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# THE CASE FOR MARKETS IN DEFENCE

Driving efficiency and effectiveness  
in military spending

Keith Hartley  
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**Keith Hartley** is Emeritus Professor of Economics at the University of York. He was Director of the University's Centre for Defence Economics and its Institute for Research in the Social Sciences. He was the founding Editor of the academic journal *Defence and Peace Economics* and has been a consultant to the United Nations, the European Commission, the European Defence Agency, the UK Ministry of Defence and the House of Commons Defence Committee. He was a NATO Research Fellow and a QinetiQ Visiting Fellow.

# Preface

The conflict in Ukraine shows that, yet again, we do not live in a peaceful world. Defence economics studies the costs of war and peace. The Ukraine conflict illustrates the costs of conflict and the economic benefits of peace. The costs of conflict in Ukraine are seen directly and indirectly. They involve the deaths and injury of military and civilian personnel and the use and destruction of military and civil equipment and infrastructure. The direct costs are shown on TV nightly in the form of the destruction of cities, towns and villages, roads, bridges, communications, houses and public buildings. Some of these conflict costs are shown in the Data Appendix. But there are further costs of this conflict felt by the Ukraine population through the loss of their freedom and liberty, the continued Russian air strikes, the need for protection and their starvation. The Ukrainian population is forced to live in shelters without lighting, heating and water supplies. There is more, reflected in the large-scale migration of refugees who have sacrificed their lives, families and friendships and have had to leave their nation state and move to foreign nations. These constitute the costs of conflict which are not new.

Similar costs arose in World War II during the Nazi Germany occupation of much of Europe. The occupied countries were treated as slave states whose populations lost their freedoms and liberties; they were starved; and some were used as forced labour compelled to work overseas in inhospitable conditions (e.g. in Nazi Germany underground rocket factories). The occupied countries also suffered the destruction of their infrastructure and housing as well as deaths, injury, torture and prison sentences of both military and civilian personnel. All these formed the real costs of the War most of which were never quantified and cannot be ignored.

This study has a more limited role. It shows how economics can be applied to defence by focusing on the opportunities for creating defence markets

and improving efficiency in the armed forces. It shows how the application of economics provides new and different insights into defence policy. Whilst the focus is on the UK, the analysis is general and can be applied to all countries with armed forces and a defence policy. It explores options suggested by economics without necessarily making recommendations. Some options are controversial and are not always suggested as appropriate solutions; but the aim is to show how economics can be used and to clarify its approach and implications allowing a more complete evaluation of alternatives.

Defence and economics are uneasy bedfellows: Admirals, Generals and Air Marshals believe that they are the guardians and custodians of all matters related to defence and security. They do not take kindly to economists, their theories and their interference in their specialist military domains. This is unfortunate and regrettable since both parties have much to offer. Economists continue to point out that the military uses scarce resources which have alternative uses reflected in the classic 'guns v. butter' choice. Military personnel have to accept that they have to work with limited resources and that choices cannot be avoided. Also, they might find that economists are not the 'enemy' but provide advice which might help the military in their 'battles' with the national Treasury. Hopefully, this study helps to bridge the gap between military staff and economists. It focuses on the opportunities for outsourcing all military activities extending to combat missions. Such an extension is presented as a logical possibility designed to provide insights and understanding to identify the limits of outsourcing. What, if any, are its boundaries and why do they exist? Are the boundaries determined by political or military factors; what precisely are such factors; and can they be removed at reasonable cost?

# Chapter 1.

## Transaction costs and public goods

### *Introduction: setting the scene*

Armed forces are not usually presented as models of efficiency; they are characterised by inefficiency. Typically, they make rather than buy a variety of goods and services, such as accommodation, training of personnel and repair of equipment (e.g. aircraft, vehicles, tanks, warships). The ‘making’ activity is undertaken by public sector monopoly ‘in-house’ units owned by the armed forces, where these activities are not subject to competition. For example, traditionally the RAF trained its pilots at Flying Training Schools; it provides military personnel to repair and maintain its aircraft; and it accepts complete responsibility over the life cycle for providing and maintaining aircraft for a variety of roles (e.g. air defence, attack roles, maritime patrol, and transport missions). These activities are not competitively tested.

For many years, the UK armed forces were amongst the pioneers in outsourcing many of their ‘in-house’ military activities. Various alternative terms were used, such as privatisation, contracting-out and competitive tendering, where competition was used to award contracts to private firms. Elsewhere, such initiatives were known variously as Private Finance Initiatives (PFIs) and Public–Private Partnerships (PPPs). PFIs were introduced in 1992, but in 2018, the government announced that they were no longer to be used. This study will review the decision to abandon PFIs and assess the opportunities for making greater use of contracts in the armed forces. Defence outsourcing is not limited to the armed forces: it can also embrace activities undertaken by and within the Ministry of Defence. Examples include procurement, finance, personnel and accommodation.



