

Defence Economics: Core Issues

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Abstract

Defence can seldom ignore the standard economic problem—the need to make critical often hard resource choices. Yet the output of defence studies focuses almost entirely on professional and strategic issues, and little on finance or economics. There is a presumption in most countries that the needs of defence must be met, and often they are met without serious political debate. Defence budgets attract limited scrutiny, even in advanced countries like the US, where the general feeling is that the bigger the budget the better. In India the defence budget has at times been approved by Parliament without a debate. Given the sheer size and scale of the defence sector and its share in the world economy and trade there is a need for greater knowledge of its economics, effective financial scrutiny and debate. Developing countries such as India with significant defence sectors need the analysis and insights of defence economics. Resources are scarce, the allocation problem are acute in the face of an unfinished development agenda and optimisation imperative. It holds the potential of enabling better utilisation of scarce resources, and getting a bigger “bang for the buck”, without compromising specified strategic objectives. Application of modelling and gaming theories can even assist in strategic decision-making. Insights and findings of defence economics can on the whole be expected to enhance national security.

Introduction

Defence and Economics. Do these two terms go together? The defence sector has been perceived to be amenable more to professional studies and strategic analysis, rather than economic and financial analysis. This is reflected in the output of defence studies, which spans almost entirely professional and strategic issues, and has very little content of finance or economics. Practitioners in this field are protective of their turf, and do

not seem to readily welcome intrusions of financial experts and economists on their terrain, for various reasons.

Some of these reasons can be stated as:

- National security. In any matter concerning the defence of the country against foreign aggression, patriotism comes into play. Surely the activities of the defence forces should not be unduly analyzed or questioned, lest it affect their performance.
- Repository of State Power: Defence forces represent the ultimate repository of force, in the expression of state power. Particularly in many developing countries, the matter of civilian control continues to be a delicate one. There is the sense that issues relating to defence should not be probed unnecessarily.
- Strategic and Operational Requirements. These are best judged by the professionals and practitioners, and override mere financial/economic concerns, however reasonable they may be in themselves. Surely policies or positions based on professional views and strategic perceptions cannot be second-guessed by armchair theorists and number-crunchers.

The public and the political leadership in most countries by and large subscribe to a “holy cow” status of matters relating to defence. Particularly in less developed countries, there is a presumption that the needs of defence must be met, and these needs are generally met without serious political debate. However, this is not a perception confined to the less developed countries. Defence budgets attract limited scrutiny, even in advanced countries like the US, where the general feeling is that the bigger the budget the better. There is the spectacle in countries like India of the defence budget being passed in Parliament without debate..

In this backdrop, financial analysis of defence is always a tough, uphill task. Since public money is involved, and there are constitutional, legal and procedural requirements in most countries regarding the use of public money, this is a task that has to be done, and is being done. Economic analysis, on the other hand, is not a mandatory requirement. Economic analysis and studies relating to defence matters are virtually unheard of, except in the more advanced Western countries such as the United States of America (USA) and the United Kingdom (UK), where it is being accepted as a legitimate discipline in itself.

Are other countries, in particular developing countries, missing anything? What is the usefulness of attempting to apply economic analysis to a field like defence? Does defence economics have anything to say of relevance to the real world? If so, what are the issues that are important? How can it contribute towards tackling contemporary challenges in this sensitive domain? Drawing on the experience and work done so far, these are some of the questions that we shall seek to shed light on in this paper.

Definitional Issues

Defence economics is essentially the application of economic principles and analysis to defence issues. This is easier said than done, since the defence sector has certain special features. It is largely state-controlled, opaque, and not as readily amenable to analysis as the rest of the economy. At the same time, defence is regarded as a public good in the economics literature, with significant externalities.

Various definitions have been attempted in the existing literature on defence economics. One version¹ views defence economics as “the allocation of scarce resources to meet spending and policy goals concerning military organizations”. A broader version² states that “defence economics consists of applying economic analysis to national defence issues. As economics is a science of choice, so defence economics is a systematic study of choices from among competing alternatives”

In the field of defence economics, the analysis can range from consideration of almost pure economic problems to the use of economic and econometric tools, such as game theory and modeling, in strategy. Broadly, both macroeconomics and microeconomics are involved. For example, macroeconomics is used in the analysis of the defence budget, and the interrelationship of the national economy and growth with the defence sector. Microeconomics comes into play when defence industries are looked at.

In defence economics, standard economic principles are applied to the formulation of defence policy: A good exposition of this has been set out by Keith Hartley³. In particular, the principle of final outputs has been explained in the following manner:

“Typically, the final output of defence can be expressed in such terms as protection, security and peace, as well as crisis management, peace-keeping

and humanitarian aid. However, debates on defence policy usually focus on the numbers of aircraft, warships, infantry regiments and tank units. These are inputs into producing defence output. The key question is what is the contribution of each of these inputs of equipment and military personnel (capital and labour) to final outputs in the form of protection and security? Furthermore, what would be the impacts on final outputs of small changes (marginal increases and decreases) in each of these inputs?"

Another important principle is the principle of substitution⁴. This recognises that there are alternative methods of achieving protection each with different cost implications. In principle, defence policy-makers have to seek the least-cost solution to providing various defence capabilities. And then there is the principle of competition⁵. Competition is a means of achieving efficiency. Although the defence forces operate largely in a monopolistic framework, competition can be harnessed for the purchase of equipment and for some of the activities traditionally undertaken 'in-house' by the Armed Forces.

Relevance of Defence Economics

Size of Defence Economy

The sheer size and scale of the defence sector and its significant share in world economy and trade compel attention, and underline its importance. The world spent more than a trillion (1000 billion) US dollars on military expenditures⁶ in 2004: Nearly half of this was spent by the USA alone. After a decade of overall decline following the end of the Cold War, world defence expenditures have been on the rise since 2001. Defence spending is significant and increasing in major countries like India, China, Japan, France, the UK and Brazil.

