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FOREIGN DIRECT INVESTMENTS AND ECONOMIC GROWTH IN BULGARIA: THEORETICAL CHALLENGES AND EMPIRICAL RESULTS

The assessment of the strength and direction of the link between foreign direct investments (FDIs) and economic growth has long been the focus of research activities, but empirical findings remain mixed. Most results, however, show that the overall effect of FDIs is positively related to growth and vice versa. At the same time, it is widely argued that the impact of FDIs is closely related to the so-called 'absorptive capacity' of the host economy, with the highest weight being the quantity and quality of the workforce; the degree of trade openness and economic freedom; the fiscal policy pursued and the degree of financial development. These are key factors for the effectiveness of foreign direct investment, which in turn further stimulate economic growth. The present study provides an overview of the basic theoretical concepts and empirical assessment of the impact of FDIs on the rate of economic growth in Bulgaria, taking into account other factors of growth as well. Quarterly data for the period 1990 Q1-2019 Q3 were used for this purpose. Relevant conclusions and recommendations are made regarding the economic policy pursued.
JEL: F21; F23

1. Introduction

The transition period[2] is over, but its study will certainly continue for a long time as many questions remain unanswered. One of them is about the role of FDIs[3] and the extent to which the future development of the economy depends on incoming financial flows. Significant international trade liberalization has taken place during the transition years, and a large volume of FDIs flows has been attracted, necessitating a more in-depth analysis of their importance for long-term growth. Figure 1 illustrates the correlation between GDP

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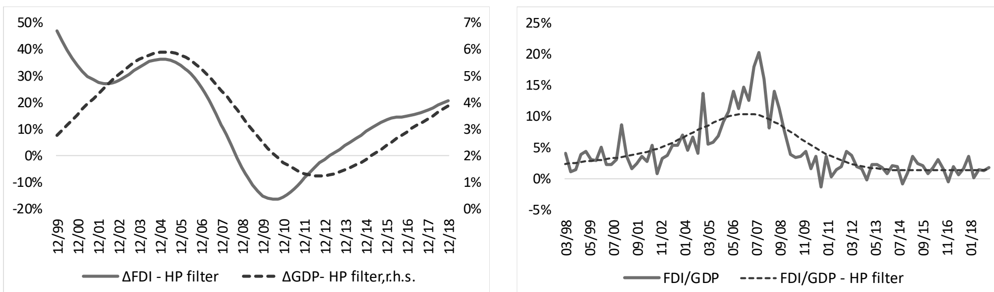
[2] Understood as a transition from centrally planned to market economy, including the building of all accompanying institutions.
[3] FDIs mean investments that involve long-term relationships and reflect a lasting investor interest. FDIs are usually seen as a composite package of funding, technology and know-how.

and FDIs growth rates. Ever since the beginning of the transition period, it can be seen that the share of foreign direct investments in GDP has a gradual upward trend, which has continued up until 2007-2008, after which a significant and steady decline has been recorded. It should be mentioned though, that repatriation of capital, exported from the country just before and at the beginning of economic reforms, may have played a substantial role for the high volumes of attracted foreign investments, especially in the pre-accession period, which explains (at least in part) the subsequent rapid decline. On the other hand, the decline of FDIs in both absolute and relative terms, which began at the end of 2007, was further exacerbated by the worsening global financial crisis, which negative effects were felt in Bulgaria starting in early 2009.

Figure 1

GDP and FDI*



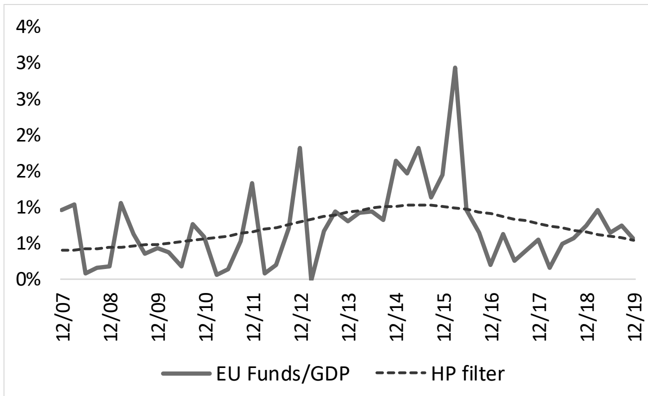
* Quarterly data, seasonally adjusted by the Hodrick – Prescott (HP) filter, λ = 1600
Source: BNB, MoF.

It can be seen as well that the reduced volume of FDIs in the economy had a negative impact on economic growth rates. EU funds (Figure 2) were not able to compensate for the sharp decline in FDIs. Consequently, economic growth rates declined from 5-6% in the 2002-2008 period to about 3% after that.

While Figure 1 does outline the link between incoming financial flows and economic growth rates, this link needs to be analyzed and evaluated in detail. This is essentially the main objective of the study, with various econometric techniques applied to its implementation. The working hypothesis is that there is empirical evidence of a statistically significant positive effect of FDIs on growth. In addition, internal factors and the absorptive capacity of the economy should also play a role. The structure of the remaining of the research is as follows: review of the literature on the topic; clarification of the theoretical approaches; a description of the methodology and data used; building and testing of various econometric models; analysis of the results obtained and drawing conclusions.

Figure 2

EU Funds share in GDP



Source: BNB, MoF

2. A Review of Literature

International financial flows are an important feature of global economy, and FDIs are perhaps their central component. Most countries, especially developing ones, are attracting FDIs to accelerate long-term economic growth with a view to increasing the well-being of the population. There are several reasons that make FDIs attractive – access to modern technology; creation of new knowledge and skills; increasing the importance of research and development (R&D) and know-how for the host country. These intangible assets are definitely beneficial to the host countries and stimulate productivity, and hence economic growth. FDI can also help accessing foreign markets, especially when the host country is used as an export platform for distribution.

Various theories of economic growth generally agree on the understanding that the high growth rate requires high levels of investments. In general, investments are provided by internal sources that are directly dependent on the economy's savings rate. When it is not high enough, an accelerated economic growth rate is still possible, provided that the country is able to attract foreign investments, and especially FDIs. Although rapid GDP growth is possible using internal resources only, such cases are extremely rare, especially in less developed countries. Much more common is the case when high growth rates are associated with an inflow (in one form or another) of external savings. On the other hand, globalization and developments in information technology have facilitated the mobilization of capital beyond national borders, which places an additional burden on the allocation of FDIs. However, economists' association with this view is rather conditional and is questioned by a wide range of studies. Although much of the theoretical literature has postulated that FDIs inflows do have benefits for the receiving country, studies by (Herzer, Klasen, 2008) and (Gorg, Greenaway, 2004) have shown quite controversial results. Similar are the results in the studies of (Irandoust & Ericsson, 2001) and (Carkovic, Levine, 2005), where no statistically significant relationship between FDIs and economic growth can be found.

Given the disparities in the empirical results of a number of academic papers, it is of particular importance to trace both the factors that lead to changes in FDIs volumes and changes in the absorption capacity of the host economy that may enhance (or reduce) the effect of FDIs. In this regard, the study of (Azman-Saini, et al., 2010), which states that there is a minimum threshold level of financial development necessary for the positive effect of FDIs on growth, is of particular interest.

