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Explorando las relaciones de la Inversión Extranjera Directa en España desde los años 70: el enfoque ARDL

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Resumen. En este trabajo se analiza la relación entre la inversión extranjera directa (IED), las exportaciones y el crecimiento económico en España a partir de series temporales anuales correspondientes al período 1970-2018. Para ello se lleva a cabo un contraste de bandas (bound testing), formulando posteriormente un modelo autorregresivo con retardos distribuidos (ARDL). Los resultados confirman una relación a largo plazo entre las variables examinadas. La prueba de causalidad de Granger indica una fuerte causalidad unidireccional entre la IED y las exportaciones con dirección desde la primera hacia la segunda. Además, se obtiene que la causalidad de Granger no es significativa entre la IED y el crecimiento económico y viceversa.
Palabras clave: Inversión Extranjera Directa; exportaciones; importaciones; PIB; modelo ARDL; causalidad

JEL: C22; F10; F30; F43

[en] Exploring the linkages of Foreign Direct Investment in Spain since 1970's: an ARDL approach

Abstract. This paper analyzes the relationship between foreign direct investment (FDI), exports and economic growth in Spain using annual time series data for the period 1970 to 2018. To examine these linkages the autoregressive distributed lag (ARDL) bounds testing approach to cointegration for the long-run is applied. The results confirm a long-run relationship among the examined variables. The Granger causality test indicates a strong unidirectional causality between FDI and exports with direction from FDI to exports. Besides, the results for the relationship between FDI and economic growth are interesting and indicate that there is no significant Granger causality from FDI to economic growth and vice-versa.
Keywords: Foreign direct investment; exports; imports; GDP; ARDL bounds; causality.

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1. Introduction

A growing interest in the relationship between foreign direct investment (FDI), trade and economic growth can be observed in the last years due to a progressive liberalization of international economic relations that has led to an important increase in both, goods and services exchange, as well as in capital movements.

According to the World Trade Organization's (WTO) definition, FDI occurs when an investor based in one country (the home country) acquires an asset in another country (the host country) with the intent to manage that asset. The management dimension is what distinguishes FDI from portfolio investment in foreign stocks, bonds and other financial instruments. FDI inflows are considered as one of the basic policies for supporting development and economic growth in less developed countries. Tekin (2012) states that FDI is a major source of finance that can facilitate the entrance of technology from advanced and developed countries to the

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host developing country allowing, through this channel, the host country to compete in international markets. Moreover, Xing and Pradhananga (2013) stand out that FDI enhances the efficiency of production, can promote specialization and productivity in the host country, the employment, job skills, managerial expertise, export markets and tax revenues. The influence of FDI and exports on economic growth has also been studied (Stamatiou and Dritsakis, 2014).

FDI increased by 38% in 2015, the highest level since the global economic and financial crisis of 2008. After this growth, FDI inflows declined by 16% in 2017 with respect to 2016. According to the Global Investment Trends Monitor report published by the United Nations Conference on Trade and Development (UNCTAD, 2019), FDI remained flat in 2019, at $1.39 billion, a 1% decline from 2018 in a backdrop of weaker economic growth and significant political risks and trade tensions, as perceived by multinational companies.

Flows declined in Europe and developing Asia, remained unchanged in North America and increased in Africa, Latin America and the Caribbean and transition economies. The effects of the tax reform implemented in the EE.UU. in 2017 reduced FDI outflows, which affected global FDI. However, by 2019 these effects appear to have diminished. Developing economies continue to absorb more than half of global FDI flows. EE.UU. remained the largest recipient of FDI followed by China and Singapore.

In the European Union (EU), FDI inflows decreased by 15% in 2019. Specifically, countries such as the Netherlands had a decline in FDI inflows of 98% from 2018; while in Ireland they increased by approximately 3%.

In the developing economies of Latin America and the Caribbean, FDI increased by 16% compared to 2018. In Africa, it increased by 3%, while flows to Asia declined by 6% due to the decline in investment in Hong Kong and the Republic of Korea. FDI in the transition economies increased by 65% in 2019 due to rising investor confidence as a result of more equity investment and more stable natural resource prices.

Spain ranks seventeenth as a recipient economy for FDI and is the tenth largest investor economy worldwide by 2018. In the first half of 2018, investment received amounted to $44,600 million, the highest level since 2008 (UNCTAD, 2019).

FDI has played a very important role in the evolution of the Spanish economy since the beginning of industrialization in the 19th century (Nadal, 1975; Tortella, 2000; 2008). Since the opening and liberalization of the economy in the 1960s, Spain has experienced an attraction of FDI flows, which has facilitated its transition to a market economy (Tascón, 2003; Puig and Castro, 2009). The incorporation of Spain into the European Community in 1986 and the subsequent integration of the Single Market (1992) boosted the inflow of foreign capital as well as the exchange of goods and services. The existing data are consistent with what Graham and Krugman (1993) call a "wave of FDI" that generated positive externalities for Spain since, in addition to influencing the balance of payments balance, it affected the country's productive structure, had effects on human capital and allowed the capture of technology from foreign companies as already indicated by Muñoz *et al.* (1978).

As a result of the economic crisis in the first half of the 1990s, there was a decline in FDI inflows (García and Tortella, 2007). Since 1997, the boost in the European integration process, the economic recovery and the advance in information and communication technologies have encouraged an increase in FDI flows.

Contrary to recent trends in international research, few empirical studies have examined the relationship between Spanish FDI outflows/inflows, exports and economic growth. In order to try to expand the empirical evidence, the aim of this paper is to analyze the relationship between FDI and other variables such as exports, imports and economic growth for Spain in the period 1970-2018. Among the contributions of the study are the use of a new database with respect to previous works and the use of the methodology based on the works of Pesaran (1997), Pesaran and Shin (1999) and Pesaran, Shin and Smith (2001) which develop a co-integration approach based on the Autoregressive Distributed Lag model (ARDL). The "late motiv" is trying to understand for the Spanish case how the relationship between FDI and exports works, since so far there are no homogeneous patterns between the different economies. Therefore, this study investigates the dynamic relationships between the FDI of Spain and other macroeconomic variables describing their relationship and determining their relative significance in influencing FDI during the previous 49 years.

The paper is structured as follows. Section 2 briefly reviews the literature on the dynamics of FDI. Section 3 describes the data and the variables used in the empirical model. Section 4 shows the methodology used. Section 5 discusses the results of the estimation of the empirical model. Section 6 concludes.