The notion of markets in defence is not widely accepted. An alternative view suggests that defence as a public good should be state financed and state provided, rejecting the suggestion that markets have any role in defence. This study takes the opposite position and argues that the armed forces represent a major opportunity for introducing markets into the provision of military activities. It will be argued that market solutions in defence offer substantial efficiency improvements, cost savings to taxpayers and benefits to the armed forces.

### ***Relevant economic concepts***

The study applies simple economic analysis comprising concepts of markets, competition, monopoly, public goods, entrepreneurship, contracts, transaction costs and public choice analysis. The approach provides new and novel insights into defence policy and the armed forces.

Markets are central to economics; they are mechanisms for achieving the efficient allocation of scarce resources between different parts of the economy. Economists start from their model of perfect competition, which is characterised by large numbers of buyers and sellers together with free entry and exit into and from the market, all of which result in an efficient allocation of resources. Such ideal and theoretical markets have only one role for entrepreneurs, namely, deciding which market to enter. All other choices are made by the perfectly competitive market (e.g. choice of product and production techniques, etc.). Examples of perfectly competitive markets include agricultural markets and foreign exchange markets. These markets also identify opportunity costs, such as the price of the nuclear deterrent in the form of the sacrifice of alternatives such as fewer schools and hospitals, and higher taxes (guns v. butter trade-offs).

Real-world markets depart from the competitive ideal in that they recognise that real entrepreneurs are faced with a variety of choices about which products to produce, using which production techniques, and what price to charge, all in the pursuit of profits in situations of uncertainty. If they are successful in identifying new market opportunities, they achieve their profit goals; otherwise, they lose money and move on to other activities.

Transaction costs are central to understanding defence markets. They determine the presence or absence of markets, with the armed forces having to decide whether to undertake activities 'in-house' or use markets (i.e. make rather than buy).

Transaction costs are the costs of running the economic system: the costs of doing business. They consist of the costs of searching to find products and suppliers, the costs of negotiating a contract for exchange and the costs of policing and enforcing contracts, including after-sales activities. High transaction costs prevent markets from working, and low transaction costs encourage transactions (e.g. the Internet promotes transactions).

Transaction costs are reflected in the institutions that emerge to undertake business. Examples include various forms and sizes of firms (e.g. vertical integration; small and large firms; different types of business organisation) and the choice between 'make' or buy. Firms can decide to make an item or buy from existing suppliers in the market, with contracts being a central part of this choice. Contracts determine the terms of trade between buyers and sellers: they determine what is produced, when and what happens in the event of default by one party to the agreement (e.g. legal sanctions and penalty payments). As a result, contracts range from extremely simple to highly complex; for example, from a simple transaction such as buying an ice cream or a carton of milk to a more complex purchase such as buying a space rocket. Obvious defence examples include equipment procurement, especially of high-technology weapons, where costs and delivery dates usually rise substantially above the original estimates. For example, the US F-35 combat aircraft is costly (\$78 million for the F-35A in 2021) and has been characterised by continued cost growth and delays (GAO 2022). Other instances of make or buy choices include the armed forces' decision to maintain and repair its equipment, to train military personnel and to provide accommodation for armed forces personnel. In reality, publicity often focuses on the cost overruns, delays and failures of highly complex defence equipment (e.g. advanced combat aircraft, missiles, warships, submarines, and UK Ajax tanks). These are lethal pieces of equipment whose actual use involves deaths and injuries. However, there is a vast range of items that are bought off-the-shelf in civilian markets. Examples include motor vehicles, office stationery, food, catering, taxi/transport services and specialist services such as accountancy, consultancy and computer advice.

### ***Defence as a public good***

Defence has a unique feature: it is a classic example of what economists call a *public good*. Such goods are best explained by considering the features of the opposite case of *private goods*. These are goods whose purchase conveys property or ownership rights. For example, my purchase

of a motor car denies you ownership of that car; we are rivals for ownership. Also, my purchase of the car allows me to exclude you from ownership. These features of *rivalry* and *excludability* are central to understanding the difference between private and public goods.

Public goods are characterised by non-rivalry and non-excludability. For example, my consumption of the air defence of London is not at the expense of the protection offered to you by it (non-rivalry). Similarly, as a citizen of London I cannot be excluded from its air defence (non-excludability). An international military alliance such as NATO also provides a public good in the form of protection provided by the strategic nuclear deterrent. Protection provided by the nuclear deterrent to one member nation is not at the expense of such protection for other members, and once a member of the NATO club, a member state cannot be excluded from protection provided by the alliance nuclear deterrent.

Private goods are bought and sold in markets, which reveal society's money valuations of various goods and services. No such market valuations exist for defence as a public good. Instead, in democracies, defence choices become political choices made through the voting system. Voting means that individual voters express their preferences for defence and other publicly provided goods and services through the voting mechanism, with different policies offered by different political parties. Parties can be viewed as vote maximisers. Parties that achieve a majority of votes form the government, which is further influenced by bureaucracies such as the Ministry of Defence and the armed forces. These various agents in the political market are often assessed using public choice analysis. They comprise voters, political parties, bureaucracies and producer interest groups, which combine to form the military-political-industrial complex (MPIC). Each agent in this complex has specific objectives, such as vote maximisation for political parties, budget maximisation for bureaucracies in the form of the Ministry of Defence and the armed forces, and income or profit maximisation for producer groups (e.g. major defence contractors in the UK and overseas, suppliers, local areas where contractors are located; more details of the MPIC are outlined in Chapter 5).