Regarding the importance of the development of the financial system in absorbing foreign direct investments, it should be noted that pioneering research in this area was made by (Schumpeter, 1911 (1934)). Later, Schumpeter's ideas were further developed in the works of a number of researchers – for example (Shahbaz & Rahman, 2012) and (Alfaro, et al., 2004), who stated that the financial channel operates by reallocating resources from traditional sectors to growth-stimulating sectors due to FDIs inflows. Another channel of influence may be through easing credit constraints and / or by lower interest rates. In the works of (Lucas, 1993) and (Romer, 1986) one can also find an argument that a well-developed financial system attracts more foreign investment and contributes to reducing the asymmetry of information, which in turn has a positive effect on the allocation of resources, and indirectly on economic growth.

Theoretically, FDIs should affect economic growth mainly through the accumulation of capital and inclusion in the production process of new materials and technologies that lead to higher productivity and correspondingly higher output. The empirical evidence, however, is not straightforward. On the one hand, (Findlay, 1978) shows that the benefits of FDIs, viewed as technology transfer; know-how; introducing new processes and training employees, are much stronger and more visible in the industrial sector of the economy, than in the extractive industry and agriculture. This, in practice, means that both the structure of the host economy itself and the structure of foreign direct investments should be added to the absorptive capacity of the economy. Obviously, in the absence of the necessary conditions, foreign investments will have limited effect.

Studies on the role of FDIs inflows and their impact on the economy have good traditions in Bulgaria. First publications in this area appeared in the mid-1990s. These studies were somewhat descriptive, focusing primarily on the need of pursuing active policies to attract foreign investments rather than on focusing on the effects on economic development. With the accumulation of sufficient amount of empirical data, more studies began to emerge, for example (Petranov, 2003), which were using quantitative assessment methods and tried to model both factors influencing FDIs inflows, and the effects on the economy. At a later stage, new publications appeared, focusing on specific effects of FDIs's inflows: for example: on the effects on income inequality (Mihailova, 2014); on the effects on unemployment (Nikolaev, Stancheva, 2013); on the effects on financial and corporate governance (Nikolova, 2014); on the effects on the transmission mechanism and economic growth (Petrova, 2018). There are already publications summarizing and evaluating policies over a longer period (Mihailova, 2019), or fully focused on the search for econometric interdependencies (Petkov, 2016).

As a summary of the brief literature review, several important conclusions can be drawn:

- Most of the studies on the impact of FDIs on economic growth show a positive effect on the host economy. Moreover, the positive effect is seen as a function of the absorptive capacity of the host country – mainly the quality and quantity of the available human and physical capital. It should also be noted that there are studies, pointing at potential chances for zero, and even negative effects of incoming FDIs flows. Even though such studies are rather few, they should be taken into account while careful consideration should be given to factors that may trigger those adverse effects.
- Another important finding relates to considerations that affect investors when choosing where to allocate FDIs. To a certain extent, this depends on the level of economic development. When investing in developed economies, the overarching aim is to gain access to markets, while investments in less developed countries are explained either by lower production costs or by securing access to scarce resources. In fact, this means that links between FDIs and growth will vary from country to country and depend on the stage of development.
- The review of literature also reveals the most important factors to consider when examining the relationship between FDIs and economic growth. They can be organized as follows:
  - Size of the economy
  - Human capital – quantity and quality
  - Economic freedom
  - Development of the financial system
  - Price of labour
  - Tax system
  - Institutional quality
  - Trading mode
  - The risks in the economy

3. Theoretical foundations

The relationship between FDIs and economic growth has been the subject of research for decades, but the topic remains debatable. In recent years, there has been a growing interest, which can be explained by the ongoing processes of globalization and the fact that multinational companies play an increasingly important role in capital formation, trade and economic growth. This said, economic growth is a complex phenomenon that is influenced by both economic and institutional factors, and directions of causation between growth and various explanatory factors are often two-way. Moreover, the numerous factors that explain growth are generally correlated, suggesting that there is multicollinearity that must be approached carefully in the process of econometric analysis. Such considerations play an important role in the empirical research. These contemplations are manifested through different channels: *first*, FDIs inflows can affect the capital formation, which is one of the main determinants of economic growth. *Second*, incoming FDIs can increase the overall factor productivity of the host economy and alter its comparative advantages. At the same time, if productivity growth is directly related to the export structure of the economy, then FDIs will affect both growth and export volumes. *Third*, the institutional characteristics of the host economy, such as its legal and tax systems; the quality of the institutions; compliance with property rights laws, etc., affect both the volume of attracted FDIs and the subsequent capital formation.

Going back to theory, in ***neoclassical growth models*** of a Solow-Swan type, FDIs have traditionally been seen as a supplement to the host economy's capital stock. Thus, there are no significant differences between domestic and foreign capital, i.e. their impact on growth will be the same and will be influenced by the law on diminishing return on capital. In other words, FDIs will have a short-term impact on growth only. In addition, the neoclassical theory of economic growth assumes that FDIs have an effect on GDP per capita ($\frac{Y_t}{POP_t}$) only, and not on economic growth $\frac{Y_t - Y_{t-1}}{Y_{t-1}}$ itself. However, current theories of economic growth accept that FDIs affect both per capita production and GDP directly. This view is well reasoned in (Irandoust, 2010).

In ***endogenous growth models***, the potential role of FDIs is greater as they examine more channels (not just through capital formation) through which FDIs influence growth. One way to make sense of this approach is by looking at how FDIs influences every argument in the production function. From this point of view, FDIs can influence production by raising capital, as mentioned above, but this impact is likely to be rather low, given the high degree of substitution between growth factors. The empirical results of this assumption are quite mixed (see for example Constantinos, Schmitt, 2016), and it is essential to check whether foreign and domestic capital are complementary or there is crowding-out. In fact, whether the ultimate effect of FDIs will be positive and significant depends largely on that.

3.1. Positive effects of FDI inflows

As already mentioned, in neoclassical models, long-term growth can only be the result of exogenous technological advances and/or growth in labour. From this point of view, FDIs can influence economic growth if it is transformed into technological progress. In endogenous growth theories, FDIs affect growth rates through two channels: directly, through greater investment and more efficient technologies; and indirectly, by improving human capital, infrastructure, institutions etc. Positive effects of FDIs can also be manifested in the form of management skills, organizational know-how and training of the workforce.

Even though the logic behind these models is broadly clear and beyond doubt, yet empirical results of some of the studies are puzzling. For example (Razin & Sadka, 2007) draw attention to the fact that while theoretical models postulate an inverse relationship between the effect of FDIs on growth and the gap between the technological capacity of the investor and the host country, it turns out that close to ¾ of the global investments are made between developed countries and not between developed and developing countries. At the same time, FDIs are often in the form of specific investment in a specific sector, especially when it comes to privatization. As much as direct investments are directed towards privatization rather than towards the creation of new capacity and/or production, the effect on the whole economy is far from certain. One of the main constraints is that privatization (especially through FDIs) is almost always linked to a reduction in the number of employees of the privatized company, which, under other things, will most likely have a negative effect on economic activity.