2. Dynamics of foreign direct investment

In this section we review a subset of a large literature which has analyzed the problem of FDI from several different perspectives. First, we summarize papers that analyze the linkage between FDI, exports and economic growth focusing on both developing and developed countries. Second, we pay special attention to the way FDI relates to several variables as well as the specification of the econometric models.

FDI and economic growth

Neoclassical growth theory proposed by Domar (1946), Solow (1956) and Harrod (2015) stand out that FDI is a promoter for economic growth because it increases the investment. In the endogenous growth model presented by Romer (1986; 1990) and Lucas (1988), FDI promotes economic growth by generating technological and knowledge spillovers. These models show that FDI is an important factor contributing to economic growth in the host countries.

Lipsey and Weiss (1981) describe a positive causal relationship between trade flows and FDI disaggregated by industry. They show that the level of activity of 14 U.S. manufacturing affiliates is positively related to exports, indicating that U.S. manufacturing affiliate activity tends to promote U.S. exports. Blomström *et al.* (1988) show a similar relationship for Sweden and the U.S. Pfaffermayer (1994) reports similar evidence for Austrian manufacturing exports, while Barrel and Pain (1997) examine the diffusion of knowledge-based firm-specific assets throughout a range of European countries.

Alfaro *et al.* (2004) point out the positive influence of FDI on economic growth, emphasizing the importance of local financial markets in this process. Furthermore, these results are confirmed by other studies which analyze countries from different parts of the world. For example, Zhang (2001) finds, for 11 countries of East Asia and Latin America, a positive effect of FDI in promoting economic performance when host countries exert a liberalized trade regime, improve education, encouraged export-oriented FDI and maintain macroeconomic stability. Bengoa and Sanchez-Robles (2003) find this positive linkage between FDI and economic growth for 18 Latin American countries. Choong *et al.* (2004) emphasize the importance of the development level of the financial sector for Eastern Asian countries. This can be seen as a source of competitive advantage in attracting FDI by host countries and, in the end, in promoting economic growth.

These results are valid also for Taiwan (Chang, 2006), Malaysia and Thailand (Chowdhury and Mavrotas, 2006). But the results stated above were not confirmed by the analysis conducted by Carkovic and Levine (2002). These authors pointed that the FDI does not exert an independent influence on economic performance and this influence depends on other determinants of economic growth.

FDI and global crisis

Other studies have investigated the relationship between the recent global financial and economic crisis and FDI flows. One of the main consequences of the Great Recession has been the deterioration of the foreign direct investment observed in past decades. According to the data from the United Nations Conference on Trade and Development (UNCTAD, 2017, 2018), FDI inflows reached an unprecedented sudden stop in 2008 with a plunge of more than 13%. Despite turmoil in the global economy, global FDI flows exceeded the pre-crisis average in 2011, reaching 1.5 trillion USD.

These facts have led economists to be interested on the effect on FDI of the crises because it may be a possible solution in, for example, unemployment reduction an economic growth. They believe that foreign direct investment may enhance private investments, encourage the creation of new jobs, transfer knowledge and technological skill in the workforce and, generally, boost economic growth in host countries' economies (Chowdhury and Mavrotas, 2006; Dritsakis and Stamatiou, 2014).

Ucal *et al.* (2010) analyze if the financial crisis influences FDI inflows using a panel data of 148 developing countries for the period 1995-2007. The results reveal that FDI inflows decrease in the years after a financial crisis and upturn the year before a financial crisis hit the country.

Alfaro and Chen (2010) point out that FDI in economic growth, volatility and economic interdependence across the countries can be seen as a growth's vector for host countries and can play a very important role in micro economic responses in order to minimize the negative aspects of financial crisis.

FDI and econometric models

Hsiao and Hsiao (2006) examine Granger causality relations between GDP, exports, and FDI in East and Southeast Asia by using time series and panel data from 1986 to 2004. They find out that each country has a different causality relation, and results of panel-VAR causality indicate that FDI has unidirectional effects on GDP directly and also indirectly through exports. There also exists bidirectional causality between exports and GDP.

Alexiou and Tsaliki (2007) examine the FDI-led growth hypothesis for Greece during the 1945-2003 years and find a long-run relationship between FDI and GDP. With respect to the Granger causality test, the FDI-led growth hypothesis has been rejected.

Katircioglu (2009) investigates the causality relationship between FDI inflows and economic growth for Turkey over 1970-2005 by applying ARDL-Bounds test and Granger causality test. The Bounds test suggests the existence of a relationship between real GDP and FDI when real GDP is the dependent variable. The results of causality indicated unidirectional causality from GDP growth to FDI in the long-run.

Miankhel *et al.*, (2009) employ a VECM framework for examining the causality between export, FDI and GDP in six emerging countries (Chile, India, Mexico, Malaysia, Pakistan and Thailand). The long-run results indicate the existence of causality from GDP to other variables such as export in Pakistan and FDI in the case of India, and bidirectional causality between GDP and FDI in Malaysia. The findings also show causality from export to FDI and GDP in Latin American countries.

Belloumi (2014) analyzes the relationship between FDI, trade openness and economic growth in Tunisia by applying the Bounds test (ARDL) approach for the period 1970 to 2008 and finds out that the variables of interest bound together in the long-run when FDI is the dependent variable.

Sunde (2017) indicates that both FDI and exports spur economic growth contrary to some studies, which found that FDI does not cause economic growth. The VECM Granger causality analysis found unidirectional causality between economic growth and foreign direct investment running from foreign direct investment to economic growth, unidirectional causality between foreign direct investment and exports running from foreign direct investment to exports and bidirectional causality between economic growth and exports. The work by Sunde confirms the FDI-led growth hypothesis for South Africa.

Khoon Goh *et al.* (2017) obtain, using an ARDL model, that there is no long-term relationship between FDI, exports and GDP in eleven Asian economies with similar economic characteristics for the period 1970-2012. However, in the short term FDI and exports have a positive impact on the economic growth of these countries.

Majok *et al.* (2018) use an ARDL model to study the dynamic causal relationship between FDI, unemployment and economic growth in Uganda for the period 1993-2015. The results, both long and short term, show that there is insufficient evidence to indicate that FDI plays an important role in economic growth and in reducing unemployment. They conclude by stressing the need to revitalize domestic industries and restructure policies to attract FDI to promote job creation, knowledge and technology transfer and overall economic growth in the host country.

