The Impact of FDI on Exports in Egypt

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Abstract

In recent decades, emerging and developing countries have been racing in the context of attracting Foreign Direct Investments (FDI). However, the impact of FDI on exports is ambiguous depending on whether they are substitutes or complements. In addition, there is no absolute opinion that determines the significance of FDI impact on exports. The flow of FDI contributes to increasing economic growth and enhancing economic development by improving the infrastructure, creating job opportunities, technology diffusion, and providing an appropriate resource for financing investments. Many economists consider that the importance of FDI as directly increasing exports. Therefore, this study aims to determine the impact of FDI on exports in Egypt in both the short run and the long run. This paper uses the cointegration method Autoregressive Distributed Lag Model (ARDL) during the period from 1980 to 2018. The study proves that FDI promotes exports in the long run as well as gross domestic savings and the depreciation of local currency (EGP). However, in the short run, only gross domestic savings, and the depreciation of local currency increase exports.

Key Words:

Export, Foreign Direct Investments, Gross Domestic Savings, Depreciation of Local Currency, Autoregressive Distributed Lag Model, Egypt.

الملخص

في العقود الأخيرة، كانت البلدان الناشئة والنامية تتسابق في سياق جذب الاستثمارات الأجنبية المباشرة. ومع ذلك، فإن تأثير الاستثمار الأجنبي المباشر على الصادرات غير محدد عما إذا كان يعد بديلا أو مكمل للصادرات. بالإضافة إلى عدم وجود رأي حاسم بدرجة كافية يحدد أهمية تأثير الاستثمار الأجنبي المباشر على الصادرات. مما لا شك فيه أن تدفق الاستثمار الأجنبي المباشر يساهم في زيادة النمو الاقتصادي وتعزيز التنمية الاقتصادية من خلال تحسين البنية التحتية، وخلق فرص العمل، ونشر التكنولوجيا، وتوفير مورد ملائم لتمويل الاستثمارات، ويرى العديد من الباحثين الاقتصاديين أن أهمية الاستثمار الأجنبي المباشر تنعكس بشكل مباشر من خلال زيادة الصادرات. لذلك، يأتي هذا البحث لتحديد تأثير الاستثمار الأجنبي المباشر على الصادرات في مصر على المدى القصير والمدى الطويل. استخدم البحث نموذج التكامل المشترك ARDL خلال الفترة من ١٩٨٠ إلى ٢٠١٨. وأثبتت الدراسة أن الاستثمار الأجنبي المباشر يعزز الصادرات على المدى الطويل وكذلك المدخرات المحلية الإجمالية وانخفاض قيمة العملة المحلية (جنيه مصري). ومع ذلك، على المدى القصير وتؤدي فقط المدخرات المحلية الإجمالية، وانخفاض قيمة العملة المحلية إلى زيادة الصادرات.

الكلمات المفتاحية:

الصادرات، الاستثمار الأجنبي المباشر، إجمالي المدخرات المحلية، انخفاض قيمة العملة المحلية، نموذج الانحدار التكامل المشترك، مصر.

1. Introduction

The flow of Foreign Direct Investment (FDI) acquires significant and broad importance in the economic area from all sides, in terms of its impact on each of the host and home countries, in developed countries, developing countries, and least developed countries. Most of the attention is focused on studying macroeconomic variables such as GDP, employment, domestic investment, and payments balance by its effects on exports, imports, and real exchange rate. Moreover, its effect above all on the transfer of knowledge, skills, and technology to the host country and a high return on capital to the home country.

In general, the flow of FDI contributes to increasing economic growth and enhancing economic development by improving the infrastructure, creating job opportunities, and providing a good resource for financing investments, especially in developing countries and the least developed countries, which often suffer from a lack of capital. Many economic studies have focused on examining the extent to which the flow of FDI will achieve the desired goals, which we mentioned above. Many researchers consider that the importance of foreign direct investment reflects directly by measuring the growth of exports.

In fact, there is great variation in studies results about the relationship between FDI and export. the result confirms positive or negative effects in two directions or only one direction, where some studies found FDI has positive effects on export others found the effects come from Export on FDI and some studies found insignificant effects. as we show in the literature review in the next part.

Therefore, this study comes to investigates the effect of FDI on exports in Egypt. besides measuring the effects of the most important variables on exports which are the real exchange rate and Gross domestic savings.

1.1. Research Problem

The problem of this research can be summarized in examining the effects each of FDI inflow, real exchange rate, and total domestic savings as independent variables on the growth of Egyptian exports as a dependent variable on the growth of Egyptian exports during the period of 1980 to 2018.

1.2. Research Hypothesis

The research is based on the following hypotheses:
1. There is a significant positive effect of FDI inflow on exports in the long-run and insignificant short run.
2. the Egyptian exports are a heigh sensitive to the real exchange rate in the long and short run.
3. Egyptian exports also are affected by total domestic savings.

1.3. Research Objectives

this research aims to Verify how extent Egyptian exports are affected by the inflow of FDI, real exchange rate, and total domestic savings, and highlighting the nature of the causal relationship between the export and other mentioned variables and examines whether there is a relationship of co-integration or substitute.

this research also aims to analyze the development of exports and FDI descriptively.

1.4.   Research Importance

The importance of this research lies in:

First, prove the type of relationship between Egyptian exports and each of the FDI real exchange rate, and total domestic savings. so that contributes to removing the existing debate regarding the relationship of exports with FDI and then presenting new evidence that contributes to resolving the variation of opinion and settled the controversy in this economic issue at least in Egypt.

Second, providing the decision-maker with important information on the results of FDI to encourage exports in Egypt, and then directing economic policies in the desired direction.

1.5.   Research Methodology

To test the hypotheses and reach the research objectives, we used basically the quantitative methodology besides descriptive methodology.   the quantitative methodology in this research relied on building an econometric model using the co-integration method Autoregressive Distributed Lag Model (ARDL) to determine the long-run correlation between export and other variables, while the short-run effects are estimated by Error Correction Mechanism (ECM) method, this research was applied by software EViews. Part three shows obviously the applied methodology of ARDL in this research.

