Economic Growth, Foreign Investments and Exports in Romania: A VECM Analysis

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The present paper deals with the relationship between GDP, FDI and merchandise exports using a vector error-correction model (VECM). The empirical model is based on quarterly data for the period 2005-2014 in Romania. The Granger causality test indicate a positive significant bidirectional relationship and between FDI and GDP and a unidirectional relationship between GDP and exports. The variance decomposition indicates that more than 50% of the fluctuations in FDI are explained by the shocks in GDP, while the influence of shocks in exports is quite low. Fluctuations in GDP are largely explained by the shocks occurring in this variable. As regards exports, 44% of fluctuations are due to FDI, while the impact of GDP reaches 13-15% after 10 quarters.

Keywords: VECM, GDP, foreign direct investment, export
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1. Introduction

The current economic reality is shaped by the dynamism of the multinationals companies acting globally and by the increasing openness of the countries of the world for both foreign investment and trade. At least from a theoretical point of view, foreign direct investment (FDI) inflows are encouraged into host countries due to their positive impact generated by the technological and know-how transfer, the gain in productivity and the modernization of the economy as a whole. At the same time, international trade affects economic growth through investment, i.e. the accumulation of factors that enables the increase of the productive capacity. Still, empirical studies analysing the impact of international trade and FDI on economic growth in the countries of Central and Eastern Europe (CEE) are few (Zikovic et al., 2014), especially those that take into account the impact of the economic crisis.

In general, studies in the literature point to the positive impact of FDI and exports on GDP (Acarvaci and Ozturk, 2012). For Damijan and Rojec (2007), FDI contributed to reducing the development gap in the countries of CEE, while Badinger and Tondl (2002) explain this effect based on the capital accumulation and transfer of technology. However, the causal relationship between the variables mentioned above varies depending on the analysed period, the countries that are studied and the econometric methods applied. As a result, there is no clear causality between these variables: some studies confirm unidirectional or bidirectional causality relationships, while other certify for lack of any type of causality (Acarvaci and Ozturk, 2012).

For Blomstrom et al. (2000), the positive impact of FDI could be reinforced only in an environment marked by trade openness and macroeconomic stability. Moreover, some studies claim that the positive impact of FDI occurs only in the short term, while growth

and prosperity are negatively affected on the long term because the main interest of investors is to achieve profit, therefore the most profitable industries, such as banking, pharmaceutics and telecommunications are targeted (Zikovic et al., 2014).

For CEE countries, which have undergone a period of economic transition, FDI were seen as a way to stimulate economic growth. FDI inflows are a source of new management abilities, know-how and technological growth in these countries that had a later start in the race for global competitiveness.

The aim of this paper is to examine the relationship between FDI, GDP and merchandise exports in Romania, a transition country in CEE. We are interested if FDI and exports positively impact the economic growth and if the market dimension and trade openness are FDI determinants in Romania. The paper is structured as follows: the second part presents the hypotheses in the literature regarding the relationship between FDI, exports and GDP. The third part describes the VECM methodology applied for the case of Romania, which offers the possibility to test the relationships between variables on both the long and the short term, together with the results obtained. The last part concludes.

2. Literature review

The studies regarding the countries in CEE, among which Romania, do not reach a conclusive result regarding the relations among economic growth, exports and FDI, although, in most cases, the same econometric model is employed. We notice different results depending on the group of countries or the time period that is analysed, as presented in Table 1.

