MILITARY EXPENDITURE AND DEBT IN SMALL INDUSTRIALISED ECONOMIES: A PANEL ANALYSIS*

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Abstract

This paper considers impact of military spending on debt in a panel of 11 small industrialising economies using panel data methods. It provides estimates for fixed effects and random effects models and then moves on to consider dynamic models. The dynamics are found to be important and the results suggest that military burden does indeed have a positive impact on the share of external debt in GDP**.**

Keywords: Military spending; external debt; panel data.

JEL Codes: H56; C33.

INTRODUCTION

Evaluating the economic effects of military spending continues to be an important and productive area of research. While researchers have recognised and studied many possible channels by which military spending can influence the economy, one channel that has had little attention has been the impact of military spending on the indebtedness of an economy, the most important component of which will be external debt. This can be a particularly important problem for developing countries with relatively weak economies and unlike other effects of military expenditure, that tend to be through the crowding out of technical resources, it can be a problem even for countries where military spending is relatively labour intensive. Brzoska (1983) made one of the first attempts to identify the importance of military spending for developing country debt, finding that for many indebted developing countries it was a major component of government spending. A limited literature including Looney (1987, 1989, 1998) has attempted to investigate this potential effect, focussing on how military expenditures can affect the external debt of developing countries.

This paper makes a further contribution to the literature. It considers impact of military spending on debt in a panel of small industrialising economies using panel data methods. The next section discusses public deficits and development, followed by a discussion of the relation between military spending and debt in section 3. The data and sample to be used in this study are then outlined and section 5 discusses the available estimation methods. Section 6 then presents some results using panel data models on the sample of countries. Finally, some conclusions are presented in section 7.

DEBT, DEFICITS AND DEVELOPMENT

Debt and deficits are important issues in developing and industrializing economies. When a government cannot cover its expenditures by its revenues it has four ways to finance the resulting deficit: printing money, using foreign exchange reserves, borrowing abroad and

borrowing domestically. Although interrelated, it is possible to identify different macroeconomic balances with different methods of deficit financing: printing money and inflation; foreign reserve use with the onset of exchange crises; foreign borrowing with external debt crisis; and domestic borrowing with higher interest rates (and possibly, explosive debt dynamics as borrowing leads to higher interest rates charges on the debt and a larger deficit) (Fischer and Easterly, 1990).

High public sector deficits relative to GDP potentially create a need for foreign borrowing and external debt accumulation, particularly when the means to finance deficits domestically is limited. Hence, there is likely to be a relatively close relation between the deficits and foreign borrowing in developing countries, where the potential to use tax revenues to finance public expenditures is limited, where the creation of money has already been (mis)used considerably, where financial markets are relatively thin and domestic borrowing possibilities are relatively limited. As Fry (1997) observes, the typical OECD country finances about 50 percent of its deficit from voluntarily domestic sources, while the same ratio for a typical developing country is only about 8 percent.

On the other hand, the dangers of excessive reliance on external borrowing to finance budget deficits (and of large budget deficits per se), are illustrated by the experience of debt crises (Fischer and Easterly, 1990). In the late 1970s and early 1980s, and later in the 1990s, most of the countries that witnessed debt-servicing difficulties were running huge public deficits. This led to a foreign debt crisis generally being seen as the mirror image of a fiscal crisis, as most of the external borrowing is usually undertaken by governments (Sachs and Larrain, 1993).

The impact of excessive foreign debt accumulation on developing economies have been investigated in the literature (see for example Doroodian, 1985; Brooks *et al*, 1998; Milman, 1998; Patillo *et al*, 2002). Some internal and external factors that are identified in effecting growth are a deterioration in terms of trade, a slow-down of economic activity in the industrialised countries, a sharp increase in the availability of foreign sources (initially), poor domestic economic policies, an overvaluation of domestic

currency, and debt mismanagement. One of the most important issues is the debt-growth relationship. The typical foreign debt crisis is seen to be accompanied by slower or even negative economic growth and accelerating inflation (Fry, 1997).

This is not to suggest that foreign borrowing inevitably damages growth. Countries with limited stocks of capital at the early stages of development are also likely to provide investment opportunities, with rates of return higher than those in advanced economies (Pattillo et al, 2002). Reasonable levels of borrowing by such countries are likely to enhance their economic growth through productive investments, which will in turn allow for timely debt repayments. However, 'debt overhang' theories suggest that large accumulated debt stocks may become an obstacle to growth, as they can discourage further domestic and foreign investment. Pattillo *et al.* (2002) use the debt 'Laffer curve' to illustrate those positive and negative impacts of debt. They suggest that on the upward-sloping or 'good' section of the curve, increases in the face value of debt are associated with increases in expected debt repayment, while increases in debt reduce expected debt repayment on the downward-sloping or 'bad' section of the curve. In their analysis they also considered the crowding-out effects that may arise from resources being spent on debt servicing instead of investment or other growth enhancing domestic spending. In addition, when debt accumulation follows a Ponzi scheme, that is that failing to pay off debt leads to the need for extra borrowing and increasing interest payments, then the total amount of debt can spiral out of control.