Globally, arms sales⁷ (excluding China) were of the order of \$ 236 billion in 2003. Similarly, the value of the international arms trade in 2003 was estimated at between \$ 38 billion to \$ 42 billion. This represented around 0.5 to 0.6% of total world trade. The top exporting countries are Russia and the USA, while the top importers are China and India.

Likewise, military manpower numbers⁸ are also impressive. Active troops in just the ten major countries number over 10 million, while if we count reserves and para-military forces, this number goes up to over 48 million, for the same set of countries. These figures do not include civilians employed directly or indirectly by the defence sector. Surely, these figures

suggest that the defence sector is a crucial component of the world economy and is worthy of study.

National Security

The security of a country, whatever the posture adopted in terms varying from aggression to deterrence with preparedness, has always been extremely costly. There are indeed few countries where the defence budget does not occupy the highest place in the national economy in terms of expenditure.

“What do dollars matter when national survival is at stake?” They matter precisely because they represent (however imperfectly in some circumstances) generalized national resources at the disposal of the military. Unless they are economically used, resources will be wasted, and the nation will have less military capability...If any one dimension of military power is wastefully planned, that is, at greater than minimum cost, some other dimension will, with a given total military budget, have fewer resources at its disposal and necessarily less capability.

An economically efficient solution to military problems does not imply a cheap force or a small military budget. It simply implies that whatever the military budget (or other limitation, for example, on personnel) the greatest military capabilities are developed.

Framework of Analysis

Defence economics seeks to present a useful way of looking at military problems many of which can essentially be seen¹⁰ as economic problems in the efficient allocation and use of resources.

We can consider the economic problems of defence at three levels: the quantity of national resources available, now and in the future; the proportion of these resources allocated to national security purposes; and the efficiency with which the resources so allocated are used. At each level there are many alternative policies from which to choose. Explicit consideration of these alternatives in terms of economic criteria will help in better decision making, which is in the overall interest of the country.

For example, looking at the macroeconomic picture in the medium term, resource constraints for defence are best viewed as general monetary constraints, and costs are usually best measured as rupee or dollar costs.

In the long run, the effective constraint on the nation's activities, including defence, can be regarded as the nations' capacity to produce, as measured by gross national product (GNP) in constant dollars.

Looking at problems in this way can aid in reaching better decisions. Increased recognition and awareness that military decisions, whether they specifically involve budgetary allocations or not, are in one of their important aspects economic decisions; and that unless the right questions are asked, the appropriate alternatives selected for comparison, and an economic criterion used for choosing the most efficient, military power and national security will suffer.

Core Issues

Defence economics has been emerging, mainly in the USA and UK, as a distinct branch of economics since the Second World War. The literature on defence economics, while not prolific, has covered a number of areas relevant for defence analysis, and used a wide range of tools in the consideration of defence issues. The presumption in the literature is usually that we are looking at more advanced, democratic countries where civilian control of the military is taken for granted. Developing countries studies are there, but rarely developing country perspectives.

If we look thematically, almost all the topics in defence economics can be grouped in five sets of issues. These are:

1. The Demand for Defence (Expenditure), encompassing the "Guns versus Butter" debate, and arms races
2. Defence and Economic Growth, including issues of impact and sustainability
3. Military Manpower
4. Arms Procurement and Trade
5. Defence Industry, including "Make versus Buy" issues, and those related to Research and Development.

We consider each of these in turn.

The Demand for Defence (Expenditure)

In most economics primers, the "guns versus butter" example is used to illustrate the resource allocation problem. In a two-commodity economy,

with a given amount of resources, the dilemma is to allocate resources either for guns (defence and security) or butter (development and welfare), both of which are equally important for the well-being of the people.

How much to allocate for defence would depend on the demand for defence, in terms of expected outputs like protection from external aggression, internal security and keeping the peace. A valuation of these outputs in turn determines the demand relationship which indicates the manner in which a country allocates its resources between defence and non-defence goods (i.e., the classic guns versus butter trade-off).

Determinants of Demand

National security is highly valued by most populations, judging by the sacrifices that many countries seem willing to make when territorial integrity, or fundamental interests, are threatened. Generally, the level of defence expenditure seems to be¹¹ an increasing function of a country's perception of the nature and extent of the threats against it. Countries tend to swing between the extremes of preferring more defence when military pressure is actually exerted on the country, and preferring less when peace prevails. Perceptions are important in determining the demand.

Some of the determinants of demand may be factors¹² like:

- Confrontations with neighbours, due to territorial and sovereignty disputes, competition over natural resources, managing bordering ethnic peoples, instability of a neighbour.
- Multilateral and treaty obligations, including cooperative efforts with the United Nations and other coalitions and countries, including peacekeeping operations, humanitarian assistance, and disaster relief.
- Impact of trans-national issues such as terrorism, drug-trafficking, and environmental issues
- □Protection of Exclusive Economic Zones (EEZs), marine resources, and fisheries.
- Protection of market access to trade, investment, energy, food, and other vital resources.
- Maintaining domestic law and order, counter-insurgency.

Nevertheless, without any tradition of systematic analysis of these factors in most countries, it is usually the perceptions which strongly influence the assessment of demand. Much can be gained in terms of more rational decision-making and better deployment of resources if a formal assessment of demand and a costing of its implications were to replace allocation decisions based on perceptions alone.

The Allocation Trade-Off

Given that the demand has been determined, by whichever manner, there is the issue of meeting the demand. Typically, there would be competing claims for funds, and inevitably resource constraints. Development programmes in social sectors such as education and health have highly valued ends. If a country has 'too much' defence, it is wasting its resources, and if it has 'too little' defence its security is at risk¹³. The penalty for the former may be a lower standard of living for the citizens, and for the latter it may servitude, or at best an unwarranted interference in their affairs.