Table 1
Summary of the main results in studies regarding CEE countries

Authors	Model	Variables	Countries	Data	Results
Dritsakis (2004)	VECM	GDP, investments, exports	BG, RO	Quarterly data, 1991-2001	Granger causal relationship between economic growth and exports and investments and exports.
Awokuse (2007)	VECM	GDP growth, exports, imports, gross capital formation, labour force.	BG, CZ, PL	Quarterly data, depending on country, Q1 1994-Q3 2004	Granger causality from exports and imports on economic growth for Bulgaria and the Czech Republic, and only for imports for Poland.
Marinaş (2007)	VECM	GDP, FDI, exports	RO	Quarterly data, 1999-2006	Long-term influence of FDI on GDP. Granger causality between exports and economic growth.
Apergis (2008)	Panel cointeg., causality tests	GDP, FDI, exports, education	27 transition economies	Annual data, 1991-2004	FDI and economic growth: significant relationship, proved for the high income countries, with successful privatization programs. Positive relationship between income and exports.
Pop Silaghi (2009)	VAR, VECM	GDP, exports, imports	BG, CZ, EE, HU, LT, LV,	Quarterly data, Q1 1990-Q3 2004	Causal relationship from exports to GDP in the case of BG, CZ, EE, LT, LV and from GDP to exports in BG, CZ, EE,

			PL, RO, SI, SK		HU, LT, RO, SI.
Weber (2010)	VECM	GDP, FDI, exports, gross capital formation	CZ, EE, HU, LT, LV, PL, SI, RU	Quarterly data, Q1 1993-Q2 2009	Both exports and FDI foster economic growth.
Fidrmuc and Martin (2011)	VECM	Industrial production, FDI, exports	BG, CZ, HR, EE, HU, LT, LV, PL, RO, SI, SK	1995-2009	Positive relationship between industrial production – exports, FDI (in almost all countries). Exports are more important than FDI. Differences among countries depending on the period of analysis.
Acarvaci and Ozturk (2012)	ARDL model, Granger causality test	Economic growth, FDI, exports	BG, CZ, EE, HU, LT, LV, PL, RO, SI, SK	Quarterly data, 1994-2008	Cointegration and causal relationship in CZ, LV, PL, SK. FDI influence growth in CZ and SK. Growth influence FDI in LV. Causal relationship from FDI to export in PL. Bi-directional causality between export and FDI in LV
Gallova (2012)	VECM	Economic growth, FDI, exports	CZ, EE, HU, LT, LV, PL, SI, SK	Quarterly data, 1993 to 2010	Long term relationships between variables in five countries. Unclear impact of FDI.
Carp	VAR	GDP,	BG,	1990-2010	Impact of FDI on GDP,

and Popa (2013)		FDI, exports	RO		no impact of exports on GDP.
Zikovic et al. (2014)	VECM	Economic growth, FDI, exports, imports	CZ, HR, SI, RS	Quarterly data, Q1 2001 – Q3 2013.	Positive influence of import coverage ratio, FDI and gross fixed capital formation on GDP in the long run, except for HR.

Source: compiled by the authors

Acarvaci and Ozturk (2012) investigate the causal relationship between economic growth, exports and FDI in the ten new EU member states. The ARDL model and the Granger causality test are used, based on quarterly data series starting with 1994 until 2008. The long run causal relationship and the long run and short run relationships among all the variables are available for only four of the ten countries analysed. FDI determines the economic growth in the Czech Republic and Slovakia, while in Poland there is a causality relationship only as regards exports and investments. There is no relationship on the long run for Bulgaria, Estonia, Hungary, Lithuania, Romania and Slovakia. For these countries, the enhancement of economic growth resides in the capacity of public policies for attracting FDI and in the creation of free trade areas, providing tax incentives and improving the human capital and the quality of infrastructure.

Fidrmuc and Martin (2011) are concerned if the long-term prospects of the countries in Central, Eastern and South-Eastern Europe have been damaged as a result of the economic crisis, which had a negative impact on their performance in terms of exports and investments. The authors test the long term relationships between capital flows, exports and industrial production in 11 countries in the region. The VECM results indicate that exports and FDI stocks have a positive impact on the industrial production and, therefore, on the

economic growth. Instead, portfolio investments are weakly connected to the industrial performance of the region. In Poland, Romania, Slovakia and Slovenia, the output growth is strongly influenced by exports and FDI, while the same is not viable for Bulgaria, Croatia, Estonia, Hungary and Lithuania. The positive relationship between FDI stocks and industrial production suggests the need for specific measures to attract investors, also studied by Paul et al. (2014) or Popovici and Calin (2012).

