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Defence, Education and Health Expenditures in Turkey, 1924–96*

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It is often assumed that there is trade-off between defence spending and spending on education and health, even though the empirical literature suggests mixed evidence about its nature. This study investigates the possible trade-off between Turkish defence spending and spending on health and education during the Turkish republican era. In this context, the relationship between health, education and military expenditure has been analysed within a multi-equation framework employing the Seemingly Unrelated Regression (SUR) estimation method. The main findings of this article suggest that while military spending decisions are made independently of health and education expenditure, there are trade-offs between defence and welfare spending. While the trade-off is negative between defence and health, it is positive between defence and education. Moreover, it appears that there is a competition between education and health expenditure in the budgeting process.

Introduction

It has been argued that there is trade-off among health, education and military expenditures, as they are the major components of a national budget. The trade-off between military expenditure and other government spending may appear simple. It is expected that for a given government budget, an increase in military expenditure will crowd out an equivalent amount of all other spending. Thus, education and health expenditures will be reduced proportionately. However, there are numerous feedbacks of the change in defence spending which make the final effects quite complex. Deger (1985) argues that there exists a large number of simultaneous channels by which these effects and counter-effects operate. Final causality is not clearcut, and there is mixed evidence about its nature.

This study is another attempt to broaden the scope of the literature, where the relationships among the health, education and military expenditures in Turkey are analysed within a multi-equation model employing seemingly unrelated regression (SUR) estimation for the time period 1924–96. The rest of the article is organized as follows. After a brief review of previous empirical

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evidence in the second section, the model is discussed in the third section. The fourth section offers a brief account of SUR estimation method. The empirical results are presented in the fifth section. The final section draws some conclusions.

Previous Empirical Evidence

Numerous studies have investigated the defence–welfare trade-off. However, there is no consensus among the findings. The main argument is that education and health are among the major sources of economic growth, especially in LDCs, and defence spending is believed to lower economic growth by reducing public expenditure on human capital formation. The negative trade-offs are reported by a number of studies (Russett, 1969; Dabelko & McCormick, 1977; Peroff & Podolak-Warren, 1979; Deger, 1985; Apostolakis,

Table I. Previous Empirical Findings

Author	*Sample period; method*	*Findings*
Russett (1969)	USA, France, UK 1939–68; time-series analysis, OLS	Negative trade-off
Caputo (1975)	Australia, Sweden, UK and USA, 1950–70; standardized regressions and Pearson coefficients	No trade-off
Dabelko & McCormick (1977)	77 countries, 1950–72; cross-sectional time-series, OLS	Small negative trade-off
Peroff & Podolak-Warren (1979)	USA, 1929–74; time-series analysis, OLS	Negative trade-off
Russett (1982)	USA, 1941–71; time-series analysis, OLS	No trade-off
Domke, Eichenberg & Kelleher (1983)	USA, UK, Germany, France, 1948–80; time-series analysis, OLS	No trade-off
Verner (1983)	18 Latin American countries, 1948–79; time-series analysis, linear and non-linear equations	Negative trade-off (El Salvador) Positive trade-off (10 countries) No trade-off (7 countries)
Eichenberg (1984)	Germany, 1950–79; time-series analysis, OLS and GLS	No trade-off
Deger (1985)	50 LDCs, 1967–73; cross-sectional time-series, 3SLS	Negative trade-off
Harris & Pranowo (1988)	12 Asian countries, 1967–82; cross-sectional time-series, OLS	Negative trade-off (3 countries) Positive trade-off (3 countries) No trade-off (6 countries)
Hess & Mullan (1988)	77 LDCs, 1982–83; cross-sectional time-series, 2SLS	No trade-off
Mintz (1989)	USA, 1947–80; time-series, OLS	No trade-off
Davis & Chan (1990)	Taiwan, 1961–85; time-series analysis, 3SLS	No trade-off
Apostolakis (1992)	19 Latin American countries, 1953–87; time-series analysis, Cochrane-Orcutt and Hildreth-Lu techniques	Negative trade-off
Frederiksen & Looney (1994)	Pakistan, 1973–86; time-series analysis	No trade-off