Those that argue for greater allocations to development relative to defence make the point that military activity is one of the most important types of economically non-contributive activity in the modern world. Military activity may have other kinds of value, but it has no economic value because it does not directly contribute to material well-being, to the material standard of living, or to poverty reduction.

But while military goods and services have no economic value, they do have considerable economic cost. Military expenditure leads to labour, machinery, equipment, and other economically productive resources to be drawn into the service of the military sector. All of these resources could alternatively have been used to produce and distribute goods and services that do raise the standard of living. Their true cost is therefore their opportunity cost, the material well-being that has been sacrificed as a result of this diversion of resources.

On the other hand, to its supporters, defence spending is viewed as a form of insurance policy providing security and protection. As we have noted above, nations require military expenditures to respond to actual or perceived threats to their national interests. Threats can reflect a struggle for power or for resources, or they can reflect differences in ideology, race,

or religion, or any kind of difference perceived as weakening a nation's security. The greater the perceived threat to a nation's interests, the more willing it will be to allocate resources to defence rather than civil goods.

Further, it is not always a straightforward choice between guns and butter. Guns also enable butter to be churned. The enabling environment provided by peace and security, though difficult to quantify, is important. For example, surely a value should be placed on deterrence, a strike capability, the defence of economic zones? It can also be argued that there is a need to look at the value that is contributed indirectly by defence to economically productive sectors. For example the tourist industry, which always takes a hit at the first signs of conflict, and which prospers in an environment of stability and security. Similarly, inflows of foreign investment into a country are directly affected by signs of conflict. There is also a developmental spin-off of defence industries, research and development, and employment of military personnel into the civilian economy.

Arms Races

Sometimes, demand is influenced by competitive arms acquisitions by adversary countries, or arms races. In the post-World War II era, arms races between the US and Soviet Union, Greece and Turkey, India and Pakistan are good examples. Although arms races increase the demand for defence, a unique feature of such situations is that two nations in an arms race might not succeed in increasing their national security by increasing their military expenditures¹⁴.

Game theory and modelling work has been used by defence economists in studies on arms races. For example¹⁵, the Prisoner's Dilemma game, which is much used in the study of international relations offers insights. If given the choice between mutual arms limitation and mutual arms escalation, the payoffs clearly suggest that mutual limitation is in everyone's interests. The dilemma results because as each nation pursues its self-interest, the payoff pattern of the Prisoner's Dilemma leads both nations to escalate their arms acquisition. The self-perpetuating role of the military tends to accentuate these trends.

If decisions were to be made rationally and optimally, the demand for defence in most democratic, peace-loving countries would be based on

the policy objective to offer minimum deterrence in a situation of possible conventional war of limited duration. A policy of minimum deterrence presumes that

(a) The most effective preparedness should be determined in relation to the given threat; and

(b) The preparedness, so determined, be procured and operated at the lowest possible cost.

Defence & Economic Growth

After the issue of resource allocation between defence and development, the impact of defence and economic growth has been one of the most studied aspects in the current defence economics literature. The interactions can however be both ways, i.e. defence impacts on economic growth of a country, and also a country's economic growth has implications for defence.

The Impact of Defence on Growth

The defence sector has a major share of the budget in most countries, and is considered essentially non-developmental or economically unproductive. Accordingly, where defence spending is high and has a large share of the government's budget, we would expect it to act as a drag on the economy, and result in reduced rates of growth. This would be especially so in the case of developing countries where resource limitations tend to be serious constraints on the pace of development and growth.

The perceived adverse effects of higher defence spending on economic growth are due to the following:

- purchase by the defence sector of domestic goods or the use of scarce foreign exchange to purchase imported goods. This lowers the investment and consequently growth rate of civilian output.
- the government sector shows no measurable productivity increases, thus an enlargement in defence shifts resources from the productive sector to the non-productive sector,
- a shift of resources to defence reduces the size of the civilian non-defence sector.

An extreme view has been that demilitarization is a prerequisite of democratization and for genuine economic development of less developed

countries. Economic growth also requires skill development which is expensive and difficult to achieve. In the face of the resources required to support extensive armed forces, this becomes virtually impossible. One example cited¹⁶ in support of this view has been Costa Rica. The Costa Rican government eliminated its national military forces entirely in 1948 and directed the nation's limited resources to more economically contributive activities. For more than half a century now, in the absence of any national military, Costa Rica has been the most stable, democratic, and economically well off nation in a part of the world that has been plagued by economic trouble and wracked by terrible spasms of violence. And it has maintained its independence. It is an interesting and important example.

A contrary view was expressed for the first time in a study¹⁷ of developing countries on this topic by Benoit in 1973. He shook a lot of students of development with his book *Defence and Economic Growth in Developing Countries*. Particularly disturbing was his statement that: "The big surprise of this study was the finding that the evidence does not indicate that defence has had any adverse effect on growth in developing countries".

Plausible or paradoxical, Benoit tried to examine how such a result was possible. He did not doubt that a switch of resources from defence to 'highly productive investments' in developing countries would have improved their growth rates. But he recognised that, in practice, in most developing countries, only a tiny proportion of their non-defence expenditure is put into productive investment. Of the favourable effects of defence spending, Benoit lists:

Security effects - to the extent that the military provides security to the country it enables an atmosphere conducive to investment and long-term planning decisions. In the absence of security, the economy may disintegrate.

Training effects - military manpower receives training even at the rudimentary level and this can be beneficial if the recruits come in substantial numbers from the subsistence economy and if the military programmes introduce people to 'modern' methods and social skills (discipline, acting on instructions, spending and saving money), travelling around the country and gaining familiarity with manufactured products (buses, trucks, cycles, planes), maintaining and repairing machinery and general inculcation of 'national' values and attributes as opposed to the

limited horizons of the village. (To this we could add the employment opportunities and reduction in poverty levels of the associated families, as well as post-retirement productive usage of military manpower in the civilian economy.)