Gallova (2012) analyses the same variables in eight Central and Eastern European countries, using a sample of quarterly data from 1993 to 2010. Based on the VECM results and the cointegration method, there is a causal relationship among FDI, economic growth and exports in five out of the eight countries. The total impact of FDI on exports in the region cannot be measured due to both positive and negative effects seized following the application of the econometric model.

Awokuse (2007) is interested in the impact of exports and imports over the three transition countries of Central and Eastern Europe, namely Bulgaria, the Czech Republic and Poland. The author uses a VECM model with quarterly data, applied on various period depending on data availability for each country. Empirical evidence suggests a bidirectional Granger causal relationship for Bulgaria and a unidirectional relationship from imports to economic growth in the Czech Republic and Poland.

Apergis (2008) identifies a bidirectional causal relationship between FDI and economic growth, considering that a higher level of investments stimulates economic growth in the host country. Such an evolution will generate subsequently higher FDI inflows. Also, there are several studies that examine the FDI determinants, the GDP level being considered as one of the main indicators that foreign investors control when deciding to invest in different locations. Popovici and

Calin (2014) provide an extensive explanation on location advantages for attracting FDI.

Zikovic et al. (2014) analyse the relationship between economic growth, exports, imports and FDI in four states in Central and Eastern Europe: Croatia, the Czech Republic, Slovenia and Serbia, using a VEC model. The GDP is positively influenced on the long term by the import coverage ratio, FDI and gross fixed capital formation in all countries, except for Croatia. The negative relationship on the long term and positive on the short term between FDI and GDP in Croatia is explained by the foreign investment type. Brownfield, rather than greenfield FDI, risk to have a negative impact on GDP, especially for transition countries. The result points to a stable, but smaller in size economic growth, achieved by focusing on internal factors. The preference for the VEC model is based on the possibility to assess both the short term and the long term relationships between variables.

The case of Romania is a special one, as the results are very dissonant (see Table 2). In half of the studies including Romania, the exports have a positive impact on economic growth or industrial production, while in four studies out of six, investments are more likely to encourage output growth. The differences could be explained by the period taken into account; it is possible that the influence of exports and investment on GDP modified in the last 26 years. In order to explain this, a similar econometric study taking into account the period starting from 2000 would be valuable. Instead, it seems that more often, the results of the studies lean towards the impact of GDP on exports, more frequent than on investments.

Marinas (2007) aims to investigate the relationship between real GDP, gross capital formation and the economic openness based on an error correction model. The analysis is developed during 1999 to 2006, using quarterly data. The author establishes that investments influence the economic growth in the long term. Also, a change in GDP will

have an impact on investments after three quarters. Also, export Granger causes economic growth.

Table 2

Main results of studies regarding Romania

Author	Period	Main results
Dritsakis (2004)	Quarterly data, 1991 - 2001	EXP - > GDP (strong causal relationship) GDP - > EXP INV - > GDP INV- > EXP (simple causal relationship).
Marinaş (2007)	Quarterly data, 1999-2006	FDI - > GDP EXP - > GDP GDP - > FDI
Pop Silaghi (2009)	Quarterly data, Q1 1990 – Q3 2004	GDP - > EXP No impact of EXP on GDP in the long run.
Fidrmuc and Martin (2011)	1995-2009	FDI - > industrial production EXP - > industrial production
Acarvaci and Ozturk (2012)	Quarterly data, 1994-2008	No cointegration between economic growth, FDI, exports.
Carp and Popa (2013)	1990-2010	FDI - > GDP No significant impact of EXP - > GDP at 5% probability.

Note: EXP = exports, INV = investments.
Source: compiled by the authors

3. The empirical model and results

The use of the VAR methodology is recommended due to the interrelationships between the variables, already demonstrated in other researches. In the VAR (autoregressive vector) models, all the variables are endogenous. Therefore, such a system of equations describes the dynamic evolution of a set of variables based on their common history (Binh, 2013).

a) Description of data

In order to test the relationship between FDI, GDP and the export volume in Romania, we used quarterly data covering the period 2001-2015.

We used the FDI stocks in million euro and the GDP expressed in million euro, as provided by Eurostat. Also, the time series were adjusted by the GDP deflator in order to express the real value. For the variable regarding the exports of merchandise, the available quarterly data are expressed as volume indices and provided by UNCTAD.

b) Empirical model and results

We used the unit root tests ADF and PP to check the stationarity of the data. Both tests showed that the variables are non-stationary in level but stationary in first difference (Table 3). This indicate that the variables are integrated of order one, which further suggest the possibility of a cointegration relationships.

Table 3

Data stationarity

	ADF test		PP test	
Variable	**t-Statistic**	**Probability**	**t-Statistic**	**Probability**
FDI (level)	-0.800760	0.8102	-0.800760	0.8102
GDP (level)	-1.933064	0.3149	-1.947578	0.3085
EXP01 (level)	-0.678711	0.8409	-0.678711	0.8409
FDI (first difference)	-7.724632	0.0000	-7.708063	0.0000
GDP (first difference)	-4.011509	0.0029	-3.984035	0.0032
EXP01 (first difference)	-5.033275	0.0002	-5.007784	0.0002

Source: authors' own computations

Before testing the existence of a long-term relationship between variables based on the cointegration test, we determined the optimal lag length based on a VAR model with initial data. The limited number of observations in the model led us to consider only models with a maximum of 3 lags. Based on the results obtained for the criteria LR, SC and HQ, the optimal number of lags in the model is 1 (Table 4). The FPE and AIC criteria indicates two lags as the optimal value, but the models based on this specification proved not to be viable.

Table 4

The results of the lag selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-777.3541	NA	4.66e+15	44.59166	44.72498	44.63768
1	-646.9358	231.0267 *	4.54e+12	37.65347	38.18674 *	37.83756 *
2	-636.3732	16.90016	4.20e+12 *	37.56418 *	38.49739	37.88633
3	-630.6944	8.112545	5.25e+12	37.75397	39.08712	38.21417

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: authors' own computations

Since the variables are integrated of order I(1), we applied the Johansen-Juselius cointegration procedure to investigate whether there is a long-term relationship between the three variables (Table 5). The

positive result requires the modeling of a VEC model (vector error correction model – VECM) and not a VAR model (Table 5). Regarding the deterministic components, the model was valid for model 3: constant in the cointegration equation and VAR, without trend in the cointegration equation and VAR.

Table 5

Cointegration testing

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.486178	36.98196	29.79707	0.0063
At most 1	0.263753	13.01037	15.49471	0.1144
At most 2	0.053713	1.987543	3.841466	0.1586

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.486178	23.97159	21.13162	0.0194
At most 1	0.263753	11.02283	14.26460	0.1531
At most 2	0.053713	1.987543	3.841466	0.1586

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: authors' own computations

Table 6 presents, in the first part, the coefficients obtained through the VECM in the long run relationship. Both the long-term coefficients of GDP and of the exports are significant.

In the second part of the table, the error correction term (CointEq1) is significant and has a negative sign, which means that the series are cointegrated and go together toward long-term equilibrium. Basically, it is the negative response required for balancing the FDI series on the long-term. The negative sign indicates that every quarter, a certain amount of deviation from the long-term balance is compensated. In our case, the error correction term for FDI has a value of -0.33 [-3.51], which shows that the deviation from the long-term balance is corrected by 33% every quarter. As the error correction term is negative and significant, this means that we have causality in at least one direction.

