

## The Demand for Military Spending in South Africa\*

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Understanding the factors that determine the military burdens in developing economies is an important area of research. Previous research has suggested that to understand the dynamics of the relationship between military burden and economic and strategic factors requires detailed case studies. This article provides an analysis of the South African experience, a particularly valuable case study given the importance of the military sector to the apartheid system, the marked reductions in military spending that have taken place under the new government and the availability of good time-series data. A detailed analysis of the trends in military spending and the changing structure of government spending over the past 40 years is undertaken. A simple model based on a general theory of the demand for military spending provides the basis for an investigation of the relative importance of strategic and other social and economic factors, and is found to perform surprisingly well. The results of the regression analysis suggest that the trends in South Africa's military spending (for the period 1963–97) could be explained as an autoregressive process in military burden conditioned on a number of country-specific strategic factors. Imposition of the mandatory UN arms embargo in 1977 and the change in regime in 1994 had significant negative impacts, while involvement in the Angolan War and the early years of the Republic had positive impacts.

### Introduction

South Africa's levels of military spending have exhibited wide variations in the past 40

years. Starting in the early 1960s, following the imposition of apartheid policies and the use of the military to defend white minority rule, a process of militarization of South African society occurred at economic, political and social levels (Cock & Nathan, 1989). During the 1970s and 1980s, there were sustained upward trends in military spending as a result of South Africa's military involvement in Namibia/Angola (after 1975) and the establishment of a domestic

\* This article is based on research undertaken as part of a project on Defence Industrial Restructuring, Conversion and Economic Growth in South Africa, funded by the Leverhulme Trust, whose support is gratefully acknowledged. We are also grateful to Associate Editor Michael Brzoska, three anonymous referees, Ron Smith and Richard Haines for valuable comments. The corresponding author is J. Paul Dunne (e-mail: J.Dunne@mdx.ac.uk). The data used can be found at <http://bobbins.mdx.ac.uk/~john6/>

defence industry in response to the 1977 mandatory United Nations arms embargo. Since the late 1980s, however, South Africa's levels of military spending have been reduced substantially, with the end of apartheid and the end of the Cold War. After nearly 10 years of defence budget cuts, by the end of the 1990s South Africa's military burden (military spending as a percentage of GDP) was at the same level as it had been in the early 1960s.

This history, with its variations in military spending, and the availability of good time-series data make South Africa a valuable case study for research into the demand for military spending in developing countries. It promises useful insights into the economic aspects of a process whereby a country that has undergone rapid and extensive militarization then experiences a relatively rapid reduction in military spending. It also allows an evaluation of the explanatory power of a general theory of the demand for military spending and the chance to investigate the importance of strategic and other social and economic factors. To this end, the first section considers the trends in military spending in South Africa since the early 1960s and discusses the reasons for the cuts in military spending since 1989. The second section examines the trends in government finances since 1989, in terms of both expenditure and revenue, with the third section providing an analysis of the changing structure of the defence budget since 1989. The fourth section specifies and estimates an econometric model of the demand for military spending in South Africa for the period 1961–97. Finally, the fifth section presents some conclusions.

### **Trends in South Africa's Military Spending**

Since the early 1960s, there have been wide variations in military spending in South

Africa, in absolute terms, as a share of GDP and as a share of total government expenditure. However, the analysis of demand for military spending during this period cannot be adequately undertaken without looking further back in history.

#### ***The Period Prior to 1961***

Between the establishment of the Union of South Africa in 1910 and 1961, when the country became a Republic, South Africa's military planners were largely concerned with internal threats. These included sporadic uprisings, such as a military rebellion in 1914 and various miners' strikes between 1913 and 1922. Following the National Party's rise to power in 1948, the policy of apartheid was methodically enforced. Domestic opposition to apartheid was ruthlessly crushed, as reflected by the Sharpeville uprising in 1960 in which 69 people were killed and 180 injured. As a result of the domestic situation, the Permanent Force component of the Union Defence Force (UDF) was increased from just over 5,000 personnel in 1940 to 18,000 by 1960 (Seegers, 1996). In the years after 1960, the military's function became very closely intertwined with that of the South African Police (SAP).

External threat considerations only became important during the two World Wars, when South Africa was obliged to make significant contributions to the Allied war effort. In World War I, South Africa sent some 76,000 soldiers to the European, North African and East African fronts. It also successfully invaded the German colony of South West Africa (now Namibia) at Britain's request and set up its own colonial administration. During World War II, South Africa committed just over 400,000 military personnel to the Allied campaign. This had a dramatic impact on the share of defence spending in total government expenditure, which rose from 1.6% in 1935 to 33.8% in

1940 (de Wet *et al.*, 1996). During the 1950s, military spending increased significantly as a result of armaments purchases for the UDF, and because of South Africa's participation in the Berlin Airlift and the Korean War.