FDI in Spain

Empirical studies that have examined the relationship between Spanish FDI outflows/incomings, exports and economic growth are few as previously mentioned. Some of these papers are Caballero *et al.* (1989), Doménech and Taguas (1997), Alguacil and Orts (1998, 2002) and Bajo-Rubio and Montero-Muñoz (1999a, 1999b, 2001). The first and third studies report evidence of a substitution relationship between outward FDI and exports in Spain, while the others found evidence of a positive relationship. None of them takes into account the recent evolution in Spain's international exchange flows, considers country-specific variables or distinguishes between goods and services.

Bajo-Rubio and Sosvilla-Rivero (1992, 1994) examine the role of FDI inflows in the Spanish economy during the 1964-1989. They find a long-run relationship between total gross FDI inflows and several macroeconomic variables such as the real GDP, the lagged foreign capital stock or the rate of inflation.

Bajo-Rubio and López-Pueyo (2002) study the main features associated with FDI inflows in Spanish manufacturing, both across 20 industries and through time. Their results display the importance of technological and skill advantages, as opposed to traditional advantages based on labor costs, in order to explain the industry allocation of FDI.

Martín and Rodríguez (2009) conducted a descriptive study on the characteristics of Spanish companies that export goods in order to identify the variables that increase the probability of a company undertaking and maintaining a successful export activity. This type of company is more relevant when designing economic policy measures that seek to increase the competitiveness of Spanish companies. They point out that the increase in the number of Spanish companies that trade and invest directly abroad is a good indicator of the internationalization process that Spain has undergone in the last decade. This increase has taken place in a context of globalization of activity and the incorporation of new economies into world trade, which has considerably increased the degree of competition that companies have to face, not only in foreign markets but also in domestic ones.

In summary, the reviewed literature seems to find that the main explanatory variables of FDI are of economic type such as the GDP, the exports. In the studies that use an econometric model to analyze which are the factors behind FDI, the most common modelling choice is to write the model using as dependent variable the FDI (e.g., Stamatiou and Dritsakis, 2014; Belloumi, 2014).

3. Data and variables

This section provides a descriptive analysis of the data and variables included in the specification of the model. Annual time series data on FDI, exports, imports and GDP covering the 1970-2018 period have been used in this paper. The selection of the time period is limited by data availability. All variables are expressed in constant 2010 US dollars, deflating by the GDP deflator. The data have been gathered from economic databases the 2018 edition of the World Development Indicators (WDI) published online by the World Bank and the Annual

Macro-Economic Database (AMECO) of the European Commission's Directorate General for Economic and Financial Affairs.

The choice of the explanatory variables is based on a thorough review of the literature on applications of the several econometric approaches and methods for the analysis of the relationship between FDI, trade and economic growth (Balassa, 1985; Ghirmay *et al.*, 2001; Belloumi, 2014; Dritsaki and Stiakakis, 2014; Faisal *et al.*, 2016; Mahmoodi and Mahmoodi, 2016).

The variables used in the empirical study are defined as follows:

- Foreign direct investment (FDI) refers to direct investment equity flows in the reporting economy. It is the sum of equity capital, reinvestment of earnings, and other capital. Direct investment is a category of cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of an enterprise that is resident in another economy. Ownership of 10 percent or more of the ordinary shares of voting stock is the criterion for determining the existence of a direct investment relationship.
- Exports of goods and services (EXP) represent the value of all goods and other market services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation of employees and investment income (formerly called factor services) and transfer payments.
- Imports of goods and services (IMP) represent the value of all goods and other market services received from the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. They exclude compensation of employees and investment income (formerly called factor services) and transfer payments.
- Economic growth (GDP) is measured by the increase of real GDP in each successive time period. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.
- A dummy variable (BREAK) is introduced to capture the differences, if any, in the intercept before and after financial and economic crisis in 2007-2008. We take into account this variable because there is still a clear break in the data for both of these series, FDI and exports. The break doesn´t occur at just a single point in time. Instead, there´s a change in the level and trend of the data that evolves over several periods. Therefore, we include an intercept and linear trend as (fixed) regressors.

The descriptive statistics for all variables are shown in Table 1. Natural logarithm has been applied to all the data to account for the expected non-linearities in the relationships and also to achieve stationarity in variance; the natural logarithms of FDI, EXP, IMP and GDP are denoted as LFDI, LEXP, LIMP and LGDP, respectively.

Table 1. Summary statistics of the variables (n=49)

Variable	LFDI	LEXP	LIMP	LGDP
Mean	18.57	25.77	25.69	27.56
Median	18.81	25.81	25.77	27.54
Maximum	20.60	26.98	26.87	28.06
Minimum	16.04	24.23	24.09	26.85
Std. Dev.	1.29	0.84	0.93	0.37
Skewness	-0.43	-0.20	-0.21	-0.17
Kurtosis	1.96	1.64	1.47	1.70
Jarque-Bera	3.70	4.06	5.13	3.69
Probability	0.16	0.13	0.08	0.16

4. Methodology

In the literature, the analysis of the causal relationships between two economic variables has been carried out using two co-integration techniques: Granger´s causal test, for which the variables need to be stationary and error correction models, for which it is a requirement that the variables be integrated in the same order.

Based on the review of the literature and with the aim of gathering more empirical evidence, we analyze the relationship between FDI, exports, imports and economic growth for Spain from 1970 to 2018. For this purpose, an autoregressive model with distributed delays (ARDL) has been used, which is presented in this section. It has several advantages in comparison with other cointegration methods such as Engle and Granger (1987) and Johansen and Juselius (1990) procedures[2].

For this reason, the methodology used for the estimation of long-term relationships has been the ARDL model proposed by Pesaran (1997), Pesaran and Shin (1999) and Pesaran *et al.* (2001) that can be applied whether the variables under the study are not integrated of the same order, while Johansen cointegration techniques require that all the variables in the system be of equal order of integration. This means that the ARDL can be applied when underlying variables are integrated of order one, zero of fractionally integrated. ARDL models have been in use for decades, but in more recent times, they have been shown to provide a very valuable vehicle for testing the presence of long-run relationships between economic time series[3].

First, a model for the correction of conditional or unrestricted error, proposed by Pesaran *et al.* (2001), is estimated to determine the existence of long-term relationships between variables in levels. This model allows measuring the speed of adjustment to an equilibrium situation in the long term, after a "shock" or imbalance caused in the short term to one of the variables in the model (see Appendix).

Secondly, the properties of the time series of each of these variables are analyzed (stationary, unit roots and structural breaks), although with the econometric method used it is not necessary to know the order of integration of the series used in the study. The unit root test Dickey-Fuller Augmented (DFA), Phillips-Perron (PP) and Dickey-Fuller GLS (DG-GLS) are applied to the series (Elliot *et al.*, 1996).