Infrastructure effects - the military may create infra-structure, such as roads, airports, docks, and communications, which can be used by the civilian sector, especially 'up country'. Also, mapping, surveying, geological and meteorological services have civilian spin-offs.

Consumable effects - the services provide substantial numbers of people with food, clothing, shelter, and medicines. They also engage in 'civic action' programmes and in 'hearts and minds' campaigns.

Later empirical studies focusing on the military expenditure-economic growth relationship give conflicting results. However, Yildirim and Sezgin¹⁸ (2002) report that defence spending enhances economic growth, by raising aggregate demand or its spin-out effects, in Turkey. Given the imperfect relationship between economic growth and job creation, Yildirim and Sezgin analyse the effects of military expenditure on employment. Their findings suggest that military expenditures negatively affect employment both in the short run and in the long run; this finding however does not have intuitive appeal if we consider most developing country situations.

The findings do not point towards a straightforward, one-size-fits-all conclusion. The existing research¹⁹ by and large seems to indicate a pattern whereby certain groups of developing countries - usually the more successful economically, the most stable politically, or those engaged in military production derive positive benefits from military spending. Countries less successful economically, more politically unstable, or lacking a domestic arms industry generally fail to have positive economic impacts from defence expenditures.

The Impact of Economic Growth on Defence

The level of economic growth expands development options, increases revenue raising potential and also thereby influences the degree to which a country can comfortably spend on defence. In the long run, the effective constraint on the nation's activities, including defence, can be regarded as the nation's capacity to produce, as measured by Gross National Product (GNP). The sustainability of the defence budget is a function of the health

of the economy. A glaring example of this in recent times has been inability of the Soviet Union to sustain high levels of defence spending in superpower competition with the USA, in the face of a faltering economy.

Closer home, empirical studies²⁰ have suggested that a similar phenomenon is in evidence in Asia. Total world defence expenditure fell in the 1990s. In real terms, Asian military expenditure rose from \$106 billion in 1990 to \$130 billion in 1998, a 22.6 percent increase overall. South Asia's military expenditure grew by 27.3 percent over this period, whilst East and Southeast Asia increased by 22.1 percent. Against a background of falling world military expenditure, Asia's share of world military expenditure rose from 10.6 percent in 1990 to 18.7 percent in 1998. The most logical explanation is that Asia's relatively rapid economic growth allowed this continued expansion. Between 1975 and 1995, when GNP per capita for all developing countries grew at an annual rate of 2.3 percent, the figure for East Asia was 7.3 percent, for Southeast Asia and the Pacific 4.4 percent. During this period, the growth rate in South Asia was only 1.4 percent for the region as a whole, but military expenditure growth in South Asia was sustained by the Indian-Pakistani arms race, better than average rates of growth in the countries concerned, and in part fuelled by inflows of foreign assistance.

Military Personnel

Ancient armies essentially comprised manpower, and the quality and costs of that manpower were the quality and costs of the army. Today, while there are other inputs that go into the output of defence, military manpower still remains the most important input. In economics, the production function specifies the relationship between factor inputs and output. In defence economics²¹, the inputs of technology, capital, and labour take the form of defence equipment, bases, facilities (infrastructure), together with the military and civilian manpower needed to provide defence forces.

Defence, however, differs from private competitive markets in that there is an absence of market prices for the output of defence, there are no rival suppliers of defence in a national market, and profitability cannot be used as a performance indicator. Military manpower operates in an administered or internal labour market dominated by hierarchies, rules and contractual commitments. It also has a price, which is not readily

evident to the users, who may treat it as a relatively cheap resource. Indeed, within the military production function, commanders often regard manpower as a resource which, compared with defence equipment, is inexhaustible, inexpensive, and readily available.

Increasing manpower costs suggests incentives and opportunities for factor substitution. Changing relative factor prices provides incentives to substitute between labour and capital. As the experience of recent conflict e.g. the First Gulf War indicates, it is possible to achieve in certain circumstances great effectiveness with heavier reliance on capital and technology inputs than labour.

The armed forces are a major employer, but military manpower and the human resource dimension of defence economics is a relatively neglected field. US studies dominate the theoretical, empirical, and policy literature on military manpower. Two issues²² have been pre-eminent. First, studies of conscription versus an all-volunteer force. Second, the concern with downsizing and its implications for military manpower.

Although there have been extensive economic studies of conscription versus an all-volunteer force, these have little relevance to developing country situations. There remain considerable opportunities for applying the analytical tools of labour economics to military manpower. Issues on the demand side embrace recruitment, factor substitution, and retention whilst supply-side factors include demography, relative pay in the civil sector, training, and skill acquisition.

Examples²³ of policy issues that arise are the impact of changes in the relative prices of service personnel and defence equipment on the employment of service personnel; the problems and costs of recruiting an all-volunteer force where the armed services are a major recruiter of young people; and the opportunities for substitution between military manpower and equipment, between reserves and regulars, between men and women, and between armed forces personnel and civilians.

Arms Procurement and Trade

The procurement of defence equipment is big business. The value of the international arms trade in 2003 was estimated²⁴ at between \$ 38 billion to \$ 42 billion. This represented around 0.5 to 0.6 Per cent of total world trade. The countries dominating this trade are also major players in the

world economy. As earlier stated, the top exporting countries are Russia and the USA, while the top importers are China and India. Expenditure on major weapons procurement accounts for a significant share of total military expenditure for developing as well as European NATO nations. Defence markets are large, government regulated, and generally non-transparent in their functioning.

