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## Foreign Direct Investments, Exports, and Economic Growth in Croatia: A Time Series Analysis

Chaido Dritsaki<sup>a\*</sup>, Emmanouil Stiakakis<sup>b</sup><sup>a</sup>*Technological Educational Institute of Western Macedonia, Koila, Kozani 50100, Greece*<sup>b</sup>*University of Macedonia, 156 Egnatia str., Thessaloniki 54006, Greece*

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### Abstract

This paper studies the relationship between foreign direct investments, exports, and economic growth in Croatia using annual time series data for the period 1994-2012. Several econometric models are applied including the bounds testing (ARDL) approach and the ECM-ARDL model. The results confirm a bidirectional long run and short run causal relationship between exports and growth. These results offer new perspectives and insight for a new policy in Croatia for a sustainable economic growth.

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### 1. Introduction

It is known that commercial transactions and foreign direct investments are the most important factors in the economic growth processing of any country. The market opening in the economic growth is due mostly to the accumulation of natural capital and the technology transfer. The exporters attempt through competition to enter foreign markets, using innovation and production technology. The foreign direct investments increase the exporting capability in the host country, causing a profit increase at foreign exchange mostly in developing countries. They also increase the provision of funds for the domestic investments, encourage the creation of new jobs, reinforce the technology transfer, and increase in total the economic growth.

There are many manuscripts which empirically study the impact of foreign direct investments and exports on economic growth. The influence of each of the two variables, i.e., foreign direct investments and exports on economic growth has been studied in many countries using different time periods, as well as econometric approaches and methods. The results of several studies regarding the impact of exports and foreign direct investments on the economic growth of developing countries are diverse (Balassa, 1985; Edwards, 1992; Ghirmay et al., 2001; Belloumi, 2014). There is no evidence for the hypothesis that exports and foreign direct investments lead to economic growth. These hypotheses support the idea that exports and foreign direct investments constitute the principal factors of economic growth.

According to Blomstrom et al. (1992), foreign direct investments drive the economic growth, when the economy of the host country is developed. The perspective of Boyd and Smith (1992) is that

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\* Tel.: +30 24610 68184

E-mail address: [dritsaki@teiko.gr](mailto:dritsaki@teiko.gr)

foreign direct investments may affect in a negative way the economic growth due to the bad distribution of resources or certain distortions that exist in the commerce. Borensztein et al. (1998), in their study, claim that foreign direct investments may be an important tool for the transfer of contemporary technology, however their efficiency depends on the stock of human capital in the host country. Finally, Nair-Reichert and Weinhold (2001) indicated that the causal relationship between foreign and domestic investments, and economic growth in the developing countries is heterogeneous.

Recent studies regarding this issue use cointegration techniques based on the cointegration of Engle and Granger (1987) or the criterion of maximum likelihood of Johansen and Juselius (1990). These cointegration techniques may not operate properly when the sample size is very small (see Odhiambo, 2009). In that case, we use the limits of cointegration test of Pesaran et al. (2001), which is more valid for small samples.

This paper is structured as follows: in Section 2 the economy of Croatia is presented, while in Section 3 the data and the econometric methodology are given. In Section 4 the empirical results are presented and finally, discussion and conclusions are provided in Section 5.

## 2. The Croatian economy

After the successful implementation of the stabilization program in 1993, Croatia enjoys the benefits of price and exchange rate stability. It was expected that in such an environment, companies would be able to be reengineered in the medium term so they could compete successfully in exports other companies in the international markets. Given that it is acceptable that a larger volume of exports can contribute in the acceleration of economic growth, the forwarding of exports has been one of the most significant duties of the Croatian economic policy.

A serious problem which contributes to the low competitiveness of the manufacturing industry of Croatia is the lack of contemporary technology in the production, due to the comparatively low investment percentage, mainly in the time period of the war and the years afterwards (Galinec and Jurlin, 2003). On the other hand, some researchers contend that wages increased very fast in relation to the increase of productivity, making the Croatian manufacturing industry not competitive.

By the end of 1995, there was a strong increase in wages and public expenses, which led to a further deterioration of exporters' competitiveness. Nikic (2003) claims that during this period the domestic production was partially replaced by the imported products. Moreover, the productivity increase in some industries, mostly resulted from the decrease in the number of employees, was balanced at a great rate with the high increase in wages and public expenses that were financed by higher tax charges. At the same time, domestic investments and inputs of foreign capital remained at low level. So, according to Nikic (2003), although the increase in the percentage of GDP from 1995 up to 1997 was high enough, this development was mostly due to the increase of domestic consumption (Vuksic, 2005).

Later, problems arose for companies when the added value was introduced as a tax in 1998, increasing furthermore the total tax charges (Nikic, 2003). This was followed by further increases in public expenses, which grew faster than public revenues, having as a result the public sector to accumulate debts towards the private sector and leading the economy mainly in the business domain to a general lack of liquidity. This situation led the banks to increase the rates, resulting in a high financial cost for businesses. The situation improved after 2000 when there was more discipline in the public expenses (Vuksic, 2005). During this period, the trade deficit was high, due to the stationarity of the exports and the expansion of domestic consumption which contributes in higher imports. These developments guided in a fast expansion of the foreign debt during the last years, which could endanger the macroeconomic stability of the Croatian economy (Vuksic, 2005).

One of the most important reasons for the low development in exports was the slow incorporation of the Croatian economy in the European and world economy. Studies by Galinec and Jurlin (2003) estimate that, the status of accession as a candidate country in the EU brought an increase of exports between 30% and 90% in some countries of the Central and Eastern Europe. However, Galinec and Jurlin (2003) contend that the completion of the incorporation will cause even higher exports. Apart from exports, foreign direct investments are another decisive factor that can influence the Croatian economy. The foreign direct investments, as a percentage of GDP, have increased during the last decade. Taking into account that exports appear stationarity at the same period, we could say that foreign direct investments do not play any role in the forwarding of exports (Vuksic, 2005). Therefore, the primary aim of this study is to empirically research the role of foreign direct investments to determine the weaknesses of exports during the examined period.

### 3. Data and methodology

#### 3.1. Data

The variables used in this study are: (i) foreign direct investment net inflows (% of GDP), (ii) exports of goods and services (% of GDP), and (iii) the GDP growth (annual %). The data sample of the present study is from 1994 to 2012. All variables come from the World Development Indicators (WDI, 2014). The descriptive statistics of the variables are illustrated in Table 1.

Table 1. Descriptive statistics

	FDICR	EXPCR	GDPCR
Mean	4.194	2.289	4.741
Median	3.964	3.655	4.187
Maximum	8.703	6.543	16.560
Minimum	0.490	-6.945	-16.168
Std. Deviation	2.535	3.415	6.892
Skewness	0.266	-1.057	-1.063
Kurtosis	1.907	3.762	5.848
Jarque-Bera	1.170	4.001	10.000
Probability	0.557	0.135	0.006
Observations	19	19	19

#### 3.2. Econometric methodology

After the descriptive statistics for the three variables examined, the study aims at the following objectives:

- The first objective is to examine the stationarity of the variables.
- The second is to examine the long run relationship between the variables using the analysis of AutoRegressive Distributed Lag (ARDL), developed by Pesaran et al. (2001).
- The third is to estimate the long and short run relationship of the variables of the model under study.
- The fourth objective is to estimate a dynamic vector error correction model (VECM) in order to infer the causal relationships.

The general form of our empirical VAR model can be written as such:

$$U = (FDI, EXP, GDP) \quad (1)$$

where, FDI stands for the foreign direct investments as percentage of GDP, EXP for the exports of goods and services as percentage of GDP, and GDP stands for the percent annual increase of GDP.

The next step is to test the unit root properties of the variables. The stationarity level of the variables is very important for policy implications.

### 4. Empirical results

#### 4.1. Unit root analysis

We have applied ADF by Dickey and Fuller (1979), P-P by Philips and Perron (1988), KPSS by Kwiatkowski et al. (1992), DF-GLS by Elliott et al. (1996), and ERS-Point Optimal Test by Elliott et al. (1996) unit root tests and the results are presented in Table 2.

Table 2. Unit Root Analysis

Variable	ADF	P-P	KPSS	DF-GLS	ERS
FDI	-2.85(2)	-1.75[1]	0.12[2]*	-3.00(2)*	0.743(2)
ΔFDI	-4.41(3)**	-4.31[1]**	0.05[1]	-4.66(3)***	195(3)***
EXP	-2.67(0)	-2.54[4]	0.18[0]**	-2.80(0)	12.4(0)***
ΔEXP	-4.48(1)**	-7.89[6]***	0.50[17]	-4.80(1)***	375(1)***
GDP	-5.06(0)***	-5.69[4]***	0.31[13]	-5.16(0)***	11.17(0)***
ΔGDP	-6.57(0)***	-18.6[6]***	0.50[17]	-6.64(0)***	14.94(0)***

Note:

1. \*\*\*, \*\* and \* show significant at 1% , 5%, and 10% levels respectively.
2. The numbers within parentheses followed by ADF statistics represent the lag length of the dependent variable used to obtain white noise residuals.
3. The lag lengths for ADF equation were selected using Akaike Information Criterion (AIC).
4. Mackinnon (1991) critical value for rejection of hypothesis of unit root applied.
5. The numbers within brackets followed by PP statistics represent the bandwidth selected based on Newey West (1994) method using Bartlett Kernel.
6. Max lags for the KPSS test chosen based on the Schwert information criteria (SIC).
7. Critical values for the KPSS test are from Kwiatkowski et al. (1992).

The results of Table 2 indicate that some variables are stationary at their levels and others at their first differences with constant and trend. This denotes that the series are integrated null I(0) and first order I(1).

4.2. Cointegration analysis

After testing the stationarity of the series, we apply ARDL (Autoregressive Distributed Lag) bounds testing approach developed by Pesaran et al. (2001) to investigate cointegration for long run relationship between foreign direct investments, exports and the growth of the Croatian economy. This method has multiple econometric advantages. For example, it seems flexible regarding the stationarity properties of the variables. The bounds testing ARDL is applicable irrespective of whether variables are I(0) or I(1). Moreover, the ARDL bounds testing provides efficient and consistent empirical evidence for small sample data. Moreover, a dynamic unrestricted error correction model can be derived from the ARDL bounds testing through a simple linear transformation. The dynamic unrestricted error correction model integrates the short run dynamics with the long run equilibrium.

Consequently, we choose the ARDL bounds testing since there are variables which are integrated null order I(0) and variables which are first order I(1). The ARDL models used in this study are the following:

$$\Delta FDI_t = \beta_{01} + \delta_{11}EXP_{t-1} + \delta_{21}GDP_{t-1} + \delta_{31}FDI_{t-1} + \sum_{i=1}^p \alpha_{1i}\Delta EXP_{t-i} + \sum_{i=0}^q \alpha_{2i}\Delta GDP_{t-i} + \sum_{i=0}^c \alpha_{3i}\Delta FDI_{t-i} + \varepsilon_{1t}$$

(2)

$$\Delta EXP_t = \beta_{02} + \delta_{12}FDI_{t-1} + \delta_{22}GDP_{t-1} + \delta_{32}EXP_{t-1} +$$

(3)

$$+ \sum_{i=1}^p \alpha_{1i}\Delta FDI_{t-i} + \sum_{i=0}^q \alpha_{2i}\Delta GDP_{t-i} + \sum_{i=0}^c \alpha_{3i}\Delta EXP_{t-i} + \varepsilon_{2t}$$

$$\Delta GDP_t = \beta_{03} + \delta_{13}FDI_{t-1} + \delta_{23}EXP_{t-1} + \delta_{33}GDP_{t-1} +$$

(4)

$$+ \sum_{i=1}^p \alpha_{1i}\Delta FDI_{t-i} + \sum_{i=0}^q \alpha_{2i}\Delta EXP_{t-i} + \sum_{i=0}^c \alpha_{3i}\Delta GDP_{t-i} + \varepsilon_{3t}$$

where  $\Delta$  denotes the first difference operator, and  $\varepsilon_{1t}, \varepsilon_{2t}$  and  $\varepsilon_{3t}$  are error term assumed to be independently and identically distributed.

Given that, it is known that the calculation of ARDL bounds testing is flexible in the selection of the lag length, we choose the optimal length of lags from the first difference of dependent variables based on the minimum value of the Akaike criterion, according to the following models:

$$\Delta FDI_t = \beta_{01} + \sum_{i=1}^p \alpha_{1i} EXP_{t-i} + \sum_{i=0}^q \alpha_{2i} GDP_{t-i} + \sum_{i=0}^c \alpha_{3i} FDI_{t-i} + \mu_{1t} \tag{5}$$

$$\Delta EXP_t = \beta_{02} + \sum_{i=1}^p \alpha_{1i} FDI_{t-i} + \sum_{i=0}^q \alpha_{2i} GDP_{t-i} + \sum_{i=0}^c \alpha_{3i} EXP_{t-i} + \mu_{2t} \tag{6}$$

$$\Delta GDP_t = \beta_{03} + \sum_{i=1}^p \alpha_{1i} FDI_{t-i} + \sum_{i=0}^q \alpha_{2i} EXP_{t-i} + \sum_{i=0}^c \alpha_{3i} GDP_{t-i} + \mu_{3t} \tag{7}$$

where,  $\Delta FDI_t, \Delta EXP_t$  and  $\Delta GDP_t$  the dependent variables,  $\alpha_1, \alpha_2$  and  $\alpha_3$  the long run coefficients, and (p, q, c) the optimal length of lags of the ARDL model.

Pesaran et al. (2001) suggest F test for joint significance of the coefficients of the lagged level of variables. The null hypothesis of no cointegration among the variables in equations (2) (3) and (4) is:

$$H_0 : \delta_{11} = \delta_{21} = \delta_{31} = 0 \text{ against the alternative hypothesis of cointegration}$$

$$H_1 : \delta_{11} \neq \delta_{21} \neq \delta_{31} \neq 0$$

and

$$H_0 : \delta_{12} = \delta_{22} = \delta_{32} = 0 \text{ against the alternative hypothesis of cointegration}$$

$$H_1 : \delta_{12} \neq \delta_{22} \neq \delta_{32} \neq 0$$

and

$$H_0 : \delta_{13} = \delta_{23} = \delta_{33} = 0 \text{ against the alternative hypothesis of cointegration}$$

$$H_1 : \delta_{13} \neq \delta_{23} \neq \delta_{33} \neq 0$$

Two sets of critical values for a given significance level can be determined. The first critical value is obtained on the assumption that all variables included in the ARDL specification are I(0), while the second level is obtained on the assumption that the variables are I(1).

The results of ARDL cointegration test are presented in Table 3.

