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Has the Accession of Greece in the EU Influenced the Dynamics of the Country's "Twin Deficits"? An Empirical Investigation

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Abstract:

This paper investigates the existence of possible causal linkages between the internal and external imbalances of the Greek economy, over the period 1960-2007, as well as the directions of the detected causal effects. Actually, it tests empirically the validity and rationale of the "twin deficits" hypothesis, taking into consideration the impact of the accession of Greece in the European Economic Community in 1981, which constitutes a great institutional change. By means of the ARDL cointegration methodology, error-correction modeling and Granger causality, we find evidence in favor of the "twin deficits hypothesis" for the Greek case over the pre-accession period (1960-1980), with causality running from the budget deficit to the trade deficit. However, over the post-accession period (1981-2007) the causal relationship is reversed, indicating changes in the linking mechanism of the two deficits and providing useful inferences for the national economic policy.

Key Words: *Budget and Trade Deficits, Twin Deficits Hypothesis, Co-integration, Greek Economy (1960-2007)*

JEL Classification*: C22, F32, F41, H62*

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1. Introduction

The "twin deficits" hypothesis claims that an increase (decrease) in the budget deficit causes an increase (decrease) respectively in the trade deficit. This link can be shortly explained through the following mechanism: an increase in the budget deficit of an economy leads to an increase in the aggregate demand and domestic interest rates. Higher interest rates raise the economy's exchange rate, leading to more expensive exports and cheaper imports, ending up with a deterioration in the trade deficit.

The above link has been a subject of controversy among economists through the last decades. Darrat (1988), Bahmani and Oskooee (1992, 1995), Salvatore (2006), Normandin (1999) and many other economists argue in favor of the Keynesian rationale, that the two deficits are closely linked and that the budget deficit causally affects the trade deficit. The opposite view, known as "the Ricardian Equivalence", supports that the two deficits are not causally connected in any way (Evans, 1988; Kim, 1995).

In an effort to validate the "twin deficits" hypothesis, a number of researchers have concluded in favor of the reverse causal relationship. Actually, Rosenweig and Tallman (1991), Alkswani (2000), Marinheiro (2006), Onafowora and Owoye (2006) and others, have presented empirical evidence that the trade deficit may causally affect the budget deficit. Hence, the understanding of the mechanism that connects the two deficits is obviously of major importance for every national economic policy.

Regarding the case of the Greek economy, previous research efforts (Vamvoukas, 1997 and 1999; Pantelidis et.al., 2009), have presented evidence that the "twin deficits" hypothesis holds for Greece. These efforts used time series techniques that are able to establish the dynamics of the examined deficit series. However, the employed methodologies provide valid inferences only under certain assumptions, regarding the integration properties of the studied variables. Moreover, in cases, the presence of significant structural breaks may alter the integration properties of the examined series leading the conventional unit root tests to unreliable inference. This further leads to misspecified dynamic relationships and spurious findings. Following the above, a question arises when a major institutional event, such as the accession of Greece in the European Economic Community, occurs. This paper attempts to investigate the above issues for the Greek economy by examining the existence of possible linkages between the twin deficits, taking into account that the accession of Greece in the European Economic Community may constitute a strong structural break. If this is the case, the analysis should proceed with the investigation of the relationship between the internal and external imbalances in distinct periods.

The paper is organized into five sections. Section 2, provides a brief reference to the evolution of the Greek twin deficits over the periods 1960-1980 and 1981-2007. Section 3, presents the methodology applied through the investigation of

the dynamics of the two deficits. Section 4, presents the data and the empirical results while the last section provides a short summary.

2. A Brief Reference to the Evolution of the Greek Deficits

2.1 The Pre-accession Period (1960-1980)

This time period concerns two decades of the Greek economic history, before the accession of Greece in the European Economic Community. Beginning from the 1960's, the budget deficit of the Greek economy was growing at low levels, varying from 1.62% of GDP in fiscal year 1960, to 2.57% in 1980, with the highest levels in 1975 (3.35%) and 1979 (2.97%). At the same period the trade deficit varied from 7.6% in 1960, to 4.17% in 1980, with its highest levels at 11.35% in 1965, and at 7.88% in 1973.

Important events of this period are the association agreement of Greece with the European Economic Community in 1961 and the military dictatorship imposed in Greece, over the period 1967-1974. The first event resulted in a gradual reduction of tariffs that created negative impacts on the trade balance. In addition the petroleum crisis maintained the trade deficit at high levels (6.5% on average), during the period 1970-1980. On the other hand, the military dictatorship implemented massive public expenditure programs for infrastructure which contributed to a large increase of GDP (16% for the referred period), and also to an increase in the budget deficit from 1.71% in 1971, to 3.35% in 1975.

2.2 The Post-accession Period (1981-2007)

The second time period under examination coincides with many important events for Greece. Firstly, the accession of Greece in the European Economic Community in 1981, secondly, the international petroleum crisis of 1980 and, thirdly, many stabilization programs implemented by several Greek governments. The budget deficit remained at high levels, closing at 14.07% in 1989. The trade deficit had been affected also by the petroleum crisis of 1980, reaching 7.83% in 1989, and 9.82% in 1990. Evidently, the high deficits of the 1980's and the early 1990's have resulted in exploding debt levels from 24.6 % of GDP in 1976 to 111.3 % in 1996.

In the first decade of this period, the stabilization program implemented over the period 1985-1987, as well as the devaluation of the national currency, were not sufficient to reverse the aforementioned situation. In the 1990's, another stabilization program implemented by the conservative Greek government of that period, also proved insufficient. In 1993, the succeeding socialist government implemented the first "economic convergence to the E.U. standards" program, (1993-1998), to support Greece's effort to meet the criteria imposed by the Maastricht treaty. This first economic convergence program was soon followed by a second one (1998-2001) and both achieved the gradual reduction of the budget deficit from 20.79% in fiscal year 1994, to 8.11% in 1997, to 5.79% in 2000.

However, the trade deficit remained at high levels, from 6.23% in 1994, to 13.5% in 2000.

The last period between 2001 and 2007, is probably the most interesting for the Greek economy. The convergence programs that were implemented by the Greek government during 1993-2001, led to the accession of Greece in the European Economic and Monetary Union, and the adoption of the new euro-currency. The continuous need for compliance with the Maastricht criteria led to fiscal discipline that resulted in preserving the budget deficit at low levels during the period 2001-2002. However, the organization of the 2004 Olympic Games, increased public spending enormously and led the budget deficit to 9.47% in 2004. After 2004, the economic performance of Greece worsened due to the international economic turmoil, as well as the delay of Greek governments to solve chronic structural problems of the economy. As a result, the Greek economy deviated from the Maastricht Treaty criteria, and was led to continuous supervision from the European Commission. In addition, the trade deficit remained high (13.16% in 2001, and 10.49% in 2007), indicating mainly the lack of international competitiveness of the Greek exports.

3. Methodology and Model Structure

In the context of the empirical analysis, we adopt the Autoregressive distributed lags (ARDL) cointegration approach proposed by Pesaran and Shin (1998). The ARDL cointegration, being a single equation technique, is considered more efficient for small data samples (Romilly et al. 2001) compared to the conventional methodologies. It also maintains the additional advantage that it can be applied irrespective of the regressors' order of integration, and thus allowing for statistical inference on long-run estimates. However, the linear ARDL cointegration technique is not valid in the presence of I(2) variables.

The general form of the ARDL model (Pesaran and Shin, 1999) is defined as:

$$\Phi(L)y_t = \alpha_0 + \alpha_1 w_t + \beta'(L)x_{it} + u_t, \qquad (1)$$

where: $\Phi(L) = 1 - \sum_{i=1}^{\infty} \Phi_t L^i$, and $\beta(L) = \sum_{j=1}^{\infty} \beta_j L^j$,

with (L) being the lag operator and (wt) being a vector of deterministic variables such as the intercept, seasonal dummies, time trends or other exogenous variables (with fixed lags).

In short the ARDL approach follows the bellow three steps; step one concerns the establishment of the long-run relationship between the variables (unrestricted error correction mechanism regression), by means of a modified F-test. Step two refers to the determination and estimation of the optimal order of the

ARDL specification (equation 1), where the optimal lag length is chosen according to the Akaike Information Criterion (AIC) or the Schwarz Bayesian Criterion (SBC). Finally, step three refers to the estimation of the error correction model, which combines the differences of the variables along with the lagged long-run solution, where the speed of adjustment of the equilibrium is determined.

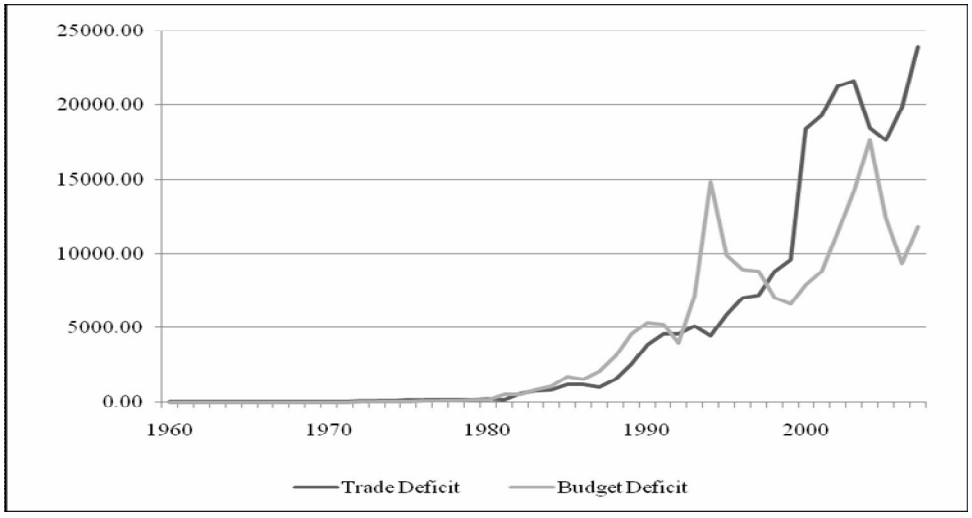
4. Data and Empirical Findings

The empirical analysis uses annual data of the Greek economy, collected from the International Financial Statistics (IFS) database for the period 1960 to 2007. The variables used for the investigation of the twin deficits hypothesis are the logarithm of the budget deficit (lnBD) and the logarithm of the trade deficit (lnTD).

The first step of the empirical analysis is the investigation of the integration properties of the two variables involved, to ensure that the variables are not I(2) stationary. According to Quattara (2004), in the presence of I(2) variables the computed F-statistics in the ARDL model are not valid, since the test is based on the assumption that the variables are I(0) or I(1).

Graph 1 below, presents the evolution of the Greek trade and budget deficits over the years 1960-2007, where we observe that after 1980 the pattern changes and sudden shifts appear in both series. Thus, our ADF testing model, includes a dummy variable to capture the observed shifts in the evolution of the examined deficit series after 1980.

Graph 1. Greek Trade and Budget Deficits over the period 1960-2007 (mil. Euro)



We applied Dickey-Fuller unit-root tests to examine the integration properties of the involved series (Dickey and Fuller, 1979). The reported results in Table 1, suggest that both series are non-stationary when tested in log level form.

When they are considered in first-difference form, both of them are found integrated of order I(1). Therefore we can proceed with testing for cointegration by applying the ARDL method.

Table 1. Augmented Dickey-Fuller unit root test

Log Levels	Include an intercept, but not a trend, critical value 5% =-2.9287		First Differences	Include an intercept, but not a trend, critical value 5% =-2.9303		
Variable	ADF Statistic	Dummy Variable p-value	Variable	ADF Statistic	Dummy Variable p-value	I(d)
lnTD	-2.0005	0.040	DlnTD	-7.8996	0.422	I(1)
lnBD	-2.4085	0.046	DlnBD	-6.6560	0.769	I(1)

Notes: The ADF statistic was selected with the use of the Schwartz Bayesian Criterion; D denotes first difference;

However, the statistical significance of the shift dummy variables indicates that a relationship between the two deficits may not remain stable over the whole time period examined[3]. Therefore, we decided to proceed with the empirical analysis separately for two discrete periods, which are from 1960 to 1980 and from 1981 to 2007.

At a next step, for both periods of our sample we test for the presence of a long-run causal relationship by estimating the equations (2) and (3) below. In both equations we test for the joint significance of the parameters of the lagged level variables (δ_1, δ_2 and δ_3, δ_4). The null hypothesis is that the tested coefficients of the lagged levels of the variables are jointly zero (H_0: $\delta_1=\delta_2$ and H_0: $\delta_3=\delta_4$) which means that no long-run relationship exists between the deficit series.

$$D\ln TD = \alpha_0 + \sum_{i=1}^{k} b_i D\ln TD_{t-1} + \sum_{i=1}^{k} c_i D\ln BD_{t-1} + \delta_1 \ln TD_{t-1} + \delta_2 \ln BD_{t-1} + \varepsilon_{1t}, \quad (2)$$

$$D\ln BD = \beta_0 + \sum_{i=1}^{k} d_i D\ln TD_{t-1} + \sum_{i=1}^{k} e_i D\ln BD_{t-1} + \delta_3 \ln TD_{t-1} + \delta_4 \ln BD_{t-1} + \varepsilon_{2t}, \quad (3)$$

The optimal lag structure of the above models is chosen based on the Akaike Information Criterion (Akaike, 1981) and the results of the bounds test are presented in Table 2.

[3] Besides, we applied the Chow's coefficient stability test to the unrestricted model determining exogenously the year of the accession 1980 as a possible break and the results (F[2,44] = 13.1570 [0.000]) indicate that the estimated coefficients can be considered not stable over the whole sample.

Table 2. Bounds test for the existence of cointegration

Time Period	Dependent Variable	F-statistic	95% Lower Bound	95% Upper Bound	Outcome
1960-1980	DlnTD	8.780	5.872	6.829	Cointegration
	DlnBD	0.317			No Cointegration
1981-2007	DlnTD	3.634	5.532	6.386	No Cointegration
	DlnBD	10.645			Cointegration

For the first period, from 1960 to 1980, where DlnTD is the dependent variable, the reported F-value is 8.780 and is higher than the upper bound critical value (6.829), while when DlnBD is the dependent variable the calculated F-statistic is 0.317 and is lower than the lower bound critical value (5.872). The above results point out that for the period 1960-1981, a long-run relationship exists between the budget deficit and the trade deficit, with long-run causality running only from the budget deficit towards the trade deficit and thus confirm the "twin deficits" hypothesis.

For the period 1981-2007, the bounds test for the differenced trade deficit equation calculates an F-statistic of 3.634, which is smaller than the lower bound critical value (5.532), while for the respective equation of the budget deficit, the F-statistic is 10.645 and exceeds the upper bound critical value (6.386). The above results reveal that in the second period the linkage relationship between the two deficits has been reversed, with long-run causality running only from the trade deficit to the budget deficit. This finding suggests that for the period after the accession of Greece in the European Economic Community, the "twin deficits" hypothesis cannot be confirmed.

Having confirmed the presence of cointegration among the deficits in the first period of our sample, as well as long-run causality running from the budget deficit to the trade deficit, we proceed with the estimation of the appropriate ARDL model. The optimal specification is based on the Akaike Information Criterion and is presented in Table 3 below. Therefore the long-run relationship for the period 1960-1981 is presented below:

$$\underset{(0.125)\ (0.039)}{\ln TD = 2.79 + 0.511\ \ln BD,} \qquad (4)$$

The estimated long-run coefficients from the implied ARDL structure reveal a long-run causal effect from the budget deficit to the trade deficit and indicate that a 1% increase in the budget deficit, results in a 0.51% increase in the trade deficit.

Similarly, we estimate the appropriate ARDL model for the second period. The optimal specification is chosen with the use of the Akaike Information Criterion (Table 3) and the long-run relationship for the period 1981-2007 is presented below:

$$\ln BD = \underset{(3.384)}{2.80} + \underset{(0.353)}{0.761}\ \ln TD, \qquad (5)$$

The results indicate that a 1% increase in the trade deficit yields a 0.76% increase in the budget deficit.

Finally, Table 4 presents the estimates for the respective Error Correction specification. The findings indicate that for the period 1960-1980 the coefficient of the lagged EC term is statistically significant and has the correct negative sign, suggesting that any deviation from the long-term equilibrium path is corrected each year by 71%. Similarly, for the period 1981-2007 the coefficient of the lagged EC term is also found statistically significant and with the correct negative sign, suggesting that any deviation from the long-term path is corrected each year by 38,5%.

Table 3. Estimated long-run coefficients

	ARDL (1,2) selected based on AIC. Dependent variable is lnTD				
Time Period: 1960-1980	Regressor	Coefficient	Standard Error	T-Ratio	T-Probability
	Constant	2.795	0.125	22.304*	0.000
	lnBD	0.511	0.039	13.065*	0.000
	ARDL (1,1) selected based on AIC. Dependent variable is lnBD				
Time Period: 1981-2007	Regressor	Coefficient	Standard Error	T-Ratio	T-Probability
	Constant	2.8036	3.384	0.828	0.416
	lnTD	0.761	0.353	2.157*	0.042

* denotes 5% significance level

Table 4. Error correction representation for the selected ARDL model

Time Period: 1960-1980	ARDL (1,2) selected based on AIC. Dependent variable is DlnTD				
	Regressor	Coefficient	Standard Error	T-Ratio	T-Probability
	DlnBD	0.224	0.157	1.429	0.175
	DlnBD(-1)	0.356	0.175	2.029	0.062
	ecm(-1)	-0.719	0.18	-3.973	0.001
ecm = lnTD - 0.511*lnBD - 2.795*C					
R-Squared = 0.676		R-Bar Squared = 0.576		F-stat. F(3,14) = 9.04(0.001)	
SER = 0.112		RSS = 0.165		DW-stat. = 2.23	
AIC = 11.64		SBC = 9.41			
Time Period: 1981-2007	ARDL (1,1) selected based on AIC. Dependent variable is DlnBD				
	Regressor	Coefficient	Standard Error	T-Ratio	T-Probability
	DlnTD	-0.19	0.191	-0.995	0.330
	ecm(-1)	-0.385	0.125	-3.077	0.005
ecm = lnBD - 0.481*lnTD - 4.844*C					
R-Squared = 0.505		R-Bar Squared = 0.440		F-stat. F(2,24) = 11.74(0.000)	
SER = 0.269		RSS = 1.664		DW-stat. = 1.76	
AIC = -4.69		SBC = -7.28			

5. Summary and Conclusions

In this paper, using annual data for the periods 1960-1980 and 1981-2007, we have attempted to investigate the dynamic linkages between the budget and the trade deficits of the Greek economy. Actually, we tested for the validity of the "twin deficits hypothesis", by applying the ARDL cointegration methodology and Granger causality tests.

Over the pre-accession period of 1960-1980, our results confirm the "twin deficits hypothesis" for the Greek case, with causality running from budget deficit to trade deficit. However, over the post-accession period 1981-2007, the above relationship is reversed, rejecting the "twin deficits hypothesis", with causality running from trade deficit to budget deficit. A possible explanation for the detected reverse causality could be addressed as follows: High trade deficits, lead to higher domestic interest rates; and when the domestic interest rates remain at higher levels than the world interest rates, the currency appreciation results in a reduction in competiveness. In such a case the government is forced to enhance the domestic demand by following expansionary policy which may lead to further worsening of the budget deficit.

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