3.2. Negative effects of FDI inflows

As noted above, studies showing a lack or even a negative relationship between FDIs and growth are not uncommon, which requires theoretical reflection. A possible channel may be the result of market mechanism distortions due to an aggressive policy to attract foreign investors. For example, (Easterly, 1993) notes that some policies, such as preferential tax treatment and other discounts, can distort incentives and repel potential domestic investors. More generally, if foreign firms are treated more favourably than local firms, long-term effects on growth will likely be negative. Another important observation was made by (Borensztein, et al., 1988), who stated that if FDIs enter an economy to overcome, or circumvent existing trade barriers, the volume and structure of these flows will not be associated with a higher long-term efficiency, instead it will just be driven by short-term incentives to maximize profits. Similar are the findings of (Balasubramanyam, et al., 1996) who argue that the infusion of human capital and new technologies into an economy, that is in a state of persistent imbalances and distortions, will neither accelerate the growth, nor may affect the production function. The whole effect will be offset by the redistribution of income in favour of certain new agents.

Other studies have argued that there are situations in which foreign direct investments can oust domestic investment by diverting scarce resources from other productive sectors. For example (de Mello, 1999) empirically proves that substitution between capital stock embodying old (local) and new (foreign) technologies is higher in developed than in developing economies.

In addition to the above, the size of the public sector and the government can also be a conduit for adverse effects on growth. The government may be asked to make major infrastructure investments in order to attract foreign direct investment. However, this can increase the budget deficit and/or external debt and lead (at a later stage) to a higher tax burden, which is a prime example of crowding out local investors in favour of foreign ones.

3.3. A simple theoretical model describing the relationship between FDI and growth

Based on the review of literature, as well as the theoretical background, a simple model can be constructed, on the basis of which a specific model can be drawn up. Figure 3 illustrates a concept underlying the process of data mining. Economic growth is a function of investments (capital) – both domestic and foreign; human capital; other factors such as labour costs, institutions and government policy, financial development, legal and tax systems, etc.

Figure 3

Relationships between FDI and Economic Growth

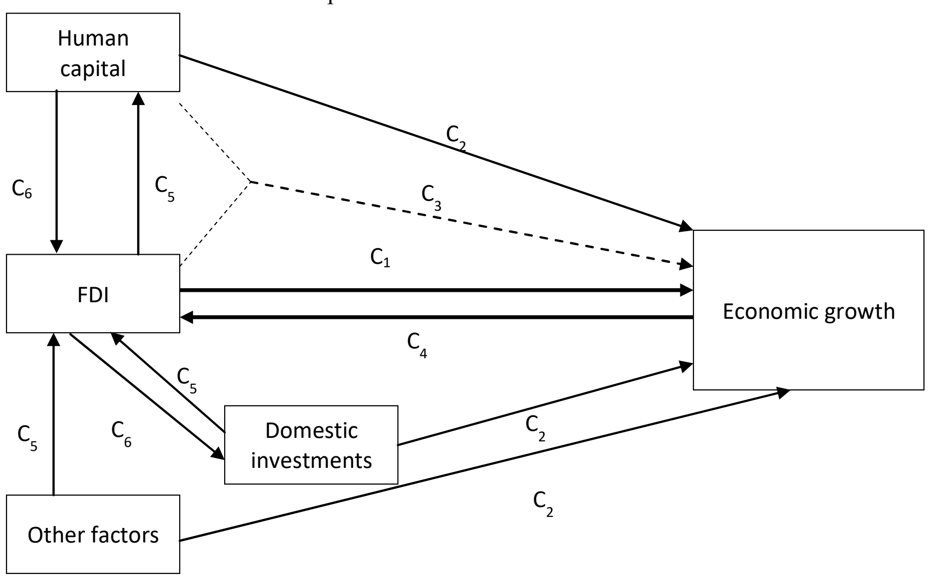


Figure 3 also shows that FDIs have a direct effect on growth, represented by C1. Other growth factors are represented by C2. In addition to direct effects, foreign direct investments could have an impact on economic growth through the human capital channel in combination with other resources represented by C3. The feedbacks in the model are represented by C4, C5 and C6, which can essentially be treated as determinants of the inward volumes of FDIs. The focus of this study is on channels C1, C2 and C3.

4. Methodology and Data

Based on the basic model, an econometric one can be constructed, which will help produce specific estimates. The approach assumed in this study is to evaluate the effects of FDIs on growth using two sets of information: theoretical literature and previous empirical studies.

Figure 3 suggests modelling the direct effects of FDIs on growth (C1), the effects of other engines of economic growth (C2), and the impact of the interaction between FDIs and other types of capital (C3). On this basis, equation (1) is drawn up, which follows from the review of the existing literature on the effects of FDIs on economic growth, controlling for the effects of other explanatory variables and the effects of FDIs interactions on the accumulation of other capital.

$$Growth_t = \alpha + \beta_1 FDI_t + \beta_2 FDI_t * HC_t + \beta_3^i Z_t + \varepsilon_t \quad (1)$$

where Growtht is the growth rate of real per capita GDP; FDI_t is the share of FDI in GDP; $FDI_t \times HC_t$ is a multiplicative term for the interaction between FDIs and other factors; Z_t is a vector of control variables and ε_t is the error term. The selection of elements from the control vector of variables is guided by the theoretical and existing empirical literature.

This study uses the autoregressive distributed lag (ARDL) approach, introduced by (Pesaran, Shin, & Smith, 2001), to test for a long-run equilibrium relationship between economic growth, FDIs, and other factors of economic development. The choice of this method is explained by its applicability regardless of the degree of integration of the variables – they can be either I(0) or I(1), or a combination of the two. In fact, this means that it is not absolutely necessary to include variables only of the same order of integration. The ARDL approach allows for relatively more accurate estimates in smaller samples – a problem that is common in calculations for a developing economy with frequent structural changes. Moreover, in the case where all variables are stationary at their first differences, I(1), then when estimating the long-term relationship, it is not necessary to increase the number of regressors to correct the residual autocorrelation.

In general, the ARDL approach can be characterized as a two-phased. The first phase consists of two steps. Firstly, we test for a short-term relationship between variables. The second step is to test for the presence of a cointegration vector. In the presence of a cointegration vector, we may proceed to the second phase, which is to reduce the model by testing for the optimal number of lags and to estimate the coefficients of the long-term relations.

To make it clearer, if the equation has only one explanatory variable, it can be written as:

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

where Y_t and X_t are respectively the dependent and explanatory variable (for example GDP per capita and the size of FDIs), α and β are the coefficients to be estimated, and ε_t is the error term. The ARDL model (p, q) derived from the above equation would have the following form:

$$\Delta y_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta y_{t-i} + \sum_{j=0}^{q} \beta_{2j} \Delta x_{t-j} + \lambda_1 y_{t-1} + \lambda_2 x_{t-1} + \varepsilon_t \tag{3}$$

where the first half of the equation, in which coefficients β are to be estimated, represents the short-term relationship between the dependent and explanatory variables, and the second half of the equation, where coefficients λ are to be estimated, represents the long-term relationship. The estimation of coefficients is performed at different lags (p, q), keeping in mind the possible occurrence of problems with autocorrelation.

As mentioned, the second step is testing for a long-term relationship, which is established by testing the null hypothesis H0: λ1 = λ2 = 0. If the null hypothesis is rejected, we move on to the second phase by choosing the optimal ARDL model, i.e. selecting the optimum lag length and estimating the coefficients of long-term and short-term relations. The latter is done on the basis of equation (3)[4], which also sets the corrective mechanism, in other words, the speed at which the deviations from the long-term equilibrium are being corrected.

