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MEASURING THE PEACE DIVIDEND: EVIDENCE FROM DEVELOPING ECONOMIES

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The paper attempts to trace the nexus between defense spending and economic growth in developing countries, using data for 59 developing countries from 1972–2000. The purpose is to measure the opportunity costs of defense spending mainly in terms of alternative public programs. The correlation of social sector expenditures with growth rate as well as the extent of correlation between social and defense sector spending is not clear in the majority of developing countries. It follows that even if defense spending is reduced, the prospects for a peace dividend in the aftermath of the Cold War might be inhibited by political interests that oppose increases in social sector expenditures. If so, defense cutbacks might not lead to a welfare windfall as is generally presumed. Accordingly, this paper tests whether a defense spending cutback will enhance funding for other public programs and whether such a reallocation of resources will prove to be beneficial for the long-term growth rate of the economy.

Keywords: Peace dividend; Military Expenditures; Growth

INTRODUCTION

Although global military expenditures declined at an average annual rate of 3.7% during 1987–91, during the year 2004 they were just 6% lower in real terms then the 1987–88 peak of Cold War military spending. In the Middle East, military expenditure actually grew at an average annual growth rate of 9.3% in real terms, from 1997 to 2004. Although lower than the Middle East, the growth rate for East Asia (3.4%) was still substantial. The combined military spending of Africa, Latin America, Asia and the Middle East in 2004 was $193 billion in current dollars (SIPRI, 2005).

How do these changes in military expenditures affect economic growth? Benoit's (1973, 1978) theoretical model emphasized the adverse effects of defense expenditures on growth, but his econometric estimates based on a cross-section of 44 less-developed countries for the period 1950–65 showed that 'countries with a heavy defense burden generally had the most rapid rate of growth, and those with the lowest defense burdens tended to show the lowest growth rates'. He and several subsequent researchers tried to rationalize their findings in terms of the possibility that alternative uses of resources diverted to defense might not be very productive in many LDCs. It was further pointed out that a highly developed and organized

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military establishment promotes economic growth through increased security, a rise in aggregate social welfare and specific spin-off effects generated in the economy. In addition, for arms producing countries there can be inter-industrial linkages, utilization of dual purpose R&D, as well as technological feedback from sophisticated arms manufacture (Sandler and Hartley, 1995).

Other researchers identify channels through which defense spending has a negative impact on growth. Deger (1986) notes that military spending reduces aggregate investment, reduces the national saving rate, produces a budgetary crowding-out effect and decreases the human capital formation which is essential to growth. Russet (1969, 1970) found that defense expenditures detract from personal consumption spending, fixed investment expenditures and state and local government spending. Hollenhorst and Ault (1971) showed that the trade-off relationships shifted substantially over time and were different during periods of peace and war (Chan 1992).

Studying the trade-off between defense and economic services, Lotz (1970) identified that a $1 increase in available resources to the state would increase defense spending by 8 cents while developmental categories will gain to the amount of 37 cents. However, Deger (1986) found out that an increase of $1 in defense spending tended to produce 0.85 cents in additional tax revenue. This implies that officials may decide to cut taxes rather than to expand social spending in the wake of lower defense spending. It follows that the view that defense cutbacks will automatically yield a 'welfare windfall' might be unrealistic (Chan, 1995).

Knight *et al*. (1996) estimated an extension of a standard growth model using a panel-data procedure that delivered robust estimates of the effect of military spending on economic growth. His model also assumes that high levels of military spending detract from growth both by reducing productive capital formation and by acting more generally to distort resource allocation. In contrast with earlier empirical work, the results of a set of simulations undertaken by him suggested that economic growth would be enhanced substantially by deeper cuts in military spending that could become feasible if a generalized international peace were achieved in the future.

The paper attempts to trace the nexus between defense spending and economic growth in developing countries, using data for 59 developing countries from 1972–2000. The research attempts to measure the opportunity costs of defense spending, mainly in terms of alternative public programs. I try to assess the implications of defense cutbacks over long periods of time, especially in the aftermath of the Cold War in developing countries, testing two competing hypotheses.

1. Most LDC governments reduce social sector[1] expenditures to fuel increases in defense expenditures. Social sector expenditures, due to their impact on human capital formation, exert a stronger positive impact than defense expenditures on long run economic growth. In the absence of statistically significant externality effects and productivity differentials for defense sector spending, reducing social sector expenditures will exercise a considerably negative impact on human capital formation, manifested through a reduction in long-run growth (Deger, 1986).
2. Defense spending has a positive impact on growth, at least for developing countries, through the spin-offs and spillover effects generated in this sector. Even if defense spending is reduced, the prospects for a peace dividend in the aftermath of the cold war might be inhibited by political interests that oppose increases in social sector expenditures. If so, defense cutbacks might not lead to a welfare windfall as is generally presumed (Chan, 1995).

[1] Expenditure on education, health, social security and welfare programs.

Accordingly, this paper tests whether a defense spending cutback will enhance funding for other public programs and whether such a reallocation of resources will prove to be beneficial for the long-term growth rate of the economy. The next section presents a model of the impact of defense spending on economic growth. The section after discusses the data used in the analysis, and the fourth section describes the regression results. The final section presents the conclusions.