Table 3. The results of ARDL cointegration test

Estimated models	Bounds testing to cointegration		Diagnostic tests			
	Optimal lag length	F-statistics	X <sup>2</sup> <sub>NOR</sub>	X <sup>2</sup> <sub>ARCH</sub>	X <sup>2</sup> <sub>RESET</sub>	X <sup>2</sup> <sub>SERIAL</sub>
F <sub>FDI</sub> (FDI/EXP,GDP)	(1,1,1)	3.232	1.091	0.923[1]	0.316[1]	0.103[1]
F <sub>EXP</sub> (EXP/FDI,GDP)	(1,0,0)	8.683**	0.917	0.075[1]	3.086[1]	0.406[1]
F <sub>GDP</sub> (GDP/FDI,EXP)	(1,0,0)	9.047**	0.115	0.318[1]	5.887[1]	0.375[1]
	Significant level			Critical values (T = 30)		
			Lower bounds I(0)		Upper bounds I(1)	
	1% level		7.977		9.413	
	5% level		5.550		6.747	
	10% level		4.577		5.600	

Note: The optimal lag length is determined by AIC. [ ] is the order of diagnostic tests. Critical values are collected from Narayan (2005). \*\*\*, \*\* and \* show significant at 1%, 5%, and 10% levels respectively.

The results of Table 3 show that there are two cointegrating vectors (F-statistics seem to exceed upper critical bounds at 5%) confirming the existence of long run relationship among the variables in equations 3 and 4. The ARDL models fulfill the assumptions of normality, autoregressive conditional heteroskedasticity (ARCH), functional forms and serial correlation of models.

4.3 Estimation of long and short run relationship

Next we examine the long run relationship among the variables of the model using the following equations:

$$FDI_t = \beta_{01} + \sum_{i=1}^p \delta_{11} FDI_{t-i} + \sum_{i=0}^q \delta_{21} EXP_{t-i} + \sum_{i=0}^c \delta_{31} GDP_{t-i} + e_{1t} \tag{8}$$

$$EXP_t = \beta_{02} + \sum_{i=1}^p \delta_{12} EXP_{t-i} + \sum_{i=0}^q \delta_{22} FDI_{t-i} + \sum_{i=0}^c \delta_{32} GDP_{t-i} + e_{2t} \tag{9}$$

$$GDP_t = \beta_{03} + \sum_{i=0}^p \delta_{13} GDP_{t-i} + \sum_{i=1}^q \delta_{23} FDI_{t-i} + \sum_{i=1}^c \delta_{33} EXP_{t-i} + e_{3t} \tag{10}$$

Moreover, a dynamic error correction model can arise from the bounds of ARDL testing through a simple linear transformation. The dynamic error correction model incorporates the short run dynamics with the long run equilibrium.

The dynamic unrestricted error correction model is expressed as follows:

$$\Delta FDI_t = \beta_{01} + \sum_{i=1}^p \alpha_{1i} \Delta EXP_{t-i} + \sum_{i=0}^q \alpha_{2i} \Delta GDP_{t-i} + \sum_{i=0}^c \alpha_{3i} \Delta FDI_{t-i} + \lambda_1 ECM_{t-1} + \varepsilon_t \tag{11}$$

$$\Delta EXP_t = \beta_{02} + \sum_{i=1}^p \alpha_{1i} \Delta FDI_{t-i} + \sum_{i=0}^q \alpha_{2i} \Delta GDP_{t-i} + \sum_{i=0}^c \alpha_{3i} \Delta EXP_{t-i} + \lambda_2 ECM_{t-1} + \varepsilon_t \tag{12}$$

$$\Delta GDP_t = \beta_{03} + \sum_{i=1}^p \alpha_{1i} \Delta FDI_{t-i} + \sum_{i=0}^q \alpha_{2i} \Delta EXP_{t-i} + \sum_{i=0}^c \alpha_{3i} \Delta GDP_{t-i} + \lambda_3 ECM_{t-1} + \varepsilon_t \tag{13}$$

where  $ECM_{t-1}$  is the error correction term.

The coefficient of the error correction term ( $ECM_{t-1}$ ) should be negative and statistically significant. This coefficient shows the adaptation speed, in other words, we could say that shows how fast the variables return to the long run equilibrium.

The results of long and short run relationship of the variables of our model in equations 9 and 10, as well as equations 12 and 13 are given in Table 4.

Table 4. Long run – Short run results

Long run analysis					
Dependent variable = $EXP_t$			Dependent variable = $GDP_t$		
Variables	Coefficient	T-statistic	Variables	Coefficient	T-statistic
Constant	-1.507	-1.112	Constant	8.296***	3.328
$FDI_{t-1}$	0.177	0.777	$FDI_{t-1}$	-1.224***	-2.818
$GDP_t$	0.367***	4.458	$EXP_t$	1.538***	4.260
$EXP_{t-1}$	0.525***	3.474	$GDP_{t-1}$	-0.367**	-2.018
$R^2$	0.710		$R^2$	0.676	
F-Statistic	11.425***		F-Statistic	9.747***	
D-W	1.980		D-W	1.410	
Diagnostic Test		Prob	Diagnostic Test		Prob
$X^2$ Normal	0.497[2]	0.779	$X^2$ Normal	0.713[2]	0.699
$X^2$ Serial	0.396[1]	0.528	$X^2$ Serial	0.743[1]	0.388
$X^2$ ARCH	0.016[1]	0.896	$X^2$ ARCH	0.079[1]	0.778
$X^2$ White	0.091[9]	0.343	$X^2$ White	6.952[9]	0.642
$X^2$ Reset	4.252[1,13]	0.059	$X^2$ Reset	0.994[1,13]	0.336
Short run analysis					
Dependent variable = $\Delta EXP_t$			Dependent variable = $\Delta GDP_t$		
Variables	Coefficient	T-statistic	Variables	Coefficient	T-statistic
Constant	0.315	0.729	Constant	-0.463	-0.503
$\Delta FDI_{t-1}$	0.230	1.066	$\Delta FDI_{t-1}$	-0.879**	-2.014
$\Delta GDP_t$	0.423***	6.650	$\Delta EXP_t$	1.790***	6.415
$\Delta EXP_{t-1}$	0.777***	4.379	$\Delta GDP_{t-1}$	-0.287**	-2.600
$ECM_{t-1}$	-1.383***	-4.791	$ECM_{t-1}$	-0.953***	-3.633
$R^2$	0.818		$R^2$	0.863	
F-Statistic	13.57***		F-Statistic	19.022***	
D-W	2.257		D-W	2.017	

	Diagnostic Test	Prob		Diagnostic Test	Prob
X <sup>2</sup> Normal	1.404[2]	0.495	X <sup>2</sup> Normal	0.685[2]	0.709
X <sup>2</sup> Serial	1.094[1]	0.295	X <sup>2</sup> Serial	0.012[1]	0.912
X <sup>2</sup> ARCH	0.013[1]	0.906	X <sup>2</sup> ARCH	0.134[1]	0.713
X <sup>2</sup> White	11.986[14]	0.607	X <sup>2</sup> White	13.339[14]	0.500
X <sup>2</sup> Reset	0.934[1,11]	0.354	X <sup>2</sup> Reset	0.871[1,11]	0.370

Notes: \*\*\*, \*\* and \* show significant at 1% , 5% and 10% levels respectively. Δ denotes the first difference operator, X<sup>2</sup> Normal is for normality test, X<sup>2</sup> Serial for LM serial correlation test, X<sup>2</sup> ARCH for autoregressive conditional heteroskedasticity, X<sup>2</sup> White for white heteroskedasticity and F Reset for Ramsey Reset test. [ ] is the order of diagnostic tests.

From the results of Table 4 we can notice in the long run function of exports that an increase of growth at 1% will result in an increase of exports at 0.367%, while in the long run function of growth an increase of exports at 1% will result in an increase of growth at 1.538%. What is interesting in this function is the negative sign of foreign direct investments. This can be interpreted as the foreign direct investments do not lead to growth in Croatia.

The negative and statistically significant estimation of ECM<sub>t-1</sub> in both functions at 1.383 and 0.953 respectively show a short run relationship among the variables of the model under study. This means that in the short run the deviations from the long run equilibrium are corrected at 138.3% and 95.3% respectively each year. Finally, all the diagnostic tests in the short run model do not seem to have any problem.

#### 4.4 Testing stability in ECM

The existence of cointegration coming from the equations 6 and 7 does not necessarily imply that the estimated coefficients are stable. This is why Pesaran et al. (1999, 2001) suggested the test of stability of the estimated coefficients in the estimated models using the tests of Brown et al. (1975), which are known as the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ).

The error correction model of equations 12 and 13 is chosen in order to apply the stability tests of Brown et al. (1975). The relative graphical representations of these tests are illustrated in Fig. 1, 2 and 3, 4.

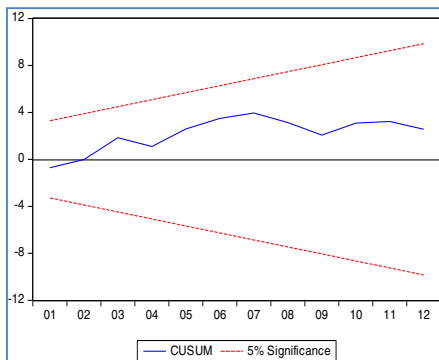


Fig. 1. Plot of cumulative sum of recursive residuals (equation 12)

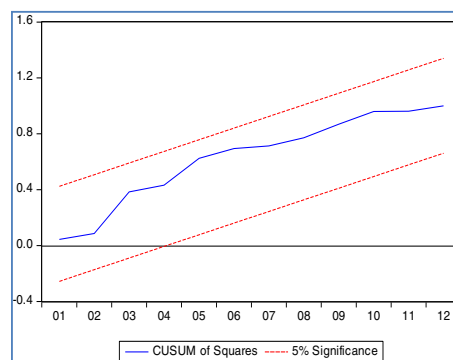


Fig. 2. Plot of cumulative sum of squares of recursive residuals (equation 12)

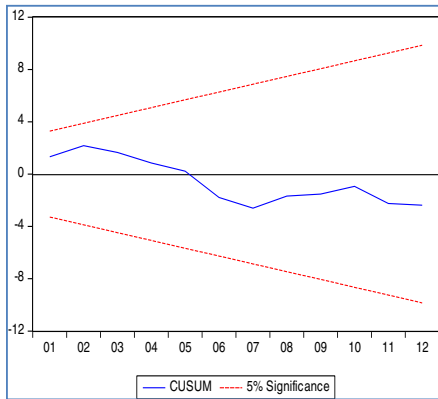


Fig. 3. Plot of cumulative sum of recursive residuals (equation 13)

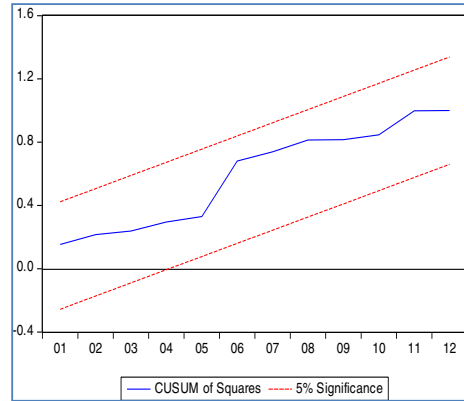


Fig. 4. Plot of cumulative sum of squares of recursive residuals (equation 13)

As it arises from the above figures, all the plots of statistics CUSUM and CUSUMSQ are inside the critical bounds at 5% level of significance, which entails that all the coefficients in the error correction model are constant.

4.5 The VECM Granger causality

After the long run relationship among the variables, we examine the direction of causality using the ECM-ARDL model.

The equations which arise are used for the Granger causality test and are the following:

$$\begin{bmatrix} \Delta FDI_t \\ \Delta EXP_t \\ \Delta GDP_t \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \end{bmatrix} + \sum_{i=1}^q \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} \\ \beta_{21} & \beta_{22} & \beta_{23} \\ \beta_{31} & \beta_{32} & \beta_{33} \end{bmatrix} \begin{bmatrix} \Delta FDI_{t-q} \\ \Delta EXP_{t-q} \\ \Delta GDP_{t-q} \end{bmatrix} + \begin{bmatrix} \lambda_1 \\ \lambda_2 \\ \lambda_3 \end{bmatrix} ECM_{t-1} + \begin{bmatrix} u_{1t} \\ u_{2t} \\ u_{3t} \end{bmatrix} \quad (14)$$

where  $i$  ( $i=1, \dots, q$ ) is the optimal lag length determined by the Akaike information criterion (AIC),  $ECM_{t-1}$  is the lagged residual obtained from the long run ARDL relationship presented in equations 8, 9, and 10,  $\lambda_1, \lambda_2, \lambda_3$  are the adjustment coefficients, and  $u_{1t}, u_{2t}, u_{3t}$  are the disturbance terms assumed to be uncorrelated with zero means  $N(0, \sigma^2)$ .

Table 5 reports results on the direction of long and short run causality.

Table 5. The ECM-ARDL Granger causality analysis

Dependent variable	ARDL Optimal lag length	Strong Causality ( $X^2$ )						
		Short run (F-stat)			Long run (t-stat)		$\Delta FDI_t$	$\Delta EXP_t$
		$\Delta FDI_t$	$\Delta EXP_t$	$\Delta GDP_t$	$ECM_{t-1}$	$ECM_{t-1}$	$ECM_{t-1}$	$ECM_{t-1}$
$\Delta FDI_t$	(1,1,1)		1.163	0.949	-1.217		1.316	1.436
$\Delta EXP_t$	(1,0,0)	0.212		0.265***	-1.868*	0.877		7.882***
$\Delta GDP_t$	(1,0,0)	1.524	5.63***		-4.228***	1.967	20.27***	

\*\*\*, \*\* and \* show significant at 1%, 5%, and 10% levels respectively.  $\Delta$  denotes the first difference operator



The results of Table 5 show that there is a bidirectional short, long run and also strong causal relationship between the variables of growth and exports. The appropriate knowledge regarding the direction of causality between the variables could assist in the design of a proper economic policy.

## 5. Conclusion and policy implications

In this study, we examined the dynamic causal relationship among foreign direct investments, exports, and economic growth for Croatia in the period 1994-2012. For the existence of the long run relationship among the variables we used the ARDL model, while the direction of causality was tested with VECM. The results of cointegration showed that there are two cointegrated vectors which certify the existence of a long run relationship among the variables examined. What is interesting in the long and short run function of growth is the negative sign of foreign direct investments, which is interpreted that foreign direct investments do not lead to growth in Croatia, either in the short run or in the long run period. This result is consistent partially with the result mentioned in the study of Vuksic (2005), that foreign direct investments do not play an important role in the forwarding of exports and thus in the growth of the Croatian economy. This indicates that there are some constraints in the expansion of exports, due to either the restricted production capability or the lack of contemporary technology in the Croatian industry (or both). Finally, the results of causality revealed that there is strong bidirectional, short and long run, causal relationship between the variables of growth and exports.

As a general conclusion, it can be mentioned that domestic capital investments and exports constitute the catalyst for the economic growth of Croatia. Greater export opportunities should be forwarded and the investments should not be only in the exports sector but also in other sectors related to exports. This finding should have significant impact by providing recommendations for the people in charge of the design of Croatian economic policy. The results of the research indicate that foreign direct investment do not have the expected positive impact on the economic growth and thus the government of Croatia should proceed to significant reformations with clear targets and strong commitments. A distinct recommendation for the economic policy of Croatia is the forwarding of investments so that it will be possible the current constraints to be overcome.

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