In its basic form for two variables, y and x, an ARDL regression model of order (*p,q*), where *p* and *q* are the maximum number of lags of the variables y and x, respectively can be expressed as:

$$y_t + \beta_1 y_{t-1} + \ldots + \beta_p y_{t-p} = \lambda + \alpha_0 x_t + \alpha_1 x_{t-1} + \ldots + \alpha_q x_{t-q} + \varepsilon_t \quad (1)$$

or

$$\beta(L) y_t = \lambda + \alpha(L) x_t + \varepsilon_t \quad (2)$$

where β_p and α_q are the coefficients of the dependent and independent variables, respectively, λ independent term of the model, ε_t is a random disturbance term which it will be serially independent and *L* is a distributed lag component.

The model is autoregressive because y_t is explained by lagged values of itself. It also has a distributed lag component, in the form of successive lags of the x explanatory variable. The ARDL*(p,q)* model can be estimated by applying the OLS method. This estimation will yield biased coefficient estimates due to the presence of lagged values of the dependent variable as regressors. If the disturbance term, ε_t, is autocorrelated, the OLS will also be an *inconsistent* estimator, and in this case Instrumental Variables estimation was generally used in applications of this model (Giles, 1975, 1977, 2013).

5. Estimation and results

The intertemporal linkages between the variables presented above-mentioned are outline in this section. Time series univariate properties were examined using the test that are in Table 2. Before testing co-integration association-ship, we selected the lag using unrestricted VAR.[4]

The results of the stationarity test show that all variables are nonstationary at levels but stationary at the first differences (Table 2). This is precisely the situation that ARDL modelling and bounds testing is designed for. Applying the unit root test to the first-differences of each series leads to a clear rejection of the hypothesis that the data are I(2), which is important for the legitimate application of the bounds test below. According to the results, it is therefore worth concluding that all the variables are integrated of order one (Table 2).

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2 See Hendry *et al.* (1984) for a comprehensive early review of ARDL models.

3 For a clearly and comprehensive explanation of ARDL models see the web page of Professor Emeritus from the University of Vitoria Dave Giles (http://davegiles.blogspot.com.es/2013/06/ardl-models-part-ii-bounds-tests.html).

4 Akaike's information criterion (AIC) lag-order selection statistics for a series of vector autoregressions are calculated.

Table 2. Unit root test on first log levels of variables

Variable	DFA		PP		DF-GLS	
	C	C,T	C	C,T	C	C,T
DLFDI	-9.85(0)***	-9.93(0)***	-9.85(0)***	-10.34(2)***	-9.70(0)***	-9.37(0)***
DLEXP	-4.98(0)**	-5.08(0)***	-5.00(1)***	-5.08(1)***	-1.85(2)**	-4.83(2)***
DLIMP	-4.47(0)***	-4.66(0)***	-4.54(3)***	-4.75(2)***	-4.23(0)***	-4.51(0)***
DLGDP	-2.96(0)**	-3.01(0)	-2.96(2)**	-3.10(1)	-2.69(0)***	-3.07(0)*

Notes: ***, **, * denote statistical significance at the 1, 5 and 10% levels. C=constant, T= linear trend.
The numbers within parentheses followed by DFA statistics represent the lag length of the dependent variable used to obtain white noise residuals.

In order to analyze the long-run relationships and short-run dynamic interactions among the variables of interest (FDI, exports, imports and economic growth), we apply an autoregressive distributed lag (ARDL) cointegration technique as a general vector autoregressive (VAR) model of order p in A_t, where A_t is a column vector composed of the four variables: $A_t = (FDI_t, EXP_t, IMP_t, GDP_t)'$.

The ARDL model used in this study is expressed by equations (3) to (6). The calculated F-statistics are reported in Table 3 where each variable is considered as a dependent variable (normalized) in the ARDL-OLS regressions. The bounds F-test for cointegration test yields evidence of a long-term relationship among variables for the equations (3) and (6) at a 1% significance level (see Appendix). From these results, it is clear that there is a long-run relationship amongst the variables when LFDI is the dependent variable because its F-statistic (11.56) is higher than the upper-bound critical value (6.36) at the 1%. Besides, the same occurs when the LEXP is the dependent variable (9.93>6.36). These models fulfill the assumptions of normality, autoregressive conditional heteroscedasticity (ARCH), functional forms and serial correlation.

The bounds F-test for cointegration test yields no evidence of a long-run relationship among variables for LIMP and LGDP. The null hypothesis of no cointegration is not rejected. Thus, the econometric analysis suggests that any causal relationship within dynamic ECM cannot be estimated for $F_{LIMP}(LIMP / LFDI, LEXP, LGDP)$ and $F_{LGDP}(LGDP / LFDI, LEXP, LIMP)$.

Table 3. F-bounds and t-bounds tests for cointegration

Dependent variable	Optimal lag	F-stat.	Cointegration
$F_{LFDI}(LFDI / LEXP, LIMP, LGDP)$	(1,1,4,2)	11.56	Yes
$F_{LEXP}(LEXP / LFDI, LIMP, LGDP)$	(1,4,2,3)	11.75	Yes
$F_{LIMP}(LIMP / LFDI, LEXP, LGDP)$	(1,4,1,3)	3.84	Inconclusive
$F_{LGDP}(LGDP / LFDI, LEXP, LIMP)$	(2,0,3,1)	4.43	Inconclusive
Significant level	Critical value bounds (Num. Obs.=45)		
	F-bounds test		
	I(0)	I(1)	
1% level	5.17	6.36	
5% level	4.01	5.07	
10% level	3.47	4.45	

Once cointegration is established, the conditional ARDL (p, q_1, q_2, q_3) long-run model for LFDI can be estimated according to the equation (7). Equation (7) is estimated using the following ARDL(1,1,4,2) and ARDL(1,4,2,3) specifications for LFDI and LEXP, respectively. The results obtained by normalizing LFDI and LEXP in the long-run are reported in Tables 4 and 5.

The estimated coefficients of the long-run relationship are significant for all main variables. We can see that in the long-run term equation of LFDI that exports, economic growth (LGDP) has involved a new boost in LFDI, meaning these variables have a positive significant impact on LFDI. Exports and LGDP stimulate LFDI inflow, which could create new business projects that may lead to economic growth. With the coefficient 1.97, a 10% increase in exports will cause LFDI to increase by 19.70% in the long run. In addition, our result suggests that imports have a negative impact on LFDI and it is also statistically significant at 1% level. If 10% increase in LIMP, it leads to 20.50% decrease in the LFDI in the long-run (Table 4).

Table 4. Long-run coefficients for LFDI

Variable	Coefficient	t-ratio
LEXP	1.97	2.62***
LIMP	-2.50	-3.58***
LGDP	10.31	4.70***

As we already noted in the Table 4, we also tested the significance of a number of variables that could have some explanatory power about LEXP. The estimated coefficients of the long-run relationship are significant for FDI, imports and GDP (see Table 5). In the case of GDP growth, there is a negative and significant relationship in the long-run. If 1% increase in LGDP, it leads to 4.95% decrease the LEXP. The negative impact of LGDP denotes that it takes more time for positive spill-over effects on Spanish exports.

Table 5. Long-run coefficients for LEXP

Variable	Coefficient	t-ratio
LFDI	0.32	2.21**
LIMP	1.47	3.43***
LGDP	-4.95	-3.12***

Following Odhiambo (2007) and Narayan and Smyth (2006, 2008), we obtain the short-run dynamic parameters by estimating an error correction model (ECM) associated with the long-run estimates. The long-run relationship between the variables indicates that there is Granger-causality in at least one direction which is determined by the F-statistic and the lagged error-correction term (ECT). The equation (3), where the null hypothesis of no cointegration is rejected, is estimated with an error-correction term (Morley, 2006).

The empirical estimations on the association-ship between FDI inflows, exports and economic growth in Spain has implied mixed results. The public authorities should keep the big eyes of the exports and GDP parameters for the long-run because are also one of the main factors for boosting the FDI inflows. Next step, we use long-run elements to create an ECM.

The results of the short-run dynamic coefficients associated with the long-run relationship obtained from equations (11) to (14) (see Appendix) are given in Tables 6 and 7. The error correction coefficient is negative (-0.88 and –0.18 for the LFDI and LEXP, respectively), as required, and is significant at 1% confidence level, so indicates that any deviation from the long-run equilibrium between variables is corrected about 88% for LFDI and 18% for LEXP for each year.

Table 6 shows that DLEXP is positive and significant at 1% level. If current year LEXP increases 1% level, LFDI increases 4.90%. It proves LEXP is the key indicator for LFDI of Spain. Also, LIMP is also positive and significant at 10% level. If exports increase 1%, LFDI will increase 1.99%. In the short-run, open economy (exports and imports) causes positive spill-over effects for foreign direct investment in Spain.[5]

Table 6. Short-run coefficients for DLFDI

Variable	Coefficient	t-ratio
C	-219.38	-7.13***
TREND	-0.11	-6.88***
D(LEXP)	4.90	4.42***
D(LIMP)	1.99	1.84*
D(LIMP(-1))	4.37	3.41***
D(LIMP(-2))	2.46	2.88***
D(LIMP(-3))	2.46	3.45***
D(LGDP)	-4.88	-1.01
D(LGDP(-1))	-9.48	-1.86*
BREAK	0.48	1.51
ECT(-1)	-0.88	-7.12***
R-squared	0.71	
F-statistic	8.14	
DW statistic	1.97	

[5] The R-squared value is 0.71, which reflects that the dependent variable is explained in 71% differences by the independent variables. The Durbin–Watson's (DW) value is 1.97, which confirms that there is no autocorrelation among the variables. Therefore, results show that our model is robust and well fitted.

The results in Table 7 indicate that Spain's LFDI and LGDP are directly related to LEXP. The coefficients are statistically significant. In addition to this, the results also show that for a one percent increase in LFDI, there is an increase in the LEXP by 0.06%. At the same time, for 1% increase in LGDP, there is an increase in the LFDI by 1.01. Both LFDI and LGDP give positive correlation with the growth of LEXP.[6]

Table 7. Short-run coefficients for DLEXP

Variable	Coefficient	t-ratio
C	20.73	7.23***
TREND	0.01	6.31***
D(LFDI)	0.06	4.96***
D(LFDI(-1))	-0.02	-1.63
D(LFDI(-2))	-0.04	-3.46***
D(LFDI(-3))	-0.04	-3.61***
D(LIMP)	-0.12	-1.18
D(LIMP(-1))	-0.46	-3.95***
D(LGDP)	1.01	2.43**
D(LGDP(-1))	0.71	1.44
D(LGDP(-2))	-1.20	-3.88***
BREAK	-0.01	-0.42
ECT(-1)	-0.18	-7.20***
R-squared	0.79	
F-statistic	10.15	
DW statistic	1.77	

The stability of the long-run coefficient is tested by the short-run dynamics. Once the ECM model given by equation (1) has been estimated, the cumulative sum of recursive residuals (CUSUM) and the CUSUM of square (CUSUMQ) test are applied to assess parameter stability (Pesaran, 1997). Figure 1 plots the results for both tests and for LFDI and LEXP variables. The results indicate the absence of any instability of the coefficients because the plot of CUSUM and CUSUMQ statistic fall inside the critical bands of the 5% confidence interval of parameter stability.

Results of the Granger causality analysis will indicate the direction relationship between variables studied in the short run. This relationship is illustrated in Table 8. Bilateral relations between the two variables are when both variables are the causal to one another. One-way relationship shows one variable is the determinant to other variable but not vice versa. In the context of FDI and exports, a one-way relationship means that FDI is the cause of exports but exports aren´t cause of FDI. There is unidirectional Granger causality running from LEXP to LIMP and LGDP growth and from LIMP to LFDI. In summary, we have reasonable evidence of Granger causality for the FDI to exports, but not vice versa.

6 The R-squared value is 0.79, which reflects that the dependent variable is explained in 79% differences by the independent variables. The Durbin–Watson's (DW) value is 1.77, which confirms that there is no autocorrelation among the variables. Therefore, results show that our model is robust and well fitted.

Figure 1. Plot of CUSUM and CUSUMQ test

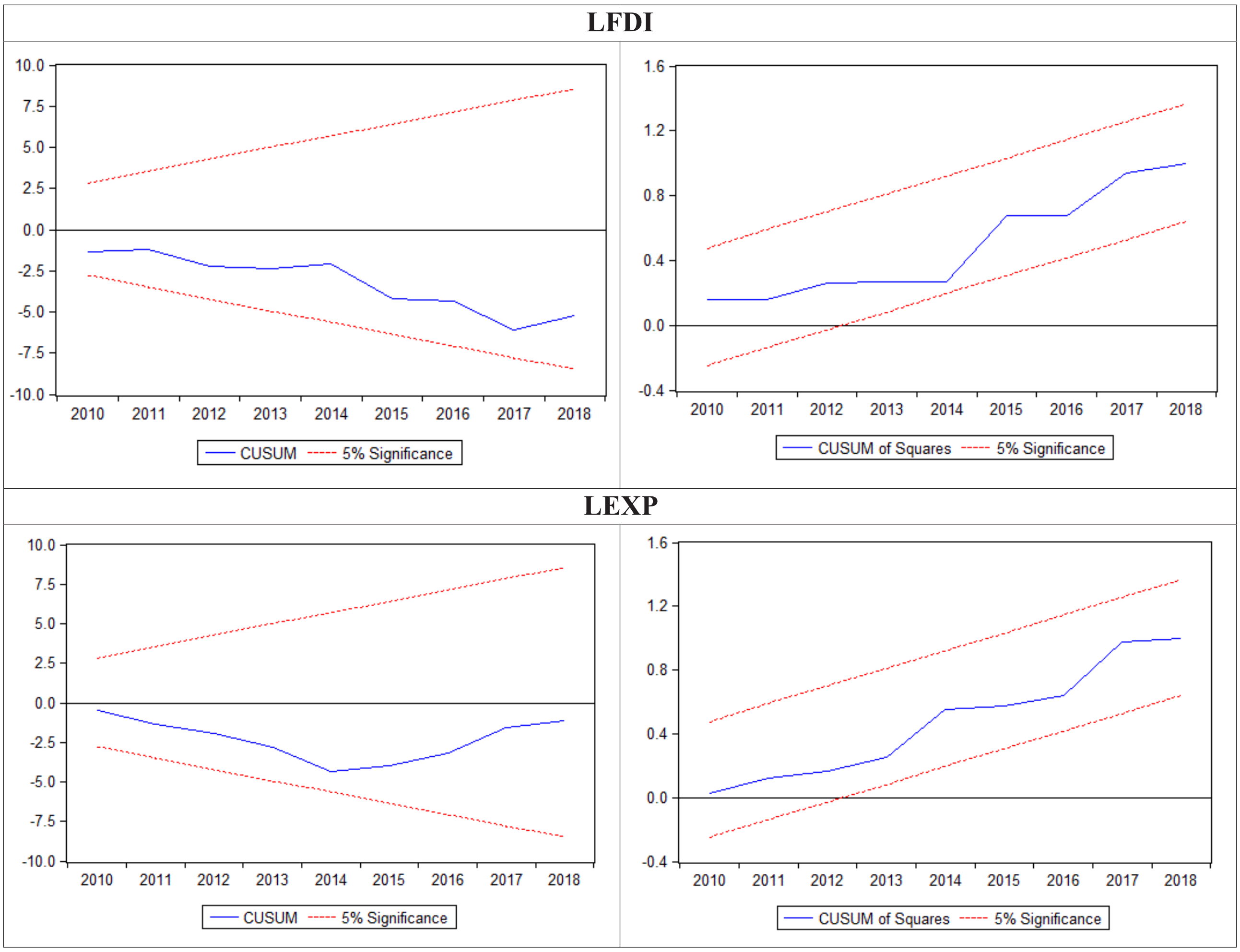


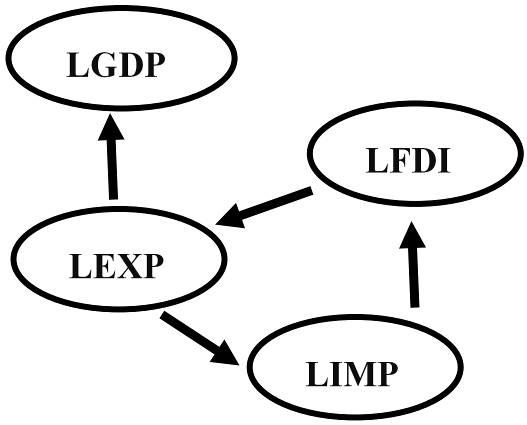
Table 8. Results of short-run Granger causality

Dependent variable	F-statistic				Direction of causality
	LFDI	LEXP	LIMP	LGDP	
LFDI		3.91***		0.42	LFDI→LEXP
LEXP	1.23		2.45*	6.45***	LEXP→LIMP
LIMP	3.10**	0.49		1.49	LEXP→LGDP
LGDP	1.93	1.39	1.80		LIMP→LFDI

Note: ** statistical significance at 5% and *** statistical significance at 1%.

A widespread belief that FDI can generate positive externalities for the host country may be confirm by our empirical results. FDI generates exports, and exports contribute to increase not only imports if not economic growth. At the same time, imports boost FDI in short run (Figure 2). These results can generate important implications and recommendations for policymakers in Spain. They suggest that for FDI to have the anticipated positive impact on economic growth, Spain will have to undertake reforms with clear objectives and commitments.

Figure 2. Granger causality relationships for Spain



We can conclude that foreign direct investment promotes exports in the short run in Spain and we have to notice that imports perform an important role to stimulate this kind of investment in the short run.

6. Conclusions

Some of the factors that have driven international capital movements in the golden Fifties and silver Sixties, with the industrialized countries being the preferred source and destination, have been market growth or changes in economic policy resulting from the creation of the General Agreement on Tariffs and Trade (GATT, 1947) or the European Economic Community (EEC). In this context, also within the framework of the Cold War, the Spanish economy was one of the receivers of this type of capital as a result of its adhesion to the EEC, which continued to progress due to the "tax free" of a potential European market with 160 million consumers and which grew until it reached the Europe of 28. The process of internationalization of companies and the progressive liberalization of economic relations at world level led to an increase in international capital movements from the 1980s onwards. A particular type of these capital movements is FDI, which has increased more than in previous periods. Finally, it seems that global FDI flows will no longer reach pre-2007 levels (Pérez Ludeña, 2019).

American FDI has had an unquestioned European vocation since the 1950s. Spain appears as a privileged destination for such direct investment in general and for the affiliates of multinationals with a US parent company. The increase of the country risk for the return of FDI in Spain during the oil crisis and also in the current economic crisis, describes the US preference as a safe bet (Tascón and López, 2016). Therefore, the influence of this business environment is also felt on the preferences of other large savers who wish to gain control of the companies in which they invest, in order to obtain the maximum return on their investments, such as FDI from China, Russia, etc.

This study highlights the importance of FDI in Spain during the 40 years of political democracy, especially since the promulgation of the 1978 Constitution. During this time, the Spanish economy has gone through various crises, the increase in competition in the decades following the Civil War, structural crises in the industrial sector, the reduction of tariff barriers since the preferential agreement between Spain and the EEC in 1970... The past is questioned from the current rationality, that is, from the back-projection that causes thoughts about the crisis that began in 2007-2008.

To carry out the proposed objective, the time series ARDL model is used in which the dependent and independent variables are related not only contemporaneously but also through their historical values. A contrast of bands is carried out, subsequently formulating an ARDL model that is estimated with annual data of the Spanish economy for the period 1970-2018. Once the existence of a long-term relationship between FDI and the rest of the variables has been verified through a cointegration analysis, it is discussed how the dependent variable reacts to changes in the explanatory variables, both in the short and long term. Finally, the process is completed with a causality analysis. Since cointegration between the variables is a necessary but not sufficient condition to speak of causality, Granger's causality tests are performed. Exports, imports and gross domestic product promote FDI in Spain in the long run. Furthermore, in order to establish economic policies, it is essential to know the causal relationships between the variables proposed.

Preliminary results show that there is co-integration between the variables specified in the model when FDI and exports are the dependent variables. There is no significant causality in Granger's sense of FDI to exports; however, there is strong causality in the direction of FDI to exports. FDI therefore influences institutions and the trajectory of host economies, although this influence is difficult to capture with econometric tools. The results obtained suggest that FDI is one of the motors of exports in Spain that also influences long-term economic growth.

It can be assumed that mathematical and theoretical-economic sophistication are combined to give a character to the historical perception that already showed a clear intuition about the relationship of these variables. Now that FDI and exports from Spain have been united by the time lag and the most adverse circumstances, the worst imaginable scenarios have made it possible to contrast the sense of the relationship that, in the case of Spain, the behaviour of FDI and exports from 1970 to 2018 shows in a unique way.

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APPENDIX 1

The methodology of this article follows several steps:

In the first step, we test for a unit root test. The literature proposes several methods for unit root tests. Since these methods may give different results, we selected the Dickey-Fuller (ADF) test (1979, 1981), the Phillips-Perron (P-P) test following Phillips and Perron (1988) and the Dickey-Fuller generalized least square (DF-GLS) de-trending test proposed by Elliot *et al.* (1996). In all these tests, the null hypothesis is that the variable contains a unit root, i.e., it is not stationary. The optimal lags for unit root test are to include lags sufficient to remove any serial correlation in the residuals. The ARDL bounds test is based on the assumption that the variables are *I(0)* or *I(1)*, but if any series are integrated of order *I(2)* or higher, then the calculated F-statistic becomes invalid (Ouattara, 2004). Therefore, before applying this test, we determine the order of integration of all variables using unit root tests. The main objective is to ensure that the variables are not *I(2)* so as to avoid spurious results. In the presence of variables integrated of order two we cannot interpret the values of F statistics provided by Pesaran *et al.* (2001) and Narayan (2005).

In the second step, a particular type of ARDL model is formulated (model (3)-(6)), called unrestricted error correction model (ECM) or "conditional ECM" according to Pesaran *et al.* (2001). Before the estimation of the model, we determine the appropriate lag structure for this using the pre-estimation version of Stata command named *varsoc*. This can be used to find lag lengths for VAR or VEC models of unknown order. As shown by Nielsen (2001), this lag-order selection statistics can be used in the presence of *I(1)* variables. The ARDL model (3)-(6) used here is expressed as follows:

$$\Delta LFDI_t = \alpha_{01} + \sum_{i=1}^{p} \beta_{1i} \Delta LFDI_{t-i} + \sum_{i=0}^{q_1} \beta_{2i} \Delta LEXP_{t-i} + \sum_{i=0}^{q_2} \beta_{3i} \Delta LIMP_{t-i} + \sum_{i=0}^{q_3} \beta_{4i} \Delta LGDP_{t-i} + \\ + \delta_{11} LFDI_{t-1} + \delta_{21} LEXP_{t-1} + \delta_{31} LIMP_{t-1} + \delta_{41} LGDP_{t-1} + \delta_{51} BREAK_t + \varepsilon_{1t}. \quad (3)$$

$$\Delta LEXP_t = \alpha_{02} + \sum_{i=0}^{p} \beta_{1i} \Delta LFDI_{t-i} + \sum_{i=1}^{q_1} \beta_{2i} \Delta LEXP_{t-i} + \sum_{i=0}^{q_2} \beta_{3i} \Delta LIMP_{t-i} + \sum_{i=0}^{q_3} \beta_{4i} \Delta LGDP_{t-i} + \\ + \delta_{12} LFDI_{t-1} + \delta_{22} LEXP_{t-1} + \delta_{32} LIMP_{t-1} + \delta_{42} LGDP_{t-1} + \delta_{52} BREAK_t + \varepsilon_{2t}. \quad (4)$$

$$\Delta LIMP_t = \alpha_{03} + \sum_{i=0}^{p} \beta_{1i} \Delta LFDI_{t-i} + \sum_{i=0}^{q_1} \beta_{2i} \Delta LEXP_{t-i} + \sum_{i=1}^{q_2} \beta_{3i} \Delta LIMP_{t-i} + \sum_{i=0}^{q_3} \beta_{4i} \Delta LGDP_{t-i} + \\ + \delta_{13} LFDI_{t-1} + \delta_{23} LEXP_{t-1} + \delta_{33} LIMP_{t-1} + \delta_{43} LGDP_{t-1} + \delta_{53} BREAK_t + \varepsilon_{3t}. \quad (5)$$

$$\Delta LGDP_t = \alpha_{04} + \sum_{i=0}^{p} \beta_{1i} \Delta LFDI_{t-i} + \sum_{i=0}^{q_1} \beta_{2i} \Delta LEXP_{t-i} + \sum_{i=0}^{q_2} \beta_{3i} \Delta LIMP_{t-i} + \sum_{i=1}^{q_3} \beta_{4i} \Delta LGDP_{t-i} + \\ + \delta_{14} LFDI_{t-1} + \delta_{24} LEXP_{t-1} + \delta_{34} LIMP_{t-1} + \delta_{44} LGDP_{t-1} + \delta_{54} BREAK_t + \varepsilon_{4t}. \quad (6)$$

where are the dependent variables defined in the section 2. are the long terms and are the optimal lag lengths of the ARDL model. L is the logarithm operator, Δ is the first difference and are the error terms assumed to be independently and identically distributed.

In the third step, we use the LM test to test the null hypothesis that the errors are serially independent, against the alternative hypothesis that the errors are AR(m) or MA(m). The errors of the estimated model must be serially independent. As Pesaran *et al.* (2001) note, this requirement may also be influential in our final choice of the maximum lags for the variables in the model.

In the fourth step the Bound testing is performed. The F test is used for testing the absence of a long-run equilibrium relationship between the variables. This absence coincides with zero coefficients for the lagged levels of the variables, $LFDI_{t-1}, LEXP_{t-1}, LIMP_{t-1}$ and $LGDP_{t-1}$ (model (3)-(6)). A rejection of null hypothesis implies that we have a long-run relationship. When long-run relationship exists, F test indicates which variable should be normalized. The null hypothesis for no cointegration among variables in equation (3) is against the alternative hypothesis. The same for the equations (4) to (6). The F-test has a non-standard distribution which depends on (i) whether variables included in the model are *I(0)* or *I(1)*, (ii) the number of regressors and (iii) whether the model contains an intercept and/or a trend. The test involves asymptotic critical value bounds, depending whether the variables are *I(0)* or *I(1)*. In each case, the lower bound is based on the assumption that all of the variables are integrated of order zero, and the upper bound is based on the assumption that all of the variables are integrated of order one. If the computed F-statistic falls below the lower bound we would conclude that the variables are *I(0)*, so no cointegration is possible. If the F-statistic exceeds the upper bound, we conclude that we have cointegration and it lies between the bounds, the test is inconclusive. Besides, a Bound t-test of, against is performed as a cross-check. If the t-statistic for the lagged levels of the dependent variables is greater than the *I(1)* bound tabulated by Pesaran *et al.* (2001), this would support the conclusion that there is a long-run relationship between the variables. If the t-statistic is less than the *I(0)* bound, we would conclude that the data are all stationary.

In the fifth step, assuming that the bounds test leads to the conclusion of cointegration, we estimate the long-run relationships between the variables using the following equations:

$$LEXP_t = \alpha_{02} + \sum_{i=0}^{p} \beta_{1i} LFDI_{t-i} + \sum_{i=1}^{q_1} \beta_{2i} LEXP_{t-i} + \sum_{i=0}^{q_2} \beta_{3i} LIMP_{t-i} + \sum_{i=0}^{q_3} \beta_{4i} LGDP_{t-i} + \varepsilon_{2t}. \quad (8)$$

$$LIMP_t = \alpha_{03} + \sum_{i=0}^{p} \beta_{1i} LFDI_{t-i} + \sum_{i=0}^{q_1} \beta_{2i} LEXP_{t-i} + \sum_{i=1}^{q_2} \beta_{3i} LIMP_{t-i} + \sum_{i=0}^{q_3} \beta_{4i} LGDP_{t-i} + \varepsilon_{3t}. \quad (9)$$

$$LGDP_t = \alpha_{04} + \sum_{i=0}^{p} \beta_{1i} LFDI_{t-i} + \sum_{i=0}^{q_1} \beta_{2i} LEXP_{t-i} + \sum_{i=0}^{q_2} \beta_{3i} LIMP_{t-i} + \sum_{i=1}^{q_3} \beta_{4i} LGDP_{t-i} + \varepsilon_{4t}. \quad (10)$$

Moreover, a dynamic error correction model (ECM) can be derived from the ARDL bounds test through a simple linear transformation. The short-run dynamic parameters by estimating an unrestricted ECM or conditional ECM associated with the long-run estimates are obtained:

$$\Delta LFDI_t = \alpha_{01} + \sum_{i=1}^{p} \beta_{1i} \Delta LFDI_{t-i} + \sum_{i=0}^{q_1} \beta_{2i} \Delta LEXP_{t-i} + \sum_{i=0}^{q_2} \beta_{3i} \Delta LIMP_{t-i} + \sum_{i=0}^{q_3} \beta_{4i} \Delta LGDP_{t-i} + \lambda_1 ECM_{t-1} + \varepsilon_{1t}. \quad (11)$$

$$\Delta LEXP_t = \alpha_{02} + \sum_{i=0}^{p} \beta_{1i} \Delta LFDI_{t-i} + \sum_{i=1}^{q_1} \beta_{2i} \Delta LEXP_{t-i} + \sum_{i=0}^{q_2} \beta_{3i} \Delta LIMP_{t-i} + \sum_{i=0}^{q_3} \beta_{4i} \Delta LGDP_{t-i} + \lambda_2 ECM_{t-1} + \varepsilon_{2t}. \quad (12)$$

$$\Delta LIMP_t = \alpha_{03} + \sum_{i=0}^{p} \beta_{1i} \Delta LFDI_{t-i} + \sum_{i=0}^{q_1} \beta_{2i} \Delta LEXP_{t-i} + \sum_{i=1}^{q_2} \beta_{3i} \Delta LIMP_{t-i} + \sum_{i=0}^{q_3} \beta_{4i} \Delta LGDP_{t-i} + \lambda_3 ECM_{t-1} + \varepsilon_{3t}. \quad (13)$$

$$\Delta LGDP_t = \alpha_{04} + \sum_{i=0}^{p} \beta_{1i} \Delta LFDI_{t-i} + \sum_{i=0}^{q_1} \beta_{2i} \Delta LEXP_{t-i} + \sum_{i=0}^{q_2} \beta_{3i} \Delta LIMP_{t-i} + \sum_{i=1}^{q_3} \beta_{4i} \Delta LGDP_{t-i} + \lambda_4 ECM_{t-1} + \varepsilon_{4t}. \quad (14)$$

where ECM_{t-1} is the error correction term that should be negative and statistically significant because indicates the speed of adjustment, that is to say, how quickly the variables return to the long-run equilibrium.

The existence of cointegration derived from the model (11)-(14) does not necessarily imply that the estimated coefficients are stable. Therefore, Pesaran (1997) and Pesaran *et al.* (2001) proposed assessing parameter stability in estimated models using which are known as cumulative sum (CUSUM) and as cumulative sum of squares (CUSUMQ) (Stamatious and Dritsakis, 2014). If the plots of the CUSUM and CUSUMSQ statistics stay within the critical bonds of a 5 percent level of significance, the null hypothesis of all coefficients in the given regression is stable and cannot be rejected. To ensure the goodness of fit of the model, diagnostic and stability tests are conducted. Diagnostic tests examine the model for serial correlation, non-normality and heteroscedasticity.

In the last step, after the long-run relationship between variables, the direction of causality using the ECM-ARDL model is analyzed.