MODELS OF DEFENSE-ECONOMY TRADE-OFF

My model is based on Feder's (1982) model on exports and economic growth. Feder's econometric analysis was based on the assumption that marginal factor productivities are different in the export and non-export sectors of the economy, with productivities being significantly higher in the export sector. The difference in productivities derives in part from inter-sectoral beneficial externalities generated by the export sector. Feder's analysis showed that growth can be generated not only by increases in aggregate levels of capital and labor but also by reallocation of existing resources from the less efficient non-export sector to the higher productivity export sector (Ward and Davis, 1992).

Ram (1986) and others have used Feder's model to study the role of government spending in the economy. Biswas and Ram (1986) studied the impact of military spending on economic growth by substituting a military and non-military sector for Feder's original import–export sectors. Mintz and Huang (1990, 1991) applied the same idea to examine the trade-offs between defense spending and investment spending. Russett (1982) notes that if social and defense expenditures consistently compete for scarce resources they will be highly negatively correlated. If they are driven by the same demands they will be positively correlated. If they generally compete but sometimes are viewed as complementary, the negative correlation will be low.

In addition to the classic Feder–Ram approach, the augmented Solow model has also been used by Knight *et al*. (1996) to study the effects of military expenditures on growth. The model is, however, too narrow given the range of variables that have been found to be significant determinants of growth, and it is implausible that the main effect of the share of military expenditure is through technology. The reformulation of the Barro model used by Aizenman and Glick (2003), which allows for security effects on output, seems potentially more promising. Security is measured by military expenditure relative to the threat and this produces a non-linear effect of military expenditure. Military expenditure has a positive effect on output when the threat is high and a negative effect when threat is low (Dunne, 2005). However, despite some of the theoretical and econometric weaknesses pointed out by Dunne, the Feder–Ram approach seems to be an appropriate choice to study the trade-off relationship between different kinds of spending and for measuring the size of any externality.

Based on Ram's initial specification, it is assumed that the economy consists of two main sectors, a private sector (C) and a public sector, with public sector spending being further decomposed into three components: social (S), defense (D) and economic (E) spending. Aggregate output in the economy is the sum of output in all these sectors, generated by capital and labor used in each sector, also allowing for spillover effects of public sector spending:

$$Y = C(K_c, L_c, S, D, E) + S(K_s, L_s) + E(K_e, L_e) + D(K_d, L_d) \quad (1)$$

The model assumes that the decision to allocate money between different government sectors is exogenous, reflecting political preferences not otherwise related to other factors influencing economic growth. The sectors are mutually exclusive and exhaustive. We allow for the productivity of labor and capital in each government sector to differ from their productivity in the private sector by a factor δ:

$$\frac{S_K}{C_K} = \frac{S_L}{C_L} = (1 + \delta s) \tag{2a}$$

$$\frac{E_K}{C_K} = \frac{E_L}{C_L} = (1 + \delta e) \tag{2b}$$

$$\frac{D_K}{C_K} = \frac{D_L}{C_L} = (1 + \delta d) \tag{2c}$$

Taking the total derivative of equation (1) and breaking each component of spending into individual inputs and spillover terms, we get

$$Y' = C_K K c' + C_L L c' + C_S S' + C_E E' + C_D D' + S_K K s' + S_L L s' + E_K K e' + E_L L e' + D_K K d' + D_L L d' \tag{3}$$

Here, C_K, C_L, etc are marginal productivities of capital and labor in the private sector, while C_S, C_E, and C_D, represent the externality effects of social, economic and defense spending on private sector output. Using equations (2a)–(2c) to substitute for S_K, E_K, and D_K, we can rewrite (3) as:

$$Y' = C_K K' + C_L L' + \left(\frac{\delta s}{1 + \delta s} + C_S\right) S' + \left(\frac{\delta e}{1 + \delta e} + C_E\right) E' + \left(\frac{\delta d}{1 + \delta d} + C_D\right) D' \tag{4}$$

Finally, let β be the marginal product of L, α the marginal product of K in the private sector, and I the investment rate (K'). We rearrange equation (4) to show the effects of factor productivity differentials (δ) and the externality effects of government spending on the private sector (θ):

$$\frac{Y'}{Y} = \alpha \frac{I}{Y} + \beta \frac{L'}{L} + \left(\frac{\delta s}{1 + \delta s}\right) \frac{S'}{S} \frac{S}{Y} + \left(\frac{\delta e}{1 + \delta e}\right) \frac{E'}{E} \frac{E}{Y} + \left(\frac{\delta d}{1 + \delta d}\right) \frac{D'}{D} \frac{D}{Y} + \theta_{SC}\left(\frac{S'}{S} \frac{C}{Y}\right) + \theta_{EC}\left(\frac{E'}{E} \frac{C}{Y}\right) + \theta_{DC}\left(\frac{D'}{D} \frac{C}{Y}\right) \tag{5}$$

Note the distinction between the productivity and externality effects. If factors used for defense spending are more productive than factors used in the private sector, the impact on growth depends on the size of defense spending relative to GDP (D/Y); if defense spending has the positive externality of raising the productivity of factors used in the private sector, the impact on growth depends on the size of the private sector relative to GDP (C/Y).

We now discuss the data, before turning to the results of the analyses.

DATA

Data on 59 developing economies is compiled for the period 1972–2000, from several different sources. The World Development Indicators database (World Bank) provides information on annual GDP growth and population growth. The Penn World Tables (Summers and Huston) provide information on private investment. The Government Finance Statistics database (International Monetary Fund) provides information on total government expenditures, and a breakdown into defense, education and health, welfare, and economic expenditures. Note that these GFS data include two categories for government 'social' spending – education and health (E&H) and social security and welfare (S&W), rather than the single social (S) category described in the earlier equations. The analyses include the two categories separately; since education and health spending is

likely to raise worker productivity more than social security or welfare spending, we would expect the effects of E&H spending on economic growth to be stronger than the effects of S&W spending. The *SIPRI Year Books* (Stockholm International Peace Research Institute) provide data on military expenditures for more than 160 countries. The Freedom in the World database (Freedom House) provides an annual assessment of the state of freedom in all countries. Banks' Data Set (Arthur Banks) provides a wide range of country-level indicators on socio-economic and political topics. The Correlates of War Project (University of Michigan) provides data on the hostility level experienced by a country, particularly cross-border disputes.

The variables used from these datasets are described in Table I. To allow for different coefficients in different regions, the complete data set was broken into separate data sets on a regional basis. An initial analysis of the data identified Kuwait and Rwanda as highly influential points. This appeared to be due to the exceptionally high levels of military spending done by Kuwait during the Gulf war period and the genocide in Rwanda that changed its pattern of spending for years thereafter. They were therefore removed from the sample. Figure 1 shows the country defense expenditures as a percentage of GDP over the period. Continents have been separated to show the difference in average level of military expenditures across regions. The Middle East shows by far the highest expenditures throughout the period, although there was a dramatic decline in military spending, from about 12% of GDP in 1973–1984 to 6% in 1987–1997. Africa also shows a small decline in military spending, while the other regions show stable spending.

TABLE I Variable Definitions (1596 Obs, 57 Countries, 28 Years)

Variable	*Definition*	*Mean*	*Std. Dev.*	*Source*
Economic Growth	Annual GDP growth rate in the country (%)	4.391	5.441	WDI
Population Growth	Annual Population growth rate in the country (%)	2.276	1.490	WDI
Private Investment	Share of private investment in GDP (%)	15.420	8.585	PWT
Total Government Expenditure	Total expenditures done by government in a particular year as a percentage of GDP	27.576	14.680	GFS
Defense Expenditure	Shares of all military expenditures incurred by the government as a percentage of GDP	3.508	4.519	GFS
Education & Health Exp	Share of all government expenditures incurred on education and health as a percentage of GDP	5.684	5.019	GFS
Welfare Expenditure	The combined social security and Welfare expenditures along with the expenditures incurred by the government for the provision of housing facilities in the country.	4.828	4.894	GFS
Economic Expenditure	All government expenditures in the areas of agriculture, industry, mining, manufacturing and construction, transport and communication etc. as a percentage of GDP.	10.513	8.735	GFS
Free (Dummy)	When Freedom House Index (an index of political rights and civil liberties derived from universal declaration of human rights) is less than or equal to 3.	0.491	0.457	FH
War (Dummy)	When Hostility level (Highest action involved in any one of cross border disputes occurring in a particular year ranging From 1 to 5 with 5 being actual war) is 3 or greater.	0.240	0.427	COW
Political Instability	A dummy variable that turns on if the number of political assassinations and revolutions in the country in a particular year are at least 1.	0.223	0.416	Bank's
Unrest	A dummy variable that turns on if Guerrilla war or Riots occur in a country or government faces some sort of crises.	0.387	0.487	Bank's

WDI=World Development Indicators; PWT=Penn World Tables; GFS=Government Finance Statistics; FH=Freedom House; COW=Correlates of War Project, Banks=Arthur Bank's Data Set

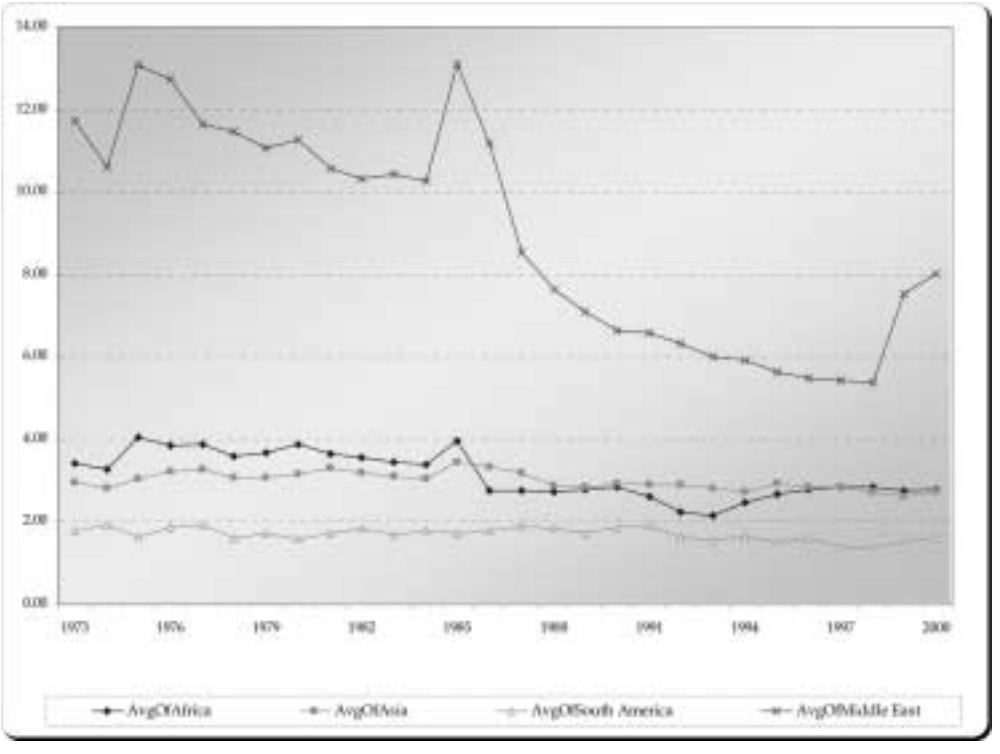

FIGURE 1 Mean military expenditure as a percentage of GDP (GFS 1973–2000)

RESULTS

Equation (5) provides the basic model for the analysis: the growth rate of GDP is regressed on growth rates of capital and labor, along with terms representing the productivity differentials and the externality effects for each government sector.[2] The IGLS technique for panel data has been used for estimation purposes with an assumption of independent and identically distributed errors across panels. The results of the basic model are shown in Table II, estimated separately for each region as well as together for the pooled sample. Table III adds a set of dummy variables to control for measures of external and internal unrest, as well as political freedom, to see whether these controls affect the estimated impacts of government spending on economic growth. Table IV re-estimates the basic model on the sub-sample of observations from countries that have democracy and political freedom (as measured by Freedom House), which proved to have somewhat different effects in my initial specification testing of the models.[3]

Table V presents the correlations between the different categories of government spending within each region. This is relevant for the issue of a 'peace dividend' arising from reductions in military spending, by seeing whether observations with lower military spending tend to have higher spending in other categories. I discuss the full range of results separately for each

[2] The productivity term for particular government expenditure is calculated by multiplying the percentage change in that expenditure over the year with its share in GDP. The externality effects are obtained by multiplying the expenditure's percentage change by consumption's share of GDP.

[3] Due to insufficient data points the Middle East was not included in this table.

TABLE II Baseline Models Across Regions (using IGLS) (Z-scores in parentheses)

	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*
Economic Growth	*(Africa)*	*(Middle East)*	*(Latin America)*	*(Asia)*	*(Pooled Data)*
Productivity					
Defense Sector	0.1044	**–0.168**	–0.170	0.668	–0.014
	(0.49)	(–2.89)	(–0.64)	(1.63)	(–0.27)
Education & Health	–0.0139	–0.104	0.135	–0.514	0.009
	(–0.15)	(–0.37)	(1.44)	(–1.12)	(0.17)
Welfare Sector	0.3449	–0.090	–0.019	0.260	–0.035
	(1.87)	(–0.65)	(–0.23)	(1.01)	(–0.61)
Economic Sector	0.0003	**0.343**	**0.321**	**0.544**	**0.294**
	(0.26)	(2.74)	(2.92)	(2.16)	(4.86)
Factor Inputs					
Population Growth	–0.1236	0.279	**0.951**	**0.616**	**0.583**
	(–0.39)	(1.61)	(4.52)	(2.27)	(5.10)
Private Investment	**0.0932**	–0.008	**0.213**	**0.122**	**0.124**
	(2.49)	(–0.23)	(6.23)	(5.66)	(8.52)
Externality					
Defense Sector	**0.0383**	**0.026**	0.004	–0.002	**0.003**
	(3.39)	(2.43)	(1.17)	(–0.26)	(4.18)
Education & Health	0.0013	0.003	0.000	0.025	0.0000
	(0.5)	(0.18)	(0.26)	(1.31)	(0.06)
Welfare Sector	–0.0024	**–0.019**	–0.000	–0.016	0.001
	(–0.81)	(–2.37)	(–0.01)	(–1.71)	(0.16)
Economic Sector	0.0116	–0.009	**0.017**	**–0.046**	**–0.009**
	(1.61)	(–0.87)	(2.0)	(–2.72)	(–4.85)
Constant	**2.8976**	**4.578**	**–1.71**	**1.88**	**0.979**
	(2.93)	(5.24)	(–2.21)	(2.72)	(2.53)
Technique:	IGLS for Panel	Data			
No. of Observations:	448	252	615	308	1596
Log Likelihood	–1371.662	–737.378	–1671.926	–781.142	0.129

region along with the context of military spending in that region, before turning to an overall discussion of the pooled results.

Africa

Seventeen African countries have been included in this study. The basic results (Model 1, Table II) show that greater private investment is associated with higher economic growth, while population growth is not. Model 1 also shows insignificant productivity effects for all types of government expenditure, suggesting that labor and capital inputs used in government sectors are similarly productive to those used in the private sector. Of the different types of government expenditure, only defense sector spending has a significant externality effect on the private sector, in this case positive. Interpreting the magnitude of the significant coefficients, we find that a 10% increase in private investment is predicted to increase the economic growth rate by about 1%. A 10% increase in defense sector spending is predicted to increase the economic growth rate by 0.3%.

TABLE III Including Measures of External and Internal Unrest (Z-scores in parentheses)

	Model 6	*Model 7*	*Model 8*	*Model 9*	*Model 10*
Economic Growth	*(Africa)*	*(Middle East)*	*(Latin America)*	*(Asia)*	*(Pooled Data)*
Productivity					
Defense Sector	0.1697	**−0.194**	−0.162	0.716	0.024
	(1.09)	(−3.73)	(−0.61)	(1.67)	(−0.47)
Education & Health	−0.029	−0.046	0.141	−0.423	0.015
	(−0.49)	(−0.18)	(1.48)	(−0.91)	(0.28)
Welfare Sector	0.2311	0.096	−0.019	0.222	0.034
	(1.47)	(0.76)	(−0.23)	(0.86)	(−0.59)
Economic Sector	0.0005	**0.319**	**0.302**	**0.579**	**0.290**
	(0.36)	(2.78)	(2.74)	(2.29)	(4.80)
Factor Inputs					
Population Growth	0.2243	**0.461**	**1.01**	**0.615**	**0.586**
	(0.94)	(2.68)	(4.87)	(2.21)	(5.04)
Private Investment	**0.0957**	−0.048	**0.214**	**0.117**	**0.125**
	(2.61)	(−0.97)	(6.36)	(5.26)	(8.54)
Externality					
Defense Sector	**0.0338**	**0.030**	0.004	−0.002	**0.003**
	(3.66)	(2.79)	(1.09)	(−0.33)	(4.12)
Education & Health	−0.0001	0.000	0.000	0.020	0.000
	(−0.02)	(0.05)	(0.44)	(1.03)	(0.18)
Welfare Sector	0.0001	**−0.019**	0.000	−0.014	0.001
	(0.02)	(−2.46)	(0.03)	(−1.48)	(0.44)
Economic Sector	0.0065	−0.011	**0.019**	**−0.050**	**−0.009**
	(1.07)	(−1.12)	(2.17)	(−2.97)	(−4.79)
Free	**0.9719**	1.02	0.032	−0.362	−0.110
	(2.12)	(0.99)	(0.08)	(−0.95)	(−0.50)
War	0.0968	**1.29**	**0.842**	−0.286	−0.223
	(0.2)	(3.5)	(2.16)	(−0.75)	(−0.03)
Political Instability	−0.8045	0.668	−0.106	−0.408	−0.334
	(−1.4)	(1.56)	(−0.28)	(−1.05)	(−1.43)
Unrest	**−1.5309**	−0.476	−0.242	0.737	0.139
	(−3.20)	(−1.05)	(−0.73)	(1.90)	(−1.68)
Constant	2.2016	3.494	−2.33	1.93	1.128
	(2.58)	(3.73)	(−2.48)	(2.09)	(2.66)
Technique	IGLS				
No. of Observations:	448	252	615	308	1596
Log Likelihood	−1319.566	−735.072	−1669.95	−778.972	−4494.714

Model 6 (Table III) adds indices of political instability and unrest to the basic model for Africa. As found in the basic model, private investment is significantly positively related to economic growth. The positive externality effects of the defense sector are the only significant effects for the various types of government spending. Some of the added control variables have large and significant effects. Having political unrest in a country decreases economic growth by 1.5%, while having democracy and political freedom increases economic growth by almost 1%.

Model 11 (Table IV) restricts the analysis to African countries having democracy and political freedom. For these countries, private sector investment continues to have a significant

TABLE IV Groups of Countries having Democracy and Political Freedom (Z-scores in parentheses)

	Model 11	*Model 12*	*Model 13*	*Model 14*
Economic Growth	*Africa*	*Latin America*	*Asia*	*Pooled Data*
Productivity				
Defense Sector	**0.893**	–0.171	–0.217	–0.016
	(2.02)	(–0.068)	(–0.3)	(–0.22)
Education & Health	–0.068	0.006	–154	–0.068
	(–0.51)	(0.06)	(–1.82)	(–0.90)
Welfare Sector	–0.04	–0.061	0.455	–0.058
	(–0.09)	(–0.72)	(1.07)	(–0.68)
Economic Sector	–0.047	0.376	0.517	0.035
	(–0.34)	(3.13)	(1.49)	(0.41)
Factor Inputs				
Population Growth	0.253	0.784	0.094	0.312
Private Investment	**0.232**	**0.08**	**0.103**	**0.114**
	(2.56)	(2.37)	(2.48)	(3.71)
Externality				
Defense Sector	0.009	0.006	0.002	0.002
	(0.50)	(1.62)	–0.28	(0.68)
Education & Health	0.039	**0.017**	**0.098**	**0.031**
	(1.90)	(2.2)	(–2.2)	(3.36)
Welfare Sector	–0.012	–0.006	–0.016	–0.001
	(–0.8)	(–1.14)	(–1.12)	(–0.18)
Economic Sector	0.033	0.01	–0.038	**0.025**
	(–1.92)	(1.16)	(–1.48)	(2.96)
Constant	1.38	0.962	2.92	1.65
	(0.79)	(1.27)	(2.79)	(2.36)
Technique	IGLS			
No. of Observations:	127	412	150	718
Log likelihood	–366.411	–1162.117	–384.985	–1980.912

positive impact on economic growth – in fact, its impact is twice as large as in Model 1. In this case, defense sector spending has a direct positive productivity effect on growth (rather than the externality effect found in earlier models). One issue for estimating these models is the possibility that the underlying relationship between growth and public investment could be non-linear.[4] Devarajan and Vinaya (1997) among others estimated such non-linear relationships and found public investment to be too high in Africa.

The overall results for Africa indicate that investment has led to greater growth; but of the four types of government spending only defense spending has had a consistently significant positive impact on economic growth. The correlations across different categories of government expenditures presented in Table V do not show any evidence of negative correlations between different types of government expenditures. Instead, various government expenditures were found to move more or less in the same directions in the region. This suggests that reducing military spending is not likely to raise other categories of spending.

[4] The augmented component plus residual plots obtained from simple regression models showed that some evidence of non-linearity, but did not greatly change the overall results, so it seemed inadvisable to further complicate the model (results available from author).

TABLE V Correlation among Government Expenditure Categories Different Regions and Pooled Data (Expenditures measured as a percentage of GDP)

Africa	*Total*	*Defense*	*E & H*	*Welfare*	*Eco*	*Latin America*	*Total*	*Defense*	*E & H*	*Welfare*	*Eco*
Total	1					Total	1				
Defense	0.23	1				Defense	0.31	1			
E & H	0.49	0.28	1			E & H	0.13	0.01	1		
Welfare	0.46	0.12	0.33	1		Welfare	0.56	0.15	0.24	1	
Economic	0.58	0.34	0.63	0.47	1	Economic	0.71	0.19	0.00	0.39	1
Middle East	Total	Defense	E & H	Welfare	Eco	Asia	Total	Defense	E & H	Welfare	Eco
Total	z1					Total	1				
Defense	0.74	1				Defense	–0.04	1			
E & H	0.66	0.38	1			E & H	0.59	–0.21	1		
Welfare	0.63	0.29	0.76	1		Welfare	0.55	0.10	–0.05	1	
Economic	0.50	0.43	0.09	0.07	1	Economic	0.61	–0.27	0.22	0.34	1
Pooled Data	Total	Defense	E & H	Welfare	Eco						
Total	1										
Defense	0.43	1									
E & H	0.29	0.09	1								
Welfare	0.48	0.12	0.27	1							
Economic	0.62	0.22	0.19	0.29	1						

Middle East

Ten Middle Eastern countries have been chosen for this study. While military spending has declined in the recent past, the amount of arms and military expenditures in the societies and economies of the Arabian Peninsula is still much larger than any other area of the world. With the exception of Kuwait (where military expenditures measured in current dollars in 1995 exceeded that of 1985), military expenditure as a percentage of GDP is down across the region in the past decade (Sadowski, 1992).

Model 2 (Table II) shows that neither population growth nor investment has produced significantly greater economic growth. Of the government sectors, the productivity effect of the defense sector has been significantly negative, while government economic spending has a positive productivity impact on the economy. Considering the coefficient magnitudes, a 10% rise in defense spending could reduce the overall economic growth rate by 1.7%, while a 10% rise in economic spending could increase economic growth by 3.4%. The externality effect of the defense sector has been positive, while a negative externality impact is associated with welfare spending. The latter effect may be explained to some extent by the political economy of the region, where Arab states have been unable to cut welfare spending despite the falling oil revenues in the 1980s, possibly generating an unfavorable influence on overall growth rate.

Model 7 (Table III) attempts to include measures of internal and external instability in the basic Middle Eastern model. Of the control variables, only war turned out to be significant, and this was (surprisingly) positively related to growth. This might be due to the presence of Israel in the sample, a country that has had a high economic growth rate in spite of the long-standing Arab–Israel conflict. The results for the government sector variables are similar to those from Model 2, although we now have a significantly positive coefficient for population growth. There is no Middle East regression in Table IV, since there are too few observations in the region of countries that are free and democratic.

The correlation matrix in Table V for different kinds of government spending provided no evidence of direct trade-offs between guns and butter in Middle East for this time period.

Defense spending, however, has been found to be significantly negatively related to growth in the region. The ratio of social to defense spending for Middle Eastern countries has been quite low compared with developed countries (perhaps because of the unusually high defense spending).

Government economic sector expenditures appear to have a significantly positive impact on growth. This is in accord with some recent studies done on growth and fiscal imbalances, where researchers have asserted that the quality of public expenditures could be enhanced in the Middle East through increased outlays on human resource development as well as through limiting investment to infrastructure and capital stock that enters the production function of the private sector (Hakura, 2004). Moreover, it has been repeatedly suggested that unproductive expenditures, including defense spending, should be reduced so that the region can look forward to reinvigorated and sustained growth with a better opportunity to benefit from changes in the international economy.

Latin America and Europe

As a result of the transition to democratic rule in the majority of Latin American countries, the defense burden has been declining over the past two decades while social sector spending has been increasing steadily, as described in Scheetz (2002) and Marwah and Klein (2002). A total of 22 Latin American and European Countries had been chosen for this study. I decided to merge European countries with the Latin American countries, partly for sample size considerations, although the merger could be justified on the grounds that almost all countries in the sample fall in the same income group (middle income countries based on World Bank categories). Moreover, an F test was conducted to check for differences in the regressions between Latin America and Europe, finding no significant differences.

Model 3 (Table II) provides the basic model for the combined sample. Both the population growth rate and private investment rate have shown positively significant effects on economic growth in this sample. Economic sector spending has both a significantly positive productivity effect (indicating inputs are more productive there than in the private sector) and a significantly positive externality effect on private sector output. Comparing coefficient magnitudes, a 10% increase in economic spending is associated with an increase of 3.4% in economic growth; while a 10% increase in investment raises economic growth by 2.3%.

Model 8 (Table III) highlights the effects of including controls for political instability, unrest and freedom. War turns out to be (surprisingly) positively related to growth in this region. The indices of internal political instability are insignificant in this region. Model 12 (Table IV) shows that, among Latin American and European countries having democracy and political freedom, education and health spending have a positive externality impact on growth. Among all government expenditures for the politically free and democratic sample of Latin American and European countries, only economic sector spending has a consistently positive and significant impact on economic growth. Private investment also has a strong impact on GDP growth in these economies.

Table V shows the correlation matrix for various categories of government expenditures for Latin America and Europe. No evidence of any negative correlation is found among various categories of government spending.

Asia

While world arms imports fell by 33% in real terms between 1982 and 1990, Asian arms imports rose by 40%. Asian countries took 33% of all arms imports in 1990 compared with 15.5% in 1982 and six Asian countries were included in the top 15 arms importers between

1988 and 1992 with India being the largest importer worldwide (SIPRI 1993). The financial crises that began in the second half of 1997 affected a number of countries – particularly Indonesia, South Korea, Malaysia, and Thailand and, to some extent, the Philippines, with side effects on Japan, Singapore and Taiwan. Some military budgets adopted for 1997 were cut as a result (Harris, 2002). Based on the availability of government finance statistics, 11 Asian countries from all over the continent were selected for this study.

Model 4 (Table II) shows the results of basic runs for Asia. Both population growth and private sector investment are significantly positively related to growth in Asia. Among the government spending categories, only economic sector expenditures are significant, with a positive productivity effect and a negative externality effect. Model 9 (Table III) shows that adding controls for external and internal unrest have little impact on the results, and those control variables are not significant.

Model 13 (Table IV), restricting the analysis to politically free and democratic countries in Asia, shows very different results – investment is still positively related to growth, but the only significant effects of government spending is a positive externality effect for the education and health sector. Examples are India and Sri Lanka, who have shown amazing development in the areas of education and health over the past three decades (Grobar, 1992). When a comparison was made between South Asia and Far Eastern countries, it was found that the productivity impact of economic sector spending is higher in East Asia, about 18–19% higher then Asia as a whole and 13% higher then South Asia. The impact of private investment has also been the strongest in this region.

In terms of a 'peace dividend', Table V shows a negative correlation between defense spending and education and health spending, indicating the possibility of some trade-off between these two categories of expenditures in Asia.

Pooled Data

We now turn to an analysis of the entire dataset, combining all the different regions. Model 5 (Table II) shows the results of basic runs for the full sample. Population growth and private investment are significantly positive in this model. The economic sector has a positive productivity impact on economic growth, although it also has a negative externality effect. In addition, the defense sector has a positive externality impact on growth. Measures of internal and external unrest are not found to be significantly related to economic growth for the full sample (Model 10, Table III), and including the unrest variables does not affect the significant variables from Model 5. Model 14 (Table IV) restricts the sample to democratic and free countries, confirming the presence of positively significant effects of private investment on growth. The significant effects of government spending on growth are seen in the positive externality effects of education and health spending as well as in the positive externality impact generated by economic sector spending. The correlation matrix for various categories of spending in pooled data (Table V) indicates a low positive correlation between defense and social sector expenditures.

CONCLUSIONS AND POLICY IMPLICATIONS

The purpose of this paper was to quantify the so-called 'peace dividend' in case of developing countries, by measuring the externality and productivity differentials of defense spending and other forms of government spending and their correlation with growth. The estimation of magnitudes and comparison between differentials, makes possible the empirical investigation of any long-term potential trade-offs and their impact on growth. The exercise is expected to

help assess the opportunity cost of defense spending in developing countries, focusing mainly in terms of alternative types of government spending. The paper seeks to address two questions that have been asked a number of times in the last three decades by economists and political scientists: is defense spending significantly related to economic growth in developing economies, and how likely is a 'peace dividend' to be realized from a fall in military expenditures? Data on 59 developing economies for the period 1972–2000 were used to test a variant of a model from Ram (1986), disaggregated to allow different productivity and externality effects for each type of government spending.

The correlations across different types of government spending (shown in Table V) for different regions provide little evidence of any serious trade-off between defense spending and other forms of government spending in the countries included. This implies that cut-backs in defense spending might not enhance funding for other public programs in developing countries.

When countries and regions were analyzed separately based on their geographic locations, different results were obtained for different regions. Regression results for the African region indicate that the defense sector through its spill-over contribution has contributed to achieving a higher growth rate in the region. In addition, private investment seems to have a positive impact on growth in the majority of African countries. The coefficients for productivity as well as externality effects of education and health spending are close to zero in almost all cases.

The overall analysis for the Middle East shows that, in the majority of the countries and time periods, social sector spending did not appear to have any significant correlation with the overall growth rate of the countries. Defense sector spending on the other hand is significantly negatively related to growth for the complete sample. Furthermore, the productivity of the economic sector is found to have a significant positive correlation with economic growth in the Middle East. Moreover, the defense sector's overall externality impact has been positively related to growth for the region as a whole. Welfare spending has been negatively related to growth, indicating that it has in fact contributed to slowing down the rate of growth in the Middle East. Education and health expenditure also appear to be unproductive in this regard.

The regression analysis for Latin American and European countries showed that defense spending does not have any significant productivity effect on economic growth in these regions. The same is true for Asian countries where the productivity of defense spending has had no significant relationship with growth, except in the form of certain spill-over effects that it generates in some countries. Only in highly unstable political environments does defense spending have some positive externality impact. Among other government sectors, the productivity and externality impact of economic sector spending was positive and significant for the majority of the countries and situations in Latin America, Europe and Asia. In addition, private investment has a clearly superior impact on GDP growth rate in almost every country included in this study, irrespective of the time period and form of government.