4.1. Specification of the model

To model and estimate the impact of FDIs on economic growth, we start from building a functional equation (4):

$$Y = f(FDI, FD, INV, GE, LF, FDI * FD) \tag{4}$$

where Y is real GDP per capita; FDIs is foreign direct investments (inflows, % of GDP); FD is a composite variable representing the level of financial development; INV is domestic investments (gross capital formation, % of GDP); GE government spending (final consumption, % of GDP); LF is the labour force. Based on the functional equation (4), an econometric equation (5) can be formulated, in which α is the constant term, β_i are the coefficients to be estimated, and ε_t is the error term. All variables are in logarithm.

$$LY_t = \alpha + \beta_1 LFDI_t + \beta_2 LFD_t + \beta_3 LINV_t + \beta_4 GE_t + \beta_5 LLF_t + \beta_6 (LFDI_t * LFD_t) + \varepsilon_t \tag{5}$$

With respect to the financial development variable (FD), the PCA[5] approach, as described in (Ang, McKibbin, 2007) is used, which implies the construction of a composite variable

[4] Equation (3) is only an example and includes only one variable. The specific calculations are further based on equations (5).

[5] Principal Component Analysis (PCA) is a statistical procedure that uses a special transformation to transform a set of observations of possibly correlated variables into a set of linearly uncorrelated variable(s), called "Principal Component(s)".

comprising of different components. The benefits of using this approach are twofold: firstly, since there are various financial development variables which tend to be highly correlated, the use of PCA helps to overcome the problem of multicollinearity; secondly, assessing the link between financial development and economic growth is hampered by the fact that there is no consensus among researchers as which single indicator should be used. The use of PCAs makes it possible to overcome this shortcoming by combining different variables relevant to financial development into one variable. In this case, the following variables are included in the procedure:

- Broad money to nominal GDP ($\frac{M3_t}{Y_t}$);
- Domestic credit to nominal GDP ($\frac{DC_t}{Y_t}$);
- Bank assets to nominal GDP ($\frac{BA_t}{Y_t}$)

The application of PCA approach is summarized in Table 1.

Table 1

Principal component analysis regarding financial development

Principal Components Analysis
Sample (adjusted): 1998Q4 2019Q3
Included observations: 84 after adjustments

Eigenvalues: (Sum = 3, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	2.866459	2.740446	0.9555	2.866459	0.9555
2	0.126013	0.118485	0.0420	2.992472	0.9975
3	0.007528	---	0.0025	3.000000	1.0000

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3
Bank Assets/GDP	0.588905	-0.090400	-0.803130
Dom. Credit/GDP	0.574011	-0.652767	0.494376
M3/GDP	0.568948	0.752146	0.332527

Ordinary correlations:

	A_GDP	DCR/GDP	M2/GDP
Bank Assets/GDP	1.000000		
Domestic Credit/GDP	0.973419	1.000000	
M3/GDP	0.949848	0.875504	1.000000

4.2. Order of integration of the variables

All the variables in equation (5) are tested for the order of integration (presence of a unit root) using ADF (Augmented Dickey-Fuller) and PP (Phillips-Perron) tests from the econometric package EViews 10. The results are shown in Table 2.

Table 2

Stationarity at levels

	Augmented Dickey-Fuller (AD) F test			Phillips – Perron (PP) test		
	Optimal lag (AIC)	t – stat.	Critical value at 1%	Newey-West Bandwidth	Adj. t – stat	Critical value at 1%
LY	3	-2.0176	-4.072	5	-2.094	-4.068
LFDI	0	-3.516	-3.510	4	-3.279	-3.510
LFD	0	-1.516	-4.068	4	-1.353	-4.068
LINV	9	-2.068	-4.081	6	-2.829	-4.068
LGE	2	-1.661	-3.510	3	-3.287	-3.508
LLF	2	-2.347	-3.510	3	-1.147	-3.508
LFDI*LFD	0	-3.688	-3.510	3	-3.437	-3.510

When using the ADF test, the Akaike Info Criterion (AIC) was used to determine the optimal number of lags, and the PP test used the Newey-West Bandwidth criterion. As expected, the variables are not stationary in terms of their levels, which requires repeating the test, but in terms of the first differences of the variables.

Table 3

Stationarity at first differences

	Augmented Dickey-Fuller (AD) F test			Phillips – Perron (PP) test		
	Optimal lag (AIC)	t – stat.	Critical value at 1%	Newey-West Bandwidth	Adj. t – stat	Critical value at 1%
ΔLY	3	-3.542	-3.512	5	-9.574	-3.509
ΔLFDI	1	-9.207	-3.514	8	-15.006	-3.512
ΔLFD	0	-10.235	-3.509	3	-10.182	-3.509
ΔLINV[6]	8	-2.098	-3.517	4	-4.804	-3.509
ΔLGE	2	-7.960	-3.511	3	-17.075	-3.509
ΔLLF	1	-2.535	-3.510	3	-3.450	-3.509
Δ(LFDI*LFD)	1	-9.217	-3.514	4	-14.438	-3.512

Table 3 shows that except for the LF variable (workforce), all other variables are integrated of order one – I(1). From the point of view of constructing and estimating the ARDL model, this is not crucial[7], as there may be a mix of I(0) and I(1) variables, but it is important in selecting the critical values of F-statistics when testing the hypothesis of a long-term relationship between economic growth (the dependent variable) and the various explanatory variables.

[6] The ADF test for the variable INV (investment) shows the non-stationarity of the first differences and the stationarity under the PP test. An additional Kwiatkowski-Phillips-Schmidt-Shin test was performed to confirm the stationarity at first differences.

[7] In fact, it matters because in order to build and estimate an ARDL model, no variable should be I(2). When constructing the final model, this feature will be considered and the labor variable (LF) will be excluded from the final model.

4.3. Building a full ARDL

After completing the required stationarity tests, and if there are no I (2) variables, the construction of an ARDL model can proceed. Provided that cointegration is detected, an error-correction ARDL model can be built as well. When specifying the model, an important challenge is the correct determination of the lag-length. The econometric literature states that when quarterly data are used, it is advisable to start the tests with 4 lags, which may subsequently be reduced. There are various diagnostic tests to help determine the optimal lag structure more accurately. As a rule of thumb, one should look for the most compact model possible. Based on these tests, the maximum lag value for both the dependent and variable explanatory variables is set to ($p = q = 4$).