1.6.   Research Plan

It remains in this part to present the previous studies, next the second part comes to presents the descriptive analysis study of the variables, and the third part reviews the

quantitative method for revealing the result, and the last fourth part summarizes the results and provides suggestions.

1.7. Literature Review

- Sultan (2013) studied the relationship between Foreign Direct Investment and Export in India and found using the Johansen co-integration test, the presence of at least one long-run relationship between variables in the period 1980-2010, it used the VECM model. as the results showed that exports granger cause FDI in the long run but neither of them causes the other in the short run. that is means, the causality tends from export to FDI inflow and not FDI inflow effect on the export direction.

- Mitic & Ivic, (2016) used correlation analysis and including a time-lag of one year to study the relationship between FDI inflows and exports in eleven European countries during the period from 1993 to 2013. The research provided a strong interdependence between these two variables in most of the countries. But fewer countries showed a correlation in the case of a one-year time lag.

- Tokuo, I and Hayato (2015) concerned with the impact of exchange rate fluctuations on Japanese exports, as it examined the effect of the "price shock" resulting from the collapse of "Lehman Brothers Bank" and the repercussions of the global financial crisis, which led to a rapid decline in global demand with a significant decline in exports. The research used the "Structural Vector Autoregression (VAR) model" and assumed two exogenous shocks, which are a foreign demand shock and an exchange rate shock. the study found that the proportional significance of exchange rate shocks explained that export fluctuations in the mid-1990s were most sharp.

- Kutan, Ali M. & Vuksic, Goran (2007) studied the impact of foreign direct investment inflows on exports in Central and Eastern Europe, and the study has covered 12 economies during 1996 and 2004. where it estimated the impact of FDI on increasing capacity of supply and on FDI-specific effects separately. This study concluded that the supply capacity-increasing effects rise if FDI inflows developed production capacity in the host country, which cause in turn, increase export supply chance. The study found in all 12 countries, that increase of FDI inflow has led to increasing the domestic supply capacity and exports. as found that FDI-specific impacts on exports have existed only in the new EU-members.

- Selimi, N. et al. (2016) analyzed empirically the relationship between foreign direct investments and export performance in the period of 1996-2013 in Western Balkan economies. and examined the fixed impacts and individual heterogeneity across years and countries. this research Based on the panel regression techniques and used the "Least Square Dummy Variable (LSDV) regression method". The Paper's results revealed that FDI promotes export if it contributes to developing the country's economy.

- Nwanna, Gladson & Baltimore (1986) examined the impact of FDI on exports with an attempt at a detailed analysis of the effect on LDCs as a group, so, the research tried to measures explicitly, the contribution of FDI to exports in LDCs. this research combined aggregate analysis and a country by a country test using a large sample of less developed countries.

- Majeed, M. T., and Ahmad, E. (2007) aimed to identify common determinants of FDI and export to determine whether the two are substitutes or complements for

each other. This study used panel data in many developing countries to estimate the determinants of FDI and export with emphasis on the interrelationship.

- Samantha, NPG & Haiyun, L. (2018) employed (ARDL) model and bounds tests to investigate the impact of inward FDI on the export in Sri Lanka using data from 1980 to 2016 for selected variables. The study found, there are a positive insignificant long run and short-run relationships between FDI and exports, but this study confirmed that in Sri Lanka, exports are highly effected by domestic investment in the long-run, however, affected by GDP and real Exchange rates in the short-run.

- Hanafy, Shima'a (2015) concerned with depicting the structure of Foreign Direct Investment in Egypt. so, it studied the FDI in 27 Egyptian governorates during the period of 1972– 2009. where deal with an unpublished dataset for the geographical distribution of FDI, both as an aggregate and at the sectoral level. this paper found out: the distribution of FDI across Egyptian governorates is uneven and only two governorates, Cairo, and Giza, have Acquired more than 60% of non-petroleum greenfield FDI stock. and roughly 90% of FDI stock target only 10 governorates. The study found out also an unequal geographical distribution of FDI by Tracing two spatial concentration indices of FDI inflows over four decades, but this trend decreased until the mid/late 1990s and came back when with a substantial increase in FDI inflows. Moreover, the strongest concentration articulated in the ICT and finance sector while the manufacturing sector acquired the most geographically scatter of FDI.

- Falk, M. and Hake, M. (2008) examined the relationship between exports and stocks of foreign direct investment and used a group of industries and seven

countries in the EU-countries during the period of 1973-2004. using the tests of causality of "Holtz-Eakin, Newey, and Rosen (1988)". This Paper found out that exports cause FDI and not the other way around. the research confirms the same result by Separate estimates of countries. and reveals heigh significant effects that only exist in the CEE countries and other developed countries (i.e. United States, Japan, Canada, etc.).

- Pandya, V. & Sisombat, S. (2017) investigated the relationship between FDI and economic growth in Australia using multiple regression analyses between FDI and selected variables. The study found out that FDI inflows contribute to the Australian economy by growth in GDP, enhance export performance, and increase employment. Moreover, the result of the study revealed that an insignificant correlation between FDI and the economic growth of Australia.

- Massoud, N. (2003) measured the effects of the FDI incentives program that Egypt adopts since the open door policy in 1974 and found that has an insignificant effect on the volume of FDI inflows attracted to Egypt and caused more budgetary burdens and on Egyptian tax-payers. the paper used quantitative estimates methods to calculate the incentives offered by Egypt to foreign investors according to Law 8/1997 to increase FDI inflows and the cost born to finance these incentives. Moreover, revealed that the Egyptian policy regarding FDI should be revisited and emphasis on deriving macroeconomic benefits from FDI rather than on attracting the FDI.