Despite the inevitable strong political overtones to decision-making in the international arms trade, economic factors are relevant in understanding and dealing with defence markets. For example, the post Cold War situation and disarmament in NATO and in the former Warsaw Pact countries has created excess capacity in their defence industries. Hence, defence contractors are actively seeking export sales to compensate for declining domestic procurement. As a result, disarmament in one part of the world might actually promote arms exports, regional arms races, and possibly instability elsewhere in the world.

To the supplying nation, arms exports can be a source of employment, of foreign currency earnings, of spreading high fixed R & D costs over a larger output, and of achieving economies of scale. Technological progress has been a distinctive feature of defence equipment markets. Major technical advances resulting in new products, and their newer advanced versions (jet engines, missiles, electronics, helicopters), have created new markets and fuelled demand from buyers who need to “catch up.” An interest by governments and international agencies in the arms trade reflects a continued concern that arms exports will promote regional arms races so increasing the possibilities of local and even global conflict.

To the purchasing nation, arms imports might be more efficient than developing a costly defence industrial base. But arms imports make the buying country dependent on overseas suppliers and vulnerable to political leverage; they require foreign currency and can lead to an increase in international borrowing and external debt. Against this, in today’s supply driven market, major arms importers enjoy considerable bargaining leverage with exporters.

At the beginning of the 21st century technology offsets have become commonplace for countries undertaking major overseas arms procurement. The purpose of offsets is to ensure that a proportion of funds spent are re-invested to achieve economic development goals. As noted above, arms purchasing countries wield substantial market power.

As the arms trade takes place within a buyers' market, it follows that arms importing countries are in a dominant position to extract compensatory investment. Such "offsetting" technology transfer has grown apace with the tightening of the global arms market. Evidence²⁵ of the growing importance of offsets can be found by referencing to the 1970s when only a handful of countries possessed counter-trade and offset guidelines; there are now upwards of 150 countries with published counter-trade requirements.

The bottom line²⁶ for undertaking offsets is that there must be a development impact. If this is absent, then there is doubtful value to pursuing offsets. To achieve this impact, the authorities must develop a vision, translating offsets into a vehicle for the long-term, dynamic, and sustainable infusion of "technology" into the local economy.

Defence Industry

This is an important part of defence micro-economics. A nation's defence industry and the efficiency with which it supplies equipment are major inputs into "national protection²⁷". By all accounts, the size of the defence industrial base is significant. An indicator for defence production is the figures for arms sales brought out by the Stockholm International Peace Research Institute (SIPRI). In 2003, arms sales of the top hundred companies of the world (excluding China) were of the order of \$ 236 billion. This is no mean amount by any count.

Countries seek to build up a defence industry for reasons²⁸ such as:

- National independence, security of supply (self sufficiency) and responsiveness in emergencies and war.
- The need to maintain a capability which a nation believes will be required in the future.
- Foreign supply leaves the buyer vulnerable to monopoly price increases.
- Foreign supply provides equipment not tailored to a nation's requirements.
- National economic benefits.
- The desire to reduce dependence on arms imports and excessive reliance upon one foreign nation.

A major motive for indigenous arms production is stated to be acute strategic need. In recent years, a number of countries plead a pre-emptive strategic need, “just in case” a conflict should emerge.

Strategic motivations apart, indigenous arms production efforts have been justified on economic grounds. The two major “economic” arguments²⁹ are:

- (1) that building up an indigenous arms industry will spur generalized industrialization by means of spill-over or spin-off effects; and
- (2) that building up an indigenous arms industry and arms export sales will permit foreign-exchange earnings.

On the first point, Brauer and Dunne (2002) indicate that, if anything, the development of indigenous arms industries in developing nations depends crucially on already established civilian capacities.

From the early 1980s to the late 1990s, a number of countries like South Korea, Taiwan, Singapore, Spain, Portugal, Israel graduated from relatively low levels and sophistication of arms production to relatively high levels. This coincides with the continued development of their civilian industrial capabilities. Among the remaining developing nations, as of the late 1990s, between 25 and 35 are engaged in some form of arms production and arms (re)exports.)

In an era of rising weapons and equipment costs, and increasingly constrained defence budgets, nations cannot avoid questioning the efficiency and competitiveness of their defence industries. It is desirable for policy makers to know what are the benefits and costs of a defence industrial base. Critics point to³⁰ monopoly-oligopoly and the absence of competition for contracts, the overpricing of equipment, cost overruns, delays in delivery, cancellations, excessive profits, poor labour productivity, labour hoarding, and failure to export. In addition, the defence industries in Europe are criticized for excessive and wasteful duplication of costly research and development (R&D) and for relatively short production runs as each state supports its national champions. It is generally believed that defence industries in most countries are inefficient and uncompetitive.

It is reasonable for decision makers to have an expectation that taxpayers should get maximum value for their money. And the reference point for determining the value of any defence - industry relationship is its

contribution to the ability of the defence forces to meet their key responsibilities. Hartley has put it well, in the context of a study on British defence industry

If buying British means paying more for some defence equipment and waiting longer for deliver, the result is smaller defence forces and less protection for our citizens. Questions then arise as to what the defence budget is buying: is it buying protection for our society or protection for UK defence industries?³¹

The above quote is valid for a broad range of countries which have defence industries. The question is whether a country should seek to build up and support a defence industrial base with the capability of developing and producing a complete range of modern high technology equipment. Instead, should more defence equipment be imported or be produced jointly (particularly valid in the European context) with other nations?

Joint production or collaborative ventures should be expected to lead to cost savings and greater scales of output. But international collaboration is only one form of work sharing: alternative forms are licensed production and offsets; these also need to be evaluated as alternatives.

A feature of the debate about the defence industrial base is the general lack of quantitative evidence on its benefits and costs. The arguments are qualitative in which various benefits are described, sometimes too vaguely, without any indication of policy-makers' willingness to pay.

