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THE ECONOMIC EFFECTS OF DEFENCE SPENDING IN GREECE 1963-90: SOME PRELIMINARY ECONOMETRIC FINDINGS

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Abstract

Greece has regularly ranked as the country with the highest defence burden in NATO and the European Union. At the same time the Greek economy has in last years exhibited some of the lowest rates of growth in Europe. It is possible that the high levels of Greek military expenditure may have partially contributed to this. This study is a preliminary empirical investigation into the economic effects of defence spending in Greece during the period 1963-1990. (JEL H56, 040)

1. Introduction

Benoit's (1973, 1978) seminal contribution generated a growing literature on the subject of the relationship between growth and military expenditure. Joerding (1986) for example, using causality analysis and data for 57 LDCs between 1962-77 reports that overall growth appears to Granger cause military expenditure while, on the basis of his results, there was no evidence to suggest the reverse. LaCivita and Frederiksen (1991) on the other hand, examining the defence-growth causality issue, report that obtained econometric results suggest a feedback relationship between growth and defence for the majority of the countries for which causality tests were performed. In his seminal study Benoit (1978) reports a positive impact by defence spending on growth. However, evi-

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dence generated by subsequent studies points to the conclusion that these positive effects, if they exist, are small relative to the overall negative economic impact of such expenditure. Overall, many of the empirical studies on the subject conclude that military spending has a net adverse effect on growth (Deger and Smith 1980, Smith 1980, Deger 1981, Lim 1983, Faini et al 1984, Cappelen et al 1985). Most of this literature utilizes cross sectional data of groups of countries and this, according to Grobar and Porter (1989), is an important weakness. Only a few studies have empirically investigated the economic effects of defence expenditure using time-series data for individual countries (Deger and Sen 1983, Kollias 1993, Frederiksen and Looney 1994). Thus, as Smith and Dunne (1994) point out with reference to studies on the US economy, it is not surprising-to observe that the volume of such country specific case studies has been growing fast in recent years (Alexander 1990, Atesoglu and Mueller 1990, Huang and Mintz 1991). As Grobar and Porter (1989) note such studies add to our understanding of this relationship since it may differ at least in intensity if not in direction among countries. For example, a study by Chowdhury (1991) using a Granger causality test suggests that the relationship between military expenditure and economic growth cannot be generalised across countries. Results reported by Kusi (1994) lead to similar conclusions .They appear to support the view that it may be difficult to make generalisations concerning the relationship between growth and defence spending. Among other things, this relationship may depend on the sample period of the study and the level of socioeconomic development of the country concerned. Furthermore, results reported by Tridimas (1992) suggest that the effects of defence spending may differ to those of other forms of government expenditure. This paper seeks to contribute to the investigation into the economic effects of military spending using Greece, one of the lesser developed countries of the European Union situated at a highly volatile region, as a case study. Using the technique of cointegration and the related notion of error correction it attempts a preliminary empirical investigation into the economic effects of greek military expenditure for the period 1963-1990.

2. Greek Defence Expenditure

Over the years, Greece has often ranked as the country with the highest defence burden (military expenditure as a percentage of GDP) in Europe and in NATO. She is a country with particularly acute defence problems in a highly volatile region (Veremis 1982, Larrabee 1992). The ongoing disputes and frictions with Turkey are the main cause of the high levels of defence spending (Constas 1991, Tsitsopoulos and Veremis 1991, Ifestos and Platias 1992).

Indeed, both countries appear to be engaged in an arms race which has intensified in the last two decades following the Turkish invasion of Cyprus in the summer of 1974. Results of empirical studies seem to support the hypothesis that Greek defence expenditure is primarily determined by Greek-Turkish frictions (Kollias 1991; Kapopoulos and Lazaretou 1993; Refenes, Kollias and Zapranis 1993, 1995). Majeski and Jones (1981) using causality analysis for twelve dyads of countries for the period 1949-75 report that in the case of Greece and Turkey there exists instantaneous causality between their respective military expenditures. Significant and reciprocal interaction for the same test period is also reported by Majeski (1985). On the other hand, econometric results reported by Georgiou (1990) do not appear to support the hypothesis of a Greek-Turkish arms race but their reliability has been questioned by Kollias (1994). The Greek-Turkish disputes date back many years but they take on a greater significance and a new dimension given the deterioration of the security situation in the region the last few years. The recent upsurge of nationalism and ethnic conflict in the Balkans created new external security concerns for Greece. As a result, despite her persistent economic problems she is forced to continue to allocate an appreciable share of GDP to national defence.

During the period in question Greece has on average allocated 5.73% of GDP to defence yearly. At the same time, the Greek economy has in the last years exhibited some of the lowest rates of growth in Europe (Table 1). During the period 1981-90 the average annual growth rate of the Greek GDP was 1.4% compared for example to an average 3.1% for Ireland, 2.3% for Italy, 2.9% for Spain, 2.7% for Portugal and an average of 2.3% for the whole EEC. The Greek economy is plagued by persistent problems, a mounting public debt and high inflation rates. It is possible that high defence spending over the last two decades may have contributed to these problems through adverse effects on the performance of the economy. This hypothesis is empirically investigated in the next section utilising the technique of cointegration and the related notion of error correction. Essentially, the basic idea in this context is that there exists a long-run relationship between a set of given economic variables that obeys equilibrium constraints with short-term dynamics embedded in it which are allowed to assume a flexible dynamic specification. Cointegration involves examining the stationarity of the residuals from the long-run relationship. If it is established, then the residuals from the long-run can be used as the error correction term to explain short-run dynamics (Granger 1986, Engle and Granger 1987, Holden and Thompson 1992).

3. Economic Effects of Defence Spending

3.1. Effects on Output

Military spending can affect the economy through a number of channels. In the context of a traditional Keynesian model defence expenditure can have Keynesian type stimulative effects through aggregate demand stimulation and generation. On the other hand, however, such expenditure may adversely affect the economy through its impact on other economic aggregates such as savings and investment. Hypothesising possible positive direct effects of military expenditure on growth through the creation of effective demand and other spin-offs then, from the standard aggregate demand function:

$$AD = C + G + I + (X\text{-}M) \tag{1}$$

where AD : aggregate demand
C : consumption
G : government expenditure
I : investment
X : exports
M : imports

if government spending is broken up in civilian (CIVG) and military expenditure (ME) so that

$$G = CIVG + ME \tag{2}$$

then (1) can be rewritten as

$$AD = C + CIVG + ME + I + (X\text{-}M) \tag{3}$$

on the assumption that any increase in defence expenditure is spent domestically then, ceteris paribus, this rise in military spending, like other forms of public and private consumption expenditure, creates effective demand and thus raises output and employment. Furthermore, the net increase in aggregate output and national income will be greater than the original increase in government military spending. Assuming that X = M we then have:

$$Y = C + I + CIVG + ME \tag{4}$$

private consumption and investment constitute the two components of private demand in the economy and can be assumed to be a linear function of income so that:

$$(C + I) = \beta Y + B \tag{5}$$

Furthermore, we can also assume that civilian government expenditure (CIVG) is a linear proportion of Y so that:

$$CIVG = \gamma Y + \Gamma \tag{6}$$

and taking military expenditure to be autonomous we have the following relationship:

$$Y = (\beta+\gamma)\, Y + B + \Gamma + ME \tag{7}$$

and if $B + \Gamma = \Delta$, which represents the autonomous components of consumption, investment and civilian government expenditure we have:

$$Y = (\beta+\gamma)Y + \Delta + ME \tag{8}$$

which if we solve through we get

$$Y = \frac{1}{(1-\beta-\gamma)}(\Delta + ME) \text{ and if } k = \frac{1}{1-\beta-\gamma}$$

then we have $Y = (\frac{ME}{k}) + (\frac{\Delta}{k})$

where, as Deger (1986) points out, k is the usual Keynesian multiplier. Of course the final increase of output will also depend on the elasticity of supply of those sectors of the economy that will be called to provide the required defence inputs. Furthermore, the effects of such expenditure may well differ from those of other forms of government spending (Tridimas 1992).

Empirical analysis of the economic effects of military expenditure faces inevitable difficulties since there are a number of channels through which defence spending may influence the performance of the economy and such effects may differ in intensity and direction. Given the above brief outline of the theoretical issues involved, it is hypothesised that there may exist possible positive direct effects of such expenditure which take the form of demand stimulation and other spin-off effects which increase national product. At the same time, however, defence spending may adversely affect the performance of the economy and, it follows, national output through indirect effects on investment or savings. In this context the long run effects of military spending in the case of Greece operationally take the following form:

$$GDP_t = \alpha_0 + \alpha_1 ME\,/\,GDP_t + \alpha_2 I/GDP_t + \alpha_3 POP_t + u_t \tag{9}$$

where all the variables are expressed in their natural logarithms and GDP_t is the gross domestic product at constant prices, α_0 is a constant, ME/GDP_t is the share of military expenditure in GDP, I/GDP_t is investment as a share of GDP, POP_t is the growth rate of population and u_t is the long-run random disturbance term of the regression. It has been shown (Granger 1986, Engle and Granger 1987) that if two variables X_t and Y_t are integrated of the same order, I(1), then any linear combination of these series $u_t = X_t - \alpha Y_t$ may be I(0), where α is said to be the constant of cointegration and, in the case of more than two variables, it becomes the cointegrating vector. It follows that u_t is the equilibrium error which measures the deviations from the equilibrium and may itself be stationary. The error correction variable in a short-run dynamic relationship measures the proportion of the disequilibrium from one period that is corrected in the next period. The assumption is that the disequilibrium errors are inclined to move towards their mean value which, in this case, implies that GDP does not permanently drift away from what is determined by its long-run determinants as they are specified in equation (9). Testing for the stability of the relationship involves testing for stationarity of the residuals of the co-integrating regression, that is to say equation (9). However, before this is done we must establish that the variables involved are themselves stationary. This is accomplished by testing the hypothesis of a unit root in each of the variables of the equation both in levels and in first differences. According to the work of Engle and Granger (1987) to test the hypothesis Ho : X_t is I(1) the following OLS regression is run:

$$\Delta X_t = b_o + b_1 X_{t-1} + \sum_{i=1}^{n} b_1 + {}_i\Delta X_{t-i} + \theta_t$$

where n, the number of lags in the dependent variable, is chosen so as to induce a white noise disturbance term. The test statistic suggested is the standard t-ratio for the estimate of bi and the rejection region consists of large negative values in absolute terms (Fuller 1976, Holden and Thompson 1992). The relevant tests are presented in Table 2 and they reveal that the hypothesis of a unit root in GDP, ME/GDP, I/GDP and POP cannot be rejected. The hypothesis of a unit root in AGDP, ΔME/GDP, ΔI/GDP and ΔPOP is rejected at least at the 5% level of confidence indicating that all the variables in question are I(1). The second stage of testing for cointegration involves an examination of the residuals from the cointegrating regression. Basically one needs to establish that the residuals from the regressions are stationary i.e. that they are I(0). For this to be true the hypothesis of u_t being I(1) must be rejected. The test procedure is the same as the one outlined above but the critical values are different (Hall 1986, Engle and Granger 1987). The results from fitting the cointegrating regression to annual data for the period 1963-1990 are shown in Table 3 where the coefficients and t-statistics (in parentheses) have been rounded to two decimal points, s.e. is the standard error of regression, SC is the F version of a Lagrange Multiplier test of residual serial correlation, FF is Ramsey's test for functional form, N is a skewness-kurtosis test for normality and H is the F version of a test for heteroskedasticity.

Turning to the obtained results it is noted that the sign of the I/GDP independent variable is consistent with theoretical expectations but its statistical significance is lower than what would normally be expected. In the case of the military expenditure regressor we note that the ME/GDP variable enters the equation with a positive and significant coefficient, suggesting positive economic effects from defence spending. To test for the existence of equilibrium forces two tests are used: the CRDW which is the cointegrating regression Durbin-Watson statistic and the ADF which is the Augmented Dickey-Fuller test statistic. Both tests reject the null hypothesis of non-cointegration in favour of cointegration. In other words, the tests indicate that there exists a long-run relationship between Greek GDP and its determinants specified in equation (9). According to the Engle and Granger theorem, if a vector of variables is cointegrated then there exists a valid error correction specification of a dynamic model which is not subject to the spurious regression problem. The dynamic relationship is based on the long-run one and it includes the lagged value of the residuals from the cointegrating regression (RES_t-i). The results of the short-run dynamic tests on the economic effects of military expenditure are shown in Table 4. The diagnostics are as before and CH is the Chow F-diagnostic that tests for predictive failure over a subset of q observations, where there is a total of T observations and K regressors. Pesaran et al. (1985) have shown that the latter test can also be used as a general specification error test.

The two equations of the short term dynamics in Table 4, appear to be satisfactory on the usual criteria as they are reported therein. The diagnostics do not detect any deviation from classical properties and the Chow test does not indicate predictive failure nor does it suggest the existence of general specification error. In particular, the error correction coefficient (RES_t-i) has the expected negative sign and is statistically significant in both cases. The coefficient of ΔI/GDP is consistent with theoretical expectations. It enters the equations with a positive and significant sign. Turning to the ΔME/GDP coefficient we note that in both cases is positive but statistically significant only in the case of equation (2). The sign of the coefficient suggests that defence spending has a positive albeit weak impact on Greek GDP. This could be attributed to direct positive effects through demand stimulation and generation for domestically produced military inputs (Deger and Sen 1983). However, in the case of Greece domestic production of military inputs accounts only for a small fraction of the total demand for military hardware and other related inputs. Empirical results by Kollias (1993) point to the conclusion that there is little evidence to support the hypothesis of positive spin-offs from military expenditure on the outputs of the Potential Defence Capacity sectors of the economy. This, in conjuction with the results reported in Table 4, suggests that the positive sign of the defence spending variable may be mostly due to indirect effects associated with such expenditure. In principle, spending on military capabilities acts as a deterrent and provides security from external threats. Increased national security encourages economic confidence. It creates the necessary stability under which savings, investment, production, accumulation and consumption can proceed in an orderly fashion.

3.2. **Effects** on **Savings and Investment**

Defence expenditure on the other hand, apart from possible positive economic spin-offs, may reduce growth through indirect effects on savings and investment. Indeed, there exists a substantial volume of empirical studies which have shown that the negative effects on growth are mostly due to crowding out of investment, straining the absorptive capacity of the economy and putting pressure on the available supplies of capital, skilled labour and foreign exchange (Smith 1977, Deger 1981, Faini et al 1984, Grobar and Porter 1989). Smith (1977) for example argues that "for most of the post war period defence and investment have been close substitutes and expenditure on the one will be at the expense of the other" (p. 73). In another study Smith (1980) has also suggested that in the case of developed countries in particular, there may be a one to one trade off between defence spending and investment shares in GDP. If savings (S) are defined as

$$S = Y - C - T \tag{10}$$

where Y : income
C : consumption
T : taxes

then (10) can also be expressed as

$$Y = C + S + T \tag{11}$$

and from

$$Y = C + I + CIVG + ME + (X\text{-}M) \tag{12}$$

if we solve through with (11) we get

$$S = I + ME + (CIVG\text{-}T) + (X\text{-}M) \tag{13}$$

which can also be expressed as

$$I + ME = S + (T\text{-}CIVG) + (M\text{-}X) \tag{14}$$

where

(T-CIVG) : the civilian budjet surplus acting as a proxy for public sector saving

(M-X) : excess of imports over exports giving the foreign capital inflows (foreign savings)

S : private sector savings

As Deger (1986) points out equation (14) indicates that in a given economy investment and military expenditure are financed by three forms of savings: that emanating from the foreign sector, government fiscal surplus and private or non-governmental surplus of income over expenditure (ibid p. 88). Thus, it becomes evident that investment and defence spending in an economy compete for finance from the same sources. It follows that any increase in military expenditure (ME), ceteris paribus, must be at the expense of investment. The importance of investment in the growth process has been emphasised in most writings on the subject (Reppas 1991, Soldatos 1993). Therefore, any adverse effect on investment will eventually lead to a slow down of growth. In this context the long run effects of military spending in the case of Greece operationally take the following form:

$$I/GDP_t = \gamma_0 + \gamma_1 \, ME/GDP_t + \gamma_2 GDPpc_t + \gamma_3 GDP_t + u_t \tag{15}$$

where I/GDP_t is investment as a share of GDP, γ_0 is a constant, ME/GDP_t is the share of military expenditure in GDP, $GDPpc_t$ is the per capita GDP at constant prices, GDP_t is the gross domestic product at constant prices and u_t is the long-run random disturbance term of the regression. A second equation was also estimated in which savings as a share of GDP (S/GDP_t) was used as the dependent variable in place of investment:

$$S/GDP_t = \delta_0 + \delta_1 ME/GDP_t + \delta_2 GDPpc_t + \delta_3 \, GDP_t + u_t \tag{16}$$

Once again in order to test for the stability of the relationship it is necessary to test the stationarity of the residuals of the co-integrating regressions (15) and (16). However, as noted previously before this is done it must be established that the variables involved are themselves stationary by testing the hypothesis of a unit root in each of the variables of the equation both in levels and in first differences (Table 5). The results of the tests as reported in Table 5 reveal that the hypothesis of a unit root in I/GDP, S/GDP, ME/GDP, GDPpc and GDP cannot be rejected while the hypothesis of a unit root in ΔI/GDP, AS/GDP, ΔME/GDP, ΔGDPpc and ΔGDP is rejected at least at the 5% level of confidence. On the basis of these results the variables in question appear to be I(1) and therefore we can proceed with the second stage of our empirical investigation. The results from fitting the cointegrating regressions to annual data for the period 1963-1990 are shown in Table 6 where the coefficients and t-statistics (in parentheses) have been rounded to three and two decimal points respectively and the diagnostics are as before. The two equations in Table 6 appear to be satisfactory on the usual criteria as they are reported therein. Note that in both equations the ME/GDP coefficient is negative. This is in line with the findings of other empirical studies and seems to suggest that both investment and savings are adversely affected by defence expenditure. The CRDW and ADF tests reject the null hypothesis of non-cointegration in favour of cointegration. In both cases the CRDW is well above the critical value at the 1% level of confidence. The ADF statistic on the other hand, is slightly low, but still above the 10% level of significance. It would seem reasonable therefore to conclude that the variables in equations (15) and (16) constitute in each case a cointegrating vector. In other words, the tests appear to indicate that there exists a long-run relationship between the two dependent variables and their respective determinants specified in equations (15) and (16). The dynamic tests are based on the long-run relationship and they include the lagged value of the residuals from the cointegrating regressions (RES_t-i). To allow for the effects of changes in the general price level the rate of inflation ($INFL_t$. has also been added in two of the estimated OLS regressions. The results of the short-run dynamic tests on the economic effects of military expenditure are shown in Table 7. The summary statistics and diagnostics are as before and suggest that the equations in Table 7 appear to be satisfactory on the usual criteria. The error correction coefficient (RES_t-i) has the expected negative sign and is statistically significant in all cases. The coefficients of ΔGDPpc and ΔGDP are consistent with theoretical expectations. They both enter all the equations with a positive sign although they are statistically significant only in the case of regressions (2) and (4). Inflation seems to have a negative impact on both investment and savings but its coefficient is significant only in the case of investment. Turning to the ΔME/GDP coefficient we note that in all cases is negative and significant. This result is in line with other theoretical and empirical work cited earlier. It suggests that in the case of Greece, as in the case of other countries, military spending adversely affects savings and investment. Given that the importance of savings and investment in the growth process cannot be overemphasised it is reasonable to conclude that through the reported effects on them, the growth of the Greek economy is retarded and as a result any positive spin-offs on output though aggregate demand stimulation and generation may be more than offset.

4. Conclusions

Greece, because of the acute external security problems that she faces, has over the years allocated an appreciable share of GDP to defence. This paper investigated the economic effects of Greek military expenditure during the period 1963-90. Empirical analysis has yielded contradictory results. On the one hand military spending appears to have a positive impact on GDP apparently due mainly to indirect effects. On the other hand, in line with the theoretical discussion and the findings of other empirical studies, defence expenditure in Greece appears to adversely affect savings and investment. Evidently the issue of the economic impact of military spending is far from settled. A major question is associated with how to capture quantitatively the concept of defence burden. As Grobar and Porter (1989) suggest, it may be captured in a number of ways in which military expenditure as a share of GDP (as used in this study) is but one. The various possible numerical measures may well move in different directions in response to outside forces and their economic impact could lead to conflicting results. The issue is further complicated by the fact that military expenditure is very heterogeneous. Among other things, it consists of spending on research and development, production of military hardware as well as salaries and pensions to retired military personnel. The effects of military spending may well depend upon the structure and content of such expenditure as these are allocated across labour, domestic production and import costs. Further empirical work in the context of a full dynamic model of the Greek economy with exogenous and endogenous variables is required to test for these effects and could enrich our understanding of the economic effects of defence spending in Greece.

Appendix

TABLE 1

Military Expenditure as Percentage of GDP and GDP Growth Rates

Year	M.E	GDP	Year	M.E.	GDP
1965	3.6	9.4	1978	6.7	6.7
1966	3.7	6.1	1979	6.3	3.7
1967	4.5	5.5	1980	5.7	1.8
1968	4.8	6.7	1981	7.0	0.1
1969	4.9	9.9	1982	6.8	0.4
1970	4.9	8.0	1983	6.8	0.4
1971	4.9	7.1	1984	7.1	2.8
1972	4.7	8.9	1985	7.0	3.1
1973	4.2	7.3	1986	6.2	1.4
1974	4.3	-3.6	1987	6.3	-0.5
1975	6.8	6.1	1988	6.4	4.1
1976	6.9	6.4	1989	5.7	2.8
1977	7.0	3.4	1990	5,9	-0.3

Sources: SIPRI Yearbooks, The Greek Economy in Figures 1992.

TABLE 2

Unit Root Tests

Variable (X)	Unit root in x		Unit root in Δx	
	DF	ADF	DF	ADF
GDP	-0.96	-1.09	-4.37	-3.89
ME/GDP	-2.03	-2.41	-4.85	-4.32
I/GDP	-2.46	-2.54	-4.18	-3.99
POP	-2.35	-1.40	-8.10	-3.94
Critical values (5%):	-3.58	-3.59	-3.59	-3.60

TABLE 3

Results of GDP Cointegrating Regression

Dependent variable: GDP_t Explanatory Variables:	Constant	ME/GDP_t	I/GDP_t	POP_t
	9.17	1.42	0.33	-0.13
	(8.46)	(8.87	(1.11)	(2.40)
Statistics				
$\bar{R}^2 = 0.79$	s.e. = 0.17	SC:F (1, 23) = 5.91		
FF:F (1, 23) = 0.05	$N{:}x^2(2) = 0.52$	H:F(1,26) = 2.38		
CRDW* = 1.06	ADF** = -3.45			

Notes:

* the null hypothesis in DW= 0. Critical values for three variable case 0.488, 0.367, 0.308 at 1%, 5% and 10% respectively (Hall 1986, p. 233).

** Critical values for three variable case -3.89, -3.13, -2.82 at 1%, 5% and 10% respectively (Hall 1986, p. 233).

TABLE 4

Dynamic Short-run Effects of Military Expenditure on Greek GDP

Explanatory variables	Dependent variable ΔGDP	
	(1)	(2)
Constant	0.040	0.022
	(8.80)	(2.69)
ΔME/GDP	0.071	0.108
	(1.54)	(2.40)
ΔI/GDP	0.130	0.122
	(1.92)	(1.96)
ΔPOP	0.001	-0.003
	(0.13)	(0.46)
ΔGDP_{t-1}	—	0.384
		(2.44)
RES_{t-1}	-0.114	-0.103
	(3.04)	(2.89)
Summary statistics		
$\bar{R}^2$	0.48	0.55
D.W.	1.39	2.32
s.e.	0.02	0.02
F-stat	6.97	7.33
Diagnostics		
SC:F (1, 21)	2.30	2.32
FF:F (1, 21)	0.01	0.78
$N{:}x_2$ (2)	1.82	0.80
H:F (1, 25)	0.84	0.22
CH:F (5, 17)	0.97	1.02

TABLE 5

UNIT ROOT TESTS

Variable (x)	Unit root in x		Unit root in Δx	
	DF	ADF	DF	ADF
I/GDP	-2.44	-2.64	-4.11	-4.12
S/GDP	-1.72	-1.63	-4.76	-4.26
ME/GDP	-2.07	-2.29	-5.00	-4.20
GDP	-0.76	-0.95	-4.42	-3.99
GDPpc	-0.89	-1.11	-4.29	-3.67
Critical valurs (5%):	-3.58	-3.59	-3.59	-3.60

TABLE 6

Results of Cointegrating Regressions for Investment and Savings

Explanatory variables	Dependent variable	
	I/GDP_t	S/GDP_t
Constant	0.123	0.191
	(4.24)	(0.53)
ME/GDP_t	-0.711	-0.350
	(1.33)	(0.52)
$GDPpc_t$	0.024	0.044
	(5.90)	(8.51)
GDP_t	-0.001	-0.001
	(6.00)	(9.05)
Statistics		
$\overline{R}^2$	0.60	0.80
s.e.	0.02	0.02
SC:F (1, 23)	13.64	12.82
FF:F (1, 21)	2,58	5.03
$N:x^2(2)$	0.50	0.01
H:F (1, 25)	6.84	0.14
CRDW*	0.84	0.83
ADF**	-3.10	-3.04

Notes:

* The null hypothesis in DW= 0. Critical values for three variable case 0.488, 0.367, 0.308 at 1%, 5% and 10% respectively (Hall 1986, p. 233).

** Critical values for three variable case -3.89, -3.13, -2.82 at 1%. 5% and 10% respectively (Hall 1986, p. 233).

TABLE 7

Dynamic Short-run Effects of Military Expenditure on Investment and Savings

Explanatory variables	Dependent variables			
	$\Delta I/GDP_t$	$\Delta I/GDP$	$\Delta S/GDP_t$	$\Delta S/GDP_t$
Constant	-0.010	0.002	-0.147	-0.006
	(1.72)	(0.32)	(2.22)	(0.60)
$\Delta ME/GDP_t$	-0.981	-1.064	-1.368	-1.433
	(2.00)	(2.34)	(2.52)	(2.68)
$\Delta GDPpc_t$	0.010	—	0.018	0.010
	(0.67)		(1.15)	(2.37)
ΔGDP_t	0.001	0.006	-0.002	—
	(0.20)	(1.83)	(0.36)	
$INFL_t$	—	-0.001	—	-0.001
		(2.02)		(1.00)
RES_{t-1}	-0.402	-0.332	-0.443	-0.400
	(2.32)	(2.05)	(2.71)	(2.39)
Summary statistics				
$\overline{R}^2$	0.42	0.50	0.54	0.56
D.W.	1.95	2.19	1.95	2.12
s.e.	0.01	0.01	0.02	0.02
F-stat	5.63	7.43	8.78	9.33
Diagnostics				
SC:F (1, 21)	0.01	1.28	0.01	0.36
FF:F (1, 21)	0.31	0.04	0.30	0.22
N:x^2 (2)	0.25	0.16	2.97	2.33
H:F (1, 25)	2.65	6.16	0.02	0.03
CH:F (5, 17)	0.48	0.45	2.38	2.22

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