- Metwally, M.M. (2004) examined the correlation between FDI, exports, and economic growth in Egypt, Jordan, and Oman where most of the FDI inflows came from the EU. using the simultaneous equations model. The results revealed that

higher rates of economic growth generated from a greater inflow of foreign capital and found out that interest rate differentials led to more effects than economic growth to attract foreign capital in the case of Egypt. While it is completely ineffective in the case of Oman, as found there is a return effect in the relationship between economic growth and capital inflow in all three countries. Moreover, this research confirmed that FDI inflow leads to an increase in exports of goods and services, and the growth in exports leads to an increase in GNP, which in turn, leads to more FD.

2. Export and FDI in Egypt.

Foreign Direct Investment involves the transfer of factors of production and the connection to commodity markets and foreign trade is established by the production function. At the same time attention is focused on the associated effects of international and intersectoral reallocation of capital as a major component of production.

Direct investment in classical foreign trade theory according to the Ricardian model, foreign trade is not sufficient to improve welfare.

Differences in factor prices can be balanced by international capital movements, and direct investments are complementary to international movements of commodities. (Stein, 1991)

According to the Heckscher-Ohlin theory, foreign direct investments are at least in part an alternative to international trade. By reducing the differences in the relative endowments of the factors, the degree of international specialization and thus also the incentive for international trade is reduced.

Corden assumes in his model three factors of production, two of which, physical capital and human capital, are internationally transferable within firms, but labor is not. It demonstrates that, under certain conditions, direct investment within multinational companies leads to an international convergence of returns on physical and human capital and labor. In the final equilibrium position, there is no difference in production costs or commodity prices, and thus there is no advantage of the place (Corden, W.M. 1985).

This trend for companies can be enhanced by focusing on a single place by increasing economies of scale. In the case of the international difference in the function of production factors, the place theory shows that the efficiency of the production factor function is the most attractive to the transfer of foreign capital. However, transportation costs or the creation of trade barriers can be led to internationally distributed production close to the market (Stein, 1991).

Either way, factors such as market size and location differences influence companies 'decisions. Changes in prior factors such as production functions and factor endowments over time lead to control of location decision and, if necessary, reallocation of factors of production, and adjustment to factor ratio sizes (Caves, Richard. E, 1996).

2.1. 2.1 Export in Egypt and its distribution:

Figure No. (1) shows the development of the flow of FDI compared to Egyptian exports, as it shows a similarity in a trend except for the years 2011 to 2015. Which affected by the incidence of January 25. The inflow of FDI achieved remarkable progress during the last three years, but it has not yet reached the best-recorded number which is 17.8 Billion US$ in 2007/2008.

Egyptian exports have witnessed a remarkable improvement since 2015, setting a record this year, reaching $ 28.5 billion.

Figure No. (1) FDI inflow and Export in Egypt 2005-2018

**FDI Inflow and Total Export in Egypt 2005-2018**
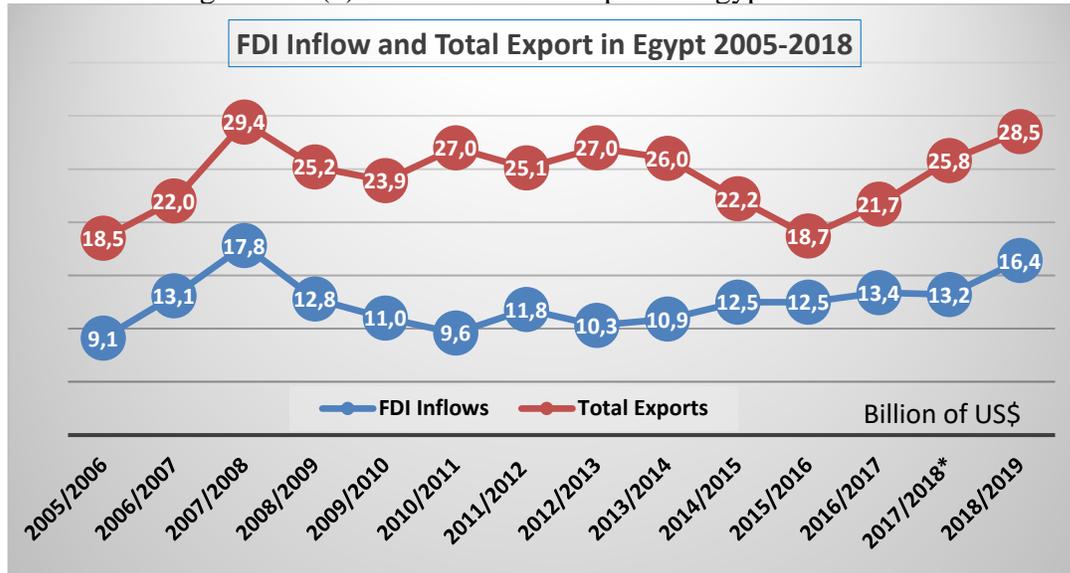
Resource: The Central Bank of Egypt (CBE) database:

Figure No. (2) shows the top ten countries to which Egyptian commodities are exported. It comes on the top of these countries the European Union, Arab countries, the United States of America and the Russian Federation & C.I.S.

Oil represents the largest share of exports, accounting for 34.0% of total exports, in 2017/2018, oil export revenues increased by 33.1% to reach $ 8.8 billion. while representing Non-oil exports about 66.0% of total exports, and its revenues increased in 2017/2018 by 12.7% to reach $ 17.1 billion. It includes raw materials by 18.9 %, finished goods 14.3 %, and semi-finished goods 7.4 %,.

12

Figure No. (3) shows sectoral distribution of exports by degree of processing whlie Figure No. (4) shows the proportional distribution of the value of exports by commodity groups.

