The Demand for Military Spending in Developing Countries

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Abstract

Numerous studies have estimated demand for military expenditure in terms of economic, political and strategic variables. Ten years after the end of the Cold War, this paper attempts to ascertain if the new strategic environment has changed the pattern of determinants, by estimating cross-country demand functions for developing countries for periods during and just after the Cold War. The results suggest that for both periods military burden depended on neighbours' military spending and internal and external conflict. Democracy and population both relate negatively to military burden. There is little evidence of a change in the underlying relationship between the periods.

Keywords: Military Spending, Developing Countries, Demand.

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1. Introduction

There is a diverse applied literature on the determinants of military spending in developing countries. It has attempted to identify the strategic and economic factors that influence the evolution of military burden, using both cross-country and detailed time series case analyses. With the end of the Cold War there has been a clear change in the strategic environment that one would expect to have influenced the determinants of military spending across countries. From a situation of two rival superpower blocks, each inclined to fight proxy conflicts through developing world client states, there is a global US hegemony, selectively used to impose 'solutions' on conflicts in weaker states. Ideological wars have largely been replaced by conflicts over resources. The number of external conflicts has greatly diminished, while civil wars have proliferated, fuelled but by ethnicity, religion and control of resources (e.g. Collier and Hoeffler, 1998).

Now that we have a reasonable number of years since the end of the superpower conflict it is possible to revisit the debate, to identify the post Cold War determinants and to compare them with the post Cold War period. This paper undertakes such an analysis. It is an attempt to evaluate the driving forces behind military spending in developing countries, comparing a period during the Cold War with the period afterwards. The sample of countries covers a wide range economically and in terms of security. It includes peaceful, low-middle income island nations with no discernible security threats, oil-rich states facing numerous long-running wars and rivalries, and impoverished sub-Saharan African nations racked by civil war and internal instability

The next section reviews the different approaches to analysing the demand for military spending in the literature, with section 3 presenting the sample used and the data sources. Section 4 then develops the empirical model used in the analysis and section 5 presents the results. Finally, section 6 offers some conclusions,

2. The Demand for Military Spending

There are two broad groups of empirical studies in the literature on the determinants of military spending. First, the arms race models developed from Richardson's (1960) seminal work, which presented arms increase in an action-reaction framework. These models have been developed in a number of ways but there are still many problems with them, both in general and in the specific application to developing countries. They are clearly more suited to analyse situations in which

countries are in conflict, such as India-Pakistan (Deger and Sen, 1990) and are therefore of limited applicability. But more importantly they often have failed to perform well empirically (Dunne, 1996; Mohammed, 1996; Smith, 1989). More recently it proved successful in analysing the military spending of pairs of countries such as India and Pakistan who are both engaged in an enduring rivalry, and for whom the other represents the overwhelming security issue (Dunne, Nikolaidou and Smith, 2001), but failed in the case of Greece and Turkey (Dunne, Nikolaidou and Smith, 2001; Kollias and Makrydakis, 1997).

Second, there are those studies which focus upon the economic, political and military determinants of military spending. These vary across disciplines, with international relations, political science, sociology, and economics all contributing studies within the focus of their disciplines. The most satisfactory empirical analyses have tended to take a comprehensive approach, combining all of the plausible economic, political and military influences and operationalising as many of them as possible. Some studies take a purely ad hoc approach to the empirical analysis. The more formal models have developed from the neoclassical approach, which considers the country or state as maximising a social welfare function, where security is an integral component. Security is then considered to be produced by military spending (Smith, 1980 and 1995). An alternative is the 'bureaucracy' model of the state's demand for military spending, as in Gonzales and Mehay (1990). In empirical work most models share Both models lead to a similar estimation equation, where the demand for military expenditure is a function of economic resources and threats to security, as well as various political factors such as the nature of the state. Much of the effort in the empirical work is then put into finding as efficient a set of variables as possible to measure the various components of 'threat' against which a country may deploy military resources.

There are also case studies which are less formal in approach but which nevertheless make important contributions. At their best they can bring together a considerable amount of historical and institutional information to complement regression analysis and can be aware of the limitations of their estimates (eg Dommen and Maizels, 1988).

No matter how formal the approach, in analysing developing countries the specific nature of these countries have to be taken into account. Indeed, such factors lead to serious questions being raised about the computational ability and rationality of actors assumed in formal neoclassical models (eg Park, 1994). In many countries military expenditure is often independent of economic conditions and generated mainly by the internal logic of the state. The overall economic environment may provide a

constraint on military burdens over time, but the importance of the strategic factors, security and threat perceptions, both internal and external, has to be recognised. In estimating demand functions the income variables need to be specified and these political and strategic effects quantified.

Within the empirical literature the cross-country analyses of the demand for military spending have developed a number of ways of dealing with the complexities of the strategic variables. An interesting and fruitful approach uses the concept of a "Security Web" concept developed by Rosh (1988). This defines neighbours and other countries (such as regional powers) that can affect a nations security as being part of a country's security web. Rosh calculates the degree of militarisation of a nation's Security Web by averaging the military burdens of those countries in the web, finding it to have a significant positive effect on a country's military burden. GDP per capita is often used to reflect the income effect. Higher income is likely to lead to higher military spending, which may or may not translate into a higher military burden. Also, higher income can lead to structural changes, inequalities and hence conflict requiring higher military spending to maintain internal control (Maizels and Nissanke, 1986). The share of total government expenditure in GDP is used to account for the fact that the military will likely benefit from high government expenditure per se (McKinlay, 1989). The effect of incorporation of a country into the world economy is measured by the share of trade (exports plus imports in GDP) (Rosh, 1988). In addition, there are attempts to model the dynamics of the government spending process. Allowing for inertia due to some hangover from previous expenditures, commitments to programmes (Dunne et al., 1984), or simply a ratchet effect as in Peacock and Wiseman (1967). This can be incorporated by estimating a dynamic model where the lagged dependent variable will pick up such effects. There are also many attempts to introduce political factors within the countries. The type of government can effect military spending, with military governments most likely to be higher spenders, though there is unlikely to be a simple dichotomy between military and non military governments. The situation in developing countries is a bit different than in developed countries as there is less likely to be arms production. There will, however, still be a 'military industrial complex' with vested interests in maintaining or increasing military spending, comprising the civil servants, industrialists, officials, and workers involved with arms imports (Dunne, 1996).

The results of the studies are mixed but do tend to suggest that in developing countries economic conditions are not the most important determinant of military burden. Studies have found clear differences in the different types of countries and their types of governments, to the extent that some argue that the determinants are country specific and not amenable to generalisation (Hartley and Sandler, 1990). This is disputed by Hewitt (1991) who finds for a wide sample of countries evidence of

economic and financial determinants which are common to the sample. Using a two-equation model, GDP is found to have a positive effect on military burden, with GDP^2 acts negatively, so large economies reduce their military burden as GDP increases. Indebtedness and available capital, war, land area, land borders and coastline are positive and significant. Monarchies spend most on the military, followed by military, "other" (non-democratic) and then socialist governments. Other recent studies include Adams and Ciprut (1994), who analyse the demand for military expenditure in South East Asia using spending by allies and enemies, adjusted for distance, as the main security variable and Batchelor, Dunne and Lamb (2001) who carry out a time-series analysis of South Africa's milex, using a number of variables relating to South Africa's changing security environment.

Overall, it is clear that the demand for military spending can be influenced by a wide range of strategic and economic factors. Any empirical analysis across countries will need to attempt to pick up the variations in these factors, but there are likely to be problems in operationalising them, particularly data availability. The next section considers the sample and data used for this study.

3. Sample and Data

In this paper a relatively comprehensive empirical analysis is undertaken on a cross section of countries for a period before the end of the Cold War and one after it. study seeks to include as many different security variables as possible. At present there is less focus on economic variables such as integration with the world economy (imports and exports as a share of GNP), though these may be included at a later stage. Two separate studies are carried out, one for 1981-88 (during the Cold War), the other for 1990-97 (Post Cold-War).

This study is concerned with developing economies and is particularly concerned with the impact of changes in security webs on military spending. The portion of the industrialised world that forms or formed part of the stable alliances systems, i.e. most of Europe, USA, Canada, Japan, Australia and New Zealand are therefore excluded. Data for military spending, national income and population were obtained from the American Arms Control and Disarmament Agency (ACDA) for the two periods 1980-88 (During the Cold War) and 1990-97 (Post Cold War). (1989 is not included in either sample as it was in many ways a transitional year.) There are data problems with some countries having missing values. To maintain a relatively large sample averages were taken and country was

included if there were five or more observations for the period concerned. This gave 93 countries in the 1981-88 study, and 111 countries for 1990-97.

Data on conflict and rivalries was constructed using four separate databases: the Dyadmid database of dyadic Militarised Interstate Disputes, the KOSIMO database of violent and non-violent conflicts, the CASCON database of conflict case-studies, and the Uppsala University Department of Peace and Conflict Research conflict database. Data on democracy comes from the POLITY98 database of democracy vs autocracy.

4. Empirical Model

In attempting an econometric analysis of the determinants of military spending it is important to have some theoretical framework to allow a specification of causality, functional form, relevant variables and the testing of implied restrictions. With a formal model hypotheses can be well defined and tested, assumptions become explicit, and the number of parameters needed can be reduced through tests of restrictions. This is normally achieved by using a neoclassical model of the state as a rational actor maximising social welfare subject to a resource constraints. The social welfare function can be determined by the state, based on individual preferences, or based on some voting rule such as the median voter. Military expenditure is then determined by balancing its opportunity cost and the security benefits it provides. Smith (1980) and Hewitt's (1991) public choice study are examples of this approach.

Thus we can define a social welfare function where social welfare is a function of utility derived from private consumption C, military spending S, and other government spending G all conditioned on political, strategic and demographic variables Z.

$$W = W(C, S, G, Z)$$

Focusing on military spending M, the level of security will depend upon the level of military expenditure M, conditioned on demographic and strategic variables Z:

$$S = S(M, Z)$$

Maximising the social welfare function subject to this and the budget constraint

$$Y = P_m M + P_c C$$

where P_m and P_c are the prices of M and C relative to an income deflator gives a demand function:

$$M = D (Y, P_m, P_c, Z)$$

We can rewrite this equation as shares in Y rather than levels to give us the demand function commonly used in empirical work (Smith, 1989, 1995).

As we have seen in analysing LDCs the specific nature of the countries have to be taken into account, with military expenditure often being independent of economic conditions and generated mainly by the internal logic of the state. The overall economic environment may provide a constraint on military burdens over time, but the importance of the strategic factors, security and threat perceptions, both internal and external, has to be recognised. To provide an estimable demand function requires the specification of the income variables and some way of quantifying political and strategic effects.

As in most studies of developing countries we have no separate deflator for military spending available. The share of military spending is, therefore, a function of GDP and various other economic and strategic variables. Population is included to capture possible size effects. It may be seen as giving some intrinsic security, reducing the need for military expenditure, or may reduce costs by allowing reliance on a large army rather than hi-tech equipment. On the other hand 'public good' theory would suggest that a high population makes military spending more effective, as it benefits a larger number of people as a 'pure public good'

In this study a major effort is made to develop variables to represent the strategic factors, by developing the security web concept of Rosh (1988). The countries included in a security web are neighbours (land or sea), regional powers capable of projecting their influence beyond their borders, other countries able to affect a country's security. Superpowers are excluded, but dummy variables were constructed to take account of countries' relations with superpowers.

To measure the level of threat a country faces Rosh uses the average military burden (milex/GDP) of the Security Web. It can be argued, however, that the absolute level of military force facing a country is a better measure of the threat it actually faces rather than the burden, which represents the effort the country puts into developing its military capability. A good example of this at a dyadic level is the case of India and Pakistan, two unequal rivals. India consistently has a higher level of military spending than Pakistan (about twice as much), but Pakistan spends around twice as high a proportion of national income on defence as India. Thus Pakistan, faced with the higher absolute level of threat, devotes a higher proportion of its resources to counter it (Dunne et al, 2001). For this reason the level of military spending is used in the security web variable.

Rosh also fails to distinguish between the effect of military spending by allies, enemies and neutral countries, with the security web broken down into enemies, potential enemies and others. This distinction is drawn in this study, using data on conflicts to divide the countries in a country's security web into enemies, potential enemies and others. To qualify as enemies at a given time, two countries must either currently be engaged in some form of armed conflict (possibly short of all-out war), or must have gone to (all-out) war in the past, with the grievance still unresolved.[1]
To qualify as potential enemies, countries must be involved in a dispute with either a history of or clear potential for militarised confrontation.[2] Anything involving a show of force (e.g. "dispatching troops or vessels") would be enough to make countries potential enemies so long as the dispute continues. Events such as "breaking diplomatic relations" are treated as borderline, and dependent on what other factors are present. When aggregating the military spending of enemies (E), potential enemies (PE) and security web (SW), each is made a subset of the next, E as part of PE and PE as part of SW. Thus in the regression analysis, the coefficient of PE will indicate the additional effect of a country being a rival rather than a friendly or neutral neighbour, and the coefficient of E the differential effect of being an outright enemy rather than merely a potential enemy.

While missing military spending data did lead to the exclusion of some countries, it did not seem sensible to exclude countries due to incomplete data on their security web. So when computing the security web, judgement was used to assign a reasonable figure, usually using the most recently available figure for military burden and that was applied to the current level of GDP to give the level. Sometimes subsequent figure were used as best guess and, occasionally, missing years where interpolated when there had been a big change. This can be justified both on the basis of necessity and because the aggregation involved in the construction of the variable makes these computations unlikely to significantly effect the final figure. Also, one could argue that it is the sort of process neighbouring countries would have to do in assessing the security threat of a country with non-transparent defence expenditure. Where there is an almost complete absence of data (e.g. Afghanistan, Somalia) a separate "Unknown Threat" variable was created for the country's neighbours. This is the population of the country whose military expenditure is unknown, doubled for a potential enemy and quadrupled for an enemy.

[1] Thus the continuing dispute over Kashmir makes India and Pakistan enemies, even during the times when they are not at war. (However, for example, Israel and Jordan ceased to be enemies following the Peace Treaty of 1994).
[2] The KOSIMO database of violent and non-violent conflicts is very detailed, and includes information on all steps taken by a party to a dispute, such as "fully fledged war", "intervention or invasion", "military force", " sporadic military

Moving beyond the security web variable, other strategic factors were considered. An index of civil conflict was constructed from the conflict databases, ranging from 0 to 4 for each country-year. Level 4 represents all-out, generalised civil war.[3] In addition, an External War dummy was constructed, which took the value one if a country was engaged in an all-out war and zero otherwise. This was to account for the fact that if a country is at war it will not only be responding to the threat of the other country's military force, but will need to replenish stocks of arms and ammunitions used up in the fighting. While superpowers' military spending were not generally included in the Security Web totals, dummies were included for proximity to the USA, the USSR and China, and another dummy was included to pick up a relation of enmity with a superpower.[4] Finally, a dummy was included for Middle East countries, to allow for the fact that the other strategic dummies may not fully capture 'bad neighbourhood' or 'contagion' effects.

It is widely found that democratic countries spend less on the military than non-democracies (e.g. Rosh, 1988; Hewitt, 1991; Maizels and Nissanke, 1986). Autocratic states are more likely to rely at least partly on the military to retain their grip on power, while dictatorships are more likely to rely on a culture and ideology of militarism to justify their rule[5]. Totalitarian states are also more likely to be able to maintain unjustifiable and inefficient levels of spending by the military and other governmental departments in pursuance of the interests of the public elite rather than the country as a whole.[6] Rather than creating a simple dummy the POLITY98 database allows the construction of a variable to reflect the degree of democracy in a country. It give figures for democracy and autocracy, broken down into various subcategories, for all states from 1800 onwards, covering institutional aspects of democracy; the competitiveness and openness of executive recruitment, constraints on executive power, diversity of levels of power, etc. Factors such as respect for human rights, press freedom, etc. are not counted. The variable used in the study is the difference between the value of the DEMOCRACY and that of the AUTOCRACY variable.

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incidents", "dispatching troops or vessels", "concentrating troops on border", "breaking diplomatic relations", "breaking agreements" "trade sanctions", "notes of protest", "mediation", "negotiations", "agreements", "fulfilling demands", etc.

[3] Level 1 would apply to situations such as China in Tibet (where strong military force is used against non-violent or disorganised opposition) or Northern Ireland post-ceasefire (not in the sample of course), where an armed opposition remains despite a general absence of actual fighting.

[4] Exceptions were made for Taiwan and India, for whom China was included in the Security Web totals, in the Enemy or Potential Enemy category as appropriate.

[5] This can also be present in democracies, but is perhaps more marked in non-democracies.

[6] Implying a 'corruption' or 'bureaucracy' model of spending rather than a neo-classical welfare maximisation model.

5. Results

Table 1 gives the means and coefficient of variation values for the expenditure and strategic variables for the two samples. Care must be taken in comparing the values for the two periods as the samples differ and some of the data may not always be directly comparable.[7] It is useful, however, to consider some of the larger differences. As would be expected it shows the average military burden fell from 0.056 during the Cold War to 0.033 after the Cold War[8], with the average for External War falling dramatically from 0.06 to 0.02, more than could be accounted for by the somewhat different sample. The Democracy variable also changes considerably, from a negative figure (more 'autocracy' than 'democracy') to a positive one, with all of the Security Web variables having considerably lower values, though the proportions of enemies and potential enemies in the total of Security Web are not much different.

Table 1: Variables Used: Means and Coefficient of Variation

	Cold War		Post Cold War	
Variable	Mean	Coeff. Var.	Mean	Coeff. Var.
M: Military Expenditure	2415.767	2.87	2203.98	2.98
Y: GNP	43468.83	2.80	66033.58	3.75
POP: population (millions)	37.94	3.53	38.67	3.67
EW: External War dummy	0.06	3.72	0.02	3.85
CW: Civil War dummy	0.76	1.78	0.98	1.31
E: Military Expenditure of enemies	2866.315	3.24	2312.89	3.76
PE: military spending of "potential enemies"	7868.509	5.47	4704.92	2.93
SW: military spending of all countries in Security Web	19698.22	4.12	13801.33	2.73
GPE: Great Power Enemy dummy	0.08	3.46	0.06	3.90
DEM: Democracy-Autocracy	-2.74	-2.34	0.37	17.83
MB: Military Burden	0.05	1.15	0.04	1.16

Note: All expenditure variables and GNP are constant $m US: constant 1997 for post-Cold War, constant $US 1991 rebased to 1997 using the US deflator for Cold War.

Log linear equations[9] were estimated, for the Cold War period and the post Cold War period and the full results for the cross section of countries over each period are shown in Table 2. Looking at the Cold War figures, the equation provides a relatively good fit for a cross section regression, with an

[7] ACDA re-estimate their data between different editions of their *World Military Expenditures and Arms Transfers* publication and as the data for the two periods come from different editions, they may not be directly comparable.
[8] The average for military burden is the average of the individual military burdens over the sample, not total military expenditure divided by total income.
[9] For both periods, a log-linear specification worked far better than a linear specification.

R^2 of over 0.6. The signs of the coefficients are as expected, though the income term (LY) is insignificant, suggesting that, across countries, military spending rises more or less in proportion to income. This can be interpreted as reflecting a combination of the role of military spending as defensive, deterring attack, which would suggest a negative coefficient (the larger the income, the smaller the proportion needed for deterrence) and the use of military capability as a means of power projection, which is relevant only for countries with higher incomes. A low income elasticity of deterrence could be balanced by the high income elasticity of power projection, giving an overall elasticity of roughly unity. The possibility of the effect of income being non-linear was tested for by adding a squared log income term, but this was insignificant. Population (LPOP) has a significant negative impact on military burden. The fact that it is negative is interesting, suggesting either that a large population is considered to offer some autonomous security in itself, or that small countries have to spend more on hi-tech weaponry rather than relying on a large army. Another explanation could be that higher populations place greater extra demands on civil consumption needs than on security needs. The effect remains even when the two population giants, China and India, are excluded from the sample.

As regards the strategic variables, military burden (LMB) does seem to be increased by increases in military expenditure in the surrounding region (LSW), though the extra spending of hostile countries, potential enemies (LPE), has a more marked effect. The insignificance of the Enemies' milex variable does not mean that an enemy's milex has no effect, as it is included in PE, and in SW, so the effects are cumulative. It does suggest that the enemy/potential enemy distinction may be unnecessary and that distinguishing hostile and non-hostile neighbours might be enough. The Great Power Enemy dummy did not prove significant. As the countries with a value of 1 were mostly US enemies, this suggests that they do not treat US power as a threat they can defend against – or that in the Cold War environment, they look to the USSR or China.

The existence of an external war (EW) would also appear to be important. At first sight, the coefficient of 0.58 is much greater than that for Civil War, which is only 0.094; however given that Civil War is on a scale from 0 to 4, while External War only from 0 to 1, the coefficients are of comparable magnitude.[10] The China proximity dummy is also significant and positive, suggesting that excluding China from the Security Web of most of her neighbours may not have been

[10] The restriction that the coefficient of EW is four times the coefficient of CW is accepted by an F-test.

appropriate. The Middle East dummy is very highly significant, suggesting a strong 'contagion' effect for all countries in the region resulting from the various conflicts there.

Basic diagnostic tests were fairly satisfactory: The Bera-Jarque (1981) test for normality based on the skew and kurtosis of the residuals and the test for heteroskedasiticity based on a regression of the squared residuals on the squared fitted values were both insignificant; however Ramsey's RESET test for functional form mis-specification based on a regression of the residuals on the regressors and the squared fitted values gave a significant result at the 10% level, suggesting some misspecification. However this problem disappeared when the insignificant variables, LY, LE and GPE, were deleted from the model. This also improves the R-bar squared statistic, and the significance of the War variables.

Table 2: Estimation Results

	Cold War (93 observations)		**Post Cold War (111 observations)**	
Variable	**Coefficient**	**T-ratio**	**Coefficient**	**T-ratio**
Constant	-4.09	-9.3	-3.87	--11.28***
LY	-0.015	-.23	-.019	-.41
LPOP	-.18	-2.65**	-.13	-2.50**
EW	.58	1.81*	.083	0.14
CW (BCW)	.094	1.98*	.26	1.75*
LSW	.064	2.07**	.051	2.02**
LPE	.084	3.23***	.054	2.60**
LE	.0058	0.24	.030	1.34
DEM	-.034	-3.17***	-.037	-4.32***
CHIN	.67	3.37***	.36	2.43**
MEAST	.70	3.25***	.46	2.24**
GPE	.29	1.22	.33	1.29

Summary Statistics					
	R-squared	**R-bar squared**	**F-stat.**	**S.E. of regression**	**Mean of LMB**
Cold War	0.661	0.614	14.33	.563	-3.377
Post Cold War	0.614	0.571	14.32	.520	-3.519

Diagnostic Tests	Cold War		Post Cold War	
	chsq-stat	P value	chsq-stat	P value
Heteroskedasticity (regression of sqd. residuals on sqd. Fitted values	.014	.905	.576	.45
Normality (Bera-Jarque tests)	3.23	.199	.176	.92
Ramsey's RESET test for functional misspecification using square of fitted values	3.73	.053	1.58	.21

Moving on to the Post Cold War figures the model again seems to work relatively well with an R-bar squared of 0.57. The picture does seem surprisingly similar, but there are a number of differences worth noting. Most strikingly, the External War variable becomes insignificant, probably reflecting the rarity of full-scale external wars in the 1990-97 period, rather than the importance of external war in determining military spending.[11] The Civil War dummy also failed to be significant in the Post Cold War period. One concern with this result was that the dummy was failing to distinguish minor 'coups' and major internal conflicts and that this was more important in the second period. A modified variable was constructed a 'Big Civil War' dummy (BCW), which was set to 1 if a country's average CW score was 3 or higher, 0 otherwise and this proved significant. Otherwise the coefficients remained similar, though for LSW, CHIN and MEAST, they are markedly lower. As these are variables relating to generally high military expenditure or tension in the region, rather than specific points of conflict, this would be expected.

The tests for heteroskedasticity, normality of residuals and functional form misspecification, as used in the Cold War regression, were all insignificant.

To consider the robustness of these results some further specification tests were carried out. As remarked above, the high coefficient and significance of the China proximity dummy in both periods, may suggest that excluding China's military spending from the security web was wrong. Adding China to the security web figures for the countries near to China (and the Potential Enemy figure in the case of S. Korea), only had the effect of improving the significance of LSW (the main variable affected by this) in both samples[12]. Interestingly, the China dummy remained significant in

[11] The 1990-91 Gulf War of course falls into this category, but apart from this there is only the Armenia-Azerbaijan conflict, with military expenditure data only available for the latter, the brief Peru-Ecuador flare-up of 1995, whose classification as a full-scale war is somewhat questionable and Vietnam's involvement in Cambodia. Israel's occupation of the Lebanon was treated as 'half' an external war.

[12] The significance of other variables was not affected, except that Great Power Enemy becomes significant (10% level) and positive for the Post Cold War period.

the Cold War sample, suggesting that there is some "regional tension" effect here akin to that in the Middle East that had not been adequately captured.[13]

In creating the security web variables, potential enemies expenditure was included in the security web value and that of enemies included in the potential enemies figure. This nesting was to detect if additional effects could be observed for spending by more hostile powers as distinct from less. Thus the significance of both the Security Web and the Potential Enemies variables (LSW and LPE) suggest that the effect of spending by hostile neighbours is indeed distinguishable from that of non-hostile ones. An alternative to this is to treat the categories of non-hostile, somewhat hostile and very hostile separately. This was done for both samples, using the data with Chinese military spending restored. The results using the Cox's J-test, an encompassing F-test, the Aikaike Information Criterion and the Scwarz Bayesian Criterion all favoured the original nested specification. A test was also undertaken to see if the use of levels rather than burdens in the construction of the security web was supported by the data. For the Cold War sample total income for the security web and for potential enemies was included in the regression in logs. They were individually and jointly insignificant. If the correct specification was the burden form these coefficients would have been negative and equal to their respective coefficient on the levels security web and potential enemies military spending variables.

An important concern in models of this form is simultaneity bias, caused by the other countries military spending variables being affected by that of the home country. To test whether this was a problem LSW and LPE were regressed on all the other significant independent variables from the Cold War study, and also on variables for the total income of the countries in the respective groups. The fitted values from these regressions were kept, and a variable addition test was performed to add these fitted values to the main regression for the Cold War study. The fitted values were jointly and individually insignificant, even at the 10% level.

Finally, we have seen that the results across the two periods are remarkably similar and it is of interest to consider a test for whether these differences are significant. To do this, the data for the two periods were combined into a single dataset, rebasing the 1991 figures to 1997, giving most countries two separate observations, though a substantial number only had an observation for one period. A

[13] Alternatively, China should have been coded as a Potential Enemy for more of the countries in question, for example on account of ideological differences which were not counted as sufficient to justify Potential Enemy status. In the Post

regression was then run on the combined sample, using all the significant regressors in either one of the models. A Chow test for structural stability across the two samples was clearly insignificant, as was the F-statistic for the Predictive Failure test (Chow's second test). Additionally, a regression on the whole sample with level and slope dummies to distinguish between the periods, gave coefficients for the dummy variables that were individually and jointly insignificant. Thus, there is no evidence of a change in the patterns of determinants of military spending between the two periods, though the data problems mean this is far from conclusive.

6. Conclusions

This paper has provided a detailed empirical analysis of the demand for military spending in developing countries during and after the Cold War. Surprisingly there seems to be very little difference in the results for the two periods, suggesting that there has been little change in determinants, despite the major changes in the strategic environment. Both before and after the Cold War, states responded in kind to military spending, even by non-hostile neighbours, though hostile neighbours clearly have a bigger effect. There were some differences in the results, which suggested that external wars were more important than civil war during the Cold War, but not after (though this may be due to a lack of external wars) and that the effect of non-hostile military spending may have declined at the end of the Cold War.

Overall, it would appear that while the prevalence of civil conflict has increased relative to inter-state war since the end of the Cold War, increasing the proportion of military spending devoted to internal threat, there is very little evidence that the underlying relationship between different classes of threat and military spending in developing countries has changed since the fall of the Berlin Wall.

Appendix: Data Sources and Construction of the Security Web

Data Sources

ACDA World Military Expenditures & Arms Transfers 1991-1992
ACDA World Military Expenditures & Arms Transfers 1998

Cold War period, the China dummy becomes insignificant, perhaps reflecting the defusing of these ideological tensions, as China moved more towards Capitalism and participation in the global economy.

Dyadic Militarised Interstate Disputes (DYMID1.0), Zeev Maoz, Tel-Aviv University, August 1999, available at http://spirit.tau.ac.il/~zeevmaoz/

Cascon historical database of conflict cases, 1999, available at http://web.mit.edu/cascon

Polity98 Dataset on democracy vs. Autocracy, Kristian S. Gleditsch, 2000, available at http://k-gleditsch.socsci.gla.ac.uk/Polity.html

Armed Conflict, 1989-98, Wallensteen, P. & Sollenberg, M., University of Uppsala Department of Peace & Conflict Research, available at http://www.pcr.uu.se/data.htm, based on data published in *Armed Conflict, 1989–98*, Wallensteen, P. & Sollenberg , M., Journal of Peace Research, Vol. 36, No. 5, 1999.

The KOSIMO violent and non-violent conflict databank, The Heidelberg Institute of International Conflict Research, 2000, available at http://www.hiik.de/en/kosimo/kosimo.htm.

Dataset

A spreadsheet containing all the military expenditure, military burden, income, population, Security Web, Potential Enemies, Enemies, Great Power Enemies and other relevant variables is available on request.

Table of Security Webs of Countries in the Study

A table is given below of the Security Web, Potential Enemies and Enemies of each country in the study, as well as the External and Civil War status of each country. The GPE status is also noted. Lists of countries relating to some of the other security variables are also given below. Note that many of the countries listed in the table were included in only one sample: firstly, many countries came into existence in the Post Cold War period (while South Yemen disappeared), and secondly, in many cases sufficient milex data was only available for one sample (usually Post Cold War). A country was included in a particular sample provided that milex data was available for at least 5 of the 8 years in the period. The table notes which countries are only included in one sample.

Unquantified Threat

As has been noted, there were a few countries for whom milex data was so completely lacking that it did not seem reasonable to include figures for their expenditure in their neighbours' Security Web

totals. These countries were classified as an "Unquantifiable Threat". In an attempt to partially quantify this, a variable UQT was constructed for each country in the sample, which totalled the population of "Unquantifiable Threat" countries in their Security Web, multiplied by two if the country was a Potential Enemy and by four if they were an enemy. The UQT variable never proved significant in any estimation. The countries classified as Unquantifiable Threats are as follows:

Afghanistan 1989-97
Angola 1981-82
Cambodia 1981-90
Cape Verde 1984-88
Laos 1981-82, 1987-90
Lebanon 1987-88
Liberia 1989-97
Somalia 1991-97
Vietnam 1981-85, 1987-88

China

In the initial specification, China was excluded from the Security Web of all countries except India and Taiwan. Instead, a China Proximity dummy was set to 1 in all of China's neighbours (except India and Taiwan), and all countries bordering the South China Sea. In the case of South Korea and Vietnam, the Great Power Enemy variable was credited with an extra 0.5. In a subsequent specification, China's military expenditure was included in the Security Web totals.

The China dummy was set to 1 for the following countries:

Brunei, Burma, Cambodia, Indonesia, Kazakhstan, North Korea, South Korea, Kyrgyzstan, Laos, Malaysia, Mongolia, Nepal, Pakistan, Philippines, Singapore, Thailand, Vietnam.

USA and USSR/Russia

The military expenditure of the USSR, Russia and the USA was excluded from all Security Web totals, except for China, for whom the Soviet Union was included. USA and USSR proximity dummies were constructed for neighbouring countries or those in the direct sphere of influence. The

USSR dummy represents either USSR or Russia proximity, and its value changes for some countries. The relevant countries are:

USA: Barbados, Belize, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Trinidad & Tobago.

USSR: Azerbaijan, Georgia, Iran (till 1991), Kazakhstan, Kyrgyzstan, Mongolia, Pakistan (till 1991), Tajikistan, Turkey, Uzbekistan.

The USSR and USA dummies were never significant.

Middle East

The following countries were classified as being in the Middle East and had the MEAST dummy set to 1:

Bahrain, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates, Yemen (North Yemen), South Yemen.

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