1992). On the other hand, however, it is also possible that defence spending may contribute to human capital formation in education and health (Ram, 1993), as defence personnel and conscripts receive good physical training and various skills, especially in developing countries (Benoit, 1973, 1978). Another argument suggests that there is no trade-off between defence and welfare spending (see Caputo, 1975; Russett, 1982; Domke, Eichenberg & Kelleher, 1983; Eichenberg, 1984; Hess & Mullan, 1988; Mintz, 1989; Davis & Chan, 1990; and Frederiksen & Looney, 1994). Additionally, Verner (1983) and Harris & Pranowo (1988) report mixed results (negative, positive and no trade-off). Although there are various studies concerning the peace dividend or budgetary effects of defence spending, this study primarily focuses on defence–welfare trade-off.[1]

The bulk of the empirical defence–welfare trade-off evidence is summarized in Table I. The results are rather mixed, suggesting that the method used for the analysis is very important to get reliable results. The empirical evidence suggests that any defence–welfare trade-off is not certain and might be country-specific because of historical, economical, political and social differences among the countries. In the cross-sectional analysis, it is difficult to distinguish and include countries with similar characteristics (e.g. literacy levels, quality of labour force, resource constrained or resource rich, per capita income levels). Therefore single-country analysis in a multi-equation framework seems to be much more appropriate. However, it also has some shortcomings, such as accuracy of data, business cycle of country's economy and the fact that it is not easy to generalize the results and structural breaks and changes.

[1] See Gleditsch et al. (1996); Cappelen, Gleditsch & Bjerkholt (1993); Bobrow (1993); Looney (1993); Frederikson & Looney (1994); Gunluk-Senesen (2000).

The Model

Although there are various studies concerning defence–welfare trade-offs, in this study Russett's (1982) model is preferred. Most of the studies reviewed above did not use any proper model for explaining defence–welfare trade-off. They mainly relied on some comparisons and a few explanatory variables (Caputo, 1975; Apostolakis, 1992; Dabelko & McCormick, 1977; Davis & Chan, 1990). However, there are some studies that used relatively sophisticated methods. Hess & Mullan's (1988) model consists of two simultaneous equations with several variables, but one shortcoming of this study is that it included many non-economic variables. Verner (1983) considers non-linearities of education and defence spending. The Domke, Eichenberg & Kelleher (1983) model is very similar to Russett's model, and Mintz (1989) replicated Russett's model with disaggregated data. We believe that the Russett model is quite simple and offers more in terms of understanding the defence–welfare issue. The model needs relatively few data, which is an advantage when working with LDCs. This study, which applies the same model to a less developed country (Turkey), is another effort to test the accuracy and reliability of Russett's (1982) and Mintz's (1989) studies.

In this study, the model developed by Russett (1982) has been used with some modifications. Russett (1982) employed the following two-equations system to analyse whether there appears to be any trade-off between military expenditure and health and education spending in the USA. In the equations, military expenditure has a negative sign, because this is the only variable expected to have a negative sign on education and health expenditure.

$$GRED_t = a_0 + a_1 GRHO_t + a_2 GRHE_t - a_3 GRMX_t + a_4 GRTX_t + a_5 GROLD_t + a_6 MED_{t-1} + a_7 GRY_{t-1} + a_8 DUM + \varepsilon_{t1} \quad (1)$$

$$GRHE_t = b_0 + b_1 GRHO_t + b_2 GRED_t - b_3 GRMX_t + b_4 GRTX_t + b_5 GROLD_t + b_6 MED_{t-1} + b_7 GRY_{t-1} + b_8 DUM + \varepsilon_{t2} \quad (2)$$

where

GRED: Growth rate of educational expenditure
GRHO: Growth rate of housing expenditure
GRHE: Growth rate of health expenditure
GRMX: Growth rate of defence expenditure
GRTX: Growth rate of taxes
GREN: Secondary school enrolment growth rate
DUM: Dummy variable
GRY: GDP growth rate
GROLD: Growth rate of population over 65 years old
MED: Number of people under medical care

Russett (1982) is concerned with the rates of changes, not levels of spending, as he assumes that trade-offs occur at the margin and thus respond to increments and decrements rather than total budgets. Additionally, this approach would produce more equal weighting than using absolute changes, which weights analysis in favour of those years in which there are huge absolute changes. Moreover, it is reasonable to use the rates of changes of the variables in the context of an analysis of stationarity. Most economic series are non-stationary, i.e. increasing over time. This has been regarded as a problem in econometric analysis, as any analysis using non-stationary variables leads to the spurious regression problem.[2] That is, if the series are not stationary, one may obtain a model with promising, but false, diagnostic tests. One remedy for this problem is to difference the series successively until stationarity is achieved. Thus Russett's (1982) approach is in accordance with stationarity analysis. As the appendix indicates, all our variables are integrated of order one, implying that the first difference of all variables may be used in the analysis, as in the model of Russett (1982).

We modified the model of Russett (1982), where growth rates of education and health expenditures are estimated, and added another equation for military expenditure. Three variables, which are included in Russett's (1982) model, have been dropped in this analysis. As no reliable data are available for housing, the number of people who are under medical care and growth rate of the population over 65 years old (*GRHO*, *MED* and *GROLD* in Equations [1] and [2]), we dropped these variables from the equations. Dropping these variables does not reduce the reliability of the model, as housing is not a main determinant of educational expenditures. Developing countries do not spend much on people under medical care, because their social security system is not well developed. Moreover, the percentage of population over 65 years old is quite low in Turkey compared to Western countries. Therefore dropping these variables for a developing country like Turkey will have little impact on the model.

Moreover, the whole process of budgeting may be considered as a system. Thus, if there is actually a trade-off between these variables, this may be seen either from the military expenditure equation or from the health and education equations. It is important to know

[2] For an elaborate non-stationarity analysis, see Charemza & Deadman (1997).

how health and education affect defence and also how defence expenditure affects education and health. Thus, a third equation, where the dependent variable is the growth rate of military expenditure, is added to the model. Moreover, rather than arbitrarily using levels or lagged values, a common lag length is chosen according to the Akaike criterion. Accordingly, the equations of our model are:

$$\begin{aligned} GRHE_t = \beta_0 + \sum_{i=0}^{n} \beta_{1i} GRED_{t-i} \\ + \sum_{i=0}^{n} \beta_{2i} GRMX_{t-i} + \sum_{i=0}^{n} \beta_{3i} GRTX_{t-i} \\ + \sum_{i=0}^{n} \beta_{4i} GREN_{t-i} + \sum_{i=0}^{n} \beta_{5i} GRY_{t-i} \\ + \beta_6 GRHE_{t-1} + \beta_7 DUM + e_{t1} \end{aligned} \quad (3)$$

$$\begin{aligned} GRED_t = \alpha_0 + \sum_{i=0}^{n} \alpha_{1i} GRHE_{t-i} \\ + \sum_{i=0}^{n} \alpha_{2i} GRMX_{t-i} + \sum_{i=0}^{n} \alpha_{3i} GRTX_{t-i} \\ + \sum_{i=0}^{n} \alpha_{4i} GREN_{t-i} + \sum_{i=0}^{n} \alpha_{5i} GRY_{t-i} \\ + \alpha_6 GRED_{t-1} + \alpha_7 DUM + e_{t2} \end{aligned} \quad (4)$$

$$\begin{aligned} GRMX_t = \gamma_0 + \sum_{i=0}^{n} \gamma_{1i} GRHE_{t-i} \\ + \sum_{i=0}^{n} \gamma_{2i} GRED_{t-i} + \sum_{i=0}^{n} \gamma_{3i} GRTX_{t-i} \\ + \sum_{i=0}^{n} \gamma_{4i} GREN_{t-i} + \sum_{i=0}^{n} \gamma_{5i} GRY_{t-i} \\ + \gamma_6 GRMX_{t-1} + \gamma_7 DUM + e_{t3} \end{aligned} \quad (5)$$

where n is the lag length.