Table 6

The results of the VECM

Vector Error Correction Estimates
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1		
FDI(-1)	1.000000		
GDP(-1)	-2.165639 (0.44419) [-4.87544]		
EXP01(-1)	-100.7429 (23.2013) [-4.34212]		
C	30278.61		
Error Correction:	**D(FDI)**	**D(GDP)**	**D(EXP01)**
CointEq1	-0.328712 (0.09359) [-3.51214]	0.034428 (0.02469) [1.39455]	0.001185 (0.00037) [3.17829]
D(FDI(-1))	-0.177533 (0.15218) [-1.16663]	0.083845 (0.04014) [2.08884]	0.000981 (0.00061) [1.61741]
D(GDP(-1))	-1.469988 (0.88606) [-1.65901]	0.691788 (0.23372) [2.95992]	0.006109 (0.00353) [1.73023]
D(EXP01(-1))	19.32489 (50.7325) [0.38092]	4.453343 (13.3818) [0.33279]	0.066691 (0.20216) [0.32989]
C	963.7679	-32.72944	0.670940

	(270.383) [3.56445]	(71.3193) [-0.45891]	(1.07743) [0.62272]
R-squared	0.334787	0.397472	0.340103
Adj. R-squared	0.248953	0.319727	0.254955
Sum sq. resids	50404524	3506909.	800.3654
S.E. equation	1275.128	336.3422	5.081165
F-statistic	3.900400	5.112480	3.994255
Log likelihood	-305.8191	-257.8429	-106.9097
Akaike AIC	17.26773	14.60238	6.217204
Schwarz SC	17.48766	14.82231	6.437138
Mean dependent	677.2977	136.8753	2.408468
S.D. dependent	1471.365	407.7930	5.886702
Determinant resid covariance (dof adj.)		3.05E+12	
Determinant resid covariance		1.95E+12	
Log likelihood		-662.5803	
Akaike information criterion		37.81002	
Schwarz criterion		38.60178	

Source: authors' own computations

According to the equilibrium equation, a 1% increase in the stock of FDI will generate an estimated increase by more than 2.16% of GDP and by 100.7% of exports. The impact on GDP and FDI stocks on exports is positive and significant on the long run. The largest increase is falling on the exports of merchandise.

Regarding the diagnosis of the residuals, the test results presented in Appendices are satisfactory and indicate the homoscedasticity, normality and lack of autocorrelation at 5%, except for some signs of autocorrelation at the tenth lag. Still, we do not consider that, in this case, the autocorrelation in the tenth lag will significantly impact the model.

We use the Granger causality test for it provides useful information on the variables for the prediction of the other variables

included in the analysis. We should notice that Granger causality indicates what variables may signal a subsequent change of the other variables included in the study (Boţel, 2002). Table 6 shows the results of the test. We find that there are three relationships at a significance level of 10%:

- GDP Granger causes FDI (Prob.= 0.0971);
- FDI Granger causes GDP (Prob.= 0.0367);
- GDP Granger causes EXP (Prob.= 0.0836).

Therefore, a change in the GDP indicates in advance a change in the level of FDI. The result is similar to the ones in the literature that assigns GDP as a determinant of FDI. Also, a positive evolution of the economic growth is able to generate an increase in exports. As compared to the studies presented above regarding Romania, this time we found a causal relationship only between FDI and GDP; the impact of exports on GDP is not significant.

As compared with the results provided above as regards Romania, we find some similarities:

- The bidirectional causal relationship between FDI and GDP, as in Marinas (2007).
- The casual relationship between FDI and GDP as in Dritsakis (2004), Fidrmuc and Martin (2011), Carp and Popa (2013);
- The impact of GDP on exports, as in Dritsakis (2004) and Pop Silaghi (2009).

The differences could be due to the different period of analysis. Our present study focuses on a period that takes into account the two years before Romania's adhesion to the EU and the economic crisis in 2008. In this period, the ability of Romania to attract FDI increased, which consequently generated the increased impact of FDI on the economic growth, as compared to the situation in the 1990s, characterized by exports and a lower level of foreign investments. Also, we must have in mind the fact that the goods exports are used in

the model, which can be another explanation for the differences in results.

Table 6

The results of the Granger causality test

VEC Granger Causality/Block Exogeneity Wald Tests

Dependent variable: D(FDI)

Excluded	Chi-sq	df	Prob.
D(GDP)	2.752305	1	0.0971
D(EXP01)	0.145098	1	0.7033
All	3.647924	2	0.1614

Dependent variable: D(GDP)

Excluded	Chi-sq	df	Prob.
D(FDI)	4.363254	1	0.0367
D(EXP01)	0.110750	1	0.7393
All	4.364256	2	0.1128

Dependent variable: D(EXP01)

Excluded	Chi-sq	df	Prob.
D(FDI)	2.616007	1	0.1058
D(GDP)	2.993690	1	0.0836
All	5.385534	2	0.0677

Source: authors' own computations

The variance decomposition allows the identification of the percentage proportions in the variance of a variable that is driven by the shocks that occur in the other variables. According to Enders (2003), the variance decomposition shows in what degree a variable changes under the impact of the own shocks or the other variables' shock. One disadvantage of this method is that the variance of a variable is fully explained only based on the variables introduced in the analysis, without quantifying the potential impact on other omitted variables (Boţel, 2002). Under these circumstances, a careful interpretation of the results is recommended. The results obtained for the variance decomposition are shown in Table 7. All the three variables are endogenous.

Fluctuations in FDI stocks are mostly explained (in proportion of 90%), in the short term (the two subsequent quarters), by the shocks that occur in their own evolution. Their impact gradually diminishes to nearly 44% of the total impact in the 10th quarter. GDP shocks have a lower impact on FDI in the first part of the period (less than 20% in the first five quarters), because becomes more important and influences more than 50% of the change in FDI at the end of the period. The shocks in exports have a lower intensity on FDI, explaining a maximum of 6.4% of the FDI fluctuations in the seventh quarter.

Fluctuations in GDP are largely explained by the shocks occurring in this variable. Throughout the 10 quarters, the evolution of GDP is more than 90% influenced by the shocks in GDP. The shocks in FDI increase their impact on GDP at the end of the period.

Finally, exports fluctuations are influenced by the shocks in exports and GDP in the first quarters. Towards the end of the period, 44% of fluctuations in exports are due to FDI shocks, while the impact of GDP reaches 13-15%.

Table 7

Variance decomposition

Variance Decomposition of FDI: Period	S.E.	FDI	GDP	EXP01
1	1275.128	100.0000	0.000000	0.000000
2	1472.990	97.39669	0.491980	2.111328
3	1623.291	94.70307	1.611492	3.685436
4	1820.633	86.46924	8.391146	5.139611
5	2095.873	74.90404	19.11072	5.985237
6	2424.502	64.29454	29.38250	6.322967
7	2773.768	56.24649	37.35836	6.395156
8	3120.857	50.52452	43.11051	6.364974
9	3454.005	46.48476	47.20897	6.306265
10	3768.717	43.58322	50.16996	6.246820

Variance Decomposition of GDP: Period	S.E.	FDI	GDP	EXP01
1	336.3422	0.576213	99.42379	0.000000
2	650.0714	3.040730	96.95545	0.003825
3	920.4836	4.978197	94.98397	0.037838
4	1147.959	6.339238	93.60337	0.057388
5	1339.220	7.269902	92.66300	0.067100
6	1502.900	7.924663	92.00433	0.071007
7	1646.235	8.397587	91.53041	0.072007
8	1774.660	8.748386	91.17996	0.071651
9	1892.039	9.015398	90.91387	0.070736
10	2001.048	9.223758	90.70659	0.069649

Variance Decomposition of EXP01:

Period	S.E.	FDI	GDP	EXP01
1	5.081165	3.393326	32.08599	64.52068
2	8.291557	19.69124	34.33642	45.97233
3	10.52324	27.53014	30.41777	42.05209
4	12.13248	32.97700	25.96386	41.05914
5	13.36529	36.75529	22.15013	41.09457
6	14.38316	39.36831	19.21261	41.41908
7	15.27439	41.17164	17.03901	41.78935
8	16.08531	42.43856	15.42801	42.13343
9	16.84060	43.36073	14.20074	42.43852
10	17.55434	44.06297	13.22957	42.70746

Cholesky
Ordering: FDI
GDP EXP01

Source: authors' own computations

4. Conclusions

The present paper investigates the relationship between FDI, GDP and goods export based on an error-correction model (VECM), using quarterly data for the period 2005-2014 in Romania. The results obtained by applying the model, the Granger causality test and the variance decomposition indicate a positive significant bidirectional relationship between FDI and GDP and a unidirectional relationship between GDP and exports.

In general, our results are similar to the ones in the literature, more prone to attest the impact of FDI on GDP and of GDP on exports for the case of Romania. The differences are due to the period analysed and the choosing of variables. In the first case, as compared to other studies, our sample includes observations over two major events for Romania: its EU adhesion and the economic crisis. In the second case, our variable expressing exports takes into account only the goods exports.

All in all, these findings point to the importance Romania has to prove for attracting FDI and therefore the need for public policy makers to focus their efforts on developing of a favourable environment for doing business and attracting foreign investors.

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Appendices

Table 1

VECM stability test

Roots of Characteristic Polynomial

Root	Modulus
1.000000	1.000000
1.000000	1.000000
0.574622 - 0.151967i	0.594377
0.574622 + 0.151967i	0.594377
-0.170330	0.170330
0.079349	0.079349

VEC specification imposes 2 unit root(s).

Source: authors' own computations

Table 2

VECM serial correlation test

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h

Lags	LM-Stat	Prob
1	8.917075	0.4450
2	10.45574	0.3149
3	11.84788	0.2220
4	6.731874	0.6650
5	17.71278	0.0387

6	13.04664	0.1605
7	14.49579	0.1057
8	4.860774	0.8463
9	11.08756	0.2698
10	21.38025	0.0111
11	5.270334	0.8101
12	6.969178	0.6403

Probs from chi-square with 9 df.

Source: authors' own computations

Table 3

VECM Residual Heteroskedasticity Tests

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)

Joint test:

Chi-sq	df	Prob.
56.53887	48	0.1863

Individual components:

Dependent	R-squared	F(8,27)	Prob.	Chi-sq(8)	Prob.
res1*res1	0.273283	1.269173	0.3000	9.838181	0.2766
res2*res2	0.536201	3.901859	0.0036	19.30324	0.0133

res3*res3	0.231636	1.017448	0.4467	8.338888	0.4011
res2*res1	0.305721	1.486160	0.2084	11.00596	0.2014
res3*res1	0.070346	0.255383	0.9750	2.532454	0.9602
res3*res2	0.314643	1.549443	0.1870	11.32716	0.1838

Source: authors' own computations

Table 4

VECM Residual Normality Tests

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal

Componen t	Skewness	Chi-sq	df	Prob.
1	-0.143129	0.122916	1	0.7259
2	-0.196299	0.231199	1	0.6306
3	0.013071	0.001025	1	0.9745
Joint		0.355140	3	0.9493

Componen t	Kurtosis	Chi-sq	df	Prob.
1	2.732668	0.107200	1	0.7434
2	3.509935	0.390051	1	0.5323
3	3.889844	1.187734	1	0.2758
Joint		1.684984	3	0.6403

Component	Jarque-Bera	df	Prob.
1	0.230116	2	0.8913
2	0.621250	2	0.7330
3	1.188759	2	0.5519
Joint	2.040125	6	0.9160

Source: authors' own computations