When looking for a long-term relation, using an ARDL model, it is essential that the parameters are estimated based on the complete model, i.e. without any restriction on individual variables. Following the methodology proposed by (Banerjee, Dolado, Galbraith, & Hendry, 1993), by means of simple linear transformations equation (5), which in practice is a vector autoregressive model (VAR), can be rewritten as follows:

$$\Delta LY_t = \beta_0 + \sum_{i=1}^{p} \beta_{1i} \Delta LY_{t-i} + \sum_{j=1}^{q} \beta_{2j} \Delta LFDI_{t-j} + \sum_{j=1}^{q} \beta_{3j} \Delta LFD_{t-j} + \sum_{j=1}^{q} \beta_{4j} \Delta LINV_{t-j} + \sum_{j=1}^{q} \beta_{5j} \Delta LGE_{t-j} + \sum_{j=1}^{q} \beta_{6j} \Delta\left(LFDI_{t-j} * LFD_{t-j}\right) + \lambda_1 LY_{t-1} + \lambda_2 LFDI_{t-1} + \lambda_3 LFD_{t-1} + \lambda_4 LINV_{t-1} + \lambda_5 LGE_{t-1} + \lambda_6 LFDI_{t-1} * LFD_{t-1} + \varepsilon_t \quad (6)$$

According to the theory outlined above, coefficients β set the short-term relationship and the coefficients λ set the long-term relationship. Equation (6), in which $p = q = 4$, is estimated by the ordinary least square (OLS) method. The results of the evaluation of the full model are shown in the following Table 4:

Table 4

Coefficients of the full ARDL model (ARDL 4,4,4,4,4,4)

Method: ARDL
Sample (adjusted): 2000Q1 2019Q3
Included observations: 73 after adjustments
Dependent lags: 4 (Fixed)
Dynamic regressors (4 lags, fixed): DLFDI D(LGE) D(LINV) D(LFD) D(LFDI*LFD)
Fixed regressors: LY (-1) LFDI (-1) LGE(-1) LINV(-1) LFD(-1) LFDI*LFD(-1) C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Δ(LY(-1))	-0.266465	0.128579	-2.072387	0.0453
Δ(LY(-2))	-0.075930	0.148537	-0.511185	0.6123
Δ(LY(-3))	-0.175730	0.146749	-1.197485	0.2387
Δ(LY(-4))	-0.249451	0.120112	-2.076810	0.0448
ΔLFDI	-0.031695	0.064337	-0.492638	0.6252
Δ(LFDI(-1))	-0.096102	0.104219	-0.922115	0.3624

Method: ARDL
Sample (adjusted): 2000Q1 2019Q3
Included observations: 73 after adjustments
Dependent lags: 4 (Fixed)
Dynamic regressors (4 lags, fixed): DLFDI D(LGE) D(LINV) D(LFD) D(LFDI*LFD)
Fixed regressors: LY (-1) LFDI (-1) LGE(-1) LINV(-1) LFD(-1) LFDI*LFD(-1) C

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Δ(LFDI(-2))	-0.104174	0.085541	-1.217822	0.2310
Δ(LFDI(-3))	-0.111461	0.073192	-1.522857	0.1363
Δ(LFDI(-4))	0.005698	0.060909	0.093552	0.9260
Δ(LGE)	-0.026077	0.029584	-0.881462	0.3838
Δ(LGE(-1))	-0.058761	0.059463	-0.988192	0.3295
Δ(LGE(-2))	-0.054402	0.054345	-1.001039	0.3233
Δ(LGE(-3))	0.004137	0.047479	0.087128	0.9310
Δ(LGE(-4))	0.013155	0.036387	0.361526	0.7198
Δ(LINV)	-0.028222	0.065944	-0.427974	0.6712
Δ(LINV(-1))	0.050767	0.065016	0.780839	0.4399
Δ(LINV(-2))	0.107142	0.059531	1.799761	0.0801
Δ(LINV(-3))	-0.019635	0.062325	-0.315035	0.7545
Δ(LINV(-4))	-0.086121	0.054335	-1.585010	0.1215
Δ(LFD)	-0.102926	0.077207	-1.333109	0.1906
Δ(LFD(-1))	-0.190655	0.108614	-1.755346	0.0875
Δ(LFD(-2))	-0.103389	0.094956	-1.088814	0.2833
Δ(LFD(-3))	-0.138791	0.078918	-1.758680	0.0869
Δ(LFD(-4))	-0.013856	0.060402	-0.229390	0.8198
Δ(LFDI*LFD)	0.006023	0.011349	0.530670	0.5988
Δ(LFDI*LFD(-1))	0.015134	0.018478	0.819057	0.4180
Δ(LFDI*LFD(-2))	0.017166	0.015113	1.135852	0.2633
Δ(LFDI*LFD(-3))	0.018629	0.012897	1.444474	0.1570
Δ(LFDI*LFD(-4))	-0.001367	0.010720	-0.127509	0.8992
LY(-1)	-0.105806	0.063964	-1.654161	0.1066
LFDI(-1)	0.232707	0.111440	2.088177	0.0437
LGE(-1)	-0.025275	0.064890	-0.389501	0.6991
LINV(-1)	-0.122012	0.043266	-2.820031	0.0077
LFD(-1)	0.131651	0.059414	2.215812	0.0329
LFDI*LFD(-1)	-0.037505	0.019943	-1.880622	0.0679
C	0.740130	0.532634	1.389564	0.1730

R-squared	0.740376	Mean dependent var	0.011752
Adjusted R-squared	0.494786	S.D. dependent var	0.013049
S.E. of regression	0.009275	Akaike info criterion	-6.216196
Sum squared residuals	0.003183	Schwarz criterion	-5.086654
Log likelihood	262.8911	Hannan-Quinn criterion	-5.766054
F-statistic	3.014678	Durbin-Watson stat	1.545306
Prob(F-statistic)	0.000625		

4.4. Reducing the full model and inclusion of an error-correction term

Following the usual diagnostic tests on residuals (normality and serial correlation), the hypothesis for co-integration between the variables is tested. As mentioned above, the null hypothesis is $H0: \lambda 1 = \lambda 2 = \lambda 3 = \lambda 4 = \lambda 5 = \lambda 6 = 0$. Its confirmation (or rejection) is based on the estimated equation (6), imposing a restriction on the coefficients λ1… … .. λ6 according to the null hypothesis. Wald's F-statistic values are compared with the upper and lower bounds of pre-calculated critical values.[8] If the F-statistic does not fall between the upper and lower bounds, a conclusion can be drawn regarding the presence or not of cointegration. When the value of the F-statistic is greater than the upper limit, the null hypothesis is rejected, signalling for the presence of a long-term relationship. When the value of the F-statistics is less than the lower bound, the null hypothesis cannot be rejected. When the value of the F-statistics falls between the lower and upper bounds, neither the null hypothesis nor the null hypothesis can be definitively rejected or confirmed. In addition, the econometric product EViews 10 offers an additional cointegration test that does not need to compare the results of the Wald test with pre-calculated values and the results are shown directly. Table 5 presents the results of the F-statistics of the Wald test and those of EViews 10.

