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**Sinking Budgets and Ballooning Prices:
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ABSTRACT

Sinking Budgets and Ballooning Prices: Recent Developments Connected to Military Spending

by Thomas R. Cusack

Military spending in the West generally declined after the Cold War. Given the economic pressures that many of these states confronted, they can be said to have experienced a fortuitous conjunction of lessening security demands with stable if not rising pressures to allocate more resources to social purposes. However, with declining financial resources a good part of military capital in these countries was reduced and most of what remains is growing obsolete. The excessive rise in relative prices associated with major military capital items, a rise only partially associated with an increase in real effectiveness, poses a challenge for many of these states if they are to retain their capacity to provide in some meaningful way for their own military defense.

Keywords: Military Spending, Weapon Systems, Military Personnel, Inflation, Conscription, East-West-Conflict

JEL Classification: H11, H56, D43, N40

ZUSAMMENFASSUNG

Sinkende Haushalte und explodierende Preise: Aktuelle Entwicklungen bei Militärausgaben

Nach Ende des Kalten Krieges sind allgemein in der westlichen Welt die Militärausgaben gesunken. Angesichts des wirtschaftlichen Drucks, dem sich viele dieser Länder ausgesetzt sahen, kann man sagen, dass dies Ergebnis eines zufälligen Zusammentreffens mehrerer Faktoren ist: geringere Sicherheitsanforderungen treffen auf gleich bleibende bzw. sogar zunehmende Forderungen nach alternativer Budgetverwendung, beispielsweise mehr Mittelausgaben für soziale Zwecke. Durch die verringerten Finanzmittel für die Verteidigung wurde jedoch ein großer Teil der militärischen Waffensysteme reduziert, der verbliebene Rest ist zum größten Teil veraltet. Die relativen Preise für Waffensysteme sind jedoch exzessiv gestiegen, ohne dass diese auf einem gleich großen Anstieg der tatsächlichen Effektivität der Waffensysteme beruhen. So stellt es für viele dieser Staaten eine große Herausforderung dar, wenn sie ihre Fähigkeit bewahren wollen, auf sinnvolle Weise für ihre eigene militärische Sicherheit zu sorgen.

Introduction

Traditionally, the military was one of the major financial commitments of the state. Such relative priority has diminished with the passage of time. And while the Cold War that occupied so much of the last half of the 20th century drew large amounts of monies into military budgets as states responded to perceived external threats, its passage has generally brought about a widespread retreat. In many Western countries, fewer and fewer resources are devoted to the national defense function. The 20th century and particularly its latter half also increasingly came to be marked by an extensive rise in the relative prices of military capital. With declining levels of financial commitment and rising costs in weapons systems, the military forces in many of the Western countries have become increasingly hollow.

The Evolution of Military Expenditure

Unlike many other functions of government, the availability of data on military spending generally can be characterized as being unproblematic. This is not to say that there are no difficulties nor disputes; rather, it is to say that at least in terms of the Western nations there is fairly widespread acceptance of at least one source, namely the Stockholm International Peace Research Institute's publication (*SIPRI Yearbook: Armaments, Disarmament and International Security*). SIPRI has made publicly available a fairly comprehensive database for the post-World War II era. The SIPRI volume has been published annually since 1970 and provides comparable and continuous annual military expenditure series (in local currency, US constant price dollars, and as a share of GDP) for most countries, going back as far as 1950. Serious problems and disputes were common during the Cold War with regard to the military outlays of the centrally planned economies (see Cusack and Ward, 1981) and the issue of military spending levels in the People's Republic of China remains contentious.

Included within SIPRI's measure of military spending are four major categories of current and capital outlays for: (1) the armed forces along with peacekeeping forces; (2) the defense bureaucracy (and other agencies engaged in military activities); (3) paramilitary forces; and (4) military space activities. SIPRI's definition is based on the NATO approach. It does exclude three things that some would argue should be included; these are outlays on civil defense, payment to military veterans, and servicing of war debt. All in all, SIPRI probably is still the most respected source on military spending for purposes of cross-national comparisons.¹

Government's control over national economic resources sharply expanded throughout the West over the last century or so. Whereas total government spending accounted on average for less than ten percent of GDP in 1880, this figure rose to about 25 percent by 1940.² Dramatic growth occurred after World War II in both the private and public sectors. However the pace of the latter far outstripped the former. Among the OECD countries, in the typical state, close to 46 per cent of all national product was going to government spending by the end of the 20th Century.

While military spending (and the associated debt repayment outlays arising out of war involvement) once constituted an overwhelming share of the total government household, it has receded in relative importance during modern times. At the end of the 19th Century, the average military burden on the economy was somewhere around two to three per cent of GDP; with that, direct

¹ See Brozka (1995) for a detailed discussion of alternative sources and the problems endemic to developing reliable and valid measures of military spending.

² Unless otherwise noted, the figures on government spending in this and the following paragraphs refer to the ten OECD countries listed here: Austria, Canada, Denmark, France, Germany, Italy, Japan, Norway, United Kingdom and United States. Data on these countries are used in of Table 1. In the data and analysis presented in the rest of the paper, two larger groups of OECD countries are used. One contains 16 countries (the ten above, less Austria, plus Australia, Belgium, Greece, Netherlands, Spain, Sweden and Switzerland) and the other contains 20 (the 16 above plus Austria, Finland, Ireland and Portugal).

military spending constituted about a quarter of total government outlays. The World Wars of the 20th Century were clearly major drains on national economies. Take World War II, for example. By 1943, military outlays constituted huge burdens on both the Axis and Allied Powers' economies. Within the Axis, 70 per cent of German GDP, 21 per cent of Italian GDP, and 43 per cent of Japanese GDP went into the war effort. Among the Allies, Britain's outlays accounted for 55 per cent of its net national expenditure and America's stood at 42 per cent of its GNP (figures from Harrison, 1998, 21).

The Cold War was witness to inordinately high defense burdens. These relative shares, however, steadily declined over time and with the passage of the East-West conflict the average burden reached levels not seen since the inter-World War period or the end of the 19th Century.

The 20th Century will not be remembered as a peaceful one. Still, as Ferguson points out:

“[A]fter many centuries during which the cost of warfare was the biggest influence on state budgets, that role was usurped in the second half of the 20th century by the cost of welfare” (Ferguson, 2001, p.27).

So, despite the massive violence and mayhem, the century also brought about a marked change in the relative priorities of Western governments in terms of resource allocation. In 1900, military budgets accounted for about a quarter of all government spending (see Table 1). By 2000, this share stood at about four per cent. Military spending was more than six times the amount spent on social transfers in 1900. This disparity was radically reversed by the end of the end of the 20th Century, with social transfers amounting to nearly ten times the amount spent on the military.

Table 1
The Development of General Government Spending Over the Last Century
(10 country averages of spending expressed as percentage shares of GDP)

	<i>Total</i>	<i>Military</i>	<i>Social Transfers</i>
1880	9.0	2.1	0.4
1890	10.4	2.5	0.4
1900	12.1	3.2	0.5
1910	14.3	2.9	0.5
1920	18.9	5.0	0.5
1930	21.6	2.1	1.5
1938	24.6	4.1	---*
1950	24.7	3.5	7.1
1960	29.2	4.1	8.9
1970	35.5	3.4	11.9
1980	45.9	3.0	15.2
1990	47.7	2.8	17.2
2000	45.7	1.9	18.5

---* Not available

Sources: Cusack and Fuchs (2003) and Lindert (2004).

The century-long revision of priorities has been dramatic. Even more impressive is to compare these figures with those of one example from the period 1700 to 1799. This is the British case. Across the entire 18th Century, spending for the army, navy and ordnance combined alone constituted more than half, i.e., 52 per cent, of total public spending.³ Debt management outlays came to an extremely high 37 per cent and the entire civilian function was funded by the derisible residual of 12 per cent of total state outlays. When one looks at the military budget and compares it with the total public outlays net of debt charges (nearly all of which were incurred to support the military effort in the many years of war involvement during the period), on average it came to 80 per cent of all spending. Why so great a burden? According to Levy (1983), in 52 years of the 18th Century, Britain was engaged in war against one or more major power. During some of these years, it was involved in two separate major power wars. This count excludes from consideration war involvements against non-major powers or non-state actors. So, whereas the state was once little more than a war-fighting machine with attendant apparatus to garner and administer the

³ These values have been calculated using data drawn from Mitchell (1962, pp. 387-9).

revenues to conduct these wars, the military function for most of the Western states has receded to the unspectacular role of being barely more than a minor financial footnote at the beginning of the 21st Century.

I focus now briefly on the evolution of military spending in the last half of the 20th Century through to the first few years of the 21st. In Figure 1, three curves are plotted. One shows the trajectory of military spending in the Soviet Union and Russia, its successor state. The source for the Soviet/Russian military spending data is the Correlates of War Project's National Material Capabilities Data Set (<<http://www.correlatesofwar.org/>>). Note that the values in this graph are presented in terms of US dollars expressed in real or constant prices with the base year being 2000. The price series derives from Johnston and Williamson (2004).

Using SIPRI data, comparable values are plotted separately for the US and the group of the 19 other OECD countries in the list of 20 noted above. Particularly up to the beginning of the 1990s, the three series provide some visual affirmation of the standard explanation of the dynamics of East-West military budgets: a competitive accumulation of arms sustained by rising financial outlays. In addition, the US series is marked by a set of cycles, the first two of which are connected to the mobilization and demobilization processes associated with major wars (Korean and Vietnamese). The third American cycle is connected initially with the Reagan buildup (here there is something to be said for the primacy of domestic considerations behind this rise) and the decline connected to the tapering off of the Cold War. On the far right side of the graph one sees the dramatic decline in Soviet/Russian outlays with demise of the former and collapse of the latter's economy. American outlays declined and stabilized through the 1990s and then took off with the onset of the Bush II administration and its "war on terrorism." While the large residual group of other OECD countries as a whole closely paralleled the Soviet trajectory, these outlays

tended to decline after the Cold War. This was followed by a long period of stability.

Figure 1



Altering the measure of military effort to one that reflects the burden on the economy (Figure 2), one sees that the average burden to the economy within the 20 OECD economies followed a general downward trend. So, even if in real terms, per above, the dollar value of military outlays generally rose throughout the last half of the 20th century, the relative burden tended to decline over time, going from over seven percent of GDP in the mid-1950s to close to two percent by the end of the century.

It is notable that even with the post-Cold War decline in the defense burden there was no pick-up in share of national economic resources coming from this group of wealthy countries to the Third World in the form of foreign aid (official development assistance, ODA). Although the UN ODA target, adopted in

the early 1970s, is 0.7 percent of GNP, few potential donor countries have ever met the goal. Even the liberation of national economic resources from defense needs brought about by the end of the Cold War was a major disappointment for the group as a whole. This opportunity to employ some of the freed-up resources for this other important international function was taken by only five of the twenty countries. Indeed, nearly all of the rest both cut the amount of relative resources going to defense and to foreign aid.

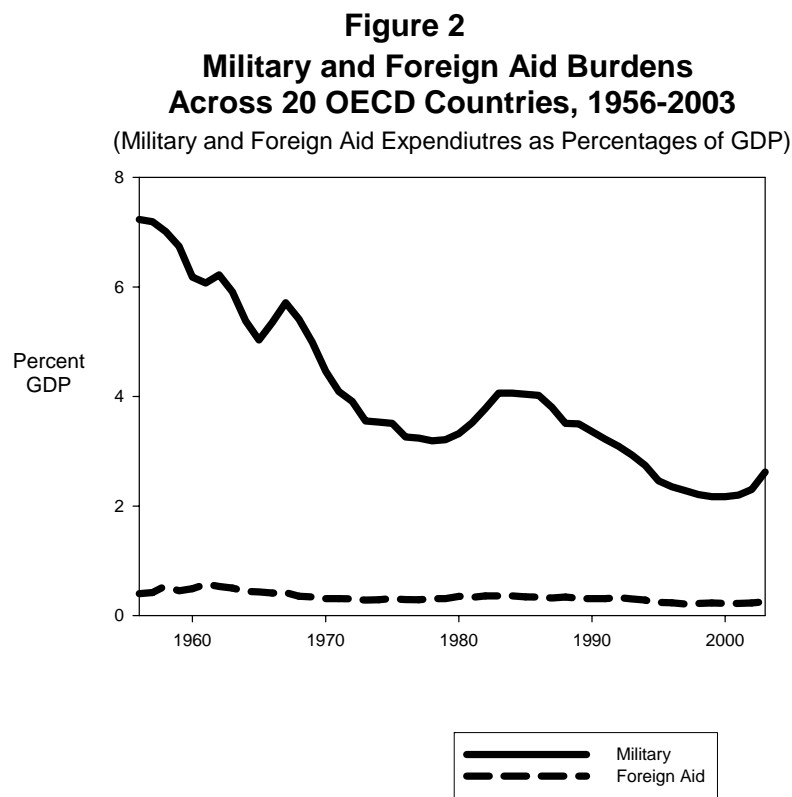


Table 2 provides a perspective on how the military burdens of individual Western countries developed over the last half-century or so. Starting in the 1960s, one can see a very broad range in share of GDP going to the military, extending from 0.9 per cent in Japan to 8.8 per cent in the United States. Slightly lower levels of defense burdens ensued over the following decades for most countries through the 1980s. With the passage of the Cold War, appreciable drops in this burden came about in the 1990s and this generally continued

through the first few years of the 21st Century; nevertheless, the relative diversity in burdens sustained continued over the entire period.

Table 2: Military Spending as a Percentage Share of GDP

	1960-69	1970-79	1980-89	1990-99	2000-03
Australia	3.1	2.6	2.6	2.2	1.7
Austria	1.2	1.1	1.2	0.9	0.8
Belgium	3.3	3.1	3.1	1.8	1.3
Canada	3.4	2.0	2.0	1.6	1.2
Denmark	2.8	2.3	2.3	1.8	1.6
Finland	1.7	1.4	1.9	1.7	1.2
FR Germany	4.3	3.4	3.2	1.9	1.5
France	5.5	3.9	4.0	3.2	2.6
Greece	4.1	5.6	6.5	4.9	4.5
Ireland	1.4	1.6	1.7	1.0	0.7
Italy	3.0	2.5	2.3	2.0	2.0
Japan	0.9	0.9	1.0	1.0	1.0
Netherlands	3.9	3.2	3.1	2.2	1.6
Norway	3.5	3.2	3.1	2.6	1.9
Portugal	6.4	5.5	3.3	2.5	2.1
Spain	1.9	1.7	2.3	1.6	1.2
Sweden	4.0	3.4	2.8	2.2	1.9
Switzerland	2.6	2.1	1.9	1.4	1.1
United Kingdom	5.9	4.8	4.8	3.3	2.4
United States	8.8	6.0	6.4	4.2	3.4
Average	3.6	3.0	3.0	2.2	1.8
Std. Dev.	1.9	1.5	1.5	1.0	0.9

Forces Shaping Military Spending

Let me turn briefly to the mainstream interpretation of the development in Western military budgets in the post-World War II era. It is often difficult to disentangle the external and internal forces that shape the evolution of a nation's military spending (see Stoll, 1981). And while there is a lot to be said for the powerful impact of domestic factors in determining military spending levels (cf.

Nincic and Cusack, 1979; Cusack and Ward 1981), here, instead, it is assumed that external threats play a critical role.

Let us take a simple arms race formulation. In this formulation, the contention is that a nation's military spending (here in constant price US dollars) is a function of an external threat measure (the scale of Soviet/Russian military spending) that acts as a positive force in pushing up military outlays. In addition, an economic term, Y , standing for real GDP in US dollars, is introduced, to capture the effects of income as both an enhancing and constraining force. Natural logs of all the variables in the equation are used, and the model has been estimated on a pooled cross-section of Western countries using six separate and consecutive period averages for all of the variables.⁴

This formulation, whether the US is included in the sample or not, appears to work very well (see Table 3). Western nations seem to have responded to variation in Soviet/Russian military outlays in the action/reaction style associated with the classic arms race formulation (see Cusack, 1985b). Income played the expected role with higher real GDP leading to greater military outlays.

⁴ The model estimated takes the following form:

$$\ln(MLX_{i,t}) = a_i + \beta_1 \ln(THREAT_t) + \beta_2 \ln(Y_{i,t}) + e_{i,t}$$

OLS with panel corrected standard errors was used to estimate the model. This was done using country fixed effects and panel corrected standard errors. The time span for the estimates is from 1950 through 2003. Each decade in the last half of the 20th century is treated as one time unit observation. The four years from 2000 through 2003 constitute the last time unit observation. The cross-sectional units are the 20 OECD countries enumerated earlier. Note, that the model is also estimated with 19 countries, dropping the US from the list to test the robustness of the model in the absence of this country.

Table 3: Panel Estimates of Model Capturing the Long-Term Dynamics of Military Spending

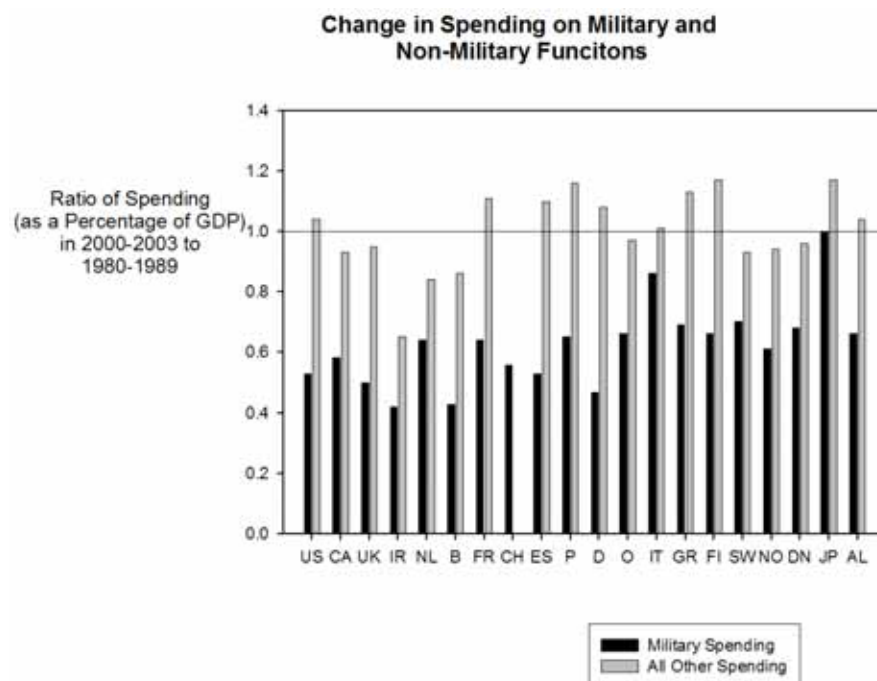
	<i>I</i> <i>Including US</i>	<i>II</i> <i>Excluding US</i>
ln(S/RMLX)	.156* (3.29)	.153* (3.38)
ln(Y)	.813* (31.55)	.819* (32.77)
\bar{R}^2	.989	.985
Number of cases	120	114
	Country Fixed- Effects/Panel Corrected Standard Errors	Country Fixed- Effects/Panel Corrected Standard Errors

z-statistics in parentheses.

*--statistically significant at .05 level.

An alternative explanation of the forces shaping military outlays, one that conforms to the general line of argument used throughout this volume, is a model that stresses forces that act to restrain and reduce resources going to this function. Certainly the long-term dynamics of the military burden (i.e., military spending as a percentage of GDP) would, on the face of it, appear to be subject to downward pressures. Indeed, relative to the aggregate of non-military outlays, it would appear that the military have been more prone to the loss of societal resources than have non-military functions. In Figure 3, the ratios of the averages of military and non-military spending as shares of GDP in the first few years of the 21st Century have been plotted against those ratios in the last decade of the Cold War (1980-1989).

Figure 3



Ten of the nineteen countries for which I have data on the non-military outlay aggregate actually experienced growth over these two decades. Another six experienced modest relative declines (from three to seven per cent) and only three experienced a relative decline of more than ten percentage points. On the other hand, all but one (Japan, which maintained basically the same level of military burden throughout) of the twenty for which I have military burden data experienced declines and most of these declines were extremely large. The average relative decline, indeed, was 36 per cent, with Ireland and Belgium leading the way (both with nearly a 60 per cent relative decline between the decade of the 1980s and the period 2000-2003).

The question suggests itself, then, as to whether pressure such as those arising from the level of public debt and the exposure to international economic forces have also been at work in driving down the share of economic resources being allocated to the military. Table 4 examines this question in some detail by

first regressing the levels of defense burdens in three different periods against a set of three variables, including income per capita, trade openness, and the prevailing level of public debt.⁵ Income per capita is based on GDP and is measured in thousands of constant price US dollars. Trade openness is the sum of exports plus imports expressed as a percentage of GDP. Finally, debt burden is the public debt expressed also as a percentage of GDP. Column 4 goes beyond this by also looking at the change in the defense burden over the period from the 1980s through the first few years of 2000 and also includes the “convergence” or “catch-up effect” (Schmidt, 2006) that might be captured by the previous level of the defense burden. Finally, column 5 looks at the changes in the defense burden from a pooled perspective, including the first differences for the last three periods under consideration. It also bring into the model, the competitive effect of Soviet/Russian military spending.

Columns I through III of Table 4 present results on the cross-sectional estimates of the determinants of the levels of defense burdens across three different periods, the 1980s, the 1990s, and the first few years of the new century. The results provide little support for the contention that the restraining effects of the economic variables frequently alluded to in accounting for lower levels of other public spending were also at work in shaping the relative size of the military budget. In only one decade is one of the estimated effects statistically significant, this is the coefficient on the trade openness measure, and it takes on a negative sign. When the convergence effect is also included in a formulation meant to account for the change from the 1980s to the new century (column IV), it turns out to be the only statistically significant factor in shaping these dynamics. None of the putative restraining or dampening effects is detectable. Finally, in column V it is clear that the arms race effect is the dominant influence on the

⁵ The cross-sectional equation estimated is:

$$MB_i = b_1 + b_2 YCAP_i + b_3 EXIMY_i + b_4 PDB_i + e_i$$

The necessary modifications were made to estimate the two first-difference models reported in column 4 and 5.

defense burden. The convergence effect is also at work. And, it would appear that the change in the level of affluence, captured by the inter-period first difference in income per capita, acts to lower the overall level of the military burden.

Table 4
The Forces of Retrenchment and Military Spending in the Post-1980 Era

	I Average Defense Burden for Period	II Average Defense Burden for Period	III Average Defense Burden for Period	IV Change in Average Defense Burden for entire Period	V Change in Average Defense Burden across each Period
	1980-89	1990-99	2000-03	1980s-2000s	1980s-2000s
Income per capita	-.668 (-1.44)	-.743 (-1.56)	-.962 (-1.68)	2.48 (1.94)	-3.08* (-2.70)
Trade Openness	-.019 (-1.36)	-.012 (-1.50)	-.012* (-2.40)	-.005 (-1.67)	-.003 (-0.50)
Debt Burden	.009 (0.43)	.002 (0.22)	.000 (0.01)	-.002 (-0.50)	-.003 (-1.50)
Lagged Military Burden	----	----	----	-.496* (-9.73)	-.661* (-3.22)
Soviet/Russian Military Spending	----	----	----	----	.494* (22.45)
Constant	10.05* (2.28)	10.13* (1.84)	12.28* (2.08)	-1.96 (-1.47)	----
\bar{R}^2	.04	.04	.20	.83	.75
Number of Cases	20	20	20	20	60
	OLS, Cross--section	OLS, Cross-section	OLS, Cross-section	OLS, Cross-section	OLS with Country Fixed Effects/Panel Corrected Standard Errors

Income per capita is period average for estimates in I-III and V; in IV it is growth rate over whole period.
Trade openness is period average in I-III and V; in IV it is period average of first decade (1980-89).
Debt Burden is period average in I-III and V; in IV it is period average in first decade (1980-89).
Lagged Defense Burden is average defense burden in period immediately previous.
Soviet/Russian Military Spending is in natural logs for each period.

Cols I—IV: t-statistics in parentheses; Col. 5: z-statistics.

*--statistically significant at .05 level.

In sum, although the internationalization of the economy as well as the levels of accumulated public debt appear to be important forces in acting as dampening factors in other non-welfare spending functions, their impact hardly

registers on the budgetary military burdens countries bear. Instead, it would seem that the rise and decline of a major international military threat to these countries has been a central influence.

Labour, Capital, and the Hollowing of the Military

Military Personnel

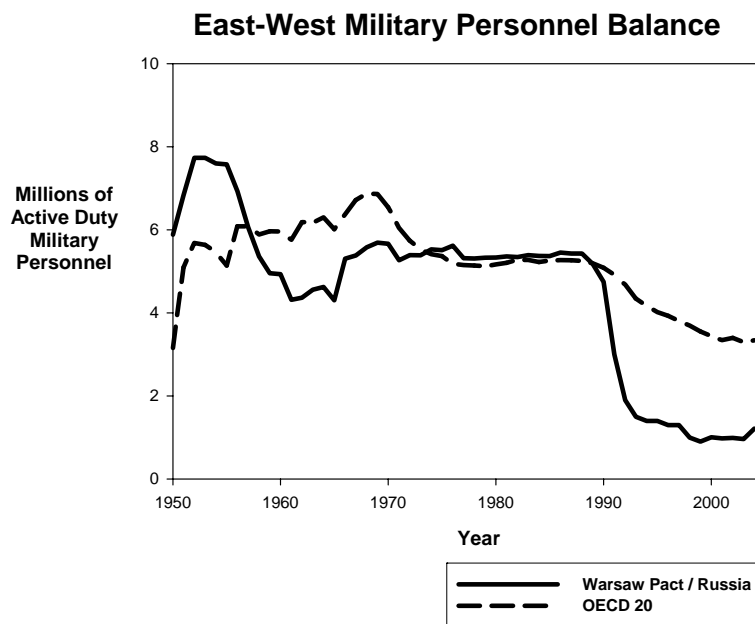
In the West, to a great extent, the rise and decline in military spending is reflected in the trend in the personnel employed within the military (see Figure 4). As the Korean War broke out, total military personnel in this group of twenty OECD countries quickly moved from the level of three to six million soldiers. The total peaked at the end of the 1960s during the Vietnam War, coming close to seven million and then retreated to around five million by the end of the Cold War. As the East-West conflict terminated, personnel needs lessened and, once again, force levels declined to close to three million active duty soldiers. For the most part, the staffing levels in the West paralleled those within the Warsaw Pact. The latter's dissolution at the beginning of the 1990s provided much of the impetus for the sharp reduction in personnel levels in Western nations.

Conscription was in fairly widespread use throughout much of the West as the Cold War set in. Seventeen of the twenty Western countries for which I have collected data used conscription to meet the personnel requirements in the mid-1950s. By the end of the Cold War, fourteen out of the twenty still retained conscription. The Anglo-Saxon countries, here the United Kingdom (in the early 1960s) and Australia and the US (both in the early 1970s), ended reliance on conscription during the Cold War. In this year, 2006, with Italy scheduled to end conscription, only nine of these twenty states will still be using this means of staffing the military.

This form of coercive labour demand played an important role in maintaining the high levels of military manpower, particularly during the Cold

War. Data on the importance of conscription in supplying personnel needs are available for fourteen of the OECD countries (see Table 5). One sees a broad range across these countries and over time. In the 1970s and 1980s, conscription helped supply anywhere from an average of 30 to nearly 84 per cent. This reliance decreased during the 1990s, with two countries ending conscription (Netherlands and Belgium) and quite a number of others lowering their dependence. In the first five years of the present decade, France and Spain ceased using conscription and most other countries generally lowered their intake.

Figure 4



A variety of reasons have been put forward to justify the use of military conscription. Mulligan and Shleifer (2004), for example, emphasize the regulatory costs and ease with which such a regime of personnel recruitment can be implemented and maintained. However, the principal grounds offered are usually economic. The legal requirement to serve in the military for a significant period of time at low wages is seen as a means of inexpensively meeting what could

otherwise be very large personnel requirements and attendant high financial costs. However, leaving aside the costs and risks this imposes on the individuals subject to such forced labour and associated risks, a number of analysts have pointed out that really very few savings actually accrue to governments that use this instrument. Cost savings estimates vary, but generally range between only five to ten per cent of the military budget (van Ypersele de Strihou, 1967; Oneal, 1992).

Table 5
The Importance of Conscription in
Supplying Military Personnel
(Conscripts as a percent of armed forces)

<i>Period:</i>	<i>1970-79</i>	<i>1980-89</i>	<i>1990-99</i>	<i>2000-04</i>
<i>Country:</i>				
Netherlands*	47	47	25	0
Belgium*	33	32	35	0
France*	54	52	44	20
Switzerland	74	84	68	52
Spain*	66	66	62	17
Portugal	73	53	36	18
FR Germany	47	46	43	36
Austria	61	58	43	46
Italy+	65	67	55	26
Greece	74	70	75	64
Finland	79	72	75	61
Sweden	71	72	74	64
Norway	68	65	61	57
Denmark	34	30	29	25

Period averages calculated using available annual data drawn from the IISS (various years) *Military Balance*.

*-- conscription ended in Netherlands (1996), Belgium (1994), France (2002), Spain (2002).

+-- conscription will end in Italy in 2006.

Military Capital

It has been possible to collect a significant amount of data on major military capital items for a large number of countries, both East and West. These data have been collected and coded from the International Institute for Strategic Studies' annual publication, *The Military Balance*. The data collection effort has been described in greater detail elsewhere (Cusack, 1985a). The weapons data

reflect a country's stock of in-use military capital items as of 1 July of the year for which the data are reported. Note that here the West is defined as the sixteen OECD countries described in footnote 2. Up until 1991, the East is defined as being constituted by the following seven countries (the dissolution of the Warsaw Treaty Organization): East Germany, Poland, Hungary, Czechoslovakia, Bulgaria, Romania, and the Soviet Union. Thereafter, it includes only the Russian Federation.

The three data series consider only important military equipment that can be used for conventional combat and exclude items entirely devoted to strategic nuclear purposes. It should be noted that some analysts (see, e.g., Lieber and Press, 2006) have concluded that the United States has not only pursued but effectively achieved predominance in the strategic nuclear area. This entails that it has gone beyond the constraints implied by the situation of “mutually assured destruction” that prevailed during the much of the Cold War period and has acquired effective nuclear primacy or hegemony with the ability to successfully launch a nuclear first strike with minimal risk of effective retaliation.