Clearly in evaluating the impact of debt on growth, it is important to consider how the external debt is used, in particular whether it used to increase productive capacity. Research has, however, suggested that a high percentage of the money borrowed abroad is not used productively (Dornbusch, 1987). One obvious and potentially important unproductive use is military expenditure, to which we now turn.

MILITARY SPENDING AND DEBT

While there is an extensive literature on the economic effects of military expenditure on developed and developing economies, there is little in the way of consensus. The different theoretical perspectives that underpin the empirical work disagree in the manner in which the economy is affected by growth in military spending and in their interpretation of the results. One can argue that the overall results tend to show an insignificant or negative impact of military spending on economic growth in developing countries and a clearer negative impact in developed economies, through military spending being at the expense of investment rather than consumption. This does, however, hide a diversity of literature and results. Many of the earlier cross-section analyses have found sample selection to be important and this led to calls for more case studies. Time series analyses of individual economies and groups of economies have improved understanding, but also produced a variety of results (Dunne, 1996). This suggests that working between these extremes, using cross-country studies of groups of similar economies with relatively long time series may be of value. This paper takes this approach, focusing upon a sample of small industrialising economies.

Some authors, starting with Brzoska (1983), have pointed to military expenditure as being an important variable in explaining the rise of foreign debt in a number of developing countries, suggesting that this has led to reduced economic growth. The relationship between military expenditures and external debt can be of two forms. First, as a budget item, military expenditure creates the need for funding. If, as discussed above, the domestic sources are not enough, one alternative is to borrow externally. More directly, a component of military spending will be allocated to pay for arms imports, which will create a need for foreign exchange. If the economy lacks foreign exchange, it will need to obtain it from external sources, mainly by borrowing. It is also possible that depreciations in currency can lead to increases in foreign exchange requirements over the life of a project (as happened in the recent South African arms deal discussed in Dunne (2003))

Following Brzoska (1983), Looney and Frederiksen (1986) suggest that high external borrowing due to defence will only have a negative effect on a country's overall growth performance if it faces constraints on international borrowing. As Looney (1989) argues, weapons purchased with scarce foreign exchange reduce the resources available for the import of intermediate and investment goods essential for self-sustaining growth. In their empirical analysis Looney and Frederiksen (1986) categorise developing countries as resource constrained and unconstrained, using discriminant and factor analysis, suggesting that the unconstrained group are able to support higher level of arms imports. Looney (1989) investigated how military expenditures and arms imports affect debt, using models, for the determinants of military expenditure, public external debt) and arms imports and running Two Stage Least Squares regressions for the whole sample, resource-constrained countries and unconstrained countries. He found arms imports to be a significant contributory factor to Third World indebtedness. More recently, Senesen and Sezgin (2002) considered the relation between debt and military expenditure in Turkey. They found that although the growth in military spending did not seem to have a positive effect on external debt, the growth of arms imports did.

SAMPLE AND DATA

For this study, data on small industrialising economies for the period 1960-2000 was taken from the World Bank Economic Indicators CD ROM, with the corresponding military burden and arms import data taken from SIPRI. The size of the sample was restricted to 11 countries by the lack of data for external debt. In addition, data was not available for the whole period for all of the countries, giving us an unbalanced panel. Table 1 gives information on the population, GNP per capita and military burden of each country.

<Table 1 here>

ESTIMATION METHODS

One major problem in the estimation of any relation between military spending and growth is the lack of variation in the military spending data relative to other economic indicators. The end of the Cold War has improved things as it has given us some years of marked changes in military spending around the world, adding to the variance of the data and making the identification of any relation with other economic aggregates easier. One way of overcoming this lack of independent exogenous variation in the data has been by pooling cross section and time series data for a relatively homogenous group of countries (Murdoch et al, 1997). There is a potential problem that the cross section and time series parameter may be measuring different thing, the former the long run and the latter the short run effects, which would mean the pooled relation is then a weighted average of the two. Panel data methods provide a variety of approaches to attempt to deal with some of these issues, with pooling the simplest form and fixed effect and random coefficient estimators providing more flexible approaches.