The outcome of the various choices made by agents in the military-political-industrial complex is reflected in national defence policy. The phrase defence policy is a broad term that encompasses the size of the defence budget and its allocation between nuclear and conventional forces, between air, land, sea and space forces, between equipment and personnel (capital

and labour), between national and NATO forces and between different geographical areas of the world (e.g. UK, Europe, Middle and Far East, between the Arctic and Antarctic and between earth and space). Each of these defence policy options can be analysed as an economic choice problem. The classic choice problem is that between guns and butter, namely, the choice between defence spending and spending on civil goods and services (e.g. schools, hospitals and roads).

There is another aspect of public goods that is central to understanding defence markets. Here, a distinction is needed between state and private *finance* and *provision*. Finance focuses on *who pays*, and provision is about *who provides* the goods and services. The framework identifies two possible general providers, namely, state and private. Often, defence is state financed and state provided. Governments pay for defence through various forms of taxation and provide national armed forces either through state provision or markets. Armed forces comprise equipment and personnel, and both can be provided by the state through state-provided and state-financed arms manufacturers, with military personnel provided through voluntary labour market transactions and/or conscription (e.g. draft versus an all-volunteer force). Table 1 shows the options for finance and provision for the acquisition of equipment and personnel, where X signifies a possible option. The symbol X (?) indicates that an option is possible but problematic. For example, some but not all defence equipment is privately financed. Lethal equipment, which is costly with limited markets, is less likely to be privately financed. Similarly, privately financed personnel might be restricted to mercenary forces, which are unlikely to be acceptable to many nation states (these options are explored in Chapter 6).

**Table 1. State and private finance and provision**

	<b>Equipment</b>	<b>Personnel</b>
<b>State Finance</b>	X	X
<b>State Provision</b>	X	X
<b>Private Finance</b>	X (?)	X (?)
<b>Private Provision</b>	X	X

***Conclusion***

Accepting defence as a public good does not mean that there are no opportunities for market solutions. The armed forces provide substantial opportunities for buying goods and services from private contractors; they have to choose between make or buy and this choice is represented by military outsourcing. Whilst outsourcing is the focus of this study, it also considers other opportunities for applying market principles to defence. Examples are taken from UK defence policy but the general principles can be applied to other nations.

## Chapter 2.

# Make or buy choices

### *The policy problem: an inefficient defence sector*

The armed forces undertake many of their activities 'in-house.' For example, they usually own and manage their military bases, such as army garrisons, air force bases and naval dockyards; they own, repair and maintain their equipment, such as aircraft, tanks and warships; they provide accommodation, food and transport for their military personnel; and they train their personnel, such as army drivers and air force pilots. These are 'make' choices where the armed forces decide to undertake the activities themselves rather than buy the services from outside contractors through outsourcing. In-house provision for the armed forces has an economic dimension: they are public monopolies, which are not subject to competition and rivalry. Economics predicts that in-house public sector monopolies lead to monopoly prices that are higher than competitive prices and result in inefficiency and a failure to innovate. In-house units in defence do not earn monopoly profits. Instead, their managers and workers 'consume' monopoly inefficiency in the form of 'organisational slack' and on-the-job leisure, staff expenditures, together with managerial emoluments and perquisites. Other benefits for staff might include job security, power, status, prestige and discretionary investment expenditures.

These outcomes reflect a broader problem known as the 'principal-agent' problem. This arises when the principal, in the form of the owner, relies on agents such as managers to pursue their objectives. For example, shareholders as owners desire maximum profits but their agents might pursue other aims, such as a quiet life. Similar situations arise in the military sector. During World War II, the commander of RAF Bomber Command (Arthur Harris) often ignored orders from his seniors in the air

force to select industrial targets rather than his preference for the area bombing of German cities (Hartley 2011).

There are further reasons why the public sector is likely to be inefficient. It lacks the efficiency incentives of the private sector in the form of competition, rivalry and contestability, where incentives comprise both the profit motive and the capital market with its threat of takeover and bankruptcy. These incentives and institutions are reflected in property rights, which are absent in the public sector, which is why the public sector has problems achieving efficient outcomes. Defence has only a single army, navy and air force, each with a monopoly of land, sea and air capabilities<sup>1</sup>. Military commanders operate on military criteria reflected ultimately in their ability to win wars; they are not entrepreneurs rewarded or penalised through profits and losses. Unlike private sector firms, military units are not subject to capital market incentives and penalties: they cannot be taken over or suffer bankruptcy. Such comparisons with the private sector identify the causes of inefficiency in public sector in-house units (see Chapter 6).

