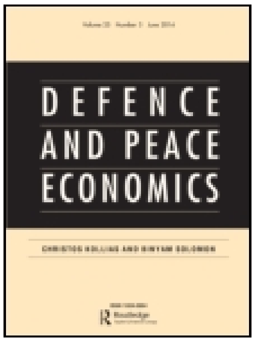

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AN EMPIRICAL NOTE ON EXTERNAL DEBT AND DEFENCE EXPENDITURES IN TURKEY

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It is often argued that defence expenditures, and in particular arms imports, are one of the main reasons for the recent increasing trend of Turkey's external debt. This paper empirically examines the relationships between Turkey's defence expenditure and external debt for the period 1979–2000 using Engle–Granger methodology. The findings show no clear evidence of defence–debt relationships for the period analysed.

Keywords: Turkey's Defence expenditure; External debt; Cointegration

INTRODUCTION

Turkey's external debt has sharply increased from early 1980s. In the same period, Turkey's defence spending and also its arms imports have risen accordingly.[1] A developing defence industry and increasing terrorist activities by separatist PKK (Kurdish Workers Party) were the main reasons for these increases. Therefore, Turkey's increasing defence expenditure and its defence imports might be contributing to Turkey's indebtedness. This paper empirically analyses the relationships between defence expenditures, arms imports and the external debt of Turkey. The rest of this paper is organised as follows. The following two sections describe the model and data. The fourth section presents the empirical results and the section after concludes.

THE MODEL

The literature concerning defence–debt relations is reviewed comprehensively by Günlük-Senesen (2004) in this issue. The model in this paper is extracted partially from Looney (1989) Looney (1989) investigated the relationship between external debt and military expenditures

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[1] See Günlük-Senesen (2004) in this issue.

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TABLE I Empirical Results of Looney (1989)

	Total sample	*Resource constrained*	*Resource unconstrained*
GNP	0.64*** (3.41)	0.07 (1.16)	1.04*** (6.58)
Import	0.54*** (5.54)	0.48*** (2.63)	0.44*** (7.75)
International Reserve Stocks	–0.20*** (–2.60)	–0.12 (–1.31)	–0.01 (–0.24)
Military Expenditures	–0.04 (–0.65)	0.40*** (3.64)	–0.14*** (–2.94)
Educational Exp.	–0.08 (–0.35)	0.40*** (4.58)	–0.41*** (–2.25)
Health Expenditures	0.11 (1.07)	–0.61*** (–4.48)	0.02 (0.22)
R^2	0.94	0.96	0.99
F	77.9	76.0	99.4

^{t}statistics in parenthesis
*Significant at the 10% level
**Significant at the 5% level
***Significant at the 1% level

for 61 Less Developed Countries. Looney (1989) defined the determinants of external debt as GNP, merchandise imports, merchandise exports, international reserve holdings and three types of governmental expenditures (military, health and education). However, in the final estimation, merchandise exports are not included in the model. The main conclusion from his study is that the effects of military expenditures on countries' indebtedness are different. For resource-constrained countries' arms imports or military expenditure contributes to their indebtedness, but for resource-unconstrained countries, a negative relationship was found. The total sample of the Looney study gave insignificant results for defence–external debt relationships (Table 1). It suggests that the effects are country specific and single country analysis should provide further evidence. In the Looney (1989) study, Turkey is classified as a resource-unconstrained country, implying a negative relationship between military and external debt.

In our estimation, we followed Looney (1989) with some modifications. Determinants of external debt are selected as GDP (Gross Domestic Product), volume of imports, volume of exports and military expenditures. Because of degrees of freedom, we used the balance of trade instead of using imports and exports separately. Obviously, total output growth would have a direct positive effect on external indebtedness. Secondly, the balance of trade would exert additional pressure on debt. International reserve shocks are not included in our model, as this variable is not so important for time series analysis. Education and health are not included in our model, because this study is limited to the military component. Finally, military expenditure is a determinant of external debt. Three proxies employed for military expenditure are arms imports, defence equipment expenditure and total defence expenditure. For time series analysis, using a share of variables reduces the robustness of the estimation. Rather than the share of variables or growth rate of variables, levels are used.

For estimation, logarithmic forms of variables are used in the following econometric forms: the natural logarithm is a monotonic transformation. This means that some of the basic properties of a time series are preserved by a logarithmic transformation. A time series that is strictly increasing over time in terms of its level values will also be a strictly increasing series when transformed by taking the natural log. A time series that exhibits exponential growth will exhibit linear growth in terms of its natural logarithms. The estimated models are of the following forms:

$$LDEBT = \alpha_0 + \alpha_1 LY + \alpha_2 LXM + \alpha_3 LMIL + \varepsilon_t \tag{1}$$

$$LDEBT = \alpha_0 + \alpha_1 LY + \alpha_2 LXM + \alpha_3 LARM + \varepsilon_t \tag{2}$$

$$LDEBT = \alpha_0 + \alpha_1 LY + \alpha_2 LXM + \alpha_3 LEQU + \varepsilon_t \tag{3}$$

Definitions of the variables:

LDEBT	=	log of real external debt,
LY	=	log of real GDP,
LXM	=	log of real balance of trade (exports minus imports),
LMIL	=	log of real defence expenditures,
LARM	=	log of real arms imports,
LEQU	=	log of real defence equipment expenditures

DATA

The period of the study is 1979–2000, which is an important period for Turkey's defence–debt relations. The data for this analysis come from several sources. Data on GDP, GNP deflator, external debt stock, US$ exchange rate, total exports and total imports were compiled from SPO (State Planning Organisation, 1997, 2002). The data on military expenditure and defence equipment expenditure were taken from various issues of *NATO Review* and *SIPRI Yearbooks*. Arms imports data are obtained from US ACDA *WMEAT Yearbooks*. Except for arms imports, all financial data were originally in current million Turkish Liras. Arms imports data were in million US$. These data were converted to current Turkish liras using the US$ exchange rate. Then all financial variables in current prices were deflated by the GNP deflator of SPO into millions of 1990 Turkish liras.

ESTIMATION RESULTS

This part of paper provides some empirical results as to what extent Turkey's defence expenditures in general, and arms imports, in particular, have contributed to the accumulation of its external debt for the period of 1979–2000. This study applies the cointegration analysis of Engle and Granger (1987). If two variables Y_t and X_t are integrated of the same order I(1) then any linear combination of these series $\mu_t = Y_t - \alpha X_t$ may be I(0). It becomes apparent that u_t is the 'equilibrium error' that 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. Testing for the stability of the relationship involves testing for stationarity of the residuals of the cointegrating regression. Before this is done, stationarity of the variables must be tested. This is accomplished by testing the hypothesis of a unit root in each variable of the equation in levels and in first differences. Dickey–Fuller (DF) and Augmented Dickey–Fuller (ADF) tests were used to test whether variables were stationary or needed to be differenced. With respect to critical values, all the variables are I(1) at 1% and 5% significance levels in DF and ADF tests (Table 2). Therefore, cointegration analysis is appropriate. Like the test of each variable for unit roots earlier, the formal test for a cointegration relationship requires the application of the DF and ADF tests for the residuals. The residual-based DF test and ADF test results support a long-run relationship (Table 3). The rejection of the non-cointegration hypothesis shows that the imposed relationship is a valid cointegration vector.

The next step is to apply the estimation of a long-run cointegrating relationship using the levels of the variables of equations (1) (2) and (3). Evidence of cointegration includes, critically, a significant DF test on the residuals, high R^2 and significant t statistics of the coefficients. The long-run estimation enables us to decide whether or not the variables in the level equations are cointegrated (Table 4). In this estimation, Turkey's external debt is negatively affected by its military expenditure. These results are in line with Looney (1989). However,

TABLE II Unit Root Tests

Variable	*Unit Root Level*		*Unit Root First Differences*	
	DF	*ADF*	*DF*	*ADF*
LDEBT	–1.823	–1.775	–3.931**	–3.784*
LY	–2.476	–2.202	–5.072**	–4.860**
LXM	–3.215	–3.667*	–6.266**	–5.857**
LMIL	–2.191	–2.178	–4.224**	–4.035**
LARM	–3.355	–2.930	–5.761**	–5.396**
LEQU	–3.678*	–3.337	–7.576**	–5.498**
Critical Values 1%	–4.469	–4.500	–3.807	–3.830
5%	–3.645	–3.659	–3.020	–3.029

t statistics in parenthesis
All the estimations were carried out by PC-Give 8.0 (Doornik and Hendry, 1995)
*Significant at the 5% level
**Significant at the 1% level