Table 5

Co-integration tests

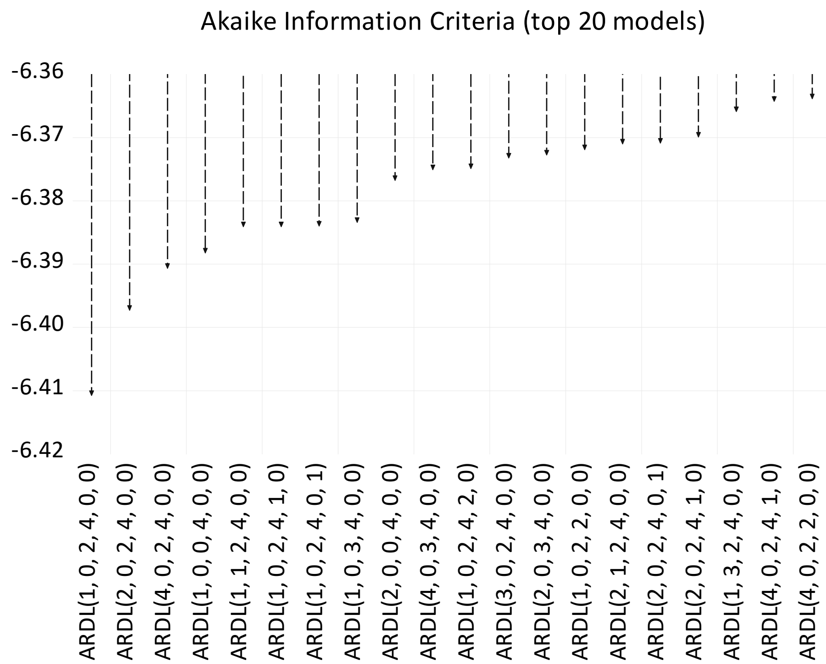
Null hypothesis	Wald test		F-Bounds Test			T-Bounds Test		
	F-stat.	Prob.	F-stat	Lower bound I(0)	Upper bound I(1)	T-stat	Lower bound I(0)	Upper bound I(1)
$H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = 0$	2.436	0.0438	6.661	2.26	3.35	-6.735	-2.57	-3.86

Results presented in Table 5 strongly reject the null hypothesis, which implies the presence of a cointegration relation between the variables. This allows for additional work on equation (6) to further reducing it, as well as including a supplementary variable in the form of an error-correction term, i.e. the deviation from the long-term trend. Again, diagnostic tests are used to determine the optimal lag-length in the reduced model. The selection was made based on maximizing the value of the Akaike Information Criterion (AIC), with the results shown in Figure 4.

[8] The critical values calculated by (Narayan, 2004) and (Pesaran & Shin, 1999) are used in this study.

Figure 4

Choice of a reduced model



According to the tests performed, the full ARDL (4,4,4,4,4,4) model can be reduced to an ARDL (1,0,2,4,0,0), and the reduced equation is as follows:

$$\Delta LY = \beta_{11}\Delta LY_{-1} + \beta_{21}\Delta LFDI + \beta_{31}\Delta GE + \beta_{32}\Delta GE_{-1} + \beta_{33}\Delta GE_{-2} + \beta_{41}\Delta LINV + \beta_{42}\Delta LINV_{-1} + \beta_{43}\Delta LINV_{-2} + \beta_{44}\Delta LINV_{-3} + \beta_{45}\Delta LINV_{-4} + \beta_{51}\Delta LFD + \beta_{61}\Delta LFDI{*}LFD + \lambda_1 LY_{-1} + \lambda_2 LFDI_{-1} + \lambda_3 GE_{-1} + \lambda_4 LINV_{-1} + \lambda_5 LFD_{-1} + \lambda_6 LFDI{*}LFD_{-1} + \varepsilon \quad (7)$$

The results of the estimation of equation (7) are shown in Table 6.

The final step of the analysis is to include in equation (7) an error-correction term (ECT). The meaning of this variable is to show how short-term fluctuations from the long-term trend are being dealt with. This said, it's paramount that the coefficient of the ECT is negative, otherwise the model will not converge to its long-term equilibrium. As already underlined, the inclusion of such a variable is only possible in the presence of a cointegration vector that has been established. It should also be recalled that the size of the ECT is indicative for the speed of convergence – the greater the value, the faster the short-term deviations will return to equilibrium.

Table 6

Coefficients of the reduced model (ARDL 1,0,2,4,0,0)

Dependent Variable: ΔLY
Method: ARDL
Sample (adjusted): 1999Q2 2019Q3
Included observations: 80 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): Δ(LFDI) Δ(LGE) Δ(LINV) Δ(LFD) Δ(LFDI*LFD)
Fixed regressors: LY(-1) LFDI(-1) LGE(-1) LINV(-1) LFD(-1)LFDI*LFD(-1) C
Number of models evaluated: 12500
Selected Model: ARDL (1, 0, 2, 4, 0, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*	
Δ(D1(-1))	-0.138261	0.097913	-1.412072	0.1630	Short-term coefficients
Δ(LFDI)	-0.032901	0.056189	-0.585543	0.5603	
Δ(LGE)	-0.026911	0.029783	-0.903571	0.3698	
Δ (LGE (-1))	-0.126521	0.040595	-3.116633	0.0028	
Δ (LGE (-2))	-0.102149	0.032815	-3.112892	0.0028	
Δ(LINV)	-0.100275	0.065924	-1.521079	0.1334	
Δ (LINV (-1))	-0.051187	0.055408	-0.923823	0.3592	
Δ (LINV (-2))	-0.016238	0.049861	-0.325663	0.7458	
Δ (LINV (-3))	0.151962	0.050364	3.017296	0.0037	
Δ (LINV (-4))	-0.150105	0.050964	-2.945334	0.0046	
Δ(LFD)	-0.042963	0.045232	-0.949830	0.3459	
Δ(LFDI*LFD)	0.006000	0.009881	0.607237	0.5459	
LY (-1)	-0.098461	0.037663	-2.614244	0.0112	Long-term coefficients
LFDI (-1)	0.131466	0.059664	2.203422	0.0314	
LGE (-1)	0.023320	0.049990	0.466500	0.6425	
LINV (-1)	-0.042434	0.021253	-1.996554	0.0503	
LFD (-1)	0.105317	0.028949	3.637974	0.0006	
LFDI*LFD (-1)	-0.021919	0.010644	-2.059309	0.0437	
C	0.387558	0.376662	1.028928	0.3076	

R-squared	0.568039	Mean dependent var	0.010240
Adjusted R-squared	0.440575	S.D. dependent var	0.015124
S.E. of regression	0.011312	Akaike info criterion	-5.922117
Sum squared residuals	0.007805	Schwarz criterion	-5.356385
Log likelihood	255.8847	Hannan-Quinn criterion	-5.695299
F-statistic	4.456470	Durbin-Watson stat	2.060228
Prob(F-statistic)	0.000006		

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Table 7

Coefficients of the reduced model with an ECT

ARDL Error Correction Regression
Dependent Variable: D(ΔLY,2)
Selected Model: ARDL (1, 0, 2, 4, 0, 0)
Case 3: Unrestricted Constant and No Trend
Sample: 1998Q4 2019Q3
Included observations: 80

ECM Regression
Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.	
C	0.387558	0.334453	1.158782	0.2511	Short-term coefficients
Δ (LGE,2)	-0.026911	0.023402	-1.149940	0.2547	
Δ (LGE (-1),2)	0.102149	0.019211	5.317317	0.0000	
Δ (LINV,2)	-0.100275	0.041456	-2.418816	0.0186	
Δ (LINV (-1),2)	0.014381	0.040866	0.351910	0.7261	
Δ (LINV (-2),2)	-0.001857	0.038966	-0.047652	0.9621	
Δ (LINV (-3),2)	0.150105	0.036879	4.070233	0.0001	
LY (-1)	-0.098461	0.033908	-2.903799	0.0051	Long-term coefficients
LFDI (-1)	0.131466	0.041375	3.177441	0.0023	
LGE (-1)	0.023320	0.043089	0.541218	0.5903	
LINV (-1)	-0.042434	0.016544	-2.564850	0.0128	
LFD (-1)	0.105317	0.024836	4.240481	0.0001	
LFDI*LFD (-1)	-0.021919	0.007405	-2.959938	0.0044	
ECT	-1.138261	0.087841	-12.95825	0.0000	

R-squared	0.779460	Mean dependent var	0.000336
Adjusted R-squared	0.736020	S.D. dependent var	0.021166
S.E. of regression	0.010875	Akaike info criterion	-6.047117
Sum squared residuals	0.007805	Schwarz criterion	-5.630262
Log-likelihood	255.8847	Hannan-Quinn criterion	-5.879988
F-statistic	17.94349	Durbin-Watson stat	2.060228
Prob(F-statistic)	0.000000		

As can be seen from

Table **7**, there is no change in the long-term coefficients compared to the reduced model, but overall the model is much better and meets the parsimonious requirements.

4.5. Diagnosis of coefficients, residuals and stability of the model

In order to establish the reliability of the model, the necessary tests were performed. The results are as follows:

4.5.1. Test for serial correlation of residuals

Table 8

Serial correlation of residuals

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 4 lags

F-statistic	1.475812	Prob. F (4,57)	0.2215
Obs*R-squared	7.507719	Prob. Chi-Square(4)	0.1114

The null hypothesis is that there is no serial correlation and as Table 8 shows, this hypothesis cannot be rejected as Prob. F-statistic> 0.05.

4.5.2. Histogram-Normality test

Figure 5

Normality test

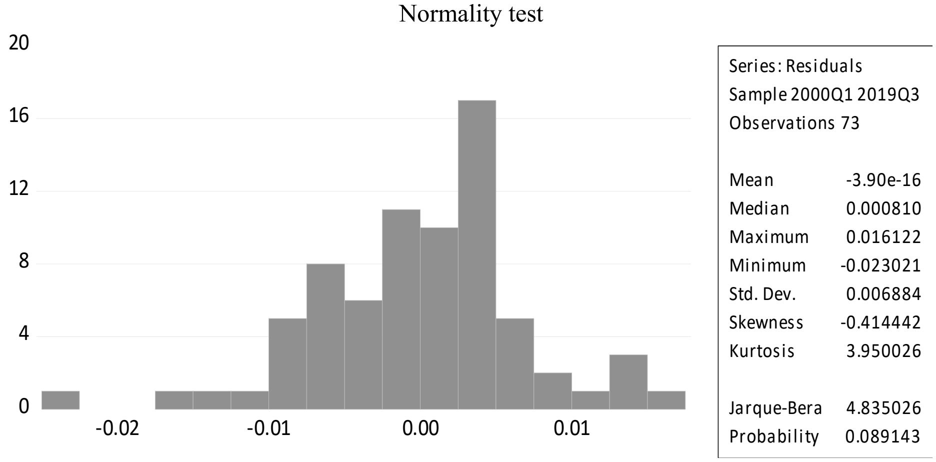


Figure 5, in particular the Jarque-Bera value, verifies the normal distribution of residues.

4.5.3. <u>Heteroskedasticity test</u>

Table 9

Heteroskedasticity test

Heteroskedasticity Test: Harvey
Null hypothesis: Homoskedasticity

F-statistic	1.250280	Prob. F(18,61)	0.2530
Obs*R-squared	21.56042	Prob. Chi-Square(18)	0.2521
Scaled explained SS	32.29083	Prob. Chi-Square(18)	0.0203

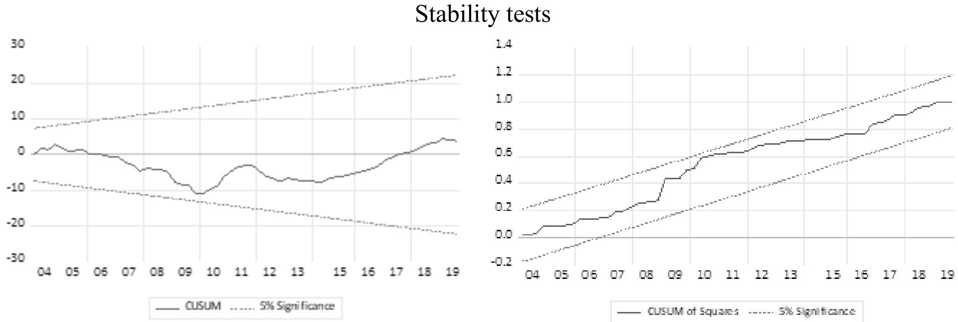
Table 9confirms that the null hypothesis of residual homoskedasticity cannot be rejected as Prob. of the F-statistic is significantly higher than 0.05.

4.5.4. <u>Stability of the model</u>

The CUSUM tests are based on the cumulative sum of the recursive residuals, or their square values. These tests plot the cumulative sum together with the 5% critical lines. The tests find parameter or variance instability if the cumulative sums go outside the area between the two critical lines. Figure 6 shows that both the value of CUSUM and its squares lie entirely within the confidence interval.

Figure 6

Stability tests



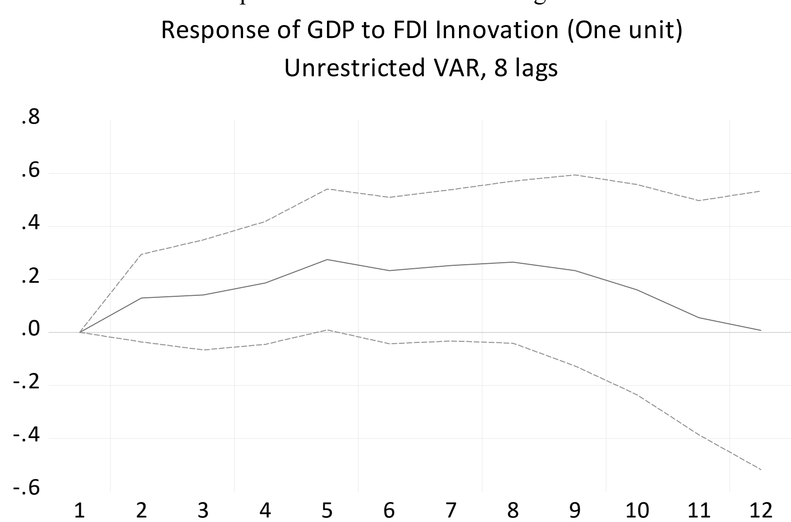
4.6. Building a VAR model and Implementing an Impulse-Response analysis

In addition to the estimates based on an ARDL model, we also apply the vector autoregression (VAR) approach. Typical for this econometric approach is that it does not seek causality and specific channels of influence, but is e entirely endogenous, in the sense that the variables included can be both dependent and explanatory. In this type of research, which usually uses multifactor analysis combined with multiple lags, there is no serious economic explanation for the coefficients, but it does have the potential of tracking potential effects in the presence of some shock, i.e. the so called "impulse response function".

In building a VAR model, we use the levels of the same variables, as in the ARDL model, taken in logarithmic form. Performed lag-length tests show that it is optimal to use 8 lags in the unrestricted specification of the model. Given that, as mentioned before, there is no economic sense in interpreting coefficients in a VAR model with 6 variables and 8 lags (there are 294 coefficient altogether), we are interested only in the impulse response function of a shock to FDIs inflows to GDP growth rates.