Critics might question whether efficiency criteria are relevant to defence. But defence is a major user of society's scarce resources, so it is relevant to question the efficiency with which it uses these resources and whether efficiency can be improved to provide more resources for defence and alternative uses (e.g. more hospitals, schools and roads, or lower taxes: see the Data Appendix for examples of defence burdens for a sample of countries). Defence lacks the entrepreneurship, profit and capital market incentives of a private competitive economy, but this does not mean that proxies for these cannot be created in the defence sector (e.g. outsourcing, fixed budgets). After all, the defence sector is involved in various forms of transactions reflected in make or buy choices, each with different cost and contractual implications. In a world where resources are scarce, efforts to economise on their use are necessary and unavoidable, and the defence sector is no different from the rest of the economy. If there are alternative methods of completing a defence transaction, why not choose the method that uses the fewest resources? Such a search for efficiency improvements means that the current organisation of defence activities needs to be subject to critical appraisal. Is the current organisation of defence activities efficient, and how do we know? Some critical elements are provided by parliament and its committees, by the National Audit Office, by universities and by independent 'think tanks'.

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1 Some nations also have a single marine and space force subject to the same inefficiencies.

### ***Defence and transaction costs***

The UK Ministry of Defence undertakes numerous of its activities 'in-house'. These are public sector monopolies, which economic theory predicts will be inefficient, reflected in higher prices and monopoly profits. For defence, this prediction has to be modified to allow such 'in-house' units to pursue organisational slack and on-the-job leisure instead of profits; in defence, monopoly profits are redistributed to staff in greater leisure and a quiet life. However, there is an alternative explanation of 'in-house' production, namely, transaction cost economics. This explains monopolies and other market failures in terms of transacting in an efficient way. For example, vertical integration is often explained as a monopoly problem but transaction cost theory explains it as an efficient transaction. Transaction cost economics distinguishes between markets, which are represented by the 'buy' choice, and hierarchies, which are represented by the 'make' choice.

Transaction costs are the costs of trading and exchange and are additional to production costs. They provide a basis for understanding the make or buy choice and hence decisions about the selection of in-house defence activities. Transaction costs involve search and information costs, bargaining and decision costs, and policing and enforcement costs. There are five determinants of transaction costs: asset specificity, uncertainty, frequency, limited rationality and opportunistic behaviour. Asset specificity involves physical and human capital, such as specialised naval dockyards for the repair and maintenance of warships or specialised labour for the design of nuclear-powered submarines. Uncertainty focuses on the risks of market exchange and imperfect knowledge about future events and their outcomes. Defence involves major uncertainty in that you never know who might wish to attack and invade your nation. Frequency concerns the frequency of transactions; a higher frequency leads to higher transaction costs. Limited rationality recognises that when making choices and decisions, agents in markets have only limited information and knowledge (they do not have perfect information and knowledge). Opportunistic behaviour means that agents have opportunities to pursue their own objectives (e.g. a quiet life).

Critics of transaction economics claim that it offers no refutable predictions; it resembles a tautology where all economic actions and organisations reflect efforts to economise on transaction costs. Anything can be rationalised by transaction cost economics. But supporters of transaction cost economics focus on asset specificity, which is measurable and the most important empirical determinant of the transaction. Asset specificity



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refers to the alternative use value of any asset: high specificity means that the asset has only value in one use and has no value in alternative uses, all of which favour hierarchies (make choices). Between the extremes of low asset specificity, which leads to market transactions (buy choices) and hierarchies, there are hybrid or intermediate cases reflected in various forms of long-term contracting and franchising (but the exact forms of business organisations in the intermediate cases are not specified by the transactions model).

Defence offers various examples of asset specificity. The strategic nuclear deterrent is highly specific and has value only as a nuclear deterrent, whereas conventional forces have many alternative uses (e.g. defence of cities, policing, occupation of foreign territory, emergency and disaster relief). A key prediction of transaction cost economics is a positive relationship between governance costs and asset specificity. For a range of asset specificity, markets have the lowest governance costs, but greater asset specificity leads to hierarchies in organisations with lower governance costs than markets. Governance costs include the costs of administrative control and coordination, incentive arrangements and ownership.

Transaction costs suggest that the costs and difficulties of market transactions favour hierarchies or in-house production. For example, a complex, risky and recurring transaction might be too costly for a standard buyer–supplier relationship, so internalising the transaction (e.g. via vertical integration) might be more efficient than market exchange. Effectively, this is a contract choice. Transaction economics is ‘...relentlessly comparative maintaining that the merits of one particular organisational arrangement can only be assessed relative to the performance of the relevant alternatives constrained by the same human frailties and propensities, technologies and information’ (Masten 1999: 54).

### ***Definitions and scope of analysis***

The UK has considerable experience with the military outsourcing of non-combat activities (Davies et al. 2011). The process has various definitions including market testing, contracting-out, contractorisation, privatisation, Private Finance Initiatives (PFIs) and Public–Private Partnerships (PPPs). These involve activities traditionally undertaken ‘in-house’ by the armed forces being transferred to private firms. Examples include the armed forces providing housing, education, transport and catering services; training pilots and the drivers of its military vehicles; and repairing military

equipment. Private firms or contractors undertaking these armed forces activities leads to the transfer of economic activities from the public to the private sector and the substitution of private firms for 'in-house' public sector organisations. This study provides an economic evaluation of military outsourcing but recognises the relevance of other perspectives, namely, legal, historical, political, strategic, military and moral-ethical. For instance, legal perspectives arise with military outsourcing where contracts have to be agreed upon with contractual agreements involving transaction costs. Also, there might be military factors that require that the armed forces undertake specific activities 'in-house.' In such cases, the forces need to explain these military factors, whether they involve additional costs and their willingness to pay the extra costs.

Military outsourcing involves issues of public (state) versus private *finance* and *provision* (see Table 1). The extremes range from government-funded and government-provided activities, such as the national army, navy and air force, to privately financed and provided activities, such as computers, mobile phones and motor cars. As a public good, defence has traditionally involved both public finance and public provision of all defence activities. Military outsourcing has demonstrated the opportunities for private finance and private provision of some defence activities, leading to the armed forces shifting from 'make to buy.' This study examines the economics of outsourcing all military activities, including combat missions. This is not to suggest the desirability of outsourcing combat missions; it is simply recognised as a logical possibility that needs to be evaluated carefully and critically (see Chapter 6).

The study addresses two major questions. First, why do governments outsource some military activities and undertake others 'in-house'? Second, what are the boundaries or limits of government and private sector activities in defence? Answers to these questions involve a choice between private and public sector agencies, each with different efficiency incentives. Private firms in competitive markets offer high-powered efficiency incentives, with such firms seeking profits, facing competitive threats from rival firms, and capital markets providing further threats of takeovers and bankruptcy. But there are costs associated with contracting in the form of negotiation, bargaining, monitoring and enforcement. In contrast, public agencies have low-powered efficiency incentives but are good at loyalty and trust (e.g. loyalty shown by the national armed forces).

But they lack the efficiency incentives of private competitive markets, as reflected in the profit motive, competition and capital markets. Nor are public agencies able to ignore the costs of contracting: they have to hire, fire and train staff.

### ***A brief history of UK policy on military outsourcing***

The UK Ministry of Defence's (MoD) competitive procurement policy was introduced in 1983 as part of the Conservative government's defence policy aimed at improving efficiency and achieving value for money. It involved competition for both equipment and support services. Contracting-out support services became part of MoD competition policy where such services could be provided more efficiently in the private sector, offering benefits to taxpayers without damaging operational capability. The result was that defence support functions were undertaken by the private sector unless it was operationally necessary or more cost-effective to keep the work in-house (Cmnd 675-1 1989: 35).

By 1985, most accommodation cleaning and laundry services had been contracted-out to private firms. Other services that were contracted-out included catering, grounds maintenance, security guarding and the use of civilian driving schools for training RAF drivers. Further examples were aircraft servicing, air traffic control, some management tasks and support for ranges and training areas. By 1989, the MoD claimed cost savings from its contracting-out policy of some £50 million a year. Even where tasks remained in-house, cost savings of between 20 per cent and 30 per cent were reported, reflecting the impact of introducing contestability into traditional monopoly defence markets.

The policy of market testing had its critics. These expressed concerns about its impact on operational capability, the contractor's obligations in war and transition to war, maintaining quality of service with private contractors, the need for a 'level playing field' allowing in-house units bidding to retain the service and the need for re-tendering at regular intervals. The estimates of cost savings from market testing also need to be evaluated critically. Do the savings reflect changes in the quality of services? Are they achieved when the contract is re-tendered? And whilst annual savings of £50 million per year appear substantial, they are only a small share of the total defence budget.

In 1992, the MoD introduced an expanded programme of market testing as part of its Competing for Quality initiative. The policy encouraged in-house units to bid against private contractors for MoD contracts as part of the MoD's policy of achieving cost savings of 20 per cent in support areas. The next new MoD policy venture was the Private Finance Initiative (PFI), which involved private finance replacing state finance for capital projects. Instead of purchasing and owning capital assets, MoD agreed that the private sector would provide the finance for the asset, with MoD leasing it through annual rental payments. PFI committed the private sector to financing the often large up-front capital costs of a project and to the provision of services of an agreed standard over future years. Initially, six areas were identified for defence PFIs, namely, training, property and accommodation, information technology, equipment, support services and utilities (Cmnd 3223 1996: 89; Davies et al. 2011). Only where a PFI is shown to be inappropriate or uneconomic will the use of MoD capital resources be considered. Whilst dedicated war-fighting equipment may be beyond the scope of a PFI, little else was 'off-limits', including support for frontline units.

In 1997, under the Labour government, the PFI policy was developed and re-launched as Public Private Partnerships (PPPs). These extended the concept of partnership with private industry to embrace other approaches, especially opportunities for revenue raising from the commercial use of MoD assets and innovative forms of partnership between the MoD and the private sector.

Many of the MoD's PFI/PPP projects have involved buildings (e.g. accommodation, refurbishment of the MoD Main Building) and training services. There have also been some novel developments, including air tankers, strategic sealift, heavy equipment transporters and military satellite communications. Another novel example was UK search and rescue missions (S&R). Traditionally, this task was undertaken 'in-house' by the MoD with helicopters provided by the RAF and Navy, but the fleet needed replacing at a substantial up-front cost. In 2013, Bristow was awarded a 10-year contract for £1.6 billion for the SAR mission. Under the contract, Bristow acquired a new fleet of helicopters, established some new bases and provided S&R services to the UK Maritime and Coastguard Agency; a privatisation that shifted a service from the MoD to a private contractor and a different Government Department (Transport rather than MoD).

By 2021, there were 39 PFI projects at an annual cost of £2.3 billion, equivalent to 9 per cent of total MoD Core Departmental expenditure. Examples are shown in Table 2.

**Table 2. Examples of UK MoD PFI/PPP projects**

<b>Annual Payments of Over £50 million</b>
Future Strategic Tanker Aircraft (FSTA)
UK Search and Rescue mission (Bristow Helicopters)
Allenby/Connaught Building Project: Colchester
Skynet 5 (satellite communications)
Defence Fixed Telecommunications Services
<b>Annual Payments of £25-£50 million</b>
Defence Helicopter Flying School
Joint Services Command and Staff College (JSCSC)
Attack Helicopter Training (Apache Simulator Training)
Roll-On/Roll-Off Strategic Sealift (RORO ferries)
<b>Annual Payments of £10-£25million</b>
Army Foundation College
Astute Class Training Services (submarines)
Heavy Equipment Transporters
RAF Cosford/Lossiemouth/ Shawbury Family Quarters (accommodation)
Tornado GR4 Simulator
<b>Annual Payments of £5-£10 of million</b>
Marine Support to Range and Aircrew Services
Naval Communications
<b>Annual Payments up to £5 million</b>
Family Accommodation: Cosford; Shawbury; Lossiemouth; Yeovilton
Hawk Simulator

**Sources:** MoD 2014; 2022a.

The PFI contract for the RAF's future strategic tanker aircraft (FSTA) was large and innovatory. Total procurement and support costs (whole life costs) were estimated at £10.5 billion for a 27-year fixed-price contract with price variations based on output indices (2008 prices), but including a substantial firm component and opportunities for gainsharing. This contract replaced the traditional solution whereby the RAF owned, operated and serviced its fleet of tanker aircraft. The aircraft are owned, managed and maintained by a private contractor, the Air Tanker consortium, which also provides training facilities and some personnel. The Air Tanker consortium was owned by Cobham, EADS, Rolls-Royce, Thales UK and the VT Group and supplied a mix of new and used Airbus A330 aircraft. Final bids for the contract were received from two competing consortia at the end of April 2003. The contractor provides capability during peacetime and transition to war and conflict. A total of fourteen aircraft are available, comprising a core fleet of nine aircraft with access to a 'surge capability' of a further five aircraft if needed by the RAF. The surge aircraft are available to Air Tanker for release to the civil market or release to partner nations for military use.

A NAO Report on FSTA concluded that despite taking five years longer than planned to sign a contract, the MoD's progress in delivering the capability had improved since contract signature. Interestingly, the MoD maintained competition on the FSTA programme for five years by contributing to the losing bidders' costs (NAO 2010: 6).

Another novel defence PFI contract involved military flying training (MFTS) with a 25-year contract awarded to Ascent, which is jointly owned by Lockheed Martin and Babcock International Group. Ascent supplies Phase 2 aircrew training for fixed-wing aircraft, helicopters and rear crew, including the provision of aircraft. The MoD provides Phase 1 elementary flying training (NAO 2015). The economic logic of outsourcing military flying training is that the armed forces simply want trained pilots and aircrew at the required standard regardless of whether they are trained by the public or private sector. A similar situation arises with the private sector instruction of car and lorry drivers.

### ***Conclusion***

The next phase of PFI was announced in late 2012 and was known as the Private Finance Initiative 2 (PF2) and was the successor to the PFI for the delivery of infrastructure and services. PF2 responded to the

problems of PFI, which included windfall gains and excessive profits for equity investors, a slow procurement process and the transfer of inappropriate risks to the private sector leading to a higher risk premium charged to the public sector (HMT 2012). Soft services such as food, catering and transport were excluded from PF2 projects and were to be provided by shorter term contracts. In the event, only twelve PF2 projects were awarded in over five years and in 2018, the government announced the end of PFI and PF2 due to their decreased use, inflexibility and fiscal risk to the government (HMT 2018; Hodge 2022). Without further explanation and clarification, these reasons for ending PF2 leave much to be desired. There remain considerable opportunities for military outsourcing.

Overall, the NAO concluded that most MoD PFI projects (over 50 such projects) had been delivered successfully on time and on budget. However, mention was made of examples of contractors incorrectly reporting performance, which would otherwise lead to payment deductions (e.g. BT on its contract for the Defence Telecommunications System: NAO 2008). Overall, the government's decision to end PFI and PF2 can be questioned. Have the limits of outsourcing been reached? What are the limits and what is the evidence? And does the decision reflect the power of interest groups opposed to change? These questions are addressed in the rest of this study.

## Chapter 3.

# International experience

### *Introduction*

There is little published information or data on the extent of military outsourcing in other nations. Some information is available for the USA, and limited information is available for other nations. International comparisons are helpful in identifying the extent of outsourcing and any innovative examples that might be applied in the UK and elsewhere.

This chapter considers experiences in the USA, European countries and a few other nations, namely, Australia, Canada and Israel. Most nations use private contractors to undertake some military activities. A key question is: does international experience identify the limits of military outsourcing?

### *US experience*

US experience with outsourcing can be divided into pre- and post-Iraq. Pre-Iraq, the USA had limited experience with outsourcing. A comparison of UK and US experience in 2000 concluded that the US Department of Defense had ‘...lagged behind the MoD in outsourcing and privatisation initiatives’ (Rand 2000: vii). Pre-Iraq, the US emphasis on outsourcing focused on such areas as depot maintenance, military base commercial activities, material management, finance and accounting functions, data centres and education and training. Claims were made that US outsourcing and privatisation had led to cost savings of some 30 per cent in annual operating costs.

The Iraq conflict led to outsourcing becoming ‘big business’ in the USA with suggestions of ‘privatising war.’ In Iraq, private defence contractors



provided base support functions and security services such as guarding installations, acting as bodyguards and protecting convoys. Armed guards for security roles meant that civilians were used to provide frontline services traditionally undertaken by military personnel. Using private contractors in conflict zones raised issues over their legal status and accountability and the rules governing the use of force, especially lethal force (e.g. legal position of foreign armed guards killing local civilians whilst on guarding duties).

The US experience also identified novel areas for outsourcing, one of which was rail operations. A Rand study found that the US Army may be able to 'obtain modest cost savings by privatising rail operations at installations with low rail activity that currently have Government-Owned, Contractor-Operated business models' (Pint et al. 2017: 35). Cost savings were estimated at \$300,000 per year at each installation. Critics of military outsourcing have claimed that there are many grounds, both theoretical and actual experience of outsourcing, for questioning the claim that private provision necessarily entails better value for money (Perlo-Freeman and Skons 2008).

In the USA, the growth of military outsourcing has been reflected in the growth of large private military outsourcing firms (e.g. Blackwater, Computer Sciences Corporation, KBR, Halliburton). Military outsourcing is likely to continue being a growth market as defence firms seek to protect themselves from cuts in weapons programmes and from the budgetary pressure for the armed forces to extend the in-service life of existing projects.

### ***Europe, Australia and Canada***

European data shows relatively low levels of military outsourcing. The UK was amongst the top nations for the shares of outsourcing in its defence budget, with France, Germany and Italy amongst the nations that did not appear in the listings (see Table 3).

**Table 3. Military outsourcing in Europe**

Country	Outsourced share of defence budget (%)
All Europe	3.7
Austria	10.5
Belgium	7.0
Czech	13.7
Finland	19.6
Luxembourg	38.1
Sweden	3.4
UK	8.0

Notes:

- i) All of Europe comprises Member States of the European Defence Agency.
- ii) Data for 2014, the series was discontinued after 2014.
- ii) Outsourcing is defined as defence spending on services contracted at central level with service suppliers outside the MoD and/or armed forces.

**Source:** EDA 2014.

France has used private contractors in support activities such as catering, hospitality and leisure, infrastructure, office software, equipment maintenance, including vehicle support, training, clothing and surface transport. There are PPPs such as equipment repair: when equipment is beyond repair, it is returned to industry for repair and resale, with the resulting revenue shared between industry and government.

Germany has restricted outsourcing to non-military services, such as clothing management, the maintenance of heavy equipment, administrative services and IT services. In choosing outsourcing, France has focused on the need to maintain a minimum base of capacity for operational independence. Its policy position is that losing a competency is a very long-term loss; winning it again and in-sourcing it again are processes that are more costly than the initial benefits of outsourcing. France aims to make budget savings and increase quality without adversely affecting the operational capability of its armed forces.

Other nations have filled various military capability gaps with contracted service alternatives. Australia has outsourced maintenance work on its patrol vessels (to the Serco company), weapons systems contracts, simulator-based training and medical and dental logistics services. Canada has used contracted services to cover gaps in its military force structure and platform capability. It has outsourced air traffic control, nav aids, logistics services, security, engineering, telecoms and IT. Also, it has outsourced basic pilot training, where the contractor provides and maintains the aircraft and runs training administration.

Israel is an interesting exception of outsourcing combat missions. It uses the Aeronautics Defense Systems company (ADS) to provide unmanned air vehicles (UAVs) for operational missions for the Israeli Defence Force.

### ***Conclusion***

Nations differ in their use and extent of outsourcing. The UK and USA have major amounts of outsourcing compared with some European nations, which have only limited roles for outsourcing. The differences might reflect different political philosophies and views about the role and extent of state involvement in the economy. Market economies will favour policies based on privatisation, competition and market testing whilst state-type economies will prefer government-type and public-sector interventions. Budget pressures are also a factor. Continued cuts in defence budgets will eventually force all armed forces to confront efficiency issues. Outsourcing allows the armed forces to retain their frontline combat roles. Outsourcing is about contracting and the costs of contracting. Comparisons of outsourcing with in-house provision encounter methodological problems. Critics of outsourcing readily point to the problems of using private contractors, reflected in firm failures and bankruptcy, excessive profits and poor performance. Criticisms of in-house provision are all too often ignored, namely, performance failures by in-house units, soft budget constraints and inefficiencies. Sometimes, in-house failures are ignored on the basis that 'we do not criticise colleagues who are part of the team.' Overall, international experience shows military outsourcing limited to various support operations but does not add to our knowledge of the limits of outsourcing.

# Chapter 4.

## The political economy of outsourcing defence support

### *Introduction: the policy problem*

The armed forces are involved in a substantial defence support business. This involves support for logistics, engineering and equipment. Defence support was subject to a review in 2022 (MoD 2022b). The review identified a series of problems in defence support, namely, poor availability, productivity and efficiency, finance and the costs of ownership, together with a culture promoting risk avoidance. Defence support employs about 60,000 personnel and involves the management of the Strategic Base, which encompasses airports and seaports and a range of military bases in the UK and around the world. The Review of Defence Support recognised a role for 'more effective commercial arrangements', but military outsourcing was not identified as a specific solution. This chapter explores outsourcing as a possible policy solution for defence support. It starts with an outline of the economics of outsourcing.

### *The economic case for outsourcing*

Military outsourcing allows private contractors to bid for defence activities traditionally undertaken 'in-house' by the armed forces. Economics predicts that 'in-house' activities and services are public monopolies, which are likely to be characterised by higher prices, monopoly profits and inefficiency. Introducing competition into such monopoly situations will lead to lower prices, reduced profits, greater efficiency and innovation. One fallacy needs to be addressed. Simply transferring resources from the public to the private sector has no effect on efficiency if identical resources are

used. There is a further complication since the government can always borrow more cheaply than the private sector (1-3 per cent in the UK). So, if military outsourcing is to lead to cost savings, the extra financing costs for the private sector must be offset by savings elsewhere over the life cycle of the project.

Outsourcing leads to cost savings from competition for the work, from contractual efficiency incentives and from innovation. Rivalry through competition should lead to lower costs for both construction and life-cycle costs, with risks transferred to the private sector. Also, contractors are encouraged to be innovative in project design, construction, operation and maintenance. Further efficiency incentives are provided by contracts that offer incentives to control and reduce costs (e.g. fixed-price contracts).

Outsourcing is not costless. The long-term nature of PFI/PPP and other outsourced contracts requires a clearly specified procurement policy with provisions for change, contract pricing, risk management, performance incentives, procedures for resolving disputes and exit strategies. These aspects involve complex negotiations reflected in transaction costs. The MoD's outsourced contracts involve various transaction costs, and these comprise:

- i. A public sector comparator (PSC).* Value for money requires that the net present value of a PFI or outsourced contract, including its risks, be lower than the PSC. The standard discount rate is recommended at 3.5 per cent in real terms. Applications of the PSC provide opportunities for 'optimism bias', which is the tendency of appraisers to be over-optimistic about a project and its costs and benefits (HMT 2022).
- ii. Competition requires at least two and ideally three bidders at the stage of invitation to negotiate.* MoD contracts are either competitive or non-competitive, with non-competitive contracts involving negotiations with single-source suppliers (see Chapter 5).
- iii. Contract prices vary between firm prices, fixed prices with price variations for inflation, target-cost incentive fee contracts (gainsharing) and cost-plus contracts.* Contracts need to specify clearly the levels of service or performance standards required by the private contractor and the consequences of failure (i.e. penalty clauses). Performance standards require reliable measures of output.
- iv. Contract duration.* Long-term contracts (e.g. up to 40 years) are designed to encourage contractors to undertake costly investments.

But such lengthy contracts create a long-term monopoly and scope for 'hold-up' (willingness to invest). Uncertainty means that long-term contracts cannot be specified completely, making them difficult to monitor and enforce legally. These contract features mean that both the principal and the agent have to rely on partnership, trust and reputation. In the absence of output indicators, agents have opportunities to pursue their own interests rather than those of the principal.

- v. *Procedures are needed for resolving disputes.* The right of the MoD to step-in and intervene in the contract and exit strategies.
- vi. *Ownership rights and end-of-contract arrangements.* The MoD has to decide whether to retain ownership of any assets for defence purposes and what happens to the asset at the end of the contract. Either the asset will be transferred to the MoD or to any new supplier, requiring payment for its residual value (estimated on some agreