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New evidence on the Export-led-growth hypothesis in the Southern Euro-zone countries (1960-2014)

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Abstract

This paper implements the bound-testing approach proposed by Pesaran, Shin, and Smith (2001) to investigate the static and dynamic relationship between exports and economic growth in the Southern Euro-zone countries. Moreover, the causal link between these variables is also tested by the Granger no-causality procedure that has been developed by Toda and Yamamoto (1995) using a three-variable vector autoregression (VAR) model. The data span for the study is from 1960 to 2014. The results suggest the existence of positive long-run equilibrium relations in Portugal, Spain, and Greece. Furthermore, the findings indicate that bidirectional Granger causality is predominant in Spain and Greece. Unidirectional causality from exports to economic growth is found for Portugal. No-causality relation is detected for Italy.

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1. Introduction

The determinants of the economic growth have been a key issue of economic research. The identification of exports as a stimulated variable of economic performance has also long been investigated. Among the first studies to demonstrate the positive relationship between exports and economic performance were those of Blumenthal (1972), Michalopoulos and Jay (1973), Michaely (1977), Balassa (1978), and Heller and Porter (1978). They had applied regression and correlation analysis on developing countries[1]. Moreover, similar empirical works have been conducted by Tyler (1981), Feder (1982), Kavoussi (1984), Balassa (1985), Ram (1985, 1987), and Sheehey (1992), who based them on production function models.

The establishment of the causal pattern between exports and economic growth was instigated by Jung and Marshall (1985), Chow (1987), Kwan and Cotsomitis (1991), Bahmani-Oskooee et al. (1991), Ahmed and Kwan (1991), and Dodaro (1993). This wave of empirical literature was able to investigate the direction of the causal relation between exports and economic growth, in each country separately. Their results, based on Granger's (1967) and Sims' (1972) causality tests, were controversial.

By the beginning of 1990s, there was a considerable number of papers on the Export-led growth (ELG) hypothesis[2] in developing countries. However, very few empirical studies were applied to test this hypothesis for developed countries. The launch of interest for the investigation of the ELG hypothesis on developed country is mainly due to the work of Kunst and Marin (1989), and Marin (1992). They engaged in an attempt to test the causal relationship between exports and productivity in developed countries. The extent of this empirical channel was enhanced with cointegration analysis. More specifically, apart from causality tests, Afxediou and Serletis (1991), Sharma et al. (1991), Marin (1992), Serletis (1992), Henriques and Sadosky (1996), Reizman et al. (1996), Thornton (1997), Ramos (2001), Balagued and Cantavella-Jorda (2004), Konya (2006), Jun (2007), and Pistoresi and Rinaldi (2012), who had also conducted cointegration tests to indentify the existence of long-run relationships between the variables of interest. Meanwhile, new causality methods [Toda and Yamamoto (1995), and Dolado and Lutkepohl (1996)] were also applied by Yamada (1998), Shan and Sun (1998), and Awokuse (2003).

This paper investigates the long-run relation between exports and economic growth using the Autoregressive Distributed Lag (ARDL) approach recommended by Pesaran, Shin, and Smith (2001) and examines the short-run relation using error-correction models. This procedure has been applied in Mah (2005) and Tang (2006) for China, and Hye et al. (2013) for six South Asian countries. In order to test the direction of the causal relations between the examined variables, we have also applied the Granger no-causality of the Toda and Yamamoto (1995) approach (hereafter TY). This methodology has been used in several studies, such as those by Shan and Sun (1998) for Australia, Akokuse (2003) for Canada, and Tang (2013) for Malaysia; however, for the countries of the sample, it has only been used by Yamada (1998) for Italy.

Our study is different from others in one crucial point: We investigate the static and dynamic relationship between exports and economic growth in the Southern Euro-zone countries. These countries have a common monetary policy, bilateral free trade, similar financial structures, and close trade relations. Regarding the latter stylized fact, over time Spain has had close trade relations with Portugal and Italy, Portugal mainly imports from

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[1] Michaely (1977) used less developed and developing countries as a sample of his analysis.
[2] The hypothesis that export growth causes economic growth is called the export-led growth hypothesis.

Spain while Greece has close trade relations with Italy. Moreover, another stylized fact of the examined countries is the current account deficits, which have been widening since the mid-1990s, except for the case of Italy, which presents current account deficit only in the mid-2010s. In Greece and Portugal, the large current account deficit observed was caused mainly by the high demand for imports in conjunction with rising external debt-service obligations. Since 2008, Italy and Greece and one year later Spain and Portugal experienced negative growth rates, which lasted to 2013 in Spain and Portugal, while rates in Greece and Italy are still marginal negative. Given that Greece and Portugal follow fiscal adjustment programs that restrict public expenditure, while Spain followed in 2010-12, and Italy is under close monitoring of its fiscal budget, exports are the critical variable, which could boost the economic growth of these countries. Finally, as we observe in Table I, these countries following similar patterns of trade, especially after the accession to the euro area. In particular, we observe that for all countries and notably for Greece and Portugal, foreign trade is especially important for their economies.

Table I: Exports and imports (as percent of GDP)

	Greece	Italy	Portugal	Spain
Nominal Exports				
1960-79	10,62	16,19	18,64	11,00
1980-99	16,34	20,70	25,95	19,45
2000-08	21,61	25,38	28,37	26,02
2009-14	26,33	26,89	34,74	28,48
Nominal Imports				
1960-79	18,28	15,98	24,65	13,18
1980-99	24,37	19,75	33,78	20,94
2000-08	32,26	25,19	37,20	29,96
2009-14	32,27	26,51	37,73	27,71

Source: World Bank.

In terms of empirical methodology, our paper adds value because we use the ARDL procedure, which can to reveal the long and short run relations between variables. This approach permits us to examine the ELG hypothesis, even in the presence of outliers and structural break in the time series. More specifically, this methods give the opportunity using dummy variables (with values zero and one) to capture the effects of outliers and structural break, and with this way to overcome most of shortcomings of alternative methods.

We use annual data supplied by the World Development Indicators of the World Bank for the period 1960-2014 for the following countries: Italy (IT), Spain (ES), Greece (GR) and Portugal (PT). The variables used in the analysis are real output, real exports of goods and services, and real imports of goods and services. All variables are in natural logarithms.

The paper is structured as follows: In the next section, we present the empirical literature and theoretical framework of the relationship between exports and economic growth. Section 3 we develop the empirical methodology. Finally, in Section 4 we present the results of our empirical analysis and in Section 5 we summarize our findings.

2. Review of Empirical Literature and Theoretical Framework

An extensive number of empirical studies have been conducted to investigate the relationship between exports and economic growth, including in the sample the southern countries of the Eurozone. The results of these studies are more conflicting. More specifically, Sharma et al. (1991) found no-causality relationship between exports and economic growth in Italy. Thornton (1997) concluded that, in Italy, exports lead to economic growth. Yamada (1998) suggests the existence of causality from exports to labour productivity only for Italy, using the TY causality approach. He based his analysis on a four-variable (real exports of goods and services, labour productivity, terms of trade, and real GDP of the OECD countries) VAR model. Ramos (2001) found a two-way relationship between exports and output using data for the Portuguese economy based on a trivariate model (exports, output, and imports). Balaguer and Cantavella-Jorda (2004) argued in favour the existence of a bidirectional relationship between exports and economic growth in the Spanish economy. Konya (2006) found evidence in favour of the validity of the ELG hypothesis in Italy and Spain, one-way causality from GDP to exports in Greece and Portugal, conducting Granger causality tests on a bivariate (GDP-exports) and trivariate (GDP-exports-openness) VAR models. Awokuse and Christopoulos (2009) have confirmed the validity of the ELG hypothesis using a nonlinear Granger causality test in Italy. Pistoresi and Rinaldi (2012) analysed the relationship between exports, imports and economic growth over time for Italy. Their results varied, depending on the selected sub-period of their sample. The sub-period in which they observed a weak support of ELG and GLI is the post-WWII period.

There are several works that support that exports could stimulate economic growth. The arguments of these works underline the role of exports in the increase of productivity, and thus in the increase of output. More specifically, the increase of exports can finance intermediate imports. These intermediate imports may incorporate knowledge of foreign technology and production know-how, thereby promoting knowledge spillovers across countries (Grossman and Helpman 1991, Coe and Helpman 1995) with a direct positive effect on economic growth. Other arguments in favour of positive impact of exports on economic growth support that exports expansion- (i) generates efficient resource allocation (Bhagwati and Srinivasan, 1979) in this way emerge comparative advantage of each country and increase the productivity (Kunst and Marin, 1989), (ii) create greater capacity utilization, (iii) lead to technological innovation in the effort to meet the international competition and to maintain these comparative advantages, (iv) permit to exploitation economies of scale by specializing in production especially if the country to which we refer is small and can not benefit from the size (Helpman and Krugman, 1985, Rivera-Batiz and Romer, 1991, and Romer, 1990), (v) cause technology spillover from the export sector to non-export sector.

3. Empirical Analysis

3.1 Bounds tests

We use the autoregressive distributed lag (ARDL) bounds procedure to test for the existence of a long-run relationship and dynamic interactions among variables of interest irrespective of whether these are I(1) or I(0). Their approach is essentially to estimate a dynamic error correction representation for the variables involved and then test whether or not the lagged levels of the variables are significant. In other words, Pesaran et al. (2001)'s test consists of estimating the following conditional error correction models (ECM):

$$\Delta y_t = \alpha_{10} + \gamma_1 y_{t-1} + \delta_{11} ex_{t-1} + \delta_{12} im_{t-1} + \sum_{i=1}^{m} \theta_{1i} \Delta y_{t-i} + \sum_{j=0}^{q} \omega_{1j} \Delta ex_{t-j} + \sum_{j=0}^{q} \varphi_{1j} \Delta im_{t-j} + \varepsilon_t \qquad (1)$$

$$\Delta ex_t=\alpha_{20}+\gamma_2 ex_{t-1}+\delta_{21}y_{t-1}+\delta_{22}im_{t-1}+\sum_{i=1}^{m}\theta_{2i}\Delta ex_{t-i}+\sum_{j=0}^{q}\omega_{2j}\Delta y_{t-j}+\sum_{j=0}^{q}\varphi_{2j}\Delta im_{t-j}+\varepsilon_t \quad (2)$$

where y_t is the real output and ex_t is the real exports and im_t is real imports, and m (q) is the number of lags of the dependent (independent) variable.

The procedure is an F-test for the joint significance of the coefficients of the lagged variables levels in (1) and (2) (so that H_0: $\gamma_i = \delta_{i1} = \delta_{i2} = 0$, for each $i = 1, 2$). Two asymptotic critical value bounds provide a test for cointegration when the independent variables are $I(d)$ (where $0 \le d \le 1$): a lower value assuming the regressors are $I(0)$, and an upper value assuming purely $I(1)$ regressors. If the test statistics exceed their upper critical values in each case, we can reject the null hypothesis ("no long-run relationship"), namely that there is no long-run relationship. If the test statistics fall below the lower critical values, the null hypothesis should be accepted. If the statistics lie within their bounds in each case, no firm conclusion can be drawn. Finally, for each model, we used dummy variables ("one zero") in order to detrended the variables and ensure normal distribution of residuals. The optimal lag length of the selected ARDL model based on the Schwartz Bayesian Criterion (SBC).

The estimated long run parameters of the variables are obtained by the unrestrained ADL model:

$$y_t=\eta_{10}+\sum_{i=1}^{p}\beta_{1i}y_{t-i}+\sum_{i=0}^{k}\psi_{1i}ex_{t-i}+\sum_{i=0}^{k}\xi_{1i}im_{t-i}+\varepsilon_t , \quad (3)$$

$$ex_t=\eta_{20}+\sum_{i=1}^{p}\beta_{2i}ex_{t-i}+\sum_{i=0}^{k}\psi_{2i}\,y_{t-i}+\sum_{i=0}^{k}\xi_{2i}im_{t-i}+\varepsilon_t \quad (4)$$

$$\eta^*_{mo}=\frac{n_{m0}}{1-\beta_{m1}-\beta_{m2}-\ldots-\beta_{mp}},\quad \psi^*_{mi}=\frac{\psi_{m0}+\psi_{m1}+\ldots+\psi_{mk}}{1-\beta_{m1}-\beta_{m2}-\ldots-\beta_{mp}},\quad \xi^*_{mi}=\frac{\xi_{m0}+\xi_{m1}+\ldots+\xi_{mk}}{1-\beta_{m1}-\beta_{m2}-\ldots-\beta_{mp}},$$

for $m = 1, 2$ (5)

where $\varepsilon_t \sim IID(0,\sigma^2)$, for each $m = 1, 2$ and, η^*, ψ^*, and ξ^* are the long run parameters.

Finally, we calculate the dynamic parameters by estimating an error-correction model:

$$\Delta y_t=\sum_{i=1}^{m}\lambda_{1i}\Delta y_{t-i}+\sum_{i=0}^{q}\gamma_{1i}\Delta ex_{t-i}+\sum_{i=0}^{q}\delta_{1i}\Delta im_{t-i}+\eta_1(y_{t-1}-\mu_{10}-\mu_{11}ex_{t-1}-\mu_{12}im_{t-1}) \quad (6)$$

$$\Delta ex_t=\sum_{i=1}^{m}\lambda_{2i}\Delta ex_{t-i}+\sum_{i=0}^{q}\gamma_{2i}\Delta y_{t-i}+\sum_{i=0}^{q}\delta_{2i}\Delta im_{t-i}+\eta_2(ex_{t-1}-\mu_{20}-\mu_{21}y_{t-1}-\mu_{22}im_{t-1}) \quad (7)$$

where μ_{ij} for $i = 1, 2$ *and* $j = 0, 1, 2$ are the short-run dynamic coefficients of the model's convergence to equilibrium and η_i is the speed of adjustment. The error-correction models can be reveal the causal relationships between the examined variables.

3.3 The Toda-Yamamoto approach

We conduct Granger causality tests using the method proposed by Toda and Yamamoto (1995) to detect the direction of causality between real output and real export. Implementing the TY procedure, we constructed a three-variable VAR model containing the variables real output, real exports, and real imports. We can augment the lag order of the VAR(k) model (where k is the lag length of the system) by d extra lags, where d is the maximum order of integration of the variables, and Wald type restrictions (linear or nonlinear) can be imposed only on the first k coefficient matrices, and the test statistics will have standard asymptotic distributions.

Therefore, it is necessary initially to test the order of integration (d) of the time series using several unit roots tests and to then select the optimal lag length (k) according to several criteria. Of these criteria, we lay greatest emphasis on the LM statistic, which controls the residual autocorrelation. The positive elements of this TY approach are that we can control for the causality between variables, irrespective of whether the variables of the system are cointegreted or not (Zapata and Rambaldi, 1997).

To apply TY version of the Granger non-causality test, we use the following VAR system:

$$y_t=\alpha_0+\sum_{i=1}^{k}\alpha_{1i}y_{t-i}+\sum_{j=k+1}^{d\max}\alpha_{2j}y_{t-j}+\sum_{i=1}^{k}\beta_{1i}ex_{t-i}+\sum_{j=k+1}^{d\max}\beta_{2j}ex_{t-j}+\sum_{i=1}^{k}\gamma_{1i}im_{t-i}+\sum_{j=k+1}^{d\max}\gamma_{2j}im_{t-j}+\varepsilon_{1t} \quad (8)$$

$$ex_t=\varphi_0+\sum_{i=1}^{k}\varphi_{1i}ex_{t-i}+\sum_{j=k+1}^{d\max}\varphi_{2j}ex_{t-j}+\sum_{i=1}^{k}\xi_{1i}y_{t-i}+\sum_{j=k+1}^{d\max}\xi_{2j}y_{t-j}+\sum_{i=1}^{k}\zeta_{1i}im_{t-i}+\sum_{j=k+1}^{d\max}\zeta_{2j}im_{t-j}+\varepsilon_{2t} \quad (9)$$

$$im_t=\eta_0+\sum_{i=1}^{k}\eta_{1i}im_{t-i}+\sum_{j=k+1}^{d\max}\eta_{2j}im_{t-j}+\sum_{i=1}^{k}\theta_{1i}ex_{t-i}+\sum_{j=k+1}^{d\max}\theta_{2j}ex_{t-j}+\sum_{i=1}^{k}\omega_{1i}y_{t-i}+\sum_{j=k+1}^{d\max}\omega_{2j}y_{t-j}+\varepsilon_{3t} \quad (10)$$

The validity of the ELG hypothesis can be proved through rejecting the null hypothesis of the Granger causality test ($H_0=\beta_{1i}=0$ for $\forall i=1,\dots k$, "exports does not Granger-cause real output"). In the same way, Granger causality from real output to exports requires $\xi_{1i}\neq 0$ for $\forall i=1,\dots k$.

4. Empirical findings

4.1 Unit root tests

Before testing whether the variables are cointegrated, we detected the nature of the underlying time-series properties using individual unit root tests, such as the Augmented Dickey-Fuller (ADF, 1979) test, the Phillips and Perron (PP, 1988) test, the Kwiatkowski, Phillips, Schmidt, and Shin (KPSS, 1992) test, the GLS transformed Dickey-Fuller (DF-GLS, Elliot, *et al.* 1996) test, the Point Optimal (ERS P.O., Elliot, *et al.* 1996) test, and the Ng and Perron (NP, 2001) unit root tests. The null hypothesis for the KPSS test is stationarity, while for the others tests, the null hypothesis is non-stationarity. Given that all time series are strongly trending we allow for a linear trend in all tests. The results for the unit root tests are reported in Table II, for the series in levels and first differences. These results indicate that all series contain a unit root in levels [i.e., I (1)]. Unit root tests on the first differences of those series were found to be stationarity.

Table II: Unit root tests

Level

	ADF	PP	KPSS	DF-GLS	Ng-Perron				ERS P.O
					MZ_a	MZ_t	MSB	MPT	
					Real Exports				
IT	-1.9982	-2.0202	0.2153b	-0.7437	-0.6482	-0.3052	0.4709	50.5506	86.3931
ES	-1.7201	-1.4713	0.1585c	-1.1731	-3.4500	-1.0706	0.3103	22.3243	38.3655
GR	-1.0246	-1.0752	0.2124a	-0.9112	-2.8430	-0.9438	0.3319	25.3969	60.2073
PT	-3.0197	-2.5181	0.0760	-2.8389	-22.1893b	-3.2946b	0.1484b	4.3256b	4.6336b
					Real GDP				
IT	-0.7924	-0.6954	0.2516[a]	-0.9715	-492.860[a]	-15.661[a]	0.0317[a]	0.2499[a]	268.0186
ES	-1.8237	-3.0183	0.1732[b]	-0.8006	-5.459	-1.4941	0.2600	15.4950	57.6577
GR	-1.8333	-1.6827	0.1836[b]	-1.0783	-52.703[a]	-5.0385[a]	0.0956[a]	2.1866[a]	34.6843
PT	-0.7561	-0.5189	0.2271[a]	-0.5091	-3.4784	-1.0014	0.2878	21.1286	182.8326
					Real imports				
IT	-2.0335	-1.9238	0.1895[b]	-1.1405	-2.5138	-0.7807	0.3105	24.907	38.2907
ES	-1.6981	-3.1362	0.0811	-1.1238	-2.9556	-0.9393	0.3178	24.1409	32.0435
GR	-0.0806	-0.3109	0.1765[b]	-0.7286	-5.2061	-1.1386	0.2187	15.8584	47.7656
PT	-1.6972	-1.8321	0.0764	-1.5826	-5.5385	-1.3817	0.2494	15.7614	18.5714

First differences

	ADF	PP	KPSS	DF-GLS	Ng-Perron				ERS P.O
					MZ_a	MZ_t	MSB	MPT	
					Real Exports				
IT	-6.9530[a]	-7.1522[a]	0.0992	-6.8895[a]	-25.4058[a]	-3.5610[a]	0.1401[a]	3.6052[a]	3.6882[a]
ES	-6.6560[a]	-6.6687[a]	0.0646	-6.6952[a]	-25.3828[a]	-3.5588[a]	0.1402[a]	3.6116[a]	3.5859[a]
GR	-6.1285[a]	-6.0717[a]	0.0605	-6.2419[a]	-25.1094[a]	-3.5411[a]	0.1410[a]	3.6415[a]	3.5123[a]
PT	-4.5479[a]	-5.7688[a]	0.0755	-4.4372[a]	-23.9450[a]	-3.4578[a]	0.1444[b]	3.8194[a]	3.8014[a]
					Real GDP				
IT	-6.2811[a]	-7.2127[a]	0.0831	-6.3443[a]	-25.0493[a]	-3.5244[a]	0.1407[a]	3.7249[a]	2.4466[a]
ES	-3.6821[b]	-3.5916[b]	0.1336[c]	-3.0160[c]	-12.5301	-2.4970	0.1992	73.054	9.2174
GR	-4.5538[a]	-4.7445[a]	0.1077	-1.9843	-7.24951	-1.8342	0.2530	12.6884	4.9507[b]
PT	-4.5209[a]	-5.4628[a]	0.0532	-4.4234[a]	-218.34[a]	-33.0363 [a]	0.0151[a]	0.0453[a]	0.0012[a]
					Real imports				
IT	-7.5042[a]	-7.5085[a]	0.0563	-7.3763[a]	-25.4166[a]	-3.5373[a]	0.1391[a]	3.7490[a]	3.7973[a]
ES	-3.9020[b]	-4.8087[a]	0.1157	-1.9192	-6.10492	-1.7426	0.2854	14.9228	0.1675[a]
GR	-5.7236[a]	-5.7352[a]	0.1178	-5.7557[a]	-24.6446[a]	-3.4368[b]	0.1394[a]	4.1337[b]	4.0500[a]
PT	-6.7417[a]	-6.7426[a]	0.0825	-6.0303[a]	-24.6208[a]	-3.5003[a]	0.1421[a]	3.7508[a]	4.4778[b]

Notes: ADF, DF-GLS, MZ_a, MZ_t, MSB, MPT and ERS P.O tests: (a), (b), and (c) imply rejection of the unit root hypothesis at the 1%, 5% and 10% level of significance, respectively. KPSS tests: (a), (b), and (c) accept the null hypothesis at the 1%, 5% and 10% level of significance, respectively. The Akaike Information Criteria (AIC) is used to determine the number of lags for the ADF, DF-GLS, MZ_a, MZ_t, MSB, MPT and ERS P.O unit root tests. The PP and KPSS tests are based on the Bartlett kernel with bandwidth selected from the Newey-West method.

4.2 The short- and long run relations between real output and real exports

4.2.1 ARDL results

Table III reports the results of the *F*-test at a 5% critical bound for the two models. We observe that there is evidence to support a long-run relationship between real output, real exports, and real imports in Greece, Portugal, and Spain, when real output is the dependent variable (model 1). The existence of a cointegrated relationship between the variables is confirmed in Greece, Spain, and Italy when real exports is the dependent variable (model 2). Therefore, in the next step, we will calculate the long-run parameters of the models where the variables are cointegrated.

Table III: F-statistics for testing the existence of a long-run relationship

	Greece	Italy	Portugal	Spain
F(y/ex, im)	**7.5217**	*2.9505*	**6.3112**	**3.9559**
F(ex /y, im)	**6.7967**	**4.4206**	1.5896	**5.0062**

Notes: The F-statistic is used to test for the joint significance of the coefficients of the lagged levels in the ARDL-ECM. Critical value bounds for the present specification with constant, no trend, k=3 and 95% level of confidence are (2.79; 3.67).

Using the long-run estimated parameters resulting from the PSS's method (Table IV), we confirm a positive association between real exports and real output in Greece and Spain. For example, in Portugal (Spain), a 1% increase in real exports causes real output to increase by 0.17% (0.23%), while real output increases by 0.59% (0.19%), given a 1% increase in real imports.

From the long-run estimated parameters of model 2, we observe that the effect of an increase of real output on real exports is positive for Greece, Italy and Spain. In the case of Greece, a strong positive impact emerges from real output in real exports. More specifically, the coefficient of real output implies that a 1% increase in real output contributes to real exports by almost 0.86%. The same positive behaviour is confirmed for real imports on real exports for all examined countries.

The short-run coefficients are negative (Table V), indicating that there is convergence. These coefficients show the speed of adjustment back to long-run equilibrium after a short-run shock.

Table IV: Estimated long-run coefficients

Dependent variable		**Intercept**	**Real Output**	**Real Exports**	**Real Imports**
Real Output					
Greece	ARDL (2, 5, 5; 2)	15.7811 (16.7034)	1.00	0.0911 (1.0121)	0.4128 (1.9372)
Portugal	ARDL (1, 5, 0; 2)	17.4502 (29.2279)	1.00	0.1754 (3.2770)	0.5921 (8.4013)
Spain	ARDL (2, 3, 1; 2)	16.6343 (27.7290)	1.00	0.2338 (3.3947)	0.1907 (3.4449)
Real Exports					
Greece	ARDL (2, 6, 1; 2)	-6.7557 (-1.0460)	0.8465 (2.4917)	1.00	0.3589 (2.9396)
Italy	ARDL (4, 0, 1; 2)	-6.6464 (-5.611)	0.5887 (6.2134)	1.00	0.6314 (3.1129)
Spain	ARDL (1, 5, 6; 2)	2.2282 (1.9871)	0.08221 (0.4278)	1.00	0.9556 (4.1632)

Notes: Figures in parentheses denote the t-statistics.

Table V: Short-run dynamic coefficients

Regressor	**ECM-GRE**	**ECM-ITA**	**ECM-ESP**	**ECM-PRT**
Δ(y)	-0.2082 (-6.6668)		-0.1110 (-9.0928)	-0.4574 (-9.9402)
Δ(ex)	-0.6836 (-6.3161)	-0.2432 (-3.379)	-0.1008 (-2.7542)	

Note: Figures in parentheses denote the t-statistics.

4.2.2 Toda-Yamamoto results

The usual lag selection procedure can be applied to a possibly integrated or cointegrated VAR, as far as the maximal order of integration does not exceed the true lag length of the model. The results for all variables are tabulated in Table VI. Table VII reports the results of the TY approach. We find the existence of a bidirectional causality relationship between real exports to real output in Greece and in Spain. In the case of Portugal, the results seem to be in favour of a one-way relationship from real exports to real GDP. No-causality relations are found for Italy.

Table VI: VAR lag order selection

	Criteria						*Selection*
	LR	**FPE**	**AIC**	**SIC**	**HQ**	**LM**	
Greece	2	2	2	1	2	2	**2**
Italy	1	1	1	1	1	1	**1**
Portugal	3	4	4	1	2	3	**4**
Spain	3	3	3	1	1	3	**3**

Notes: LR: sequential modified likelihood ratio statistic, Final Prediction Error (FPE), Akaike (AIC), Schwarz (SC) and Hannan & Quinn (HQ) criteria, LM: Lagrange multiplier tests are also computed and the optimal number of lags for each country's VAR(k) model eliminates serial correlation from the residuals.

Table VII: Toda-Yamamoto causality tests

	Real exports to real output	**Real output to real export**
Greece	**0,0972**	**0,0505**
Italy	0,2514	0,9545
Portugal	**0,0022**	0,4922
Spain	**0,0329**	**0,0956**

Note: Bolded types signify cases in which the null hypothesis of non-causality is rejected at the 10% significance level.

5. Summary of the Findings

This paper examined the relationship between economic growth and exports in the Southern Euro-zone economies. We utilize the ARDL bounds approach of Pesaran et al. (2001), which ensures that our results are robust to uncertainty about the order of integration of the variables. It is imperative to lead theses countries towards economic recovery through increasing export, especially in these economies that have suffered the negative consequences of the economic recession in recent years. If the ELG hypothesis is validated in these countries, export-oriented policies should be applied, to increase economic growth rates. It is therefore of interest to policy-making on the promotion of export policies and for the overcoming of their recent sub-prime crisis. The empirical analysis shows first that export-orientated policies may guarantee long-run economic growth in all countries except for Italy because the export-led growth is stable over time. More specifically, our results support the existence of a positive long-run relationship between the variables of interest in Portugal, Spain, and Greece. In the case of Italy, there is a positive equilibrium relation when the dependent variable is real exports. Moreover, the TY procedure for detecting causality indicates that there is a bidirectional causal relation in Spain and Greece. In the case of Portugal, we find a unidirectional causality relationship from real exports to economic growth. No-causality relations are found for Italy.

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