The pooled OLS model estimates:

$$y_{jt} = \alpha + \beta\, x_{jt} + u_{jt} \qquad (1)$$

and assumes all parameters are the same for each country. The fixed effects estimator allows the intercept to differ across countries

$$y_{jt} = \alpha_j + \beta\, x_{jt} + u_{jt} \qquad (2)$$

which ignores all information in the cross sectional relation. Time fixed effects can also be allowed for separately or together in a two way fixed effect model:

$$y_{jt} = \alpha_t + \alpha_j + \beta\, x_{jt} + u_{jt} \qquad (3)$$

With the relatively long time series available it has become possible to introduce dynamics to the panel data models. In dynamic models of the form:

$$y_{jt} = \alpha_j + \beta\, x_{jt} + \lambda\, y_{jt-1} + u_{jt} \qquad (4)$$

the fixed effect estimator is not consistent as N, the number of groups, goes to infinity for fixed T because of lagged dependent variable bias, which biases λ downwards. It is, however, consistent as T goes to infinity. For samples where T is large, as it is the bias is small, but if the parameters differ over the groups then there is a further heterogeneity

bias. When T is large this bias can be avoided by estimating each equation individually and then taking the weighted or unweighted average of the individual estimates. A common weighted average is the random coefficient model (RCM), discussed in Pesaran and Smith (1995).

An alternative approach to dealing with the dynamics is to use the method developed in the context of samples with small numbers of time series observations. This takes the estimation equation and differences it to transform out the country specific effects and then allows a dynamic specification in differences, with a lagged dependent variable. As the differencing induces a bias in the coefficient on the lagged dependent variable, because of the correlation between it and the unobserved fixed effects in the residual, an instrumental variable method must be adopted. The Arellano and Bond (1991) generalised method of moments (GMM) technique uses lags of the endogenous variables t-2 and earlier as instruments to give unbiased and consistent estimates of the coefficients. This requires that the differenced equation does not exhibit second and higher order autocorrelation.

In this study we do have a reasonable number of observations but the unbalanced nature of the panel prevents us from using the random coefficient model. So the approach taken is to initially estimate a static fixed effects model, move to introduce a lagged dependent variable and then use the Arellano and Bond GMM estimator to take account of the dynamics.

ESTIMATION RESULTS

There is little guidance in the literature as to how one might model the determination of external debt. Using Looney (1989) and Senesen and Sezgin (2002) as pointers, we take a simple model in which the share of external debt is a function of military burden (MB) economic growth and the share of exports in GDP and this gives the results in Table 2.
<Table 2 here>

The variables are:

ETDBS =	External debt as a share of GDP
GY95=	growth of GDP constant US $ 1995
MB=	Military burden: milex as a share of GDP
RESDS=	Net international reserves as a share of GDP
FINAS=	Financing from abroad as a share of GDP
ITE=	Interest payments as a % of GDP
GDY=	Central government as a % of GDP
TAXS=	Tax revenue as a share of GDP
TDSY=	Total debt service as a % GNI
TDSDS=	Total debt service as a share of GDP
AIS=	Arms imports (1990) prices as a share of GDP (1995 prices
XDS=	Total exports of goods and services as a share of GDP

The dependent variable is external debt as a share of GDP. Clearly this will include both public and private debts, but in small industrializing economies it seems reasonable to assume that debt related to the import of arms and arms components will be very important. Alami (2002) shows this for the Arab countries in a recent contribution. The dependent variables include economic growth and exports to account for the fact that faster growing and exporting countries are more likely to need to spend by borrowing abroad, but if they do need to borrow are more likely to be able to repay. They are likely to be considered a good risk. We would expect growth to have a positive effect on external debt, but exports are a bit more difficult to call. We might expect a negative sign, but it is also possible that increases in exports lead to increased imports of capital and so lead to the positive effect we observe in the static model. Interestingly, when we introduce a lagged dependent variable the coefficient on exports becomes insignificant.

There is a wider issue of the stage of development of the economies as, although the share of military expenditures does not necessarily depend on the level of development of the countries, the more developed the economy the easier it is likely to be to fund spending. For example, international reserves can be important for arms imports and the less developed the economy the more likely that it will have to use foreign borrowing. Using panel data methods should allow such factors to be picked up as fixed effects.

The results suggest that military burden has a positive effect on the share of debt in GDP when we allow for dynamic effects within the model. The other variables are much as one would expect. The random effects model results are presented in Table 3 give similar results.