The regional analysis of the sample also shows that, in the majority of the countries and time periods, the productivity of the defense sector is not significantly related to growth. There is some evidence of an 'externality' effect of defense spending, with higher defense spending increasing the productivity of inputs in the private sector. Among all categories of government spending, only economic sector expenditures have a positive correlation with economic growth in the majority of the countries included. Social sector spending has a positive impact on growth only in developing countries that have a democratic form of government as well as political stability. The results are somewhat inconsistent with Malcolm Knight's earlier study on the subject. The difference in results might be due to the use of different models and methodology in the estimation.

One possible policy prescription is that efforts should be made to increase the spill-over impacts of the defense sector in developing countries through the establishment of defense-based industries having linkages with the civilian sector. In addition, the defense sector could

be encouraged to play a role in the development of the social sector through provision of education and health facilities in peacetime, as well as constructing urban and rural roads and improving decaying social infrastructure. Hence, the military could effectively contribute in many other sectors of the economy depending on the available facilities in each country.

The analysis also suggests that governments should spend more on economic development activities. Private investment should also be encouraged by governments at all levels since it is found to be significantly positively related to growth in all countries and time periods. If (as these results suggest), social sector spending is most efficient in democratic and politically free economies, efforts should be made to create such environments to allow investments to be utilized most efficiently to enhance economic growth in these developing countries.

References

Aizenman, J. and Glick, R. (2003) Military expenditure, threats and growth. NBER Working Paper 9618.

Banks, A. S: (2001) *Cross National Time-Series Data Archive*, Binghamton, NY: Databanks International [producer and distributor].

Benoit, E. (1973) *Defense and Economic Growth in Developing Countries.* Lexington, MA: D.C. Health

Benoit, E. (1978) Growth and defense in developing countries. *Economic Development and Cultural Change* **26**(2) 271–280.

Biswas, B. and Ram, R. (1986) *Military Expenditure and Economic Growth in Lesser-Developed Countries: An Augmented Model and Further Evidence.* University of Chicago Press.

Chan, S. (1992) *Defense, Welfare and Growth*, edited by S. Chan and A. Mintz (London: Routledge and Kegan Paul).

Chan, S. (1995) Grasping the peace dividend: some propositions on the conversion of swords into plowshares. *Mershon International Studies Review* **39**(1) 53–95.

Deger, S. (1986) *Military Expenditure in Third World Countries: The Economic Effects*, London: Routledge & Kegan Paul.

Deger, S. and Somnath, S. (1995) Military Expenditure and Developing Countries. In *The Handbook of Defense Economics*, edition 1, volume 1, edited by K. Hartley and T. Sandler. Amsterdam: Elsevier & Science B. V.

Devarajan, S. and Vinaya, S. (1997) *What do Governments Buy? The Composition of Public Expenditure and Economic Performance.* World Bank.

Dunne, J. P. and Smith, R. (2005) Models of military expenditure and growth: a critical review. *Defence and Peace Economics* **16**(6) 449–461.

Feder, G. (1982) On exports and economic growth. *Journal of Development Economics* **12.**

Harris, G. (2002) *Military Expenditure and Economic Development in Asia during the 1990s in Arming the South*, New York: Palgrave.

Grobar, L. M. (1992) Country survey: Sri Lanka. *Defense Economics* **3** 135–146.

Hakura, S. D. (2004) Growth in Middle East and North Africa. IMF Working Paper.

Hollenhorst, J. and Ault, G. (1971) An alternative answer to: 'who pays for defense?' *American Political Science Review* **65** 760–763.

Huang, C. and Mintz, A. (1991) Defense expenditures and economic growth: The externality effect. *Defense Economics* **3** 35–40.

Knight, M., Loayza, N. and Villanueva, D. (1996) The peace dividend: military spending cuts and economic growth. *IMF Staff Papers* **43** 1–44.

Lotz, J. R. (1970) Patterns of government spending in developing countries. *Manchester School of Economics and Social Studies* **38**(2) 119–144.

Marwah, K., Klein, L. R. (2002) *The Military Civilian Trade-Off in Guatemala: An Econometric Analysis. Arming the South*, London: Palgrave.

Mintz, A. (1989) Guns versus butter: a disaggregated analysis. *American Political Science Review* **83**(4) 1285–1293.

Mintz, A. and Huang, C. (1990) Defense expenditures, economic growth and the 'peace dividend'. *The American Political Science Review* **84**(4) 1283–1293.

Mintz, A. and Huang, C. (1991) Guns vs Butter: the indirect link. *American Journal of Political Science* **35**(3) 738–757.

Ram, R. (1986) Government size and economic growth: a new framework and some evidence from cross-section and time-series data. *The American Economic Review* **76**(1) 191–203.

Russett, B. M. (1969) Who pays for defense, *The American Political Science Review* **63**(2) 412–426.

Russett, B. M. (1970) *What Price Vigilance? The Burdens of National Defense*, New Haven, Yale University Press.

Russett, B. M. (1982) Defense spending and national well being. *America Political Science Review* **76** 767–777.

Sadowski, Y. (1992) Scuds vs butter: the political economy of arms control in the Arab world. *Middle Eastern Report*-July–Aug 2–13

Scheetz, T. (2002) *Military Expenditure and Development in Latin America. Arming The South*, London: Palgrave.

SIPRI Year Books (1980–2000) Stockholm International Peace Research Institute.

Ward, M. and Davis, D. (1992) Sizing up the peace dividend: economic growth and military spending in United States, 1948–1996. *The American Political Science Review* **86** 748–747.