

Foreign Direct Investment in Morocco: "Attempt to Model its Behaviour through Different Economic Indicators"

Qamqam Meriam, El Haddad Mohamed Yassine

Department of Management, University of Mohammed 5 Agdal, Faculty of Law, Economics and Social sciences Rabat-Agdal, Morocco

Abstract: *This paper proposes the study of foreign direct investment behaviour in Morocco, which is one of the main areas of research of economic theory, but also a field of very vivid controversies. The magnitude of fluctuations in foreign direct investment and its role in economic movements has led to a plethora of analyses, sometimes difficult to associate with a school of thought and often technically complex. We will make an empirical assessment, based on Moroccan data, to explain the behaviour of FDI through different economic indicators over the period 1970-2017. To do this we will carry out an econometric study which will treat FDI according to several parameters such as: growth rate (GR), inflation rate (INFLR), degree of openness (DO), exchange rate (XR), human capital (HC) and fiscal pressure (FP). For this, We will use the EVEIWS Software to present the model of multiple regression, then we will deal with the violation of hypothesis from which we will apply tests of multicollinearity, autocorrelation and heteroscedasticity.*

Keywords: FDI, simple regression, multiple regression, multicollinearity, autocorrelation, heteroscedasticity

1. Introduction

Globalisation has fostered the liberalisation of economies and the development of a globalized process of economic activity that affects both developed and developing countries. The globalisation of economies has created a dynamic process in which FDI is central.

Indeed, integration into the international economy has become essential for economic development. Many countries have embarked on programmes to liberalize their economies in order to promote investment and the attractiveness of foreign funds. Only each territory has certain specificities that can constitute a comparative advantage as they can be a constraint to the entry of foreign investors.

Since the 1980s, States have been striving to develop a series of incentive measures and reforms with the same objective, which is to improve the attractiveness of their territories to foreign direct investment.

Like other developing countries, Morocco has embarked on a multitude of reforms to embrace a new logic that enshrines the laws of the market and the liberalization of the economy that affect all sectors of activity.

The main objective of this article is to assess the impact of economic indicators, in particular, the growth rate, the inflation rate, the degree of openness, the exchange rate and the tax burden on FDI in the Moroccan model.

This article is organized in two parts. First of all, we will summarize the literature review of FDI in Morocco, namely the definitions of foreign direct investment, the explanatory theories of FDI, we will also discuss the topicality of this phenomenon. In a second step, we will focus on the impact of economic variables on EDI through an econometric study by presenting simple regression models and applying

different tests such as multicollinearity tests, auto correlation and heteroscedasticity. In fine we will make a correction of our model in case of violation.

Section 1: Conceptual framework of the EDI

I- Definitions of foreign direct investment

Investment is an economic phenomenon with many definitions and forms, including international investment, which in turn implies many forms, including foreign direct investment, and we will therefore try to highlight different definitions of FDI in this area.

The different definitions proposed by some global organizations highlight the importance of the term "control" in management and participation in decision-making in order to consider foreign private financing as a direct investment. It is a real participation in the management of potential policies and strategies aimed at developing the company's activities. Control refers to the managers of the company and its representatives abroad, the location and form of the foreign presence. The control may also concern cooperation operations with other investors in the form of franchises, joint ventures or subcontracting.

Generally speaking, the IMF defines FDI in its Balance of Payments Manual, fifth edition, as: "investments that an entity resident in one economy (direct investment) makes in order to acquire a lasting interest in an enterprise resident in another economy (the direct investment enterprise)". Sustainable interest means that there is a long-term relationship between the direct investor and the company and that the investor has a significant influence on the management of the company. Direct investment includes not only the initial transaction, which establishes the relationship between the investor and the company, but also all subsequent transactions between them and between related companies, whether incorporated or unincorporated and therefore having a separate legal personality.

As for the World Bank, it considers that FDI corresponds to a net investment flow that makes it possible to acquire at least 10% of the capital of a firm of a different nationality from that of the investor.

In contrast, the OECD (2008) defines FDI as a type of transnational investment made by an entity resident in one economy for the purpose of establishing a lasting interest in an enterprise resident in another economy. The notion of sustainable interest implies the existence of a long-term strategic relationship between the direct investor and the direct investment enterprise and the fact that the investor can have a significant influence on the management of the direct investment enterprise.