TABLE III DF and ADF Test from Error Correction Model

Cointegrating Regressions			*Critical values*	
			1%	*5%*
LDEBT= *f* (LY, LXM, LMIL, Trend)	Calculated DF	–3.094**	–2.682	–1.958
(equation (1))	Calculated ADF	–2.823**	–2.689	–1.959
LDEBT= *f* (LY, LXM, LARM, Trend)	Calculated DF	–3.001**	–2.682	–1.958
(equation (2))	Calculated ADF	–2.838**	–2.689	–1.959
LDEBT= *f* (LY, LXM, LEQU, Trend)	Calculated DF	–3.282**	–2.682	–1.958
(equation (3))	Calculated ADF	–2.938**	–2.689	–1.959

t statistics in parenthesis
All the estimations were carried out by PC-Give 8.0 (Doornik and Hendry, 1995)
*Significant at the 5% level
**Significant at the 1% level

TABLE IV Long-Run Relationships 1979–2000

	Equation (1)	*Equation (2)*	*Equation (3)*
Constant	7.79*** (7.34)	6.84*** (5.37)	7.49*** (6.26)
LY	0.56*** (3.67)	0.31** (2.36)	0.32* (1.93)
LXM	0.05 (0.88)	0.11* (1.87)	0.12* (1.98)
LMIL	–0.36** (–2.22)	–	–
LARM	–	0.09 (1.15)	–
LEQU	–	–	0.02 (0.82)
Trend	0.04*** (13.25)	0.03*** (7.32)	0.03*** (7.28)
R^2	0.99	0.98	0.98
DW	1.27	1.21	1.30
F (4–17)	424.38***	354.14***	328.83***
RESET F(1–16)	1.40	3.30	4.01

t statistics in parenthesis
All the estimations were carried out by PC-Give 8.0 (Doornik and Hendry, 1995)
*Significant at the 10% level
**Significant at the 5% level
***Significant at the 1% level

when arm imports and equipment expenditures proxies are used, the coefficients became insignificant.

The second stage of the Engle and Granger (short-run) estimation is shown in Table 5. The validity of the $RES_{t\text{-}1}$ specification requires the existence of a long-run relationship or cointegration between the variables. The error correction terms are significant in the two equations and have the expected negative signs (equations (2) and (3) but are not significant in equation (1). In these estimations, equations (1) and (3) gave insignificant results for defence. However,

TABLE V Short Run Relationships

	Equation (1)	*Equation (2)*	*Equation (3)*
Constant	0.04*** (5.95)	0.03*** (4.47)	0.03*** (5.83)
DLY	0.44* (1.92)	0.45** (2.51)	0.44** (2.06)
DLXM	0.01 (0.15)	0.05 (0.94)	0.05 (0.84)
DLMIL	–0.19 (–1.03)	–	–
DLARM	–	0.10* (1.88)	–
DLEQU	–	–	–0.02 (–0.48)
RES_{t-1}	–0.43 (–1.69)	–0.46* (–1.84)	–0.43* (–1.79)
R^2	0.41	0.46	0.42
DW	1.20	1.36	1.12
F (4–16)	2.85**	3.54**	2.91**
RESET F(1–15)	0.20	0.02	0.01

t statistics in parenthesis
All the estimations were carried out by PC-Give 8.0 (Doornik and Hendry, 1995)
*Significant at the 10% level
**Significant at the 5% level
***Significant at the 1% level

equation (2) is positive and significant at the 10% level. It suggests that Turkey's arm imports contribute to its indebtedness in the short run.

CONCLUSIONS

This study is an attempt to provide an empirical explanation of the effects of defence expenditures, defence equipment expenditures and arms imports on Turkey's external debt by using data for the period 1979–2000. The empirical results showed that there is a negative relationship between external debt and defence expenditure in the long run, but when arms imports and equipment spending are considered separately, the coefficient became insignificant. In the short run, external debt is positively related to arms imports, implying Turkish arms imports have contributed to Turkey's indebtedness. A caveat for this study is related to the length of the data. The findings reported in this paper are therefore tentative and should be interpreted with caution.

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