Empirical studies investigating the possible trade-off among these variables generally employ multi-equation models and estimate them using OLS, 2SLS or GLS methods.[3] However, one may expect collinearity between the residuals of these equations as each of them is found to have a significant effect on the other. In this study, the Seemingly Unrelated Regression (SUR) method is employed in the belief that error terms might be correlated across equations due to the omission of variables, or because of other reasons, as a government's decision to allocate its budget to any of these alternatives may not be independent of what amounts are to be allocated to others. Moreover, SUR provides parameter estimates that are asymptotically more efficient than ordinary least squares estimates because of the correlation between contemporaneous disturbances across equations.

Additionally, it is not possible to impose and test cross-equation restrictions when estimation is carried out by employing methods other than the SUR method. Therefore, Zellner's SUR method is employed in this study.[4]

SUR Models

SUR is a technique that models a system of individual regression equations to allow for contemporaneous correlation in the individual regression error terms. If there is a shock that affects all equations similarly but that is not controlled for in the explanatory variables, SUR is a more efficient method for dealing with the shock than estimating a series of individual regression equations.

Equations might appear to be unrelated. However, they may be related in that some coefficients are the same; the disturbances are correlated across equations and/or a subset of right-hand side variables are the same. In such cases, even though the parameter estimates are still linear and unbiased, they are no longer efficient. However, the SUR method proposed by Zellner gives BLUE estimators.

[3] See Table I.

[4] See Zellner (1962).

In general, the i^{th} equation of the N equation model can be represented as $y_{it} = X_{it}\beta_i + u_{it}$, t = 1,. . .,T; i = 1, . . ., N, where y_{it} is a $T \times 1$ vector of observations on the i^{th} dependent variable, X_i is the $T \times ki$ matrix of observations on the ki independent variable, β_i is a $ki \times 1$ vector of regression coefficients, and u_i is a $T \times 1$ vector of random error terms.

The best linear unbiased estimator of the parameters (BLUE) of the model is given by Aitken's GLS formula

$$\hat{\beta} = \left(X'\Omega^{-1}X\right)^{-1} X'\Omega^{-1}Y$$

where Ω is the variance–covariance matrix.

There are two special cases under which the GLS and OLS estimators are identical. First, although it is thought that the equations are seemingly unrelated, they are actually unrelated. However, larger covariances mean that there is a larger efficiency gain in using SUR. Second, if the regression equations contain the same number of explanatory variables, then there is no advantage of applying Zellner's SUR. The more dissimilar the explanatory variables are, the greater the gain in using SUR.[5]

Empirical Results

The data for this study consist of defence expenditure, health expenditure and educational expenditure for Turkey, and also include taxes, secondary school enrolment, GDP and GDP deflators for the years 1994–96. All variables are in the form of growth rates. As a system estimation is considered in this article, selecting such a long time period allows researchers to be free from any degrees of freedom problems. The data for educational expenditures, health expenditures, defence expenditure and government taxes were taken from the Ministry of Finance, Turkey (1994, 1995, 2000). GDP growth, GDP deflators, population and schooling data were taken from the State Institute of Statistics, Turkey (1999). All financial data were deflated to 1987 constant million Turkish Liras.

Data consistency is hard to achieve for a long time period, especially for developing countries such as Turkey. Educational and health expenditures are rather mixed; there are university hospitals, which are not included in health but education; Social Security hospitals are totally excluded; and military hospitals are included in defence. Moreover, the military has secondary schools and high schools – even a university – and these expenditures are not included in education spending but in defence.[6] However, there are no other data available even for a limited period for the true level of health and educational expenditures.

The estimations are performed by employing SUR for the time period, after allowing for lags and the differencing, 1927–96, using RATS (Regression Analysis of Time Series) version 3.02 (Enders, 1996). Before specifying the equations, the lag length is chosen according to the Akaike criterion, which indicated that one lag is appropriate for the estimation. The preliminary estimations[7] indicated that the levels of enrolment, GNP growth rate and the lagged value of the health expenditure are insignificant in all equations. Moreover, the effects of the lagged value of tax growth rate and the level of the tax growth rate are opposite in education and health equations, even though one should expect a fairly stable tax growth, whereas the lagged value of tax growth rate is insignificant in the military expenditure equation. Accordingly, the levels of enrolment, GNP growth rate, the lagged value of tax growth rate and the lagged

[5] For an elaborate analysis of panel data and GLS estimation, see Hsiao (1986).