Thus, direct investment differs from portfolio investment in terms of the degree of participation and involvement in the management of the company's activities. The OECD Reference Manual considers that: "Direct investment enterprises are companies that may be subsidiaries in which the investor holds more than 50% of the voting rights or associated entities, in which the investor holds between 10% and 50% of the voting rights or quasi-corporations, such as branches (which are effectively wholly owned by their respective parent companies). The relationship between the direct investor and its direct investment enterprises can be complex, as the enterprise may have only a limited relationship or even no relationship with management structures.

The common denominator of the previous definitions is that FDI takes the form of foreign participation in order to have a lasting influence on the management of a host company. They do not explicitly take into account FDI for the creation of new companies or subsidiaries, and short-term FDI in unstable legal and political environments.

II- Foreign Direct Investment Theory

As foreign direct investment is one of the international economic phenomena that has attracted the attention of economists, they have proposed various theories of foreign direct investment.

These theories have varied over time according to the economic conditions that have coincided, with the emergence of each of these theories, we will try here to mention the most important and common theories.

The first attempts to explain FDI are those based on traditional theories of international trade. With the assumption of market perfection, the difference in factor endowments between countries in labour or capital is the main driving force behind international trade, whether in trade or investment. Ricardian theory of comparative advantages: Ricardo interprets international trade by the differences in the presence of production factors between countries. The reasoning in perfect competition suggests that a country will export goods for which it has a comparative advantage in terms of factor costs and import goods for which it has a production disadvantage.

The model is based on a single factor of production, labour. Ricardo considers it to be homogeneous and perfectly

mobile within the country, yet not transferable to other foreign territories. Capital is part of the factors of production, so it is assimilated as indirect labour and therefore has the same characteristics of the labour factor. It assumes that all firms have the same function of profit maximization and will specialize in one or more activities in which they have an absolute or even relative advantage compared to foreign countries.

For neoclassical theory, foreign direct investment flows correspond to an adaptation of firms to national and international market conditions, in terms of factor costs resulting from factor endowments.

This is what Lucas hypothesizes, he assumes that capital should go to countries where it is abundant to those where it is scarce because in the latter, the returns on new investments should be higher.

That is, it proposes a model based on traditional neoclassical contributions to the demand for production factors as part of a diversified monopolization strategy.

The role of FDI begins particularly in developing countries as part of the depentanzed analysis resulting from Marxist analyses on imperialism, which initially developed in Latin America.

Dependants are interested in the influence that multinational firms can have on the definition of host countries' economic policies. The mistrust of host country governments towards foreign firms that prevailed in the 1970s and 1980s, however, has gradually given way to strategies to attract them given the development and development opportunities they offer.

Section 2: Empirical evaluation test of the impact of different economic variables on FDI between 1970-2017

I- Specification of the direct investment model according to different economic indicators.

Our explanatory model of Moroccan GDP is written according to the following functional form:

$$FDI = f(GR, INFLR, DO, XR, HC, FP).$$

The variable to be explained: Foreign direct investment (FDI)

The explanatory variables: the growth rate (GR), the inflation rate (INFLR), the degree of openness (DO), the exchange rate (XR), human capital (HC) and the FISCAL PRESSURE (FP).

The theoretical relationships between each explanatory variable of the model and the explained variable can be justified as follows:

- **GR:** the rate of GDP growth. This variable refers to the size of the internal market. Indeed, a large market implies a high demand for goods and services and therefore makes the host country more attractive to FDI.
- **INFLR:** inflation rate the percentage change in this price index over a given period.
- **DO:** expressed by the ratio of exports and imports to GDP, guaranteed to the multinational firm, on the one hand, greater flexibility in importing intermediate

consumption goods necessary for production and, on the other hand, increased facilities and opportunities for exporting the goods produced.

- **XR:** it represents the indicator for measuring the stability of the financial market. Exchange rate volatility can both discourage and encourage foreign investment. If the strategy of multinational firms is to export their products from the host country, the appreciation of the national currency is likely to discourage the attractiveness of FDI.
- **HC:** the HC stock is measured by the secondary school enrolment ratio
- **FP:** the fiscal pressure defines the relative importance of a tax or group of taxes in the national economy.

The macroeconomic framework is an important factor in investor confidence, in particular, the growth rate, the level of inflation, the tax burden, the openness rate, human capital and the exchange rate system influence how investors view the host country. It is clear that Morocco's economic performance is not the only determinant. But it is also about the progress made and the potential of governments to meet their commitments in terms of inflation and economic reforms.

In the macroeconomic area. The Moroccan authorities have made significant progress during the period from 1990 to 2017. The pace of macroeconomic reforms has fully advanced and is yielding encouraging results: the inflation rate has been brought under control for the most part to acceptable levels thanks to a prudent monetary policy.

Table 1: Empirical data from our sample for the period 1970-2017

Year	FDI	GR	INFLR	DO	XR	HC	FP
1970	20000000	4,71	1,28	39,22	5,06	1,70	61,07
1971	23100000	5,6	4,16	36,68	5,05	1,68	61,08
1972	13000000	2,44	3,76	37,8	4,59	1,75	61,06
1973	5490000	3,56	4,08	42,94	4,11	1,84	61,07
1974	20400000	5,6	17,56	55,75	4,37	2,01	61,04
1975	5020000	7,56	7,92	55,82	4,05	2,20	61,04
1976	38014963	10,81	8,5	54,64	4,42	2,47	61,17
1977	7994056	6,06	12,6	54,22	4,5	2,71	61,05
1978	11759988	2,23	9,72	46,44	4,17	2,93	61,05
1979	7437549	4,79	8,33	46,87	3,9	3,21	61,04

Table 2: Descriptive statistics on our sample

	FDI	GR	INFLR	DO	XR	HC	FP
Mean	8.68E+08	4.591957	4.878913	58.50696	7.742174	4.733913	63.09130
Median	87038926	4.555000	3.495000	54.99000	8.450000	4.815000	61.42000
Maximum	3.56E+09	12.37000	17.56000	85.67000	11.30000	7.510000	71.50000
Minimum	549182.0	-5.410000	0.440000	36.68000	3.900000	1.680000	57.50000
Std. Dev.	1.26E+09	3.585918	4.046324	13.17680	2.185124	1.644350	3.374967
Skewness	1.127944	-0.168051	1.056139	0.638373	-0.587309	-0.296717	1.476695
Kurtosis	2.579546	3.555280	3.569066	2.445459	2.053828	2.351785	4.136485
Jarque-Bera	10.09281	0.807492	9.172315	3.713726	4.360354	1.480331	19.19372
Probability	0.006432	0.667814	0.010192	0.156162	0.113022	0.477035	0.000068
Sum	3.99E+10	211.2300	224.4300	2691.320	356.1400	217.7600	2902.200
Sum Sq. Dev.	7.17E+19	578.6463	736.7730	7813.266	214.8646	121.6749	512.5681
Observations	46	46	46	46	46	46	46

Source: Personal elaboration based on data from our econometric study

- The distribution of the FDI series is characterized by an asymmetry coefficient (S) equal to (1.12) which is

1980	89416223	3,64	9,41	47,34	3,94	3,51	61,24
1981	58581336	-1,74	12,49	57,44	5,17	3,80	61,17
1982	79528177	8,96	10,53	55,34	6,02	4,04	61,22
1983	46123624	1,39	6,21	52,61	7,11	4,33	61,14
1984	46989197	6,42	12,45	60,36	8,81	4,55	61,14
1985	19975167	6,01	7,73	59,32	10,06	4,71	61,07
1986	549182	9,27	8,73	50,28	9,1	4,98	61,03
1987	59574901	-0,33	2,7	49,66	8,36	5,25	61,17
1988	84661628	11,88	2,37	50,14	8,21	5,47	61,23
1989	167056032	2,85	3,26	50,35	8,49	5,39	61,42
1990	165122978	3,41	6,78	54,63	8,24	5,46	61,42
1991	31746241	7,22	7,99	49,78	8,71	4,36	61,1
1992	422470462	-2,1	5,74	50,26	8,54	0	62,03
1993	491466065	-0,74	5,18	49,67	9,3	4,49	62,34
1994	550924374	10,59	5,14	47,31	9,2	4,70	62,2
1995	92386208	-5,41	6,12	51,72	8,54	4,79	57,5
1996	76412286	12,37	2,99	47,1	8,72	4,84	60,5
1997	3 568 764	-1,56	1,04	51,15	9,53	4,86	62,1
1998	11869540	7,24	2,75	50,8	9,6	4,77	63,6
1999	2651865	1,08	0,68	53,99	9,8	4,79	63,4
2000	220739724	1,91	1,89	59,16	10,63	4,94	63
2001	143838237	7,32	0,62	59,42	11,3	5,07	62,3
2002	79160964	3,12	2,8	60,53	11,02	5,27	62,3
2003	2312682907	5,96	1,17	58,33	9,57	5,41	62,5
2004	787053819	4,8	1,49	61,6	8,87	5,47	63,2
2005	1619752454	3,29	0,98	67,91	8,87	5,96	63,1
2006	2366000096	7,57	3,28	71,5	8,8	6,20	63,3
2007	2806642141	3,53	2,04	78,49	8,19	6,38	63,2
2008	2466288357	5,92	3,71	85,67	7,75	6,34	65,4
2009	1970323920	4,24	0,99	67,92	8,06	5,85	65,1
2010	1 240625859	3,82	0,99	75,25	8,42	5,11	68,5
2011	2521362081	5,25	0,92	83,43	8,09	6,40	67,8
2012	2841954371	3,01	1,28	85,12	8,63	6,72	69,7
2013	3360909924	4,73	1,89	79,71	8,41	7,25	71,4
2014	3561625590	2,42	0,44	80,88	8,41	7,41	71,3
2015	3160038376	4,4	1,56	79,03	9,76	7,05	70,9
2016	2322874048	4,1	1,14	77,72	9,65	7,40	71,5
2017	2651770854	4,29	1,07	76,42	9,99	7,51	69,61