Figure 7

Impact of FDIs shocks on GDP growth



5. Evaluation of results and conclusions

The purpose of this empirical study was to estimate the effect of FDIs on economic growth and to explore the channels through which it occurs. The main conclusion is that FDIs do have a positive long-term effect on growth rates. The effect is statistically significant, but it is rather weak. This allows to conclude that ***FDIs are not a significant factor for economic growth in Bulgaria***. In addition, data in Table 7 also lead to the conclusion that the absorptive capacity of the economy is low and does not allow for full use of attracted FDIs.

It should be noted that Figure 7 shows results that broadly correspond to the results of the ARDL model, as presented in Table 7. The effect of FDIs on economic growth appears to be positive but weak. The long-run coefficient is just 0.13, which means that an increase in FDIs inflows (as a share of GDP) by 1 pp. will accelerate long-term growth by 0.13 pp. The

VAR specification, and the impulse response function, in particular, show that a possible shock, in the sense of a rise in FDIs by one unit (1 pp), leads to an increase in GDP, which reaches a maximum value of 0.26 pp. in the fifth quarter after the onset of the shock, and then gradually subsides and completely disappears after the third year.

The inclusion of a variable on the interaction between FDIs and the development of the financial sector improves the model (as t-stat is high), but somewhat surprisingly, the coefficient has a negative sign, indicating a reversed relationship. The theoretical expectation is that the value should be positive. The explanation is most likely related to the specific nature of monetary policy, which is subject to restrictions coming from the currency board arrangement. The peculiarities of the currency board make it possible to pursue a "quasi-monetary policy", implemented through changes in BNB's monetary liabilities. In fact, BNB's monetary liabilities are far from being influenced by movements in the reserve money only, as implied by an orthodox currency board. They include many more items, including government deposits, and thus changes in these items may affect money supply with no corresponding links to official foreign reserves. This practically hinders the automaticity of the currency board, which implies an immediate change in the money supply depending on the change in official foreign currency reserves. Consequently, when FDIs inflows tend to decrease, this could not be compensated by the usual instruments of monetary policy; hence the composite variable reflecting financial development may well be negative.

Overall, the test results of the various models are consistent with the idea that FDIs inflows, accompanied by relevant technologies, skills and know-how, can only increase the growth rate of the host economy by interacting with the economy's absorbing capacity. At the same time, the results obtained raise two important questions:

- Are FDIs more effective than domestic investments?
- Is there a crowding-out effect between FDIs and local investments?

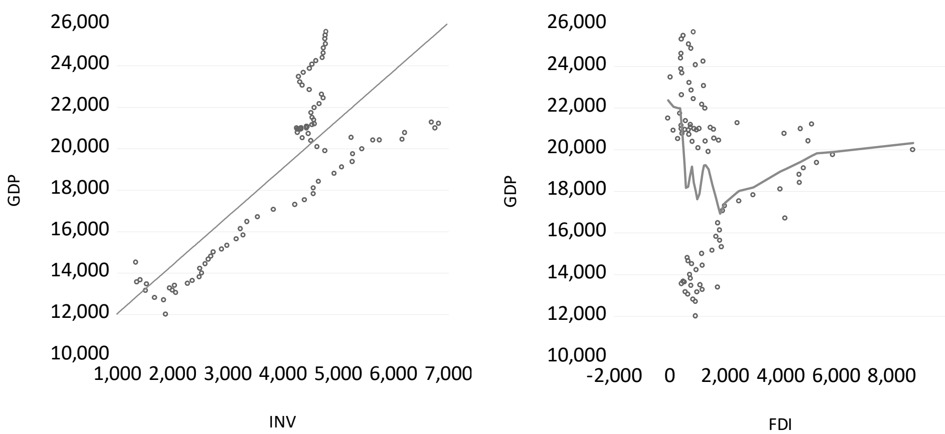
It must be acknowledged that the specification of the models is not intended to answer these questions directly. However, some indirect conclusions can be drawn from the results presented in Table 6 and Table 7. To examine the possibility of higher FDIs efficiency, we test whether FDIs have effects higher than those of aggregate investments in the growth equations.

To further explore the contribution of FDIs to economic growth, we analyze its relationship to total investments. The theoretical hypothesis is that FDIs can add economic growth simply by increasing the accumulation of capital in the host economy. This will require FDIs not to crowd-out investments from local sources from competing in the product or financial markets, but to complement them.

Figure 8 shows that, overall, domestic investments are more sustainable than foreign ones, with its relationship to GDP rather linear, while FDIs are definitely not linear. Even visually, it can be seen that when there was a strong inflow of FDIs, domestic investment slowed down. This is also supported by the negative sign of the long-term ratio. Although the value of the coefficient is very low, its statistical significance is high and should not be neglected. This leads to the conclusion that FDIs are fast to transform into economic growth but are more fragile. Moreover, Figure 7 shows that the effect is not constant but fades away relatively quickly. This can be interpreted in a sense that ***foreign investments are more effective, but only in the short term***. This finding has a logical explanation. For example, it is clear that local businesses have better knowledge and access to domestic markets. If a foreign company chooses to enter the market, it must offset the advantages enjoyed by local firms. In practice, this means that in order to succeed, a foreign company is likely to have lower costs and higher productivity than its domestic competitors, at least in the first years after the investment. This is even more true in developing countries, where higher FDI efficiency is combined with sophisticated management skills and the introduction of advanced technologies. ***At the same time, the data show that FDIs tend to crowd out local investments rather than complement them. This conclusion again emphasizes the adverse impact of the low absorptive capacity of the economy.***

Figure 8

GDP, FDI and INV



The present study confronts the understanding that FDIs have an undeniable and necessarily great positive effect on the economy of the host country. It follows that there are no economically justifiable actions on the part of the Government aimed at creating privileged conditions for foreign investors at any cost. It should be made clear that this does not mean that more foreign investment repulsion policies should be applied. This finding is limited to the fact that any active action to attract foreign investors (especially large ones) must be well thought out because the positive short-term effects can be quickly replaced by the long-term negative ones. ***Another important finding is that in order to maximize the effect of FDIs, absorptive capacity of the economy (human capital, financial development and institutions) should be given priority. This will not only improve the current macroeconomic characteristics of the economy but will also help to better absorb any future financial flows.***

6. Concluding remarks

Assessments and conclusions made in this study must be approached with caution, especially as regards the interpretation of the magnitude of the effect of foreign direct investment on economic growth. The estimation methods used rely on linear dependencies, which are not always true in real life, at least at certain times. This inevitably distorts the assessments and the conclusions drawn accordingly. Another reason to be cautious is the fact that the FDI data used in the study measures flows as recorded in the balance of payments. We must admit that these are only part of the funds that foreign companies invest, as part of the investment can be financed through debt or equity. Things are even more complicated when the investment is not a "greenfield" one, and especially in cases where there is involvement with local companies. In these cases, highlighting the effect of direct investment is difficult, if not impossible. In such cases, the assessment of the effect of FDI can be seriously overestimated.

Rather, the results of this study should be considered as a starting point for further research. The results support the view that the beneficial effect of FDI on growth is due, in the first place, to higher efficiency rather than simply greater capital accumulation. This implies future studies to test the effect of FDI on the dynamics of overall factor productivity in the host economy. In addition, given the theoretically defined link between human capital and FDI, it may be interesting to study the impact of FDI on the level of human capital.

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