Does it really matter?

For countries like India, facing localized conflict situations, it may well be questioned whether the existence or otherwise of defence production capabilities really matter in strategic terms. While anyone can see the danger of supplier countries, for political reasons or whatever, turning off the tap at a critical juncture, thus jeopardising the country's fighting capability and compromising its freedom of action, there is a school of thought which holds that whatever advantage of internal strength the defence industry may have enjoyed earlier, it will never come into play in a short, swift war which is the basis of future defence planning in such countries. War materials in current production, the argument runs, cannot reach the front before fighting stops due to Security Council dictation or other international pressures. In other words, the war will be fought with the stockpile of

weapons and ammunition already held and the strength of the production line cannot possibly affect the outcome.

Research and Development (R&D)

While there are a number of countries that have developed a defence industry, a few have also made efforts at research and development of arms and armaments in tandem with defence industry. If domestic industry is not already at the cutting edge of technology and reaping the benefits of economies of scale, R&D is likely to be a costly proposition.

A long lead-time for design and development and fast-changing technology are the twin bugbears of all R&D planning for defence production. For example, in the case of India's Defence Research and Development Organisation (DRDO) the development time taken is in many cases said to be so long that before an item reaches the prototype stage, the specifications and performance parameters aimed at are obsolete by contemporary standards. This is known to happen in more advanced countries also. By the time a new item can be brought into production, the user's specifications get upgraded and costs escalate; these in turn cause further delays. More effective products may meanwhile enter the armaments market and the dictates of military preparedness would not be satisfied with what is under indigenous development. True, the newer weapon systems are becoming more and more prohibitively priced, but then in defence parlance no weapon is costlier than an outdated or outclassed one. So fresh imports are resorted to and another effort at indigenous design launched, in a vicious circle.

If the question is what to develop, the answer may well be in terms of a strategy for buying information rather than a detailed blueprint of some futuristic operational weapon. Economies of scale are usually vital to justify the kind of R&D expenses that would give the programme a chance of success. With technological uncertainty layered on top of strategic uncertainty, it is rarely possible to specify an advanced weapon system well in advance and schedule a development program for it. And it may be a mistake to try. It may even be worthwhile and more cost effective focusing R&D towards re-engineering, rather than original development. In any case, the costs and benefits associated with R&D efforts in support of domestic defence industry need a long, hard look.

Changing Nature of Security Challenges and Globalisation

The post cold war period and the end of superpower confrontation were expected to lead to a “peace dividend.” For a while, global defence expenditures did decline. But the peace dividend proved illusory. Instead, the global security environment has evolved in unanticipated directions in recent times, particularly since the 9/11 incident in 2001. The sole superpower US has decided to defend its pre-eminence by actively striking out, and even anticipating threats to its security and seeking to crush them by use of force. At the same time, terrorists and rogue states can pose asymmetric threats even to the strongest nations. The need for greater global security interdependence is now being felt.

Today’s world is susceptible³² to insurgencies, terrorism, and other forms of non-conventional conflict. Additional risks of conflict stem from the increased arms trade of 1980s and 1990s that flooded the world with weapons that can be used in insurrections. States bent on destabilizing other nations may view covert low-level operations, such as terrorism, as a cost-effective means for achieving political disruption. Dissatisfied groups may be able to cause great havoc and impose huge costs on a strong government when such groups resort to guerrilla warfare tactics. Non-conventional forms of warfare pose a significant risk to individual countries as well as to the world community. Defence economics has contributions to make in understanding and help tackle challenges in these areas, and other trends resulting from globalisation.

Terrorism

The threat of trans-national terrorism is now a reality that most countries have to face and factor into their security matrix. Each country has to study the problem and come out with its own solutions. For example³³, economic models of terrorist behaviour use the standard consumer choice models with individuals and groups facing an allocation and choice problem. Terrorists aim to maximise their individual or group utility. But they are subject to limited resources (income, wealth, labour, time) which have to be allocated between various terrorist and non-terrorist activities.

A rational-actor model depicts an individual or collective as optimizing some goal, usually that of utility or net benefits, subject to a set of constraints that restrict actions. These constraints indicate the limits imposed by resources, laws, institutional rules, or other considerations on the

participants. Alteration in these constraints brought about, say, through government policies (e.g., increased security or stiffer penalties) should have a predictable effect on the agent's or optimizer's behaviour.

The choice-theoretic model³⁴ leads to some testable hypotheses with respect to terrorism. If a government policy increases the relative cost or price of one kind of terrorist mode of attack, then terrorists are anticipated to substitute those modes whose prices are unchanged. The greatest substitution will occur between modes that achieve similar purposes - for example, between hostage-taking events, or between different operations directed at diplomatic personnel. The overall level of terrorism need not decline. To achieve a general decline in terrorism, the government must either reduce terrorist resources in general, or else raise the costs of all terrorist operations relative to non-terrorist activities. Piecemeal policies, aimed at one or two modes of attack, will not necessarily curb terrorism.

Enders, Sandler, and Parise (1992) attempted to calculate the impact of terrorism on European tourism. Their results showed that terrorists had been successful in deterring tourism and that there was a generalization effect: an incident in one nation acted to deter tourism in neighbouring nations. The negative externality has important consequences for the proper amount of expenditures used to thwart terrorism, since countries are unlikely to account for these spillovers when allocating resources to terrorism prevention.

These economic models of terrorism offer various predictions³⁵:

- *Substitution effects.* If a government increases the price of one form of attack, terrorists will seek lower-cost alternatives. For example, increased airport security might mean more bombings of other civilian targets (e.g. city centres).
- *Income effects.* Government can try to reduce terrorist activity by denying access to funds (budget constraints).
- *Increase the costs of terrorism.* Deterrence is one option (tit for tat policies). Or, costs might be imposed on nations supporting terrorist groups (e.g. Afghanistan).
- *Free riding.* Nations have incentives to free ride on any nation (e.g. USA) which actively pursues international terrorist groups.

At the same time, recent terrorist strategies like use of suicide bombers

do not readily fit into these predictive models. There will be an increasing need in the future for these models to be drawn upon, and newer models thought of in tackling the terrorist threat.

Cost Benefit Analysis of Conflict

The economics of conflict is a developing field that can be applied to both full-blown conflict situations as well as the lower intensity ones that are becoming increasingly frequent. A contribution by economists is to focus on the costs of conflict. However, there is a lack of empirical work on the costs and benefits of conflict.

For the conflict participants, estimates of military costs are made taking into account factors³⁶ like:

- The additional cost of the conflict
- The need to include the costs of replacing equipment
- The need to value the human capital losses (i.e. based on the discounted value of future earnings)
- Possible long-term costs such as the need for peace-keeping forces and a greater threat from terrorism
- Possible financial contributions from nations not participating in the conflict.

There are also costs³⁷ for the civilian economy. These include impacts on oil prices; on airline and tourist markets; on share prices and the state of general confidence in various economies; possible recession effects; and on public spending plans (e.g. greater spending on defence at the expense of social welfare programmes). In undertaking such analysis, the counterfactual cannot be ignored, namely, what would have happened without any conflict? For example, would the airlines have experienced a recession in their markets?

A cost-benefit approach to conflict obviously requires estimation of both costs and benefits; e.g. what are the likely benefits to the UK from a war with Iraq and how highly are such benefits valued? Here, one possible approach³⁸ is to use costs to indicate the minimum valuation which must be placed on the benefits. For example, the Gulf War cost the UK some £2.5 billion with contributions to the UK from other nations of over £2 billion (1991 prices). Today's costs to the UK of the conflict in Iraq are likely to end up being much, much higher. In purely economic terms,

benefits in such cases then must be valued as greater than the costs incurred. If they are not, then this must be brought out, and an informed decision taken.

Alliances

The need for global action to address the trans-national nature of the threats of the 21st century has renewed interest in coalitions and alliances, and opened up new horizons for the economic theory of alliances. There is already considerable defence economics literature³⁹ on military. This literature models alliances as 'clubs' providing a public good in the form of collective defence-security (e.g. US strategic nuclear umbrella which is non-rival and non-excludable for members of the alliance). One prediction of this model is free riding whereby the more defence a nations' allies provide, the less the nation will spend on defence. As a result, small nations exploit the willingness of large nations to provide alliance defence.

The range of alternative policies is also wide in defence missions that involve alliances. The broad choices include alternative allocations of tasks among allies so as to realize economies of specialization in forces, in production, or both; various arrangements for burden sharing; and adjustments of domestic policies in the light of the constraints and opportunities presented by alliances. Finding efficient solutions is complicated by the fact that allies have divergent national interests.

The economic theory of alliances can throw insights into the issues of burden sharing and alliance composition. It can also be fruitfully applied to the study of other supranational structures, such as environmental pacts, the United Nations, and common markets.

Trends in Defence Industry

During the 1990s, defence firms had to adjust to the end of the Cold War. The result was job losses, plant closures, exits from the industry and major mergers creating larger defence firms. Over time, the top arms producing companies have grown enormously in size, and today match multinational corporations in size and scope. Defence industries where the companies are sub-optimal will face difficult times, and have to rely on state support if the State deems their existence absolutely necessary. Efficiency and profitability of defence production are the imperatives for the defence industry of today.

Other trends⁴⁰ that are expected to be reinforced are that companies involved in defence production will focus on more profitable defence activities, such as systems integration. They will be more global with international supplier networks and international alliances. They will have a 'mix' of defence and civil business. Civil work will provide insurance against defence downturns; it will also allow the transferability of human and physical capital

Another trend, strengthened in the Iraq War, is that of increasing outsourcing. There is likely to be⁴¹ greater military outsourcing with firms and contractors involved in support activities for the Armed Forces. Obsolescence is expected to be rapid, which has implications for R&D and production decisions.

All these trends open up areas for micro-economic analysis and empirical studies. The more businesslike the defence industry becomes, and the closer it approximates to the private sector, the more the economists and financial wizards will have to contribute.

Technology

Technological advances occur today occurs at a breathtaking pace. The challenge for defence and defence economics is to try to keep up and stay on top of the changes. Information and communication technology, specially the power of the internet, is revolutionizing business and lifestyles, and impacting the economies of the world. It has proved to be a great leveller, with the geographically disadvantaged and economically weak as able to derive its benefits as those better placed. Instant communications and access to remote corners of the globe have led to economic shifts that are no respecter of established power equations and strengths. The implications of the thesis⁴² of "The World is Flat" have yet to be fully realized. Business process outsourcing that is one outcome of this phenomenon will have its impact in the defence sector as well, though perhaps less dramatically because of its highly controlled nature. Defence economists have much to contribute in helping identify least cost solutions consistent with security imperatives, using the potential offered by technological changes.

US operations in Iraq and Afghanistan have pointed the way to a future in which there may well be a "remote-controlled war". Till then, increasing

capital intensity, and declining labour intensity of the armed forces seem to hold out potential of greater efficiencies and effectiveness.

Technology today is divisible, with very small formations able to leverage great power (e.g. hand-held missiles). The enemy, whether conventional or unconventional such as terrorist groups, is likely to have access to latest technology. A higher level of technological solutions will have to be found to counter these.

Finally, information and communication technology has also empowered a range of non-state players such as civil society, non-government organizations and most notably the media. The interplay of these forces influences the outcomes of military operations, has to be factored in.

Research and Analytical Issues

There are issues in the analytical framework of defence economics that when considered add value to the analysis. Some examples are given below, and illustrations of relevant directions of research are set out.

Enemy Response

One useful methodological distinction⁴³ is the degree to which the analyst considers the enemy response. There are three broad classes of analysis. Studies in the first category assume no enemy response. This type of analysis is very relevant to technical questions concerning issues such as the choice among available production methods where our choices are unlikely to affect enemy strategy. Most microeconomic studies relating to defence industry or military manpower would fall in this category.

The second category, while still employing the method of constrained maximization, introduces explicitly the enemy's reaction to our choices. They are analogous to partial equilibrium analysis in economic theory.

The third category considers overall strategic action and cannot be treated as a strictly economic issue. In this mode of analysis, quantification becomes increasingly difficult; socio-political considerations may predominate. At times, it may only be possible to describe the important strategic interactions and to rank them according to their relative importance.

Measurement and Transparency

The accurate measurement of defence expenditures is notoriously difficult. Security concerns result in budget opaqueness and production secrecy. Classification of defence expenditure in non-defence heads in the budget is resorted to by many countries seeking to underplay their total defence spending. For example, paramilitary forces in a military role not being accounted for; merging defence pensions in the civilian budget, and intelligence gathering. There are also conceptual definitional problems, and empirical measurement difficulties. However, analysis undertaken overcoming these handicaps, even if less than perfect by economist standards, has much to contribute.

Future Discounting

As with much of the government, the proper valuation of future outputs is usually neglected. There is a marked tendency on the part of the military and the government to undervalue future capabilities. The reason seems to be that the primary responsibility of the military services is the operation of today's forces. Perhaps significantly, they always have emergency war plans, but seldom long-range war plans. Since personnel involved (whether in the forces, bureaucracy or at the political level) have a short personal time-horizon; almost everyone is trying to make a recognizable mark in the very near future.

The result also is that measures that promise significant savings over a period of years are often rejected because they involve somewhat higher expenditures the following year. This bias in decision-making presents opportunities for quantitative economic analysis to demonstrate large gains in efficiency.

Future Directions

In the consideration of the core issues of defence economics above, the key research directions have been identified. Most of these directions have been researched to some extent in select economically developed countries. Research in developing economies on this subject is rare. It is needed.

Some of the key directions that need to be looked at, and which seem to be of relevance to developing countries as well, are:

The demand for defence
Impact of defence expenditure on the civilian economy
Economic growth and sustainability of defence expenditure
Optimal military manpower mix
Cost-benefit analysis of defence industries and exports
Subsidization of R&D
Empirical studies on procurement
Arms race models with strategic interactions
Alliance economics
Cost-benefit analysis of conflict, including low-intensity conflict
Game analysis of terrorism
Cross country empirical studies
Identification of economic best practices
Nuclear non-proliferation

A range of issues set out above represents the prominent concerns in defence economics. Much work has already been done in the nascent discipline of defence economics in select advanced countries, but the discipline is yet to take off in developing countries.

If there is no work on defence economics in developing countries, should it matter to them? Yes, if the defence sector is an important sector in the economy, or absorbs a significant share of the national budget. Further, while existing studies are useful in bringing out the issues, they may not necessarily be useful in serving as a guide to policy formulation. Unfortunately from the point of view of developing countries, most issues are studied by Western researchers with a Western perspective, with their countries' interest the setting. Even when developing country issues are looked at, it is with the same perspective.

The results of such research, however academically sound it may be, has been to willy-nilly enhance and strengthen understanding of the economics of defence relevant to the world-view of the countries and philosophies that are represented by the researchers and institutions concerned. However, it is the developing countries with significant defence sectors that need the analysis and insights of defence economics. Resources are scarcer, the allocation problem more acute in the face of an unfinished

development agenda, and optimization imperative. For these countries, it holds the potential of enabling better utilization of scarce resources, and getting a bigger “bang for the buck”, without compromising specified strategic objectives. Application of modelling and gaming theories can even assist in strategic decision-making. As noted earlier, insights and findings of defence economics can on the whole be expected to enhance national security.

We can begin here and now. As a major defence spender, producer and trader, India deserves a better back-up for decision-making on defence issues. In the USA and UK, where defence economic studies seem to have taken root, work in defence economics is anchored in universities and academic institutions, as well as in think-tanks. Ideally, therefore, a defence economics facility ought to be created and nurtured in an institution of excellence in economics. However, the nature of the sector (security concerns predominate, there is lack of transparency in information available) is such that this may not be practicable at present. A defence economics facility would need to be anchored in an academic institution or think-tank with strong linkages to the defence establishment, and its willingness to go along, for such an endeavour to succeed.

The Institute of Defence Studies & Analyses (IDSA) is one such potential anchor that would fit the bill. A beginning can be made by establishing a chair in defence economics in the IDSA. This could be the nucleus around which defence economics expertise could be developed, harnessed and studies felt to be important taken up. It would be a small step, but one which has the potential of leveraging enormous value. Surely there is already more than enough material within the country’s defence sector to be looked at from an indigenous defence economics perspective to keep the chair busy for many years! In time, once the critical mass is built up, the institution can seek to offer its expertise also to friendly developing country counterparts, and thereby acquire a greater academic stature in the field.

We can, of course, always take the view that we have been managing fine without, and will continue doing so. However, the rapidly evolving global scenario will have no mercy on laggards, in whatever field. Can we really say that we don’t need to know; we don’t need to benefit from an analytical method that has been shown to be relevant and useful in other, more advanced parts of the world? Would it be prudent to deny ourselves the benefit of information, techniques and analysis that are currently

available and may help us make better defence policy decisions? Probably not. It might well amount to putting an avoidable and perhaps ultimately dangerous handicap on our own national security.

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