Source: Personal elaboration based on the World Bank and CNUCED reports

II- Descriptive Statistics of the Variables studied:

To have a clear picture of the distribution of the FDI series, an analysis by descriptive statistics is necessary.

greater than 0 which results in an asymmetry to the right and a flatness coefficient equal to (2.57) which is greater than 1.96 and therefore the distribution of the FDI series is pointed. However, the Jarque-Bera statistic

(10.09) is higher than (5.9) or the p-value of the Jarque-Bera statistic (0.006) is lower than the 5% threshold so the assumption of the normality of the FDI series is rejected.

- The distribution of the GR series is characterized by an asymmetry coefficient (S) equal to (-0.16) which is less than 0 therefore an asymmetry to the left and by a flattening coefficient equal to (2.57) which is greater than 1.96 and therefore the distribution of the GR series is not flat. However, the Jarque-Bera statistic (0.80) is less than (5.9) or the p-value of the Jarque-Bera statistic (0.667814) is higher than the 5% threshold so the assumption of the normality of the series of GR is accepted.
- The distribution of the INFLR series is characterized by an asymmetry coefficient (S) equal to (1.05) which is greater than 0 therefore an asymmetry to the right and by flattening coefficient equal to (3.55) which is greater than 1.96 and therefore the distribution of the INFLR series is not flat. However, the Jarque-Bera statistic (9.17) is higher than (5.9) or the p-value of the Jarque-Bera statistic (0.010) is lower than the 5% threshold so the assumption of normality of the INFLR series is rejected.
- The distribution of the DO series is characterized by an asymmetry coefficient (S) equal to (0.63) which is greater than 0 therefore an asymmetry to the right and by flattening coefficient equal to (2.44) which is greater than 1.96 and therefore the distribution of the DO series is not flat. However, the Jarque-Bera statistic (0.156) is less than (5.9) or the p-value of the Jarque-Bera statistic

(0.15) is higher than the 5% threshold so the assumption of the normality of the DO series is accepted

- The distribution of the XR series is characterized by an asymmetry coefficient (S) equal to (-0.58) which is less than 0 therefore an asymmetry to the left and by a flattening coefficient equal to (2.05) which is greater than 1.96 and therefore the distribution of the XR series is not flat. However, the Jarque-Bera statistic (4.36) is less than (5.9) or the p-value of the Jarque-Bera statistic (0.11) is higher than the 5% threshold so the assumption of the normality of the XR series is accepted.
- The distribution of the HC series is characterized by an asymmetry coefficient (S) equal to (-0.29) which is less than 0 therefore an asymmetry to the left and by a flattening coefficient equal to (2.35) which is greater than 1.96 and therefore the distribution of the HC series is not flat. However, the Jarque-Bera statistic (1.48) is less than (5.9) or the p-value of the Jarque-Bera statistic (0.47) is higher than the 5% threshold so the assumption of the normality of the HC series is accepted.
- The distribution of the FP series is characterized by an asymmetry coefficient (S) equal to (1.47) which is greater than 0 therefore an asymmetry to the right and by a flattening coefficient equal to (4.13) which is greater than 1.96 and therefore the distribution of the FP series is not flat. However, the Jarque-Bera statistic (19.19) is greater than (5.9) or the p-value of the Jarque-Bera statistic (0.000068) is lower than the 5% threshold so the assumption of the normality of the PREF series is rejected.

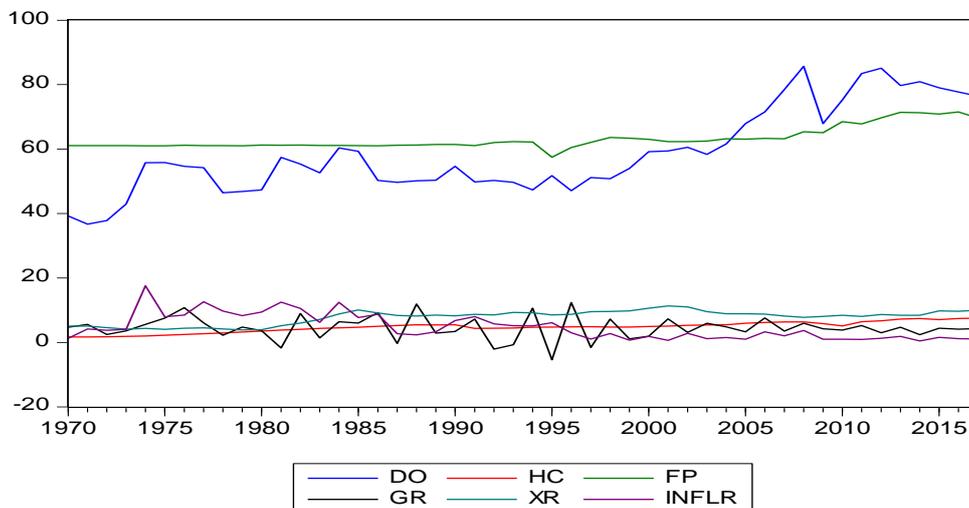


Figure 1: Evolution of exogenous variables over the period 1970-2017

Source: Personal elaboration based on data from our study

The variables XR, HC and FP are almost stable. GR and INFLR evolve over time with almost the same rate but different from that followed by the other exogenous variable DO. The DO and XR have evolved faster with large numbers compared to other exogenous variables. It seems that the remaining six variables are stable in relation to the evolution of DO. The HC and FP overlap. There is a co-linearity relationship between exogenous variables.

2. Conclusion

The main objective of this study was to assess the impact of the various economic indicators on foreign direct investment in Morocco over the period 1970-2017. The achievement of this objective was first reflected in an analysis of FDI flows to Morocco by an econometric evaluation of the interactions between FDI and exogenous variables over the said period. The data for the study come mainly from the World Bank and CNUCED reports.

This study provided a concrete touch to linear regression, as we have seen, the development of an econometric model must necessarily involve the establishment of relationship hypotheses. We started by statistically describing each variable, studying its normality and doing a graphical analysis as well as explaining the choice of this model and making an application on these two software with presentations and interpretations of the results found.

We have retained the optimal model with 4 exogenous variables where the explanatory power is average (20.18%), the regression is of average quality so the model is globally significant at the threshold $\alpha=5\%$ (the p-value of recording < 0.05) also all exogenous variables are all significant and non-collinear between them, absence of autocorrelation and heteroskedasticity.

It appears that the optimal model has been verified economically:

$$fdi_t = -1.21E + 10 + 0.27E + 08DO + 2.84E + 08HC + 1.74E + 08FP - 1.26E + 08XR + e_t$$

This means that the openness rate, the human capital, the tax burden, have a positive impact on FDI. On the other hand, the exchange rate has a negative impact on FDI, the more the exchange rate increases, the more FDI inflows decrease.

Indeed, the exchange rate reflects the host country's relationship with the rest of the world. Theoretically, the weaker the local currency compared to the foreign currency, the more FDI falls. This result is in line with the theoretical framework of Caves (1988), Froot and Stein (1991), Blonigen (1995) and Blonigen and Feenstra (1996) find a significantly negative correlation between the exchange rate and FDI flows.

Ultimately, this study is a contribution to the literature that addresses the determinants that influence inward FDI flows in a given country. Our econometric model seeks to identify the factors that explain the choice of location and the volumes of FDI received by an economy. The result of our research revealed the influence of economic indicators as a determinant of attractiveness.

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Appendices

Appendix 1: Multiple regression testing

Dependent Variable: FDI				
Method: Least Squares				
Sample: 1970 2017				
Included observations: 46				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GR	-394955.9	18457825	-0.021398	0.9830
FP	1.35E+08	37785677	3.582956	0.0009
DO	35362541	11180698	3.162821	0.0030
XR	-1.64E+08	55875230	-2.933604	0.0056
HC	2.51E+08	1.13E+08	2.227715	0.0317
INFLR	-56560729	22485424	-2.515440	0.0161
C	-9.38E+09	2.17E+09	-4.326403	0.0001
R-squared	0.893822	Mean dependent var	8.68E+08	
Adjusted R-squared	0.877487	S.D. dependent var	1.26E+09	
S.E. of regression	4.42E+08	Akaike info criterion	42.79016	
Sum squared resid	7.61E+18	Schwarz criterion	43.06843	
Log likelihood	-977.1737	Hannan-Quinn criter.	42.89440	
F-statistic	54.71821	Durbin-Watson stat	1.461287	
Prob(F-statistic)	0.000000			

Appendix 2: Testing multicollinearity between exogenous variables

Variance Inflation Factors			
Sample: 1970 2017			
Included observations: 46			
	Coefficient	Uncentered	Centered
Variable	Variance	VIF	VIF
GR	3.41E+14	2.702270	1.009721
INFLR	5.06E+14	4.743455	1.907932
DO	1.25E+14	105.8205	5.002619
XR	3.12E+15	47.52676	3.435821
HC	1.27E+16	74.75471	7.891992
FP	1.43E+15	1342.741	3.748288
C	4.70E+18	1107.959	NA

Appendix 3: Error Autocorrelation Test

Dependent Variable: FDI				
Method: Least Squares				
Date: 02/14/17 Time: 14:07				
Sample: 1970 2017				
Included observations: 48				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DO	24237059	11448319	2.117085	0.0401
HC	3.58E+08	1.15E+08	3.100411	0.0034
FP	1.57E+08	36579763	4.289727	0.0001
XR	-1.55E+08	56524389	-2.733688	0.0091
C	-1.10E+10	1.97E+09	-5.571575	0.0000
R-squared	0.864009	Mean dependent var	8.58E+08	
Adjusted R-squared	0.851359	S.D. dependent var	1.24E+09	
S.E. of regression	4.79E+08	Akaike info criterion	42.91128	
Sum squared resid	9.87E+18	Schwarz criterion	43.10619	
Log likelihood	-1024.871	Hannan-Quinn criter.	42.98494	
F-statistic	68.29950	Durbin-Watson stat	1.196402	
Prob(F-statistic)	0.000000			

Appendix 4: Homoscedasticity Test

Dependent Variable: FDI				
Method: Least Squares				
Sample: 1970 2017				
Included observations: 46				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GR	-394955.9	18457825	-0.021398	0.9830
INFLR	-56560729	22485424	-2.515440	0.0161
DO	35362541	11180698	3.162821	0.0030
XR	-1.64E+08	55875230	-2.933604	0.0056
HC	2.51E+08	1.13E+08	2.227715	0.0317
FP	1.35E+08	37785677	3.582956	0.0009
C	-9.38E+09	2.17E+09	-4.326403	0.0001
R-squared	0.893822	Mean dependent var	8.68E+08	
Adjusted R-squared	0.877487	S.D. dependent var	1.26E+09	
S.E. of regression	4.42E+08	Akaike info criterion	42.79016	
Sum squared resid	7.61E+18	Schwarz criterion	43.06843	
Log likelihood	-977.1737	Hannan-Quinn criter.	42.89440	
F-statistic	54.71821	Durbin-Watson stat	1.461287	
Prob(F-statistic)	0.000000			

Appendix 5: Econometric result of the linear regression according to significant variables

Dependent Variable: FDI				
Method: Least Squares				
Sample: 1970 2017				
Included observations: 46				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DO	27815787	11328198	2.455447	0.0184
HC	2.84E+08	1.17E+08	2.421631	0.0200
XR	-1.26E+08	56451865	-2.229723	0.0313
FP	1.74E+08	36329843	4.782476	0.0000
C	-1.21E+10	1.98E+09	-6.104200	0.0000
R-squared	0.876525	Mean dependent var	8.68E+08	
Adjusted R-squared	0.864479	S.D. dependent var	1.26E+09	
S.E. of regression	4.65E+08	Akaike info criterion	42.85413	
Sum squared resid	8.85E+18	Schwarz criterion	43.05289	
Log likelihood	-980.6449	Hannan-Quinn criter.	42.92859	
F-statistic	72.76303	Durbin-Watson stat	1.221842	
Prob(F-statistic)	0.000000			