Figure No. (2) Export in Egypt Geographical Distribution 2005-2018
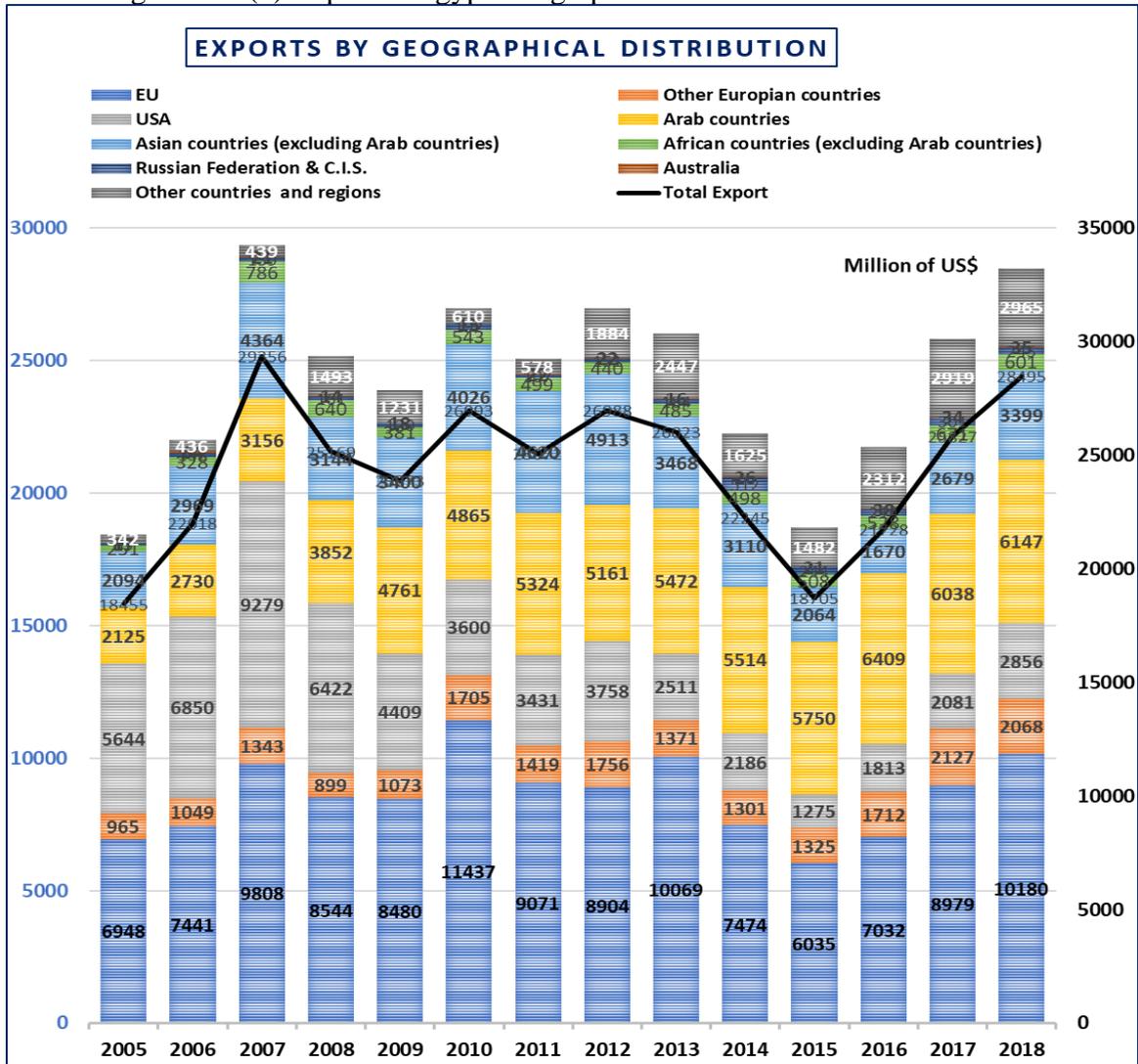
Resource: The Central Bank of Egypt (CBE) database.

Figure No. (3) sectoral distribution of exports by degree of processing

oil exports ◾ materials ◾ finished goods ◾ semi-finished goods ◾ Others
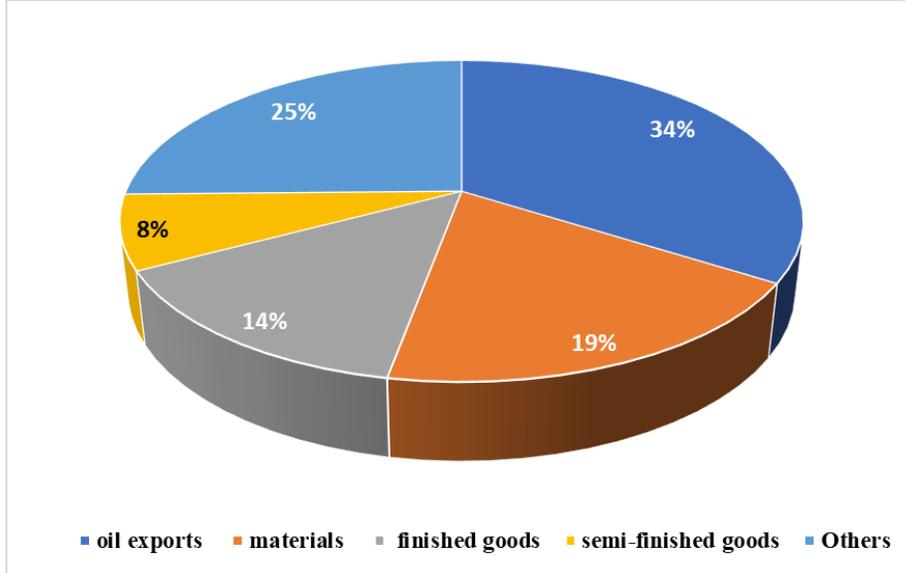
Resource: CBE Yearbook2018.

Figure No. (4) shows the distribution of the value of exports by commodity groups.

■ Metal products ■ Textile and articles thereof
■ Vegetable products ■ Chemical industries products
■ Machinery, electrical appliances ■ Others

Resource: CBE Yearbook2018.

14
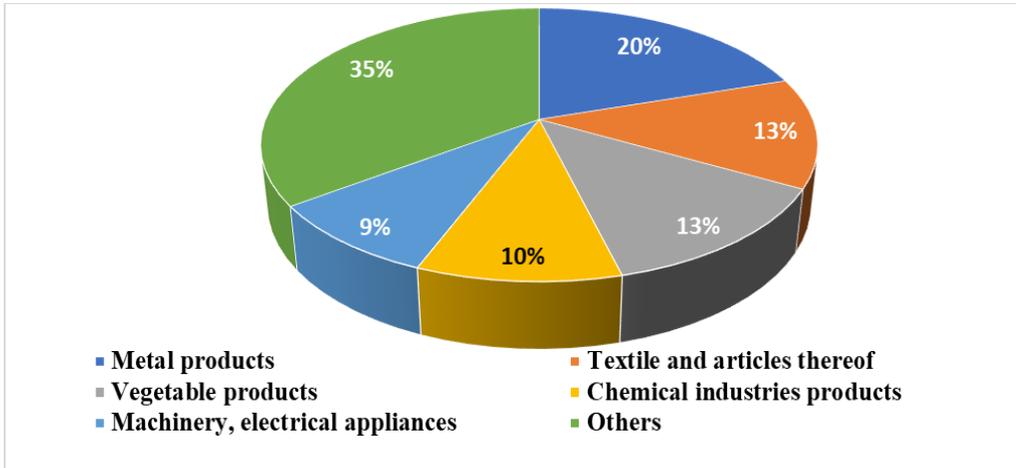
2.2. 2.2 FDI inflow in Egypt and its distribution

Table No (1) shows the sectoral distribution of total FDI flows in percent in Egypt

It indicates also an increase in foreign investment in the industrial sector, reaching about 10% in 2017/2018, While the rest of the foreign investments are divided into different economic activates, where the most important of that is the service sector which represents about 11% of invests in real estate and finance, tourism, communication, IT and other services.

Figure No. (5) shows the top ten countries that investments flow into Egypt. European Union comes at the top, then the United Kingdom, Arab countries, the US, the United Arab Emirates, and Kuwait.

Table No. (1) sectoral distribution of total FDI flows in %

	2013/14	2014/15	2015/16	2016/17	2017/18
Oil	71,7	58,4	53,5	61,3	67,3
Manufacturing	2	2,3	3,4	5,8	10
Agriculture	0,2	0	0	0,2	0,1
Construction	2,2	6	1,5	0,9	4,5
Services, of which:	4	10	10,4	9,4	11,2
Real estate	1,4	6,2	3,6	3,1	2,7
Finance	1	2	3,8	1,6	1,9
Tourism	0,1	0	0,3	0,4	0,3
Communication an IT	0	0	0,5	0,3	3,4
Other services	1,5	1,8	2,2	4	2,9
Unallocated	19,9	23,3	31,2	22,4	6,9

Resource: CBE Yearbook: Various Issues.

Figure No. (5) FDI inflow in Egypt by best country 2005-2018

Foreign Direct Investment (FDI) in Egypt by best Country

Legend: USA ■ EU ■ Germany ■ France ■ UK ■ Italy ■ Belgium ■ Arab Countries ■ Saudi Arabia ■ United Arab Emirates ■ Kuwait
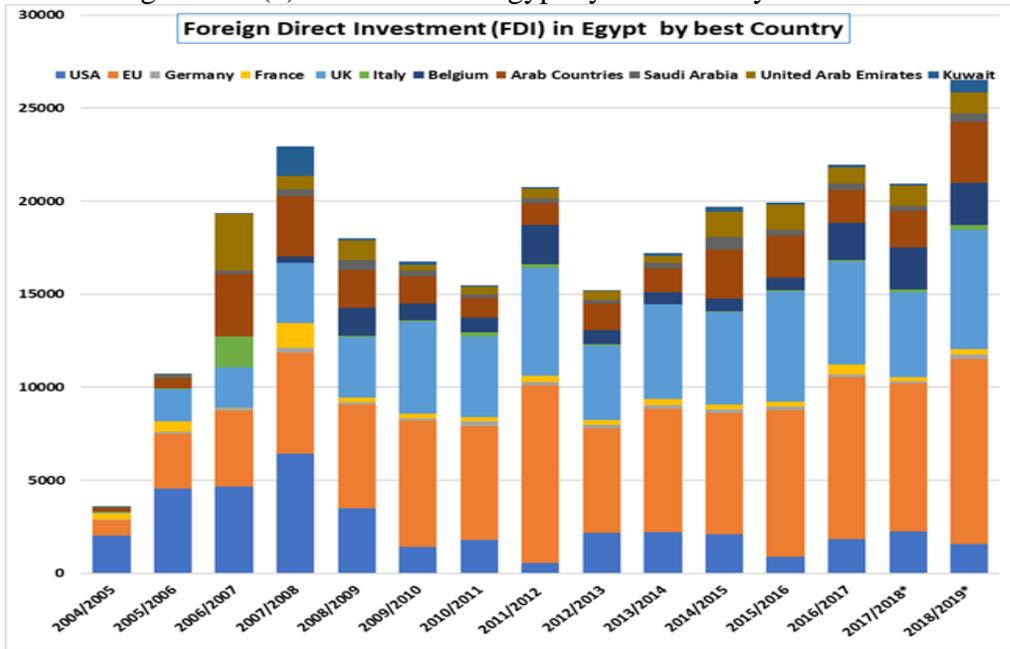
Resource: CBE Database: Various years

3. Methodology

3.1. Data and Variables

To test the impact of FDI on exports, the research uses annual data during the period 1980-2018. In this period, Egypt adopted both fixed, managed floating and freely floating exchange rate regimes.

Table No. (2) shows the variables abbreviation, description, and data resources.

Table No. (2) Variables

Abbreviation of Variable	Description	Source
FDI	Foreign Direct Investment inflows as % of GDP	UNCTAD
RER	Real Exchange Rate It is calculated using the following equation $RER = E \times \frac{p}{p^*}$ Where we multiply nominal exchange rate by CPI of Egypt and divide it by CPI for US (Ellis, L., & Ellis, L. (2001).	World Development Bank
GDS	Gross Domestic Savings as % of GDP	World Development Bank
EX	Exports as % of GDP	World Development Bank

3.2. Model specification

Recently, Economists became more attracted to using variables in their state form to study the long-run and dynamic relations among the underlying variables.

Since, many macro variables are not stationary that would lead to spurious regression if we used conventional models. The idea of co-integration had appeared which means that although individual variables are non-stationary on their own, they follow the same long-run relationship, so the residuals became stationary. that is why we are going to use a co-integration methodology in our research.

Unlike each of (Engle and Granger, 1987) and (Johansen, 1991, 1995), the test for co-integration under the condition that all variables must be I (1).

The ARDL bounds testing procedure developed by (Pesaran et al. ,2001) can be used nevertheless whether the independent variables are I (0) or I (1) or jointly co-integrated.

Also, the test provides more efficient results in case of small sample sizes as in this research than other co-integration tests.

The ARDL model is a dynamic model since it includes lags to both dependent and independent variables so we can measure both short and long relationships between variables under concern.

3.3. Co-integration

We can set the long-run relationship between variables by Co-integration. and combines short-run dynamics with long-run equilibrium.

The Co-integration test investigates how time series, which may not be separately stationary, can be jointed, where the mechanisms of equilibrium forces will Prevent any deviation too far and share stationary linear sequence.

So, this research examines the long run relationship using the "Autoregressive Distributed Lag" (ARDL) Co-integration technique and bound test of Co-integration (Pesaran and Shin 1999 and Pesaran et al. 2001).

The null hypothesis in this research present as following:

$H0: \beta1 = \beta2 = \beta3 = \beta4 = \beta5 = 0$

While the alternative hypothesis:

$H1: \beta1 \neq \beta2 \neq \beta3 \neq \beta4 \neq \beta5 \neq 0$

3.4. Unit Root Tests

To apply the ARDL bounds testing approach, we need to follow several procedures. First, we must test for stationarity of variables. Since ARDL bound methodology assumes that variables are purely I (1), purely I (0), or co-integrated and do not suffer from seasonal unit roots and volatile roots and it crashes down if variables are I (2). And we can find that this condition is satisfied in our case as in table 4 in the appendix.

Bounds Testing Procedure

Second, we must estimate the co-integration equation

$$\Delta EX_t = a_0 + \beta_{1i}\,\Delta EX_{t-i} + \beta_{2i}\,\Delta\text{FDI}_{t-i} + \beta_3\,\Delta GDS_{t-i} + \varphi_1\,EX_{t-i} + \varphi_2\,logRER_{t-i} + \varphi_3\,LogGRS_{t-i} + \varphi_4\,\text{FDI} + \varepsilon_t$$

Using ordinary least squares (OLS) to test for the presence of co-integration where φ's are long-run coefficients and. ε_t is the error term which is assumed to have zero mean and homoscedastic

The test is based on the well-known "Wald" or "F-statistics" in a generalized "Dicky–Fuller" type regression but with two different asymptotic critical values.

The lower value assumes that the independent variables are I (0), while the upper bond assumes that they are purely I (1) regressors.

If the computed F-statistic is located outside the critical value bounds, we can make a conclusive inference whether variables are co-integrated or not.

 If the F-statistic is above the upper critical value, we can reject the null hypothesis of no co-integration. On the contrary,

 if the Test statistic falls below the lower bond, we accept the null hypothesis. But, if the Wald or F-statistic value is between these bounds, we cannot make a conclusive inference whether variables are co-integrated or not.

In our case, the calculated "F-statistics" (4.5178) is higher than the upper bound critical value (4.35) at the 5 percent level. Thus, we reject the null hypothesis that there are no long-run co-integration relationships.

3.5.   Optimal Lag length

Third, we must determine the optimal lag length, we are going to use the information criteria such as   "Akaike Information Criterion (AIC)", and "Schwarz Bayesian Information Criterion (SBC)", but we must take in consideration if we choose too many lags it will lead to a loss in degrees of freedom and multicollinearity, and at the same time, choosing a less number of lags than optimal may be cause autocorrelation.

So, the optimal numbers of lags are chosen according to the lowest values for information criteria.

According to "Akaike information criteria", the optimal lag length in this model was (1, 1, 0,0) for the variables exports as % of GDP, FDI inflow as % of GDP, real effective exchange rate, and gross domestic savings as % of GDP, respectively.

3.6. The long run relationships

$$EX_t = a_0 + \sum_{i=1}^{p} (\beta_1 \, EX_{t-i}) + \sum_{i=0}^{Q} (\beta_2 \, RER_{t-i}) + \sum_{i=0}^{M} (\beta_3 \, GDS_{t-i})$$
$$+ \sum_{i=0}^{M} (\beta_4 \, FDI_{t-i}) + U_t$$

Where t refers to years and β's are long run coefficients, EX is the dependent variable and RER, GDS and FDI are the independent variables and U_t is the error term.

Table No. (3): The long Run Coefficients

Long Run Coefficients			
Variable	**Coefficient**	**t-Statistic**	**Prob.**
FDI as % of GDP	1.010321	2.546421	0.0157
real exchange	3.107944	5.706880	0.0000
gross domestic savings	0.626156	3.552820	0.0012
C	-10.439654	-2.324866	0.0264

We can find that foreign direct investment has a positive and high significant impact on exports in the long run.