### **1961–89**

Between 1961 and 1989, South Africa's military spending was influenced by a combination of strategic, economic and political factors. In the early 1960s, it amounted to just over 1% of GDP, but increased quite rapidly in the mid-1960s with the start of the ANC's armed struggle and the imposition of the first UN arms embargo in 1963. By 1965, the defence share of total government expenditure had increased to 7.4%, up from 3.2% in 1960 (de Wet *et al.*, 1996). The increase in military spending was also related to the growth of the South African Defence Force (SADF), which almost doubled in size between 1960 and 1970 (Seegers, 1996). The 1963 UN embargo severely limited the country's access to international arms sources and provided the impetus for the establishment of a domestic arms production capability. This included the creation of the Armaments Development and Production Corporation (Armscor) in 1968 (Batchelor & Willett, 1998).

During the late 1960s and early 1970s, military spending remained a constant share of GDP and then declined slightly, as the South African government was able to contain political opposition to apartheid within South Africa and Namibia. From 1972 onwards it began to increase again as a result of growing external and internal opposition to apartheid, with large-scale strikes in Durban in 1973. The state responded by increasing the length of compulsory military service for white males, which had been introduced in 1967, from 9 to 12 months. In July 1973, the SADF took over from the South African Police the

function of maintaining security in Northern Namibia.

From the mid- to late 1970s, South Africa's military expenditure began to increase substantially owing to regional and internal developments. The independence of Angola and Mozambique in 1975 and the establishment of Marxist governments in both these countries changed the geopolitical nature of the Southern African region dramatically. In addition, South African and Namibian liberation movements began to use these two 'front-line' states as springboards for their guerrilla operations in South Africa. In August 1975, the SADF invaded Angola 'covertly' via northern Namibia and engaged the MPLA (Popular Movement for the Liberation of Angola) government forces, the FAPLA (People's Armed Forces for the Liberation of Angola), in an operation code-named Savannah. The SADF invasion was short-lived. The material assistance promised by the United States never materialized, and by January 1976 Operation Savannah was terminated and the South African troops withdrew from Angola (Seegers, 1996). For the next two years, SADF operations into Angola were limited to cross-border 'hot-pursuit' raids and to providing financial and material support to UNITA (National Union for the Total Independence of Angola), the Angolan rebel movement.

In 1977/78, military spending peaked at nearly 5% of GDP and over 18% of total government expenditure. This was in response to a number of developments: the 1976 Soweto uprising, which resulted in a major security crackdown within South Africa; the South African government's purchase of large amounts of weaponry prior to the imposition of the mandatory UN arms embargo (1977); and the implementation of 'Total Strategy' in response to the perceived threat of communist expansionism in Southern Africa. The government's attempt to create a highly self-sufficient domestic arms

industry in South Africa proved to be an extremely expensive undertaking, and was reflected in the dramatic increases in military burden during the late 1970s and throughout the 1980s (Batchelor & Willett, 1998). Towards the end of the 1970s, various other factors, such as an increase (to two years) in the period of conscription for white males, the start of South Africa's secret nuclear weapons programme (in 1979), and the creation of armed forces in the nominally independent homelands (e.g. Transkei), which were financed by the apartheid defence budget, also contributed to the increases in military spending.

In the early 1980s, military spending declined slightly as a share of GDP, as the government successfully repressed domestic unrest and opposition to apartheid. From the mid-1980s, however, South Africa's increasing military involvement in Angola, Namibia and Mozambique, and the deteriorating internal security situation brought about by violent domestic opposition to apartheid, led to upward pressures on spending. From 1984, SADF troops were deployed in many of the country's black townships in an attempt to quell the growing political unrest, and in 1985 a state of emergency was declared. Military spending peaked again in the late 1980s at over 4% of GDP and nearly 13% of total government expenditure, but declined quite dramatically after 1989.

### *1989–97*

Between 1989/90 and 1997/98, South Africa's defence budget declined by more than 50% in real terms (an average of 8% per annum). As a share of total government spending, it declined from nearly 13% in 1989/90 to 5.4% in 1997/98, and as a share of GDP from 4% to 1.6% during the same period. By 1997/98, South Africa's level of military spending was at the same level as it had been during the early 1960s (see Table I).

There were four fundamental reasons for

the dramatic cuts in defence spending in the period after 1989.

First, the end of the Cold War saw the withdrawal of South African troops from Angola and Namibia, which paved the way for Namibia's independence in March 1990. After 1990, South Africa formally abandoned its policy of military aggression and regional destabilization<sup>1</sup> and embarked on an ambitious programme of diplomatic and economic outreach to African states (Nathan & Phillips, 1992). This led to improved relations between South Africa and the rest of the region, as well as greater regional cooperation on defence and security matters. These developments were also accompanied by the implementation of various disarmament measures in many Southern African countries. For example, between 1991 and 1994, full-time force levels were reduced from 58,000 to 11,000 in Mozambique, and from 54,600 to 46,900 in Zimbabwe (International Institute for Strategic Studies, 1995). Military expenditure levels also declined significantly in many countries in the region. In Botswana, military spending fell from \$156 million in 1990 to \$126 million in 1994 (US\$ in constant 1990 prices); in Zambia from \$74 million to \$31 million; and in Zimbabwe from \$388 million to \$242 million (George, Allebeck & Loose-Weintraub, 1997).