[6] See Gunluk-Senesen (2000).

[7] The preliminary estimates are not reported here to conserve space. However, they are available on the *JPR* website (see note on p. 569).

Table II. Estimation Results

Variables	$GRHE_t$	$GRED_t$	$GRMX_t$
Constant	0.0014	0.007	–0.0410*
	(0.9576)	(0.2997)	(–1.8792)
$GRHE_t$		0.8937***	–0.0583
		(13.1381)	(–0.5645)
$GRED_t$	0.9486***		0.3783***
	(13.2927)		(3.6918)
$GRED_{t-1}$	0.2010***	–0.1940***	
	(4.1169)	(–4.1072)	
$GRMX_t$	–0.1800*	0.3579***	
	(–1.8297)	(3.9164)	
$GRMX_{t-1}$			0.1646*
			(1.9667)
$GRTX_t$	0.3190**	–0.2954**	0.6576***
	(2.2504)	(–2.0427)	(4.1013)
$GREN_{t-1}$	–1.4104***	1.3044***	
	(–3.3840)	(3.2752)	
GRY_{t-1}	0.0072***	–0.0079***	0.0044**
	(3.5389)	(–4.1259)	(1.8398)
S28	–0.9410***	0.9891***	–0.4522***
	(–6.8457)	(8.2956)	(–2.6148)
S36	0.8531***	–0.7767***	
	(7.0909)	(–6.4578)	
S83	–0.3755***	0.3763***	
	(–3.1096)	(3.3711)	
R^2	0.80	0.85	0.65
F	31.1453	45.7569	18.5635
ARCH	$\chi^2(1) = 1.0717$	$\chi^2(1) = 0.0102$	$\chi^2(1) = 6.2295$
(*p*-values)	(0.3005)	(0.9194)	(0.0145)
LM	$\chi^2(1) = 2.2681$	$\chi^2(1) = 3.7335$	$\chi^2(1) = 1.3793$
(*p*-values)	(0.1320)	(0.0533)	(0.02402)

All the estimations were carried out by RATS (Regression Analysis of Time Series) version 3.02.
* $p < .01$; ** $p < .005$; *** $p < .001$

value of health expenditure are dropped and the equations re-estimated without the insignificant variables. Moreover the lagged value of the military expenditure variable in the health and education equations and the lagged values of the education expenditure and enrolment variables in the military expenditure equation are insignificant. There seem to be outliers in the data in 1928, 1936 and 1983 for the health and education equations, and in 1928 for the military expenditure equation. After the inspection of the residuals, three dummy variables are included in the analysis, which are S28, S36 and S83 taking the value of 1 for 1928, 1936 and 1983, respectively.

The estimation results, where all insignificant variables mentioned above are dropped and the dummy variables are included, are presented in Table II, where the variables in parentheses are the respective t-values.[8] In

[8] The estimations are carried out for the time period 1950–96 in order to see the robustness of the results, but are not reported here to conserve space. The subperiod estimations, which are available upon request from the authors, indicate that the results apply to that period as well.

Table II, R^2 denotes the coefficient of determination; F denotes F tests for the hypotheses of joint significance tests of all coefficients; ARCH denotes tests for the hypotheses of no autoregressive conditional heteroscedasticity against a one lag alternative; LM denotes tests for the hypotheses of no serial correlation up to order one. Next, the symmetry restrictions are imposed. That is, the coefficient of education expenditure in the health equation is expected to be equal to the coefficient of health expenditure in the education expenditure equation, and so on. These restrictions can be formulated in the context of Equations (3), (4) and (5) as follows:

$$\beta_{10} = \alpha_{10}$$

$$\beta_{20} = \gamma_{10}$$

$$\alpha_{20} = \gamma_{20}$$

When the restrictions are jointly tested, they yield a test statistics of $\chi^2(3) = 1.3872$, implying the acceptance of the restrictions. The estimation results with symmetry restrictions are presented in Table III. In the health equation ($GRHE_t$), the coefficients of education ($GRED_t$ and $GRED_{t-1}$), growth rate of tax revenues ($GRTX$) and previous year's growth rate (GRY_{t-1}) are statistically significant and positively correlated to Turkish health expenditure, but the relationship between defence spending ($GRMX_t$) and health spending is significantly negative. These results support the idea that increased defence expenditure reduces the resources available for health, implying that defence has a priority in the budgeting process, which could be due to the external and internal security considerations and crowds out health. The secondary school enrolment rate variable ($GREN_{t-1}$) also has a negative impact on health expenditure as expected. As mentioned, education and health expenditure are mixed in Turkey. University hospitals are included in education but provide a health service for a large number of people, especially students. Accordingly, when the number of people increases in education, their health expenditure (in part) appears in educational expenditure. This might be the reason for the negative relationship we found. Therefore, the results should be treated with caution.

In the education equation ($GRED_t$), defence spending is positively correlated with educational expenditure. This result suggests that there is a positive trade-off between defence and education, and defence does not crowd out education. The relationship between education and health is positive in this equation too. However, the tax growth rate has a negative effect on education expenditure. This may be due to the fact that even though there have been increases in tax revenues, real education expenditure has been declining in recent years. The enrolment rate has a positive and significant value as expected. Surprisingly, the previous year's economic growth does not help educational expenditure. Although coefficients of economic growth are positive in the health and defence equation, the coefficient is strongly negative for education. This implies that high economic growth causes a lower level of educational expenditure and that a low level of the previous year's economic growth induces a higher level of educational expenditure.

When the defence equation is considered, the findings are consistent with the previous equations. There is a negative correlation between defence and health expenditure, but the relationship is positive for educational expenditure. The growth rate of tax revenues and the previous year's income growth positively affect military expenditure growth. Furthermore, all diagnostics are satisfactory at the 1% level of significance for each equation.

A close inspection of the estimation

Table III. Estimation Results with Symmetry Restrictions

Variables	$GRHE_t$	$GRED_t$	$GRMX_t$
Constant	0.0032	0.0069	–0.0384
	(0.1213)	(0.7870)	(–1.7937)
$GRHE_t$		0.9216***	–0.1276**
		(26.0507)	(–1.8230)
$GRED_t$	0.9216***		0.3557***
	(26.0507)		(5.4452)
$GRED_{t-1}$	0.1971***	–0.1953***	
	(4.0654)	(–4.1970)	
$GRMX_t$	–0.1276**	0.3557***	
	(–1.8230)	(5.4452)	
$GRMX_{t-1}$			0.1516**
			(1.8360)
$GRTX_t$	0.2991**	–0.3278***	0.7626***
	(2.6022)	(–2.9073)	(6.0682)
$GREN_{t-1}$	–1.3996***	1.3198***	
	(–3.3759)	(3.3338)	
GRY_{t-1}	0.0069***	–0.0080***	0.0045**
	(3.4856)	(–4.1598)	(1.9250)
S28	–0.9133***	0.9918***	–0.4369***
	(–7.2658)	(8.3348)	(–2.7978)
S36	0.8479***	–0.7871***	
	(7.1233)	(–6.8116)	
S83	–0.3655***	0.3776***	
	(–3.1017)	(3.3862)	
R^2	0.80	0.85	0.63

All the estimations were carried out by RATS (Regression Analysis of Time Series) version 3.02.
* $p < .01$; ** $p < .005$; *** $p < .001$

results in Table III indicates that the coefficients of the tax rate, the lagged values of education expenditure, secondary school enrolment rate, income growth rate and those of the dummy variables in the health equation are almost the same as those in the education equation but with opposite signs. In order to test this statistically, cross-equation restrictions are imposed, whereby the equality of the coefficients in both equations is investigated. When jointly tested with symmetry restrictions, the cross-equation restrictions are accepted, yielding $\chi^2(10) = 8.8138$ (0.5498). The final estimations are presented in Table IV. These findings are consistent with those presented in Table III. Moreover, it appears that when government allocates its budget, the main concern is not allocating the funds among the three major components. Instead, military expenditure gets its share first, then the remaining amount is divided between health and education expenditures. This result becomes more plausible when the political and strategic situation is considered. Turkey can be characterized as a country with civilian governments under close surveillance by the military (Gunluk-Senesen, 2000) and is located in an unstable area (neighbouring Iraq, Iran, Syria, Greece, Bulgaria and the former Soviet Union) with its internal problems.

Table IV. Estimation Results with Cross-Equation Restrictions

Variables	$GRHE_t$	$GRED_t$	$GRMX_t$
Constant	–0.0011	0.0026	–0.0342
	(–0.0451)	(0.1065)	(–1.5887)
$GRHE_t$		0.9206***	–0.1347**
		(36.6782)	(–1.9415)
$GRED_t$	0.9206***		0.5513***
	(36.6782)		(7.6267)
$GRED_{t-1}$	0.1932***	–0.1932***	
	(4.4190)	(–4.4190)	
$GRMX_t$	–0.1347**	0.3646***	
	(–1.9415)	(5.1841)	
$GRMX_{t-1}$			0.1196
			(1.6763)
$GRTX_t$	0.3035**	–0.3035**	0.3646***
	(2.9648)	(–2.9648)	(5.1841)
$GREN_{t-1}$	–1.3333***	1.3333***	
	(–3.5712)	(3.5712)	
GRY_{t-1}	0.0075***	–0.0075***	0.0055**
	(4.1919)	(–4.1919)	(2.4588)
S28	–0.9555***	0.9555***	–0.5687***
	(–8.5771)	(8.5771)	(–3.600)
S36	0.8042***	–0.8042***	
	(7.4706)	(–7.4706)	
S83	–0.3612***	0.3612***	
	(–3.4286)	(3.4286)	
R^2	0.80	0.85	0.64

All the estimations were carried out by RATS (Regression Analysis of Time Series) version 3.02.
* $p < .01$; ** $p < .005$; *** $p < .001$

Turkey has also experienced several military coups (1960, 1970 and 1980). These factors give priority to military spending. When these results are compared with previous findings, there seems to be a trade-off between welfare spending and defence expenditure for Turkey, but this trade-off is positive for education and negative for health.

Conclusions

The aim of this study has been to evaluate the defence–welfare relationship for Turkey. Earlier empirical studies on this subject have reported statistical results of limited reliability, thus leading to confusing conclusions that could be due to usage of single equation models for cross-section studies. In this study, it is proposed that in order to get the full picture of the nature of the defence–welfare relationship, a time-series analysis for a single country should be employed in a multi-equation framework.

Accordingly, this article has studied the defence–welfare relationship for Turkey employing the Seemingly Unrelated Regression (SUR) method, whereby a three-equation system is estimated, modifying the model proposed by Russett (1982), for the time period 1924 to 1996. The empirical findings suggest that there are trade-offs between defence and welfare spending, but they are different for education and health expenditures. Moreover education expenditure variables give some puzzling results. In education equations, the lagged value of education expenditure has a negative effect. This may be due to the data problems addressed above. While there is a negative trade-off between defence and health, the trade-off is positive for education. Furthermore, it appears that government allocates the funds for military expenditure independent of other government expenditures, and health and education expenditures share the remaining resources between themselves and other minor articles of government expenditures. However, the reported results should be treated with caution.

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Appendix: Unit Root Tests

Variables	*LAG*	*A-DF(X)*	*A-DF (DX)*
Y	3	–2.91	–3.54**
E	1	–2.68	–7.28**
H	1	–2.20	–7.64***
M	1	–2.99	–5.56***
T	1	–2.04	–7.64***
ENR	1	–1.80	–4.85**

All the estimations were carried out by RATS (Regression Analysis of Time Series) version 3.02. Here Y denotes GDP at 1987 prices, E education expenditure, H health expenditure, M military expenditure, T taxes and ENR is the secondary school enrolment rate.
** $p < .005$; *** $p < .001$

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