<Table 3 here>

Overall, these results suggest that when time series and cross section data are brought together and country specific effect are allowed for, as well as dynamics (in a very simple way) that military spending has a positive impact on the share of debt, as does the level of reserves and exports. Growth as expected has a negative impact.

The Arellano-Bond GMM estimates from the routine in Stata 7 are presented in Table 4.

<Table 4 here>

This method uses a two stage procedure, the first stage for inference on the coefficients, the z statistics and the second for inference on the model specification, namely the Sargan test on instruments and first and second order autocorrelation tests. The second step estimates of the coefficient standard error tend to be biased in relatively small samples. The results are generally consistent with the other dynamic results, providing further evidence that military burden tends to have a positive impact on external debt.

CONCLUSIONS

This paper has provided a contribution to the debate on the economic effects of military spending on debt, focusing upon a sample of small industrialising economies and using panel data techniques. The large changes in military spending in the post Cold War period have increased the variation in the data making it more likely that empirical analyses would be able to distinguish any underlying macroeconomic relationship from noise. Combining this with panel data methods gives us the best chance of identifying any empirical relation between military burden and debt. Static and dynamic fixed effects

and random effects models were estimated. The dynamics were found to be important and gave the result that military burden does indeed have a positive impact on the share of external debt in GDP. Using a more satisfactory approach to dynamic panel data models, the Arellano-Bond GMM technique, provided estimates that were consistent with this finding.

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Table 1: Sample Characteristics 1998

Country	Population Millions	GNP per capita $1998	Rank	Defence %GNP 1997
Chile	14.8	4990	66	3.9
Brazil	165.9	4630	68	1.8
Argentina	36.1	8030	55	1.2
Venezuela	23.2	3530	81	2.2
South Africa	41.4	3310	83	1.8
Malaysia	22.2	3670	78	2.2
Philippines	75.2	1050	132	1.5
India	979.7	440	161	2.8
Pakistan	131.6	470	158	5.7
S. Korea	46.4	8600	51	3.4
Turkey	63.0	3160	85	3.3

Source: World Development Indicators 2000

Table 2: Fixed Effects Estimation Results

Dependent variable is EDBTDS

	Coeff	T ratio	Coeff	T ratio	Coeff	T ratio	Coeff	T ratio
MB	0.011	1.5	0.017	4.4	0.012	1.6	0.018	5.2
RESDS	-0.948	-3.8	0.106	0.8	0.466	2.2	0.234	2.6
GY95	-0.680	-3.3	-0.808	-7.8	-1.012	-4.6	-0.786	-8.3
XDS	0.721	5.8	0.071	1.1				
EDBTDS1			0.829	28.3			0.861	36.2
CONST	0.305	6.6	0.028	1.1	0.354	9.5	0.018	1.0
N	280		276		317		306	
Countries	11		11		11		11	
Min obs	7		6		7		6	
Max obs	31		30		31		30	
Av obs	25.5		25.1		28.8		27.8	
Rsq within	0.17		0.80		0.08		0.83	
Rsq	0.08		0.87		0.12		0.88	

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Table 3: Random Effects GLS regression Results

Dependent variable is EDBTDS

	Coeff	T ratio	Coeff	T ratio	Coeff	T ratio	Coeff	T ratio
MB	0.014	1.9	0.010	5.0	0.011	1.5	0.011	4.8
RESDS	0.50	2.6	0.142	2.6	-0.870	-3.5	0.129	1.4
GY95	-1.02	-4.7	-0.800	-8.9	-0.710	-3.4	-0.878	-9.0
XDS					0.670	5.7	0.012	0.3
EDBTDS1			0.889	44.8			0.888	41.6
CONST	0.34	6.53	0.040	3.4	0.299	4.8	0.040	3.1
N	317		306		280		276	
Countries	11		11		11		11	
Min obs	7		6		7		6	
Max obs	31		30		31		30	
Av obs	28.8		27.8		25.5		25.1	
Rsq within	0.08		0.83		0.17		0.79	
Rsq	0.12		0.88		0.08		0.88	

Table 4: Dynamic Panel GMM Estimates

Dependent variable is first difference of EDBTDS

	Coeff Step 2	Z Step 1	P
EDBTDS: LD	0.734	26.1	0.0
MB: D1	0.019	4.6	0.0
RESDS: D1	-0.016	0.5	0.6
GY95: D1	-0.070	-7.9	0.0
XDS: D1	-0.133	1.1	0.3
CONST	0.004	1.0	0.3
N	265		
Countries	11		
Min obs	5		
Max obs	29		
Av obs	25.1		
Sargan step2	7.13	P=1	
AR(1)	-1.45	P=0.95	
AR(2)	0.09	P=0.93	