Second, a number of critical political reforms took place within South Africa. In February 1990, all opposition groups were unbanned, and political prisoners, such as Nelson Mandela, were released. The national state of emergency, which had been imposed in 1985, was lifted. Indemnity was granted to hundreds of anti-apartheid activists in exile, and many of the prohibitions against

<sup>1</sup> Despite formally abandoning its policy of support to UNITA and RENAMO, evidence has emerged that South Africa, or elements within the South African state, continued to provide covert support to RENAMO up to the signing of the Rome Agreement in 1992, and to UNITA up to the elections in South Africa in April 1994.

Table I. South Africa's Defence Budget, 1989/90–1997/98

	<i>1989/90</i>	<i>1990/91</i>	<i>1991/92</i>	<i>1992/93</i>	<i>1993/94</i>	<i>1994/95</i>	<i>1995/96</i>	<i>1996/97</i>	<i>1997/98</i>	<i>Avg.: 1989–97</i>
Defence budget	11,435	10,070	8,094	7,605	6,589	7,153	6,249	6,013	5,670	
% change		<i>-11.9</i>	<i>-19.6</i>	<i>-6.0</i>	<i>-13.4</i>	<i>8.6</i>	<i>-12.6</i>	<i>-3.8</i>	<i>-5.7</i>	<i>-8.1</i>
<i>Defence/GDP (%)</i>	<i>4.1</i>	<i>3.6</i>	<i>3</i>	<i>2.8</i>	<i>2.4</i>	<i>2.6</i>	<i>2.2</i>	<i>1.9</i>	<i>1.6</i>	<i>2.7</i>
Defence/total government expenditure (%)	<i>12.8</i>	<i>11.0</i>	<i>10.3</i>	<i>8.1</i>	<i>6.5</i>	<i>6.7</i>	<i>6.7</i>	<i>5.9</i>	<i>5.4</i>	<i>8.2</i>

Figures are in Rand million in constant 1990 prices, using GDP deflator. Figures in italics are in percentages.

Sources: Department of Finance, various years; South African Reserve Bank, various years.

political activities, such as public demonstrations and marches, were scrapped (Nathan & Phillips, 1992). In 1991, the remaining legislative cornerstones of apartheid were abolished. These political reforms created the conditions for the process of constitutional negotiations, which began with the Convention for a Democratic South Africa (CODESA I) in late 1991 and culminated in the holding of South Africa's first democratic elections in April 1994. The election of the African National Congress (ANC) in April 1994 as South Africa's first democratically elected government had a profound effect on the domestic political environment. This was reflected in the dramatic decline in the level of political violence in the period after the elections.

Third, after 1989, South Africa's economy deteriorated dramatically, prompting reductions in defence spending. In addition, there was a real decline in government revenue, including tax revenue, which imposed severe constraints on the absolute levels of government spending, while the re-prioritization of the government's spending priorities shifted the focus to social spending (e.g. education, health, housing and welfare). In this context of severe budgetary constraints and changing spending priorities, defence was an 'easy target'. From April 1994, the new ANC-led government continued reducing defence spending. These cuts have been informed by the government's stated commitment to development (articulated in the Reconstruction and Development Programme); the prioritization of social spending; and a commitment to fiscal discipline (Batchelor & Willett, 1998).

Fourth, the defence cuts were also implemented as a result of, and in conjunction with, a variety of disarmament measures. The SADF was rationalized and restructured, the system of conscription for white males was abolished, various SADF units were disbanded and a number of military bases and

installations were closed and/or scaled down. In addition, many of the SADF's major procurement projects were cancelled or postponed; large numbers of SADF and Armscor personnel were retrenched between 1989 and 1993, and the country's nuclear weapons programme was terminated in 1989 (Batchelor & Willett, 1998).

### **Trends in South Africa's Government Finances, 1989–97**

It is often assumed that a reduction in military spending as a share of total government expenditure frees resources that can be used for other purposes.<sup>2</sup> For example, these resources can be reallocated to other forms of government spending or can be used to reduce the budget deficit (Gleditsch et al., 1996). This section analyses the trends in South Africa's government finances (both revenue and expenditure) between 1989 and 1997 to ascertain what happened to the resources that were released as a result of the cuts in military spending. Batchelor & Dunne (2000) provide a more detailed analysis of the prospects for a 'peace dividend' in South Africa.

On the revenue side, there was a marked real decline in government revenue between 1989/90 and 1992/93 as a result of the severe domestic recession, but increases in government revenue every year from 1993/94 to 1997/98 as the economy started to recover. Despite this positive growth, the revenue levels in 1996/97 were only marginally higher in real terms than in the late 1980s. From 1989/90 to 1997/98, the average annual growth of government revenue was 1.4%, while the average contribution to GDP was 23.6% (see Table II). On the

<sup>2</sup> The trade-offs or complementarity between military expenditure and other forms of government expenditure are not examined in this article. See studies by Harris, Kelly & Pranowo (1988), Gyimah-Brempong (1992), Roux (1994) and Mohammed & Thisen (1996).