A 1% increase in FDI results in an approximately 1 % increase in exports, keeping other things constant. Where FDI could promote labor skills through training and introduce new technologies to the market, rising the efficiency and productivity of factors of production and hence the competitiveness of exports in international markets.

Also, the real exchange rate shows a positive and highly significant impact on FDI.

A 1 % increase in real exchange rate leads to a 3.1 % increase in exports. Where an increase in real exchange rate means a depreciation of the local currency which in turn leads to an increase in the competencies and quantity of exports.

Finally, the gross domestic savings leads to 0.626 expansion in exports. Since if gross domestic savings increased domestic investment increases, so exports increase.

3.7. The Short run dynamics

$$
\Delta LogEX_t = a_0 + \sum_{i=1}^{p-1} (\beta_{1i}\, \Delta EX_{t-i}) + \sum_{i=0}^{Q-1} (\beta_{2i}\, \Delta \text{FDI}_{t-i})
$$
$$
+ \sum_{i=0}^{M-1} (\beta_3\, \Delta RER_{t-i}) + \sum_{i=0}^{Q-1} (\beta_{2i}\, \Delta \text{FDI}_{t-i}) + \varphi ECT_{t-1} + U_t
$$

Where Δ refers to first difference operator, β's refers to short run coefficients and the φ is speed of adjustment term which shows convergence towards long run.

Table No. (4): Error Correction Model for the Applied ARDL Model

Short Run Coefficients			
Variable	**Coefficient**	**t-Statistic**	**Prob.**
D (FDI as % of GDP)	-0.071383	-0.295524	0.7694
D (real exchange)	1.544476	6.010343	0.0000
D (gross domestic savings)	0.311165	2.918664	0.0063
CointEq (-1)	-0.496945	-5.459204	0.0000

We obtained the results of the short-run dynamic coefficients by applying ECM (Error Correction Model).

We found that the signs of the relationship between variables except FDI are the same as in the long run. where we find that FDI is in the short run insignificant because its effects on export need surely time.

However, A 1 % change in the real exchange rate leads to a 1.5% increase in the exports in the short run keeping other things constant.

On the other hand, A 1 % change in gross domestic savings leads to a 0.31 % increase in the exports in the short run which is less change than in the long run.

This can be justified by the fact that the increase in savings needs long period of time to react in the economy as investments that can produce and export.

The equilibrium correction coefficient φ is highly significant and related negatively

It implies a moderate speed of adjustment to equilibrium. where it takes exports about 2 years to return to equilibrium. in other words, about 49.6% of disequilibria is adjusted yearly.

3.8. The ARDL model results

Table No. (5) The ARDL model results

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
EXPORTS GDP (-1)	0.503055	0.091029	5.526330	0.0000
FDI GDP	-0.071383	0.241548	-0.295524	0.7694
FDI GDP (-1)	0.573457	0.238399	2.405446	0.0219
Real exchange	1.544476	0.256970	6.010343	0.0000
Gross domestic savings	0.311165	0.106612	2.918664	0.0063
C	-5.187932	1.996934	-2.597948	0.0139
R-squared	0.870010			
Adjusted R-squared	0.850315			
F-statistic	44.17328			
Prob(F-statistic)	0.000000			
Durbin-Watson stat	1.564393			

We can notice that the ARDL model is highly efficient with R2=87% which means that 87% of the variation in the dependent variable can be explained by the variation in the independent variables.

Also, F-statistics is insignificant which shows that all independent the variables in the model are significant and illustrate dependent variable.

Also, we can confirm that the model does not suffer from multicollinearity between variables according to VIF test.

3.9. Robustness Test

The first test: Breusch-Godfrey (Also called as LM Test) Autocorrelation test.

If the model suffers from autocorrelation, OLS will overestimate of t-values so we might fall in type I error where we deduce that variables are statistically significant while they are not.

We test whether the error term is correlated or not using Breusch-Godfrey Test through regressing residuals on its lags and all the X variables used in the original model. The test results (F-statistics) are insignificant, so we accept the null hypothesis that residuals are pairwise independent.

The second test: Heteroscedasticity Test

Heteroscedasticity tests examine whether the variance of residuals alters as any of the explanatory variables $X_{,s}$ changes, as in the following equation

$(\text{var}(u|x_1, x_2,..., x_j) = \sigma^2)$.

If the model suffers from heteroscedasticity, the error variance would be biased leading to inappropriate standard errors and Void t-statistics and F statistics

The third test: Jarque-Bera (JB) Normality Test (Jarque and Bera (1980)).

In the OLS model, the (unobserved) disturbance vector ε is assumed to be normally distributed. And the ignorance of normality conditions may lead to inaccurate economic models.

So, we used the Jarque-Bera test to test whether the residual follows normal distribution or not and the test results confirmed that the parameter (JB) is insignificant, so model residuals are normally distributed.

4. Conclusion and Recommendation

The study aims to determine whether foreign direct investment (FDI) is a substitute or a complement to exports. The results show that (FDI) is linked to a complementary relationship with exports in Egypt. The study also revealed some critical results including:

- The quantitative analysis proves that FDI has a positive and high significant impact on exports in the long run. Where a 1% increase in FDI results in an approximately 1 % increase in exports.

- Real exchange rate shows a positive and highly significant impact on FDI. Where a 1 % increase in real exchange rate leads to a 3.1 % increase in exports and the gross domestic savings lead to 0.626 expansion in exports.

- The study reveals that the signs of the relationship between variables except FDI are the same as in the long run. where we find that FDI is in the short run insignificant because its effects on export need surely time. However, a 1 % change in the real exchange rate leads to a 1.5% increase in exports. And a 1 % change in gross domestic savings leads to a 0.31 % increase in the exports in the short run which is less change than in the long run.

- Moreover, the equilibrium correction coefficient φ is highly significant and related negatively, it implies a moderate speed of adjustment to equilibrium. where it takes exports about 2 years to return to equilibrium. in other words, about 49.6% of disequilibria is adjusted yearly.

- The explanatory ability of the model is very good, as around 85 % of export is described by the variables included in the model, and it does not suffer from autocorrelation problem as shown by the Robustness test.

- The flow of foreign direct investment is weak and decreased sharply after the 25 January events, but it has achieved remarkable gradual progress in the last three years.

- The volume of Egyptian exports is very modest however it began to recover after the devaluation of the Egyptian pound in late 2016, and that it achieved its highest value this year, reaching 28.5 billion US dollars.

- Egyptian major exports are oil and materials, while manufacturing exports represent a few percent despite its rise in 2018 and reached about 10%.

- The results also indicate that the volume of Egyptian exports is very modest however it began to recover after the devaluation of the Egyptian pound in late 2016 and that it achieved its highest value this year, reaching 28.5 billion US dollars.

The study provides some critical recommendations for policy makers including:

First, Decision makers regarding stimulating the attraction of FDI should pay attention to the impact on Egyptian exports.

Second The government should make every effort to facilitate the flow of FDI, give more priority to the inflow of FDI which supports increased exports, and high careful attention to FDI in support of export that has high processing degrees.

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30

Appendix

Table No. (A1): Unit root tests

Philips Perron Unit root test (PP)							
		At Level			At First Difference			
		EXPORTS _GDP	FDI __GDP	REAL_ EXCHANGE	d (EXPORTS _GDP)	d (FDI _GDP)	d (REAL_ EXCHANGE)	d (GROSS_ DOMESTIC _SAVINGS)
With Constant	t-Statistic	-2.6439	-3.2862	-2.2621	-5.0911	-8.6097	-5.1596	-7.1444
	Prob.	0.0915	0.0210	0.1881	0.0001	0.0000	0.0001	0.0000
With Constant & Trend	t-Statistic	-2.5744	-3.1468	-2.6377	-5.0615	-8.5475	-5.0934	-7.5194
	Prob.	0.2933	0.1073	0.2663	0.0008	0.0000	0.0007	0.0000

Augmented Dicky Fuller test - UNIT ROOT TEST TABLE (ADF)							
		At Level			At First Difference			
		EXPORTS _GDP	FDI __GDP	REAL_ EXCHANGE	d (EXPORTS _GDP)	d (FDI _GDP)	d (REAL_ EXCHANGE)	d (GROSS_ DOMESTIC _SAVINGS)
With Constant	t-Statistic	-4.1735	-3.6517	-2.8433	-5.1060	-4.4282	-5.2023	-7.1008
	Prob.	0.0020	0.0082	0.0600	0.0001	0.0009	0.0001	0.0000
With Constant & Trend	t-Statistic	-4.1668	-3.6425	-3.3076	-5.0801	-4.3995	-5.1382	-7.5079
	Prob.	0.0104	0.0368	0.0775	0.0008	0.0054	0.0006	0.0000

Table No. (A2): Unit root tests

	Exports GDP	FDI GDP	Real exchange	Gross domestic savings
Mean	21.22035	2.811130	6.360790	13.92641
Median	20.56743	2.383447	6.085929	15.14286
Maximum	33.04299	9.321199	9.972311	21.08844
Minimum	10.34546	-0.209000	2.807133	1.783862
Std. Dev.	5.980580	2.135553	1.736134	4.558801
Skewness	0.317812	1.269938	0.004450	-0.855684
Kurtosis	2.057885	4.619971	2.731887	3.207114
Jarque-Bera	2.098847	14.74732	0.116941	4.828969
Probability	0.350140	0.000628	0.943206	0.089413
Sum	827.5938	109.6341	248.0708	543.1298
Sum Sq. Dev.	1359.159	173.3023	114.5381	789.7414

Table No. (A3): Unit root tests

Foreign Direct Investment (FDI) in Egypt by Country										
	USA	EU	Germany	France	UK	Italy	Belgium	Arab Countries	Saudi Arabia	ed Arab Emir	Kuwait
2004/2005	2040,1	812,9	42	338,8	50,1	15,6	0	213,6	32,4	40,6	17,2
2005/2006	4553,5	2954,3	113,6	565,7	1724,7	20,2	0	554,5	99	63	72,5
2006/2007	4681,3	4061	97,2	36,7	2209,6	1631,4	8,7	3351,4	204	3049,5	24,8
2007/2008	6447,8	5430,1	250,3	1302,7	3239,3	31,6	326,9	3235,6	365,4	726,2	1597,2
2008/2009	3515	5578,4	102,6	254,3	3231,8	70,1	1541,6	2029,7	514,1	1037,4	118
2009/2010	1424,9	6770,5	109,7	286,2	4926,1	67,8	930,1	1439,5	323,4	303,5	188,7
2010/2011	1790,5	6114,5	274,5	227	4307,1	246,5	776,7	1052,6	206,3	410,8	58,6
2011/2012	577,6	9510,4	202,5	315,6	5819,7	193,3	2089,2	1185,7	240,4	559,8	63,5
2012/2013	2182,9	5624,6	186,4	266,1	3997,4	75,1	719,6	1456,4	191,7	480,6	46,4
2013/2014	2230,3	6610	194,2	347,4	5078,5	16,8	617	1290,1	284,4	401,2	129,6
2014/2015	2115,8	6522,5	190,2	230,2	4989,7	37,1	663,8	2667,5	649,1	1382,5	236,8
2015/2016	883	7876,7	201,5	251,2	5944,5	42,1	678,2	2277,7	313	1328,7	132,5
2016/2017	1832,9	8710,5	147,6	535,8	5518,6	82,9	1988,1	1800	343,7	836,9	149,8
2017/2018*	2244,4	7952,3	122,3	240,3	4552,8	130	2288,6	1925,5	296,7	1075,4	111,5
2018/2019*	1570,9	9950,3	231,2	296,1	6423,7	253,2	2262,5	3258,4	478,1	1104,2	684,2