The first series deals with naval forces. It is an annual count of the number of *major surface combat vessels (MSCVs)*; this category includes frigates, destroyer escorts, destroyers, cruisers, battle ships and aircraft carriers. The second series is connected to land forces and is a simple annual count of the category of armor conventionally described as *main battle tanks (MBTs)*. The third series deals with the air force's principal offensive weapons platform: *fixed-wing combat aircraft (FWCAs)*, including both fighters and bombers. These three weapons systems data do not extend as far back as the personnel series, but they do cover a significant span of time, namely from the 1960s or early 1970s through to the beginning of this century.

In the naval area during both the Cold War and beyond, the West held an appreciable lead over the Warsaw Pact in the sheer number of *MSCVs*. One

sees that the end of the 1960s marked the beginning of a significant decline in the West's stock of important combat vessels (see Figure 5). The decline was principally driven by large cutbacks in American weapons stocks as US involvement in the Vietnam War drew down. This decline was reversed somewhat in the 1980s, partially in response to the Warsaw Pact (mainly Soviet) buildup. Again, with the end of the Cold War, the former potential enemy's stock of capital in this area declined dramatically. A gentler decline was set in train throughout the West.

In terms of land-based military capital items, one can observe a dramatic gap to the apparent advantage of its Eastern competitors (see Figure 6). Throughout the Cold War period, the East enjoyed more than a two-to-one advantage. However, it should be pointed out that inside the Socialist centrally planned economies, counts of the number of capital items, particularly *main battle tanks*, almost certainly exaggerate of the actual number of functioning weapons platforms. Within centrally planned economic systems, there was little or no incentive to produce spare parts. Often, then, a significant portion of existing weapons stocks was cannibalized in order to replace worn-out parts. Nevertheless, on both sides of the East-West conflict, there was a substantial rise in the stock of such weapons through the 1970s and 1980s. And, again, with the end of the Cold War, there were dramatic cutbacks on both sides.

Finally, along the third dimension, the air, one can see that the decline in the Western stock of *fixed-wing combat aircraft* with the winding down of the Vietnam War was eventually followed by a build up during the Reagan administrations (see Figure 7). With the end of the Cold War, the stock of such weapons systems once again set into decline. Over the entire period, there was an almost consistent downward trend in the stock of these weapons held by the Warsaw Pact countries. Russian stocks plummeted through the 1990s and into the first few years of the new century.

Figure 5

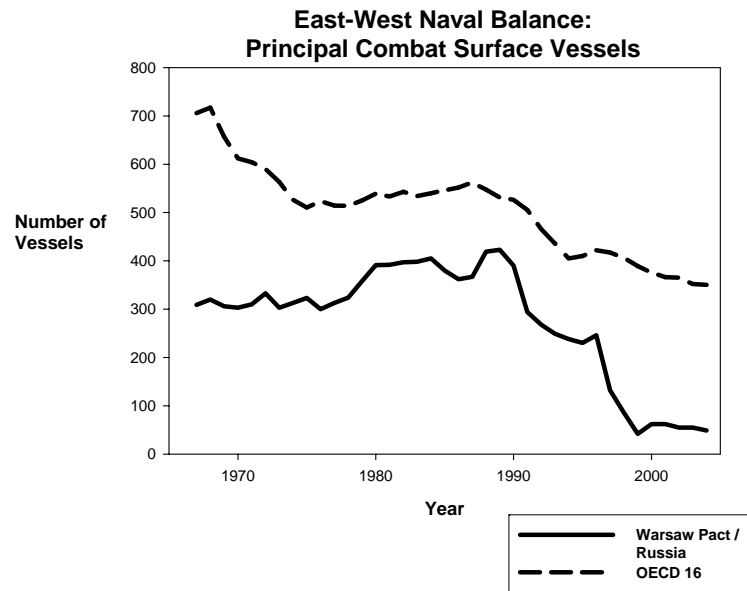


Figure 6

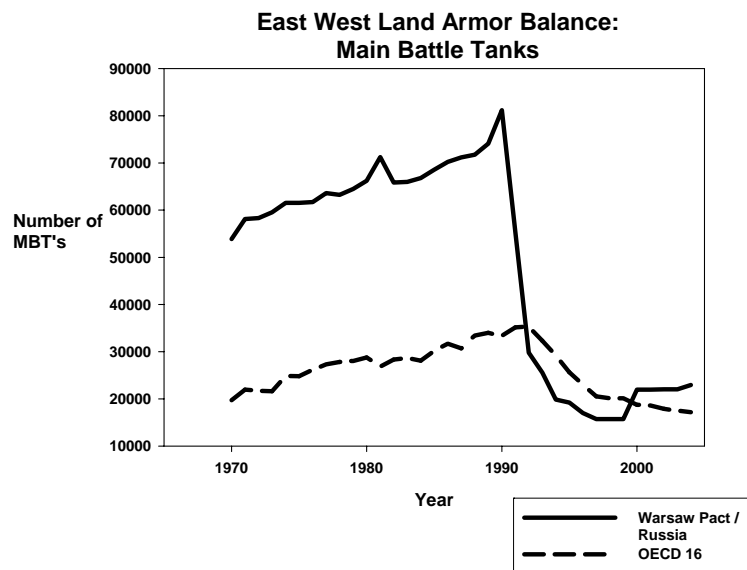
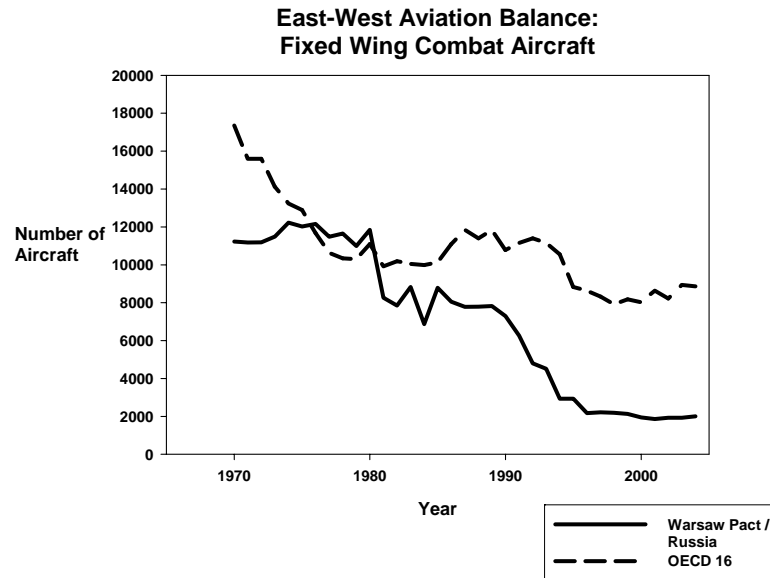


Figure 7



On a country-by-country basis, the picture is generally uniform. Table 6 provides information on the country holdings of the three major conventional military capital items for the years 1970, 1980, 1989, and 2004. For most countries, the stocks of these weapons have generally declined, and in quite a number of cases significantly. For example, France, Germany, the United Kingdom, and even the United States have greatly cut back on the air, land and naval forces' major weapons stocks, and this despite the significant efforts to maintain or actually increase their stocks during the last decade of the Cold War. For many of the smaller countries the scope of these cutbacks has sometimes been as large if not greater.

Table 6: Conventional Weapons Stocks, 1970-2004

	Fixed-Wing Combat Aircraft				Major Surface Combat Vessels				Main Battle Tanks			
	1970	1980	1989	2004	1970	1980	1989	2004	1970	1980	1989	2004
Australia	224	135	116	152	14	11	12	10	140	90	103	71
Belgium	208	142	126	90	0	4	4	3	640	529	467	143
Canada	280	247	151	140	20	23	19	16	330	114	114	114
Denmark	112	108	89	60	6	10	3	3	298	368	262	231
FR Germany	1080	707	507	384	19	23	14	13	3300	3826	5005	2398
France	740	605	598	478	52	48	43	34	2030	2225	1570	614
Greece	200	264	330	389	12	16	21	14	1100	1510	2219	1723
Italy	425	310	390	220	47	29	33	17	1000	1595	1720	1093
Japan	590	504	362	280	28	48	63	54	685	810	1200	980
Norway	114	123	83	61	7	8	7	3	201	186	187	165
Netherlands	135	161	189	137	32	22	15	15	720	938	913	283
Spain	202	177	217	177	38	28	19	16	600	935	874	552
Sweden	650	430	417	207	16	8	0	0	300	800	985	280
Switzerland	315	377	272	111	0	0	0	0	650	800	820	355
United Kingdom	816	732	570	426	67	70	49	34	900	1171	1561	543
United States	11260	6073	7412	5541	254	191	229	118	11596	12875	15992	7620
Average	1084	693	739	553	38	34	33	22	1531	1798	2125	1073
USSR/Russia	8025	8833	5388	2002	225	310	328	49	41140	50200	54550	22950
PRC	3300	6000	5000	1900	13	29	56	63	8500	11000	9750	8580

Note that values given for Major Surface Combat Vessels in 1970 are from 1971 in the cases of Italy and the United Kingdom, from 1972 in the case of Denmark, from 1974 in the cases of Canada and France, and from 1975 in the case of the PRC. The Main Battle Tanks value in the 1970 column for Norway is actually from 1973.

The Dramatic Rise in Prices

In an era of declining capacity or willingness to finance the military, and in particular, to pay the costs of new capital acquisition in many countries, the seemingly ineluctable rise in the relative costs of military capital items has and will continue to hollow out the military might of these nations. Some analysts have remarked upon this feature (see Kirkpatrick and Pugh, 1983; Pugh, 1993; Kirkpatrick, 1995; Augustine, 1997). Note that Kirkpatrick and Pugh (1983), using a variety of sources, report growth rates for a variety of American military

weapons systems. The values provided are as follows: infantry anti-tank weapon: 13%; tank: 11%; destroyer: 9%; aircraft: 8%; and aircraft carrier: 6%. They also report an estimate of 8.3% for British combat aircraft in the post-WWII era. Their estimate of aircraft carrier construction cost inflation is exactly the same as that I derive. Their figure on aircraft is slightly lower than the value estimated below for the data I have been able to assemble on fighter aircraft in the US over the period 1916-2005. Other, but similar estimates are also provided by Pugh (1993) for both UK and US weapons procurement.

Indeed, Augustine (1997, p.107) suggested that the tendency for the relative costs of military capital items to rise has achieved a law-like quality. This is summarized facetiously in the quote below:

“In the year 2054, the entire defense budget will purchase just one aircraft. This aircraft will have to be shared by the Air Force and Navy 3-1/2 days each per week except for leap year, when it will be made available to the Marines for the extra day.”

Construction costs of the first two US built aircraft carriers (the Saratoga and the Lexington, both put into service in 1927) were 234.5 and 245.7 millions of dollars in constant prices (base year 2000).⁶ About fifty years later the cost of constructing the first of the Nimitz class carriers, put into service in 1975, was 4.3 billions of dollars in real 2000 terms, i.e., about twenty times the price in real terms of the first two purpose-built carriers. The implied average annual growth rate (above and beyond economy-wide price increases) is close to 6 per cent. Such a growth rate entails a doubling of construction costs over and above economy wide inflation every 12 years. While this pace of growth is not as great as that seen in the costs of *fixed-wing combat aircraft* (see below), it is still extremely high and poses grave challenges to governments attempting to keep

⁶ Data related to early US aircraft carrier construction costs derive from the Federation of American Scientists (2005). Price data are drawn from Johnston and Williamson (2004).

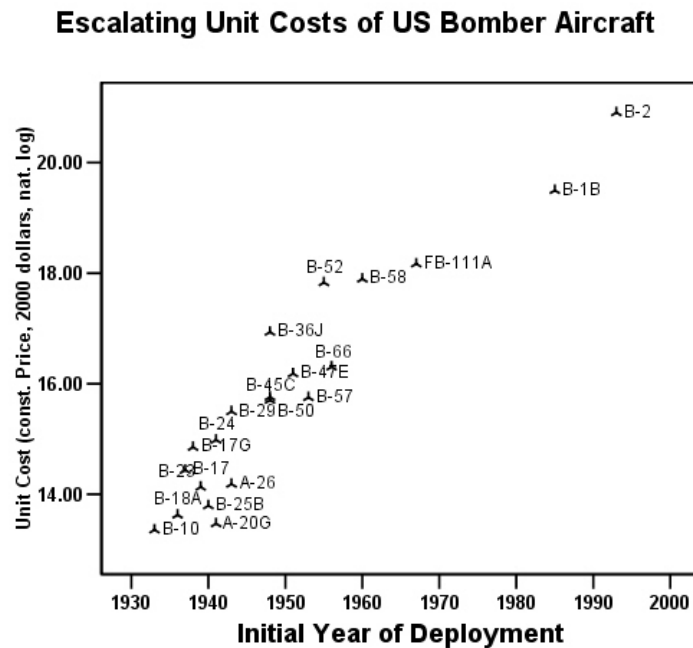
costs under control while at the same time not diminishing the means employed in the pursuit of state aims. It is fascinating to realize that the problem of Baumol's (1967) disease, first characterized in the 1960s in reference to services as a whole and later often used to explain the growing costs of government because of its heavy reliance on labour in the delivery of services (e.g., Beck, 1981), is actually reversed in the case of the military.

Of course, acquisition is not the only cost confronted in fielding a major weapons system. There are additional costs that cannot be avoided. Given the long service life that governments attempt to achieve for these expensive weapons systems, one also needs to take into account the modernization costs that are periodically required over a long life-span as well as the operating and support costs incurred if these systems are to be employed for the purposes for which they were constructed. Finally the deactivation and disposal costs also need to be taken into account. Return to the Nimitz class carrier example. To the initial investment of 4.3 billions of dollars, one has to add the mid-life modernization costs of 2.5 billions, the operating and support costs of 15.6 billions, and the deactivation and disposal costs of 0.9 billion. In sum, each of the 12 US aircraft carriers in the US fleet in 2003 entailed a commitment of at least 23.3 billions of dollars. Totalling the costs of the entire fleet of 12 carriers, one comes to the sum of 280 billions of dollars (and all of this is without the costs of the expensive aircraft (see below) stationed on these carriers being taken into account) over their anticipated service lives.

Even more dramatic have been the rising relative costs in *fixed-wing combat aircraft*. Take, for example, bomber aircraft. Figure 8 plots the escalating costs of US bomber aircraft over the period from 1933 (when the first US-made bomber, the B-10, went into service) until the 1993 (the year the most recent bomber type, the B-2, was initially brought into operation). In real terms, the first bomber cost about 630 thousand dollars. The B-17, one of the workhorse bombers employed during World War II was introduced at the end of the 1930s,

just prior to the war. The B-17G, the more commonly produced of this type, came into service in 1938 and cost 2.8 millions in 2000 prices, in other words, four and one half times the real cost of the bomber introduced only five years earlier. Brought into operation only five years later, the B-29 came in at double the price of the B-17G. The B-52, initiated into service twelve years further on, and the mainstay of both the conventional and strategic bomber forces of the American military during the Cold War and beyond, came into operation at a cost ten times as great as the B-29. The most recent bomber type introduced into the American military, the B-2, entered active service in 1993, shortly after the Gulf War. The purchase cost of a single unit was close to 1.2 billion dollars in real terms. This represented an increase of over 2000 per cent in the real dollar cost of a bomber to the American taxpayer.

Figure 8



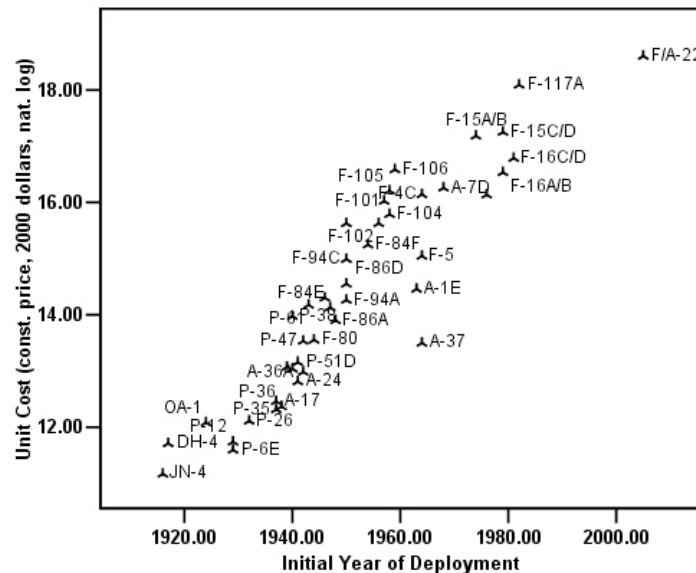
Nearly as dramatic has been the rise in real terms of the unit costs of fighter aircraft, of which there has been a far broader and diverse set of

acquisitions (see Figure 9). The first type that I have been able to assemble data on both initial year of service and purchase cost is the JN-4, the first mass-produced American aircraft. This two-seat bi-plane was acquired and put into active service in 1916. In terms of 2000 US dollars, the acquisition cost of this plane was about 70 thousand dollars. The P-39, introduced about twenty years later, shortly before America's entry into the Second World War, viz., 1939, was acquired at a cost of 470 thousand dollars – nearly seven times the unit costs of the JN-4. The F-84E, one of the main early jet propelled fighters of the American military was introduced eight years later, after the War. It came in at the cost of 1.37 millions (constant price 2000 dollars), about three times the unit acquisition costs of the P-39. The F4C, introduced at the beginning of direct and intensive American involvement in the Vietnam War, entered active service at a cost of 10.2 million (constant price 2000 dollars), more than seven times the unit acquisition costs of the F-84E. Inflation in real terms over and above what was going on throughout the American economy continued apace. One of the most recent systems-type acquisition is the stealth fighter, the F-117A, would first come into operational service during 1982 at a cost of 72 million, to be followed by the 2005 acquisition of the F/A-22 at a unit price of 120 million.

Based on these data, the estimated average annual rates of growth in real unit costs of US bombers and fighter planes were 13.3 and 9.9 per cent, respectively. These estimates are based on the historical data dealing with the unit prices and dates of deployment for 21 individual bombers and 43 fighter aircraft. Note, again, these inflation rates are over and above those occurring within the economy as a whole. Thus, if the GDP rose by an average annual rate of 1.7 per cent, a modest rate of overall inflation, the implied inflation rate in the cost of a bomber aircraft would be 15 per cent, , in other words, a doubling time of less than five years and a quadrupling in unit cost within less than a decade.

Figure 9

Escalating Unit Costs of US Fighter Aircraft



Extrapolating, using these rates and the prices of the last acquisitions in these inventories, this would mean that by the year 2062, were a new fighter aircraft to be developed and acquired, its cost would be 29 billion dollars in 2000 prices. This is 6.7 billion greater than the entire 50 year life-span cost of a Nimitz carrier. Furthermore, should a new bomber aircraft be developed and added to the inventory in 2062, it would cost 9.17 trillion dollars; a sum close to the size of the entire US economy in the year 2000 as measured in constant price GDP terms (9.92 trillion dollars).

It is interesting to compare these rising real costs with those associated with another major component of military strength, labour. US Department of Defense (DOD) personnel costs have risen at an annual rate over and above economy-wide inflation by 1.8 percent.⁷ This estimate is based on annual data on

⁷ Annual data on DOD spending on military personnel are taken from the Budget of the United States Government: Historical Tables Fiscal Year 2005 produced by the US Government Printing

DOD spending on military personnel are taken from the Budget of the United States Government: Historical Tables Fiscal Year 2005 produced by the US Government Printing Office. Personnel data come from the Correlates of War Project. Price data are from Johnston and Williamson (2004).

Contrast this change with the rise in the real costs of the typical civilian employee in the same period. Note that using data on compensation of employees and civilian employment taken from the Council of Economic Advisors' *Economic Report of the President for 2005* and the price data are from Johnston and Williamson (2004), the real cost of civilian labour rose at a rate of 1.2 per cent per annum over and above economy-wide inflation. Thus, while inflation in military personnel costs are clearly greater than those found in the civilian labour market, they pale in comparison with the huge inflationary pressures connected to major military capital items.

So, just as in the logic of Baumol's disease, the cost of one of two major items in the production function is growing disproportionately (and at a relatively rapid rate). One effect of this is to squeeze the capacity of the governments to maintain existing force levels. In this regard, the end of the Cold War came at an opportune and fortuitous moment. Demands for newer and even more expensive weapons systems subsided just as already stretched resources were being dramatically reduced.

One of the implications of the rapid relative rise in the unit cost of weapons systems is the decreasing frequency with which new systems are introduced into the military inventory (Lorell, 2003). A very good example of this is to be found in the case of fixed-wing combat aircraft within the US military over the last century or so. Some of the long-run consequences only exaggerate the problem. One begins to see a decline in the frequency with which new systems can be

Office Personnel data come from the Correlates of War Project. Price data are from Johnston and Williamson (2004).

introduced (see Table 7 for the American experience in terms of FWCAAs). Another consequence, one that generally further heightens acquisition cost pressures, is the ever diminishing size (in terms of the number of firms competing) of the defense capital weapons-building industry (Lorell and Levaux, 1998). This only further heightens cost pressures as industry becomes more oligopolistic, indeed monopolistic, with the consequent price inflating pressures.

Table 7: The Evolution in the Number of Types of New Fixed-Wing Combat Aircraft Introduced Into the US Air Fleet

<i>Period</i>	<i>Total</i>	<i>Of which: Fighters</i>	<i>Bombers</i>
1910-19	2	2	0
1920-29	3	3	0
1930-39	10	5	5
1940-49	19	11	8
1950-59	14	10	4
1960-69	7	5	2
1970-79	4	4	0
1980-89	3	2	1
1990-99	1	0	1
2000-05	1	1	0

The maintenance of existing force structures has come to pose significant difficulties for most of the Western nations. With declining overall allocations to the military, this has constrained choices in terms of how the ever more restricted budgets are used. Outside two of the larger powers, such as the US and the UK, most countries for which I have data (see Table 8) seem to have foregone the acquisition of new equipment in order to cover personnel and general operating costs – and this in an era when many countries have significantly cut back on personnel. As the level of resources going to the military have stagnated or declined, in most cases smaller shares of these reduced resources have been allocated to the purchase of new equipment. In other words, there appears to be a real tradeoff in terms of the level of overall spending and the ability to allocate some of those resources to the purchase of new military capital. As military budgets decline, so too does the purchase of new hardware and increasingly most of the military budget goes to personnel and operations.

Table 8: Changing Composition of Military Budgets

<i>Country</i>	<i>Period</i>	<i>% Share of Military Budget for Personnel</i>	<i>% Share of Military Budget for Other Purposes</i>	<i>% Share of Military Budget for Equipment</i>	<i>Military Spending as % Share of GDP</i>
US	1986-88	36.4	37.9	25.7	6.4
	2001-03	33.7	41.5	24.8	3.5
Canada	1986-88	46.1	33.4	20.6	2.1
	2001-03	42.8	43.8	13.4	1.2
UK	1986-88	39.6	35.3	25.1	4.6
	2001-03	39.5	36.6	23.9	2.4
Netherlands	1986-88	41.2	39.3	19.5	3.0
	2001-03	48.9	34.2	16.9	1.6
Belgium	1986-88	62.3	25.0	12.7	2.8
	2001-03	70.5	22.7	6.8	1.3
Spain	1986-88	52.1	25.2	22.7	2.2
	2001-03	63.5	23.8	12.7	1.2
Portugal	1986-88	66.1	24.9	9.0	3.2
	2001-03	79.7	14.3	6.0	2.1
F.R.Germany	1986-88	49.1	30.9	19.9	3.0
	2001-03	60.3	26.3	13.4	1.5
Italy	1986-88	58.2	22.0	19.8	2.3
	2001-03	72.6	15.3	12.1	1.9
Greece	1986-88	60.6	20.7	18.8	6.3
	2001-03	66.4	19.6	14.0	4.3
Norway	1986-88	44.8	35.4	19.8	3.2
	2001-03	38.1	39.6	22.2	1.9
Denmark	1986-88	56.4	29.1	14.4	2.1
	2001-03	51.3	31.3	17.4	1.6

Tradeoffs

Not only within the military budget, but from the perspective of the broader budget, the question of tradeoffs often surfaces. Does military spending come at a direct cost to other government priorities, the classic “guns/butter” tradeoff? If there is a systematic pattern, let us assume that it is symmetric. This means that if some other major component of government spending suffers as military spending increases, that component gains when military spending decreases. Using this widespread and traditional, but admittedly restrictive, assumption, it is possible to evaluate the question of broader budgetary tradeoffs for a number of major items, including social transfers, education spending, health outlays, and foreign aid.

Again, using a pooled data set for 20 OECD countries, four tradeoff equations have been estimated.⁸ These include spending on social transfers, education, health, and foreign aid. In each of the formulations, the level of expenditures on a particular category relative to the size of the overall economy serves as the dependent variable. To ascertain whether these relative allocations lose or gain in the budgetary process relative to the military, the military burden term is included. Also included are measures of societal affluence and the partisan character of the government. Note that the last variable in this formulation, DPOP, standing for dependent population as a percent of total population, is used only in the equations for social transfers and health expenditures. All expenditure variables, $EXP(j)$ and MB , are expressed as percentages of GDP. The societal affluence term, income per capita variable, $YCAP$, is measured in terms of thousands of constant price US dollars. The center of political gravity (CPG) measure is on a scale, ranging from -100 to +100, with very low values indicating a government political orientation on the far

⁸ The general form of the equations is as follows:

$$EXP(j)_{i,t} = b_1 + b_2 MB_{i,t} + b_3 YCAP_{i,t} + b_4 CPG_{i,t} + b_5 DPOP_{i,t} + e_{i,t}$$

left and very high values capturing a government political orientation on the far right (see Cusack and Engelhardt, 2002). Note that it is anticipated that the estimated effect of the income variable is positive, that of the political term to be negative, and that of dependent population to be positive. Whether the parameter estimate is positive or negative on the military burden term would depend on whether the other spending variable (on the left hand side of the equation) is complementary or competing. A statistically insignificant parameter would signal that decisions regarding spending on the two items are independent of one another.⁹

OLS with panel corrected standard errors and country fixed effects was the technique used to estimate the model. The estimation results are presented in Table 9. In three of the four equations the parameter on the military burden term is negative. However, one of these parameter estimates is not statistically significant; this is in the equation for social transfers. This finding of a lack of a tradeoff between defense and welfare spending is consistent with earlier research (see, e.g. Domke, et al 1983). Interestingly, the military burden parameter estimate in the foreign aid equation takes on a positive (and statistically significant) value, suggesting that rather than being competitive budgetary items, military spending and foreign aid have been complements to one another, rising and declining jointly. This relationship is quite the opposite of what one would expect of the idealistic interpretation some analysts give to the motives of aid provision (cf., Lumsdaine, 1993). Finally, there seems to have been a competitive relationship between military spending and both health and education outlays. This interpretation, of course, relies on the assumption that tradeoffs are a symmetric phenomena – a change in spending on one component implies a change in the opposite direction for the other component. In terms of the four major civilian spending categories that have been examined, this tradeoff relationship appears to occur only between the military budget on the one side, and health and education spending on the other.

⁹ For a more plausible assumption regarding competition between components of government and competition for scarce resources, see Cusack (1985b).

Table 9: Panel Estimates of Model Capturing the Potential Tradeoffs with other Spending Priorities

	<i>Social Transfers</i>	<i>Education</i>	<i>Health</i>	<i>Foreign Aid</i>
Military Burden	-.136 (0.71)	-.197* (-2.10)	-.479* (-5.15)	.105* (4.57)
Income per capita	.326* (9.31)	.094* (5.88)	.055* (2.04)	.023* (5.75)
CPG	-.014 (-1.00)	-.019* (-6.00)	-.016* (-3.20)	.001 (1.00)
Dependent Population	.582* (13.23)	----	.219* (4.98)	----
\bar{R}^2	.91	.72	.84	.69
Number of cases	98	84	82	99
	Country Fixed-Effects/ Panel Corrected Standard Errors	Country Fixed-Effects/ Panel Corrected Standard Errors	Country Fixed-Effects/ Panel Corrected Standard Errors	Country Fixed-Effects/ Panel Corrected Standard Errors

z-statistics in parentheses.

Conclusion

Throughout the West, the drain that the military has placed on both government and societal resources generally has diminished since the heydays of the Cold War. This decline was hastened with the culmination of that conflict and the receding international threat. Given the economic pressures that many states confronted from both international and domestic sources, the West can be said to have experienced a fortuitous conjunction of lessening security demands with stable if not rising pressures to allocate more resources to social areas. At least in the areas of health and education, it would seem that governments have been able to move some resources away from the military function to these social purposes.

But in most countries there is little left in both financial terms and with respect to the military capability that financial resources can buy. A good part of the present reduced stocks of military capital in these countries is growing old (therefore potentially obsolete) and wearing out. Should other countries adopt and pay for the materials associated with the so-called “Revolution in Military Affairs,” these Western nations may be confronting external threats that they can no longer meet. Even in the absence of high-tech external threats, the demographic surges outside the West are likely to pose many international security challenges.

The excessive rise in relative prices associated with major military capital items, a rise only partially associated with an increase in real effectiveness, poses a test for many of these states if they are to retain their capacity to provide in some meaningful way for their own military defense. The money available for military purposes is declining or, at best, stagnating. The price per unit of military capital is rising exponentially. For many of the OECD countries, the laws of mathematics assure that something similar to the farcical outcome described by Augustine will come to the fore sooner rather than later.

At the same time, the aging problem in the OECD countries will make it more difficult to attract sufficient personnel to the military (Goure, 2000). With shrinking younger age cohorts, the size of the recruitment pool will grow smaller and the costs of attracting people into the military will increase. All of this takes place against a backdrop of popular anti-military sentiment that only makes recruitment more difficult.

Soldiers alone do not make an army. Without modern equipment, the military of many of these countries might better be employed for some internal or international policing purposes or other socially useful activities. The provision of security from external threats would then best be outsourced and resources found to pay for it. Obviously, one of the more preferable means to do this is

through international cooperation. However, cooperation in the security area is one of the most difficult tasks national leaders can undertake.

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