Table II. Government Finance Statistics, 1989/90–1997/98

	<i>1989/90</i>	<i>1994/95</i>	<i>1997/98</i>	<i>Avg. share of GDP, 1989–97</i>	<i>Avg. annual growth, 1989–97</i>
Revenue	75,420	72,396	83,456	<i>23.6</i>	<i>1.4</i>
Expenditure	87,913	88,318	96,961	<i>28.9</i>	<i>1.4</i>
Deficit	12,493	15,922	13,505	<i>5.3</i>	<i>7.5</i>
Total government debt	97,647	153,114	169,161	<i>41.5</i>	<i>7.3</i>

Figures are in Rand million in 1990 constant prices, using GDP deflator. Figures in italics are in percentages.

Source: Department of Finance, various years.

expenditure side, there was a slight decrease in government expenditure between 1989/90 and 1991/92, with a recovery in 1992/93 followed by a period of marginal annual real increases until 1997/98, with the exception of 1994/95. From 1989/90 to 1997/98, the average annual growth of total government expenditure was 1.4% per annum, while the average contribution to GDP was 28.9% (see Table II).

After 1989, there was a significant increase in the budget deficit, as well as in the absolute size of total government debt. Both grew by an average of more than 7% per annum during the period 1989–97, despite growth in revenue of just over 1% per annum over the same period. These sharp increases were linked to the recession, which hit tax revenue and saw the growth of expenditure exceed the growth of revenue, particularly in the period prior to 1993. While there was a marginal decline in the size of the budget deficit in 1990/91, between 1991/92 and 1993/94 it expanded to 29% of total expenditure, its highest share ever. This was the result of the significant costs associated with South Africa's transition to democracy. After 1993/94, with the coming to power of the ANC and the introduction of tighter fiscal policies, the deficit was gradually brought under control, and by 1997/98 it had been reduced to 13.9% of expenditure and 3.8% of GDP, its lowest since 1989/90.

The absolute size of total government debt (both domestic and foreign) continued to grow after 1989/90, largely as a result of the unavoidable increases in government expenditure during 1992/93 and 1993/94.<sup>3</sup> High levels of government dissaving occurred, both pre-1994 and post-1994, as savings (loans) were used to finance consumption (current expenditure) and led to increases in debt.<sup>4</sup> By the mid-1990s, South Africa was heading for a 'debt trap'. In 1995/96, government debt as a percentage of GDP peaked at 48% before declining slightly in 1997/98. Most was domestic in origin as South Africa, because of financial sanctions, was prevented from borrowing on international capital markets during the apartheid era. For example, in 1997/98, 95% of total government debt was owed to domestic financial institutions.<sup>5</sup>

Between 1989/90 and 1997/98, the trends in government finances, particularly the low levels of real growth in revenue, government dissaving and the large and growing size of total government debt, imposed significant constraints on the

<sup>3</sup> The real increase in the absolute size of total government debt during the mid-1990s was also related to the fact that the post-1994 ANC government took responsibility for the debt of the former TBVC (Transkei, Bophutatswana, Venda and Ciskei) homelands. This debt was formerly excluded from South Africa's national accounts.

<sup>4</sup> Based on figures obtained from South African Reserve Bank, various years.

<sup>5</sup> We are grateful to one of the referees for this comment.

growth and structure of total government expenditure. Total expenditure grew by an average of 1.4% in real terms over the whole period (1989–97), 2.6% in 1989–94 and 0.2% in 1994–97. The defence budget was a particular target. Defence declined by 8.1% over the whole period, though its annual average decline was much higher in the early period (12.7%) than in the later period (3.4%). Between 1989/90 and 1994/95, as a share of total government spending, defence declined by 6 percentage points from 12.8% in 1989/90 to 6.7% in 1994/95. If there has been any 'peace dividend' in South Africa, then it occurred during this period (see Batchelor & Dunne, 2000). Other categories that saw a reduction in their share of total government spending after 1989 were housing and community services, recreation, culture and sport and economic services (e.g. mining, manufacturing and construction, agriculture, forestry and fishing).

It is evident from Table III that the main beneficiaries of the decline in defence

spending since 1989/90 have been social services (e.g. education, health, social security and welfare) and public order and safety (police, justice and correctional services). The increases in education, health and social security and welfare reflect the prioritization of social spending, particularly since 1994 when the ANC came to power. The increases in public order and safety are a direct response to the increasing levels of crime and violence which accompanied the transition to democracy. Another significant trend in government finances after 1989/90 was the increasing share of interest on government debt, which increased from 12.4% in 1989/90 to 19% in 1997/98, the second largest category of expenditure after education.

Overall, it would appear that the cuts in defence spending since 1989/90 led to a reallocation amongst other categories of government spending, most notably social security and welfare, education, health and public order and safety. Clearly, we have not

Table III. General Government: Shares of Expenditure, 1989/90–1997/98

<i>Category of expenditure</i>	<i>1989/90</i>	<i>1994/95</i>	<i>1997/98</i>	<i>Avg.: 1989–97</i>
General public services <sup>1</sup>	9.2	10.9	10.7	10.4
Defence	12.8	6.7	5.4	8.2
Public order and safety <sup>2</sup>	6.8	8.8	9.0	8.4
Education	17.7	20.4	21.9	20.2
Health	8.9	9.1	13.1	10.1
Social security and welfare	6.3	9.2	8.8	8.8
Housing and community services	4.4	3.4	2.9	3.5
Recreation, culture and sport	1.3	1.5	0.3	1.2
Fuel and energy	0.2	4.5	0.3	1.1
Agriculture, forestry and fishing	2.4	1.9	1.4	2.3
Mining, manufacturing and construction	3.0	0.9	0.1	1.3
Transportation and communication	6.0	5.1	4.1	5.1
Other economic services <sup>3</sup>	2.4	2.7	1.9	2.7
Interest on government debt	12.4	13.6	19.0	14.6
Other	6.2	1.3	1.1	2.0

Figures are in percentages.

Sources: Department of Finance, various years; South African Reserve Bank, various years.

<sup>1</sup> Includes parliament, foreign affairs and general administration.

<sup>2</sup> Includes police, justice and correctional services.

<sup>3</sup> Includes water affairs, tourism, labour and multi-purpose projects.

proved any causality, but have simply suggested that this reallocation resulting from the defence cuts is not inconsistent with the data. We have not conditioned on the possibility of other occurrences, which might explain the trends in the shares.

### Changing Structure of the Defence Budget, 1989–97

The cuts in the absolute levels of defence spending after 1989 were also accompanied by significant changes in the structure of the defence budget (see Table IV). These changes were a reflection of various external and internal factors, such as South Africa's new

geostrategic environment (e.g. end of the Cold War), as well as domestic political priorities (e.g. the integration and formation of the new South African National Defence Force).

Personnel spending as a share of total military expenditure grew from nearly 19% in 1989/90 to 52% in 1997/98 and averaged over 32% during the whole period. This can be attributed to the costs associated with the downsizing and rationalization of the SADF, which occurred during 1989–93, and the integration and creation of the new South African National Defence Force (SANDF), which took place from 1994. When the SANDF was formed in April 1994, it

Table IVa. Structure of Defence Budget: Category of Expenditure 1989/90–1997/98

<i>Year</i>	<i>Personnel</i>	<i>Operating</i>	<i>Procurement</i>
1989/90	18.8	22.6	58.6
1990/91	21.2	21.7	57.1
1991/92	27.6	26.9	45.5
1992/93	27.9	26.9	45.2
1993/94	31.6	28.3	40.1
1994/95	38.6	33.5	27.9
1995/96	33.8	32.8	33.4
1996/97	41.9	40.0	18.1
1997/98	52.3	30.3	17.4
Avg.: 1989–97	32.7	29.2	38.1

Table IVb. Structure of Defence Budget: Average Annual Growth Rates, 1989/90–1997/98

<i>Year</i>	<i>Total</i>	<i>Personnel</i>	<i>Operating</i>	<i>Procurement</i>
1990/91	-11.9	-0.8	-15.5	-14.1
1991/92	-19.6	4.7	-0.3	-36.0
1992/93	-6.0	-5.2	-6.1	-6.6
1993/94	-13.4	-1.8	-8.9	-23.2
1994/95	8.6	32.7	28.3	-24.5
1995/96	-12.6	-23.8	-14.6	4.3
1996/97	-3.8	38.8	1.1	-50.9
1997/98	-5.7	1.6	-17.4	-2.9
Avg.: 1989–97	-8.1	5.8	-4.2	-19.2

Figures are in percentages, growth rates are in constant 1990 prices, using GDP deflator.

Sources: Department of Finance, various years; Department of State Expenditure, various years.

comprised personnel from the former SADF, the former TBVC (Transkei, Bophutatswana, Venda and Ciskei) defence forces and the liberation armies of the ANC and the PAC. The number of members of the SANDF increased from 84,052 in 1993/94 and peaked at 102,600 in 1995/96. Since then, it has declined as a result of demobilization and voluntary retrenchments (Department of Finance, 2000).

Operating costs as a share of the total defence budget almost doubled after 1989, from 22% in 1989/90 to 40% in 1996/97, before declining to 30% in 1997/98. This was due to the armed forces' internal deployment in support of the police, additional costs associated with the rationalization of the SADF between 1989 and 1993, and the creation of the SANDEF. The share of procurement spending in the defence budget declined dramatically from 58% in 1989/90 to 17% in 1997/98. The cancellation and postponement of major procurement contracts and the fact that the procurement budget was used to fund most of the cuts in the absolute size of the defence budget were the major contributing factors to this trend.

These changes in the structure of the defence budget were also reflected in the average annual growth rates for the various categories of expenditure. Personnel expenditure grew by an average of 5.8% per annum in real terms between 1989/90 and 1997/98. During the same period, the growth of operating expenditure declined by an average of 4.2%, while the growth of procurement expenditure declined by nearly 20% per annum. The total defence budget declined by an average of more than 8% per annum during the same period.

The structure of the defence budget, in terms of programmes, also changed after 1989, reflecting the country's new strategic, political and economic realities, and the defence force's new roles and functions.

As Table V indicates, the share of the

Special Defence Account, which is used to fund all procurement projects, declined considerably, from 58% in 1989/90 to under 18% in 1996/97. The share of the General Support programme also declined after 1989/90, with the withdrawal of troops from Angola and Namibia, but has begun to increase in recent years. Most other programmes experienced increases in their shares after 1989, although this did not reflect real increases in the amount of available resources. The Landward Defence programme (the army) saw the most significant increase after 1989/90, and by 1997/98 it accounted for more than a third of the total budget. This reflected the fact that the bulk of the integration in the SANDF took place in the army, and the increasing involvement of the army in supporting the police (public-order policing, border patrol).

Having provided a detailed analysis of the changes in military spending and investigated its relation to other forms of government spending, we can see that there are important and marked changes that have taken place. We now move on to an econometric analysis of the demand for military spending. This allows us to make some judgements on the extent to which general economic factors, such as costs and income constraints, can explain the dynamics of military spending in South Africa over time, and to judge the relative importance of the specific factors we have identified.

### **Modelling the Demand for Military Spending**

There are two broad groups of empirical studies in the literature on the determinants of military spending. First, there are the models developed from the action–reaction framework of Richardson (1960). These models are used mostly to deal with countries undergoing arms races; they are of more limited use empirically. Second, there are studies that focus on the economic, political

Table V. Structure of Defence Budget by Programmes, 1989/90–1997/98

	1989/90	1994/95	1997/98	Avg.: 1989–97
Command & Control	2.0	3.6	2.7	3.1
Landward Defence	12.6	37.0	35.8	26.2
Air Defence	10.3	14.9	18.7	15.4
Maritime Defence	3.8	5.9	7.2	5.7
Medical Support	2.8	7.7	8.1	5.8
General Support	10.0	3.0	8.1	5.7
Special Defence A/c*	58.5	27.9	17.4	38.1
Total	100	100	100	

Figures are in percentages.

Sources: Department of Finance, various years; Department of State Expenditure, various years.

\*The Special Defence Account is used to fund all procurement projects. Its operation is governed by the Special Defence Account Act of 1974.

and military determinants of military spending. These models have tended to be more useful for developing countries, and the most satisfactory of these have tended to take a comprehensive approach, combining all economic, political and military influences and operationalizing as many as possible (see Maizels & Nissanke, 1986; Hartley & Sandler, 1990; Mohammed, 1998). The studies also vary from cross-country studies to case studies of individual countries. A recent cross-country comparative study (Mohammed, 1998) found the demand for military spending in sub-Saharan Africa tending to be determined by a variety of political, bureaucratic, strategic and economic factors operating at both internal and external levels.<sup>6</sup> Dunne (1996) provides an overview of the literature on the demand for military expenditure in developing countries.

In the light of the discussion in the first section on the trends in South Africa's military spending since the early 1960s, and having identified some of the key political, strategic and economic events that may have influenced the trends in military spending,

we now investigate the determinants of the demand for military expenditure in South Africa between 1963 and 1997 using regression analysis. This allows the conditional impact of various factors on military spending to be determined. In this way, the significance of general features of the demand for military expenditure and the relative importance of specific country factors can be assessed.

Using the standard neoclassical model of the demand for military spending outlined in Smith (1989, 1990):

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

where welfare  $W$  is a function of security  $S$ , economic variables consumption  $C$  and population  $N$ , and other variables  $Z$ . This function is maximized subject to a budget constraint:

$$Y = p_c C + p_m M$$

where  $Y$  is nominal aggregate income and  $p_c$  and  $p_m$  are the prices of real military spending and consumption, respectively. Security cannot be measured and needs to be replaced by other quantifiable variables using a security function:

$$S = S(M_1, \dots, M_p, ZS)$$

The perceived sense of security is a function

<sup>6</sup> The most important factors include: the size of total government expenditure; the size of the armed forces; the nature of the government; and the security web (external and internal security concerns) (see Mohammed, 1998).

of the military spending of other countries, both allies and enemies, and other strategic factors  $ZS$ . Solving this optimization problem will give a derived demand function for military spending:

$$M = M(p_m/p_c, Y, N, M_1, \dots, M_n, ZS, Z)$$

ignoring  $N, ZS$  and  $Z$  for simplicity and assuming a Stone-Geary welfare function of the form:

$$W = \alpha \log(C) + (1 - \alpha) \log(S)$$

Following Smith (1995) and assuming the state is not aggressive but faces one threatening neighbour with military forces  $M_1$  and that neither has allies, its security is:

$$S = M - M^* = M - (\beta_0 + \beta_1 M_1)$$

where  $M^*$  is the forces the country would need to resist an attack by its neighbour. It is determined by fixed elements unrelated to the opponent's force ( $\beta_0$ ) and by the size of the opponents forces ( $\beta_1$ , the Lanchester coefficient). Solving the constrained optimization problem using the Lagrange method gives the Linear Expenditure System equations for  $M$  and  $C$ .

$$M = (1 - \alpha) Y/p_m + \alpha(\beta_0 + \beta_1 M_1)$$

and

$$M = (\alpha/p_c) [Y - p_m(\beta_0 + \beta_1 M_1)]$$

which determines military spending as a function of income, prices, preference parameters ( $\alpha$ ) and strategic parameters ( $\beta$ ). This model can easily be generalized to allow for the more realistic assumption that security depends upon stocks of military forces rather than flows of military expenditures. Following Smith (1995), the stock of military forces (equipment plus embodied human capital) is defined as the depreciated sum of past expenditures

$$K_t = (1 - \delta) K_{t-1} + M_t$$

where  $\delta$  is the depreciation rate. Assuming a

similar measure for the other country means that security is given by

$$S_t = K_t - (\beta_0 + \beta_1 K_t) = M_t - M^*_t$$

where

$$M^*_t = \beta_0 + \beta_1 [M_{1t} + (1 - \delta) K_{1t-1} - (1 - \delta) K_{t-1}]$$

which gives a demand function

$$M_t = (1 - \alpha) (Y/p_m)_t + \alpha M^*_t$$

As stocks are not observed, they can be substituted using:

$$K_t = M_t / (1 - (1 - \delta)L)$$

where  $L$  is the lag operator, such that  $Lx_t = x_{t-1}$ . Multiplying through by  $(1 - (1 - \delta)L)$  and rearranging gives a dynamic demand equation:

$$M_t = + \alpha \beta_0 \delta + (1 - \alpha) (Y/p_m)_t + \alpha \beta_1 M_{1t} + (1 - \alpha)(1 - \delta) [M_{t-1} - (Y/p_m)_{t-1}]$$

To operationalize this model in the present study requires some compromise because of the lack of reliable data. In common with most studies of developing countries, we have no separate deflator for military spending available and have to use the overall deflator  $p$ .  $Y$  is total output, measured by GDP in real terms, and  $M$  is military spending in real terms – both are in 1990 prices. This makes the reduced form estimating equation:

$$M_t = \gamma_0 + \gamma_1 (Y/p)_t + \gamma_2 M_{1t} + \gamma_3 (M_{t-1} - (Y/p)_{t-1})$$

To get a measure for  $M_1$ , the military spending of the main countries representing a threat to South Africa, is difficult given the wars in Angola and Mozambique and the unreliability of most of the data from these countries. As a proxy, we use the share of military spending in GNP for the whole of Africa from ACDA. These data were only available from 1963. There was also a possible problem with the data which

became apparent when splicing the different ACDA publications. The figures for 1986–87 go from 4.8% to 4%, which seems to be a discontinuity in the data series. To account for this, we created a dummy variable (*DAM*) that was zero from 1961–86 and 1 from then on.

A number of other dummy variables were introduced to pick up important strategic factors identified in the previous sections. A dummy variable for the mandatory UN arms embargo (*DUN*) takes the value of 1 between 1977 and 1993 and zero otherwise. A dummy variable (*DANG*) for the Angolan war taking the value of 1 in the period 1975–89 and zero otherwise was introduced as well as a dummy variable to represent the new regime (*DANC*), taking the value of 1 (1994–97) and zero otherwise.

An analysis of the residuals suggested a further problem with the early 1960s, when South Africa became a Republic and there was a significant military buildup. We use a dummy variable (*DREPUB*), which takes the value of 1 in 1961–64 and zero otherwise, to capture this impact.

Using the log forms of the variables gave the OLS results in Table VI. There are no data for  $M_t$  for 1961–62, so the model is estimated over the period 1963–97. The diagnostic tests suggest a problem of heteroscedasticity. To deal with this, the reported *t* statistics are White's heteroscedasticity-consistent estimates. This simple model explains a high proportion of the variance of the dependent variable, with an  $R^2$  of 0.94. The variable for African military burden is not significant, and of all the strategic environment dummies, only the republic dummy is not significant at 5%. As expected, there is a positive impact of the Angolan War, with a negative impact of the UN arms embargo and the change in regime. The negative effect of the UN embargo reflects the fact that it was anticipated and preceded by a significant buildup and then a

marked decline in military burden when in place. There was no significant change to the process of declining military burden when it came to an end.

There is, however, a noticeable problem with the specification. The coefficient on  $(Y/P)_t$  is not significantly different from 1, which suggests the dependent variable should be  $(M_t - (Y/P)_t)$ , the log of the share of military spending in output rather than  $M_t$ . Testing this restriction gives a likelihood ratio test value of 0.0214, which is  $\chi^2$  with one degree of freedom and is clearly not significant. The results imposing the restriction are given in the second part of Table VI. This implies that the demand process at work is an evolution of the military burden conditioned on a number of specific strategic factors.

The re-specification leads to a reduction in the standard error of the regression from 0.1203 to 0.1181, but the signs on the other variables remain the same. The fact that it is military burden rather than the level of expenditure that is determined shows that economic factors play an important role in determining demand. There are some minor differences with the republic dummy becoming significant, the African military burden variables having increased *t* ratios and the Angolan War only significant at 10%. This suggests that the South African military burden can be understood as an autoregressive process conditioned by a number of strategic factors: the UN embargo and the change in regime having significant negative impacts, the involvement in the Angolan War and the early years of the republic having positive impacts.

## Conclusions

This article has provided a detailed analysis of the demand for military spending in South Africa. In describing the trends in South Africa's military spending since the early 1960s, the influence of various political,

Table VI. OLS Estimates of Demand Equations

Dependent variable $M_t$ 1963 to 1997		
Regressor	Coefficient	T-Ratio*
C	-2.05	-0.55
$(Y/P)_t$	1.07	3.07
$(M_{t-1} - (Y/P)_{t-1})$	0.73	5.12
$M_{1t}$	0.27	0.98
<i>DAM</i>	0.11	1.14
<i>DUN</i>	-0.27	-3.48
<i>DANC</i>	-0.26	-2.13
<i>DANG</i>	0.17	2.89
<i>DREPUB</i>	0.28	1.10
<i>R</i> -squared	0.93	
<i>R</i> -bar-squared	0.91	
S.E. of regression	0.12	
DW-statistic	2.22	
Log likelihood	29.67	
Serial correlation <sup>a</sup>	CHSQ(1) = 3.14	[.08]
Functional form	CHSQ(1) = 0.613	[.43]
Normality	CHSQ(2) = 3.52	[.17]
Heteroscedasticity	CHSQ(1) = 9.55	[.00]
* White's heteroscedasticity-consistent estimates		
Dependent variable $(M_t - (Y/P)_t)$ 1963 to 1997		
Regressor	Coefficient	T-Ratio
C	-1.36	-2.43
$(M_{t-1} - (Y/P)_{t-1})$	0.71	4.55
$M_{1t}$	0.30	1.42
<i>DAM</i>	0.13	1.82
<i>DUN</i>	-0.26	-2.53
<i>DANC</i>	-0.24	-2.40
<i>DANG</i>	0.17	1.77
<i>DREPUB</i>	0.26	2.06
<i>R</i> -squared	0.83	
<i>R</i> -bar-squared	0.79	
S.E. of regression	0.12	
DW-statistic	2.19	
Log likelihood	29.64	
Serial correlation <sup>a</sup>	CHSQ(1) = 3.55	[.06]
Functional form	CHSQ(1) = 0.104	[.75]
Normality	CHSQ(2) = 5.46	[.07]
Heteroscedasticity	CHSQ(1) = 1.55	[.21]

$(Y/P)_t$ : log of real output, 1990 prices.

$M_t$ : log of real military spending, 1990 prices.

$M_{1t}$ : log of African military burden (ACDA).

*DAM*: Dummy for discontinuity in African military burden data (1987–97).

*DUN*: Dummy for mandatory UN arms embargo (1977–93).

*DANC*: Dummy for change of regime (1994–97).

*DANG*: Dummy for involvement in Angolan War (1975–89).

*DREPUB*: Dummy for South Africa's move to a republic (1961–64).

<sup>a</sup> Serial correlation test – Lagrange multiplier test of residual serial correlation; functional form test – Ramsey's RESET test using the square of the fitted values; normality test – based on a test of skewness and kurtosis of residuals; heteroscedasticity test – based on the regression of squared residuals on squared fitted values. See Pesaran & Pesaran (1997) for details.

economic and strategic factors has been highlighted. Political factors included the imposition of apartheid policies and the regime's use of military force to defend white minority rule against internal and external threats. Economic factors included the costs associated with compulsory conscription for white males and the severe domestic recession between 1989 and 1993, while strategic factors included the imposition of UN arms embargoes and South Africa's military involvement in neighbouring conflicts (Angola, Namibia and Mozambique).

The results of the regression analysis, estimating a simple demand model, suggest that the trends in South Africa's military spending (for the period 1963–97) could be explained as an autoregressive process in military burden, conditioned on a number of country-specific strategic factors. The imposition of the mandatory UN arms embargo in 1977 and the change in regime in 1994 had significant negative impacts, with involvement in the Angolan War (1975–89) and the early years of the republic having positive impacts. The final form of the model differs from those of other national and cross-country case studies investigating the determinants of military spending in developing countries, and particularly in Africa (see Hewitt, 1992; Mohammed, 1998), but the results are broadly similar. While there are problems with the model, given the lack of reliable data for African military spending (which we use to model external threats) and the fact that there is no military price deflator for the output term, it does seem to provide a good explanation of the data.

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