.V.	Eigenvalues
r = 0	r ≥ 1	123.292	125.615	0.571
r ≤ 1	r ≥ 2	86.879	95.754	0.522
r ≤ 2	r ≥ 3	55.132	69.819	0.440
r ≤ 3	r ≥ 4	30.233	47.856	0.302
r ≤ 4	r ≥ 5	14.771	29.797	0.173
r ≤ 5	r ≥ 6	6.540	15.495	0.108
r ≤ 6	r ≥ 7	1.681	3.841	0.038

Notes: * indicates rejection of the null hypothesis at 5 percent level. H_0, and H_1 are the null and alternative hypotheses, respectively. C.V. is the critical values of the λ_{max} and λ_{trace} at the 5 percent level.

B.1.3 DOLS model

The DOLS model is utilized to estimate equations (4.2 and 4.3). The DOLS estimates have better small sample properties and provide superior approximation to normal distribution. The maximum lag length for DOLS model is one based on table 5.4. The DOLS results of the long run coefficient of cor matches the result of Johansen cointegration in tables 5.4 and B.2. Given that the estimates of our three models (Johansen cointegration, ARDL, and DOLS) yield the same results, this support the reliability of the econometric methods used and the fact that our estimates are robust. Fortunately, the information on causation is embodied in the VECM. So, we move to estimate the VECM for equations (4.2 and 4.3), after determining the optimal number of lags, the suitable mode for testing the VAR models and the number of cointegrating vectors the VECM should have.

Table B.4: DOLS estimation

Variables	Coefficients	Std. Error
cor	1.247835	0.764900
g	0.783110***	0.212112
y	0.045715***	0.011986
hk	0.652019***	0.143270
trade	0.006666	0.024015
inv	0.346977***	0.150867
infra	0.177114***	0.054862
inflation	-0.815154***	0.152969
R-squared	0.958107	
Adjusted R-squared	0.828237	
Stability Tests[a]: Stable		

Notes: *, ** and *** denote rejection of the null hypothesis at the 10 percent, 5 percent and 1 percent levels respectively. a: Stability tests refer to the CUSUM test and CUSUM of Squares test.

APPENDIX (C)

C.1 Back-casting procedures

Following Ellis and Price (2003), we use DEM from the QoG Institute with annual back runs to 1946 to back-cast for the missing COR data from 1970 to 1980. We extrapolate recent COR data points into the past based on the correlation between DEM and COR. As shown in figure 5.1, both COR and DEM are highly correlated over the period 1980-2015. Both COR and DEM are upward trended and their rates of increase are approximately equal. Unit root tests for COR and DEM indicate that both variables are I(1) at standard significance levels. The levels regression or COR vs DEM has residuals that are I(0)- testing without intercept or trend, so the series appear to cointegrate. This implies that the below ECM is appropriate.

Table C.1: Error correction estimation, dependent variable, DCOR

Variables	Coefficients	Std. Error
Constant	0.166216***	0.065815
ECT_1	-0.322229***	0.118884
DCOR (-1)	-0.039532	0.193981
DCOR (-2)	-0.041540	0.194123
DCOR (-3)	-0.074843	0.192299
DCOR (-4)	-0.119853	0.191307
DCOR (-5)	-0.148068	0.189305
DDEM (-1)	-0.203130**	0.109516
DDEM (-2)	-0.045233	0.113707
DDEM (-3)	-0.079318	0.113096
DDEM (-4)	-0.068449	0.107010
DDEM (-5)	-0.211770***	0.096965
R-squared	0.496770	
Adjusted R-squared	0.189240	
F-statistic	1.615355*	
Prob. (F-statistic)	0.100000	
Diagnostic Problems[a]: None		

Notes: *, ** and *** signify 10 percent, 5 percent and 1 percent significance levels respectively. a: Diagnostic problems refer to the 4 diagnostic tests performed by E-Views8 for Serial Correlation (SC), Functional Form (FF), Normality (NM), and Heteroscedasticity (HSC).

Lagged differences in COR are not significant so we remove them as follows:

Table C.2: Error correction estimation, dependent variable, DCOR

Variables	Coefficients	Std. Error
Constant	0.138966***	0.052862
ECT_1	-0.311682***	0.103712
DDEM (−1)	-0.195745***	0.095553
DDEM (−2)	-0.045758	0.102066
DDEM (−3)	-0.088344	0.095350
DDEM (−4)	-0.072466	0.090513
DDEM (−5)	-0.223141***	0.080202
R-squared	0.469034	
Adjusted R-squared	0.330521	
F-statistic	3.386216***	
Prob. (F-statistic)	0.015301	
Diagnostic Problems[a]: None		

Notes: *, ** and *** signify 10 percent, 5 percent and 1 percent significance levels respectively. a: Diagnostic problems refer to the 4 diagnostic tests performed by E-Views8 for Serial Correlation (SC), Functional Form (FF), Normality (NM), and Heteroscedasticity (HSC).

Then, we remove the insignificant lags in the following table:

Table C.3: Error correction estimation, dependent variable, DCOR

Variables	Coefficients	Std. Error
Constant	0.115229***	0.043544
ECT_1	-0.264013***	0.072421
DDEM (−1)	-0.166174***	0.069743
DDEM (−5)	-0.195808***	0.068380
R-squared	0.469034	
Adjusted R-squared	0.330521	
F-statistic	6.952468***	
Prob. (F-statistic)	0.001376	
Diagnostic Problems[a]: None		

Notes: *, ** and *** signify 10 percent, 5 percent and 1 percent significance levels respectively. a: Diagnostic problems refer to the 4 diagnostic tests performed by E-Views8 for Serial Correlation (SC), Functional Form (FF), Normality (NM), and Heteroscedasticity (HSC).

Although DDEM (−5) is statistically significant, we remove it because this long lag will restrict the applicability of a predictor of COR in 1970-1980. Hence, the ECM will be as follows:

Table C.4: Error correction estimation, dependent variable, DCOR

Variables	Coefficients	Std. Error
Constant	0.079837***	0.043880
ECT_1	-0.205721***	0.074064
DDEM (−1)	-0.168916***	0.073164
R-squared	0.469034	
Adjusted R-squared	0.330521	
F-statistic	4.630245***	
Prob. (F-statistic)	0.017397	

Diagnostic Problems[a]: None

Notes: *, ** and *** signify 10 percent, 5 percent and 1 percent significance levels respectively. a: Diagnostic problems refer to the 4 diagnostic tests performed by E-Views8 for Serial Correlation (SC), Functional Form (FF), Normality (NM), and Heteroscedasticity (HSC).

We convert to a model in levels and then lose the insignificant term:

Table C.5: Error correction estimation, dependent variable, DCOR

Variables	Coefficients	Std. Error
Constant	0.041467***	0.176347
ECT_1	-0.264013***	0.072421
COR (-1)	0.785084***	0.074708
DEM (-1)	0.009572	0.078355
DEM (-2)	0.199178***	0.079477
R-squared	0.911325	
Adjusted R-squared	0.902458	
F-statistic	102.7717***	
Prob. (F-statistic)	0.000000	
Diagnostic Problems[a]: None		

Notes: *, ** and *** signify 10 percent, 5 percent and 1 percent significance levels respectively. a: Diagnostic problems refer to the 4 diagnostic tests performed by E-Views8 for Serial Correlation (SC), Functional Form (FF), Normality (NM), and Heteroscedasticity (HSC).

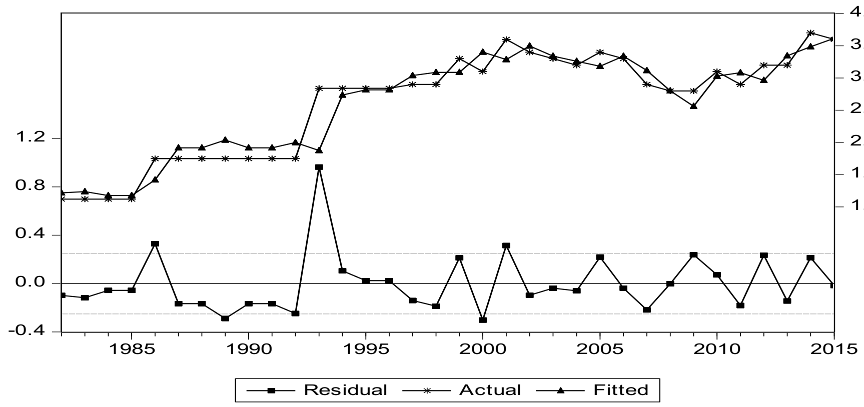
Then, we remove the insignificant lags in the following table:

Table C.6: Error correction estimation, dependent variable, DCOR

Variables	Coefficients	Std. Error
Constant	0.049839***	0.159885
COR (-1)	0.787950***	0.069794
DEM (-2)	0.203266***	0.070935
R-squared	0.911281	
Adjusted R-squared	0.905557	
F-statistic	159.2092***	
Prob. (F-statistic)	0.000000	
Diagnostic Problems[a]: None		

Notes: *, ** and *** signify 10 percent, 5 percent and 1 percent significance levels respectively. a: Diagnostic problems refer to the 4 diagnostic tests performed by E-Views8 for Serial Correlation (SC), Functional Form (FF), Normality (NM), and Heteroscedasticity (HSC).

The Figure below displays actual and fitted COR as well as the residual:



Consequently, we decided to construct a back series for COR to 1970. COR over the period 1970-1979 is calculated based on the following equation:

$$\widehat{\mathrm{COR}}_t = 0.050 + 0.788\mathrm{COR}_{t-1} + 0.203\mathrm{DEM}_{t-2}$$

The above equation indicates that COR (-1) and DEM (-2) are good in-sample predictors of COR. Nevertheless, out-of-sample predictions breach the (0-1) limits, consequently, we use logistic regression to predict probabilities because it respects the (0-1) limits. Using E-views 8, we transform the COR values so that they have 0-1 limits according to the following equation:

$$\mathrm{COR01} = \frac{\mathrm{COR}}{10}$$

And perform the logistic transformation as follows:

$$\mathrm{CORlogit} = \log(\frac{\mathrm{COR01}}{1 - \mathrm{COR01}})$$

Then, we run the following regression model over the period (1980-2015):

$$\mathrm{CORlogitdem.\,LS\ CORlogit\ c\ CORlogit}(-1)\ \mathrm{dem}(-2)$$

We use the fitted equation: $\mathrm{CORlogit} = \mathrm{b0} + \mathrm{b1} * \mathrm{CORlogit}(-1) + \mathrm{b2} * \mathrm{DEM}(-2)$ and convert it to an equation for CORlogit (-1) as follows:

$$\mathrm{CORlogit}(-1) = \frac{\mathrm{CORlogit} - \mathrm{b0} - \mathrm{b2} * \mathrm{DEM}(-2)}{\mathrm{b1}}$$

We shift the time index by +1: $\mathrm{CORlogit} = \frac{\mathrm{CORlogit}\ (+1) - \mathrm{b0} - \mathrm{b2} * \mathrm{DEM}(-1)}{\mathrm{b1}}$, then use it to back-cast the CPIlogit values as follows:

$\text{CORlogitfit} = \text{CORlogit}$; and

$$\text{CORlogitfit} = \frac{\text{CORlogfit}(+1) - \text{b0} - \text{b2} * \text{DEM}(-1)}{\text{b1}}$$

We undo the previous steps of logistic transformation and the division by 10:

$$\text{CORfit} = \frac{10\ \text{e}^{\text{CORlogitfit}}}{(1 + \text{e}^{\text{CORlogitfit}})}$$

Then fill the rest of the series from observed values according to:

$$\text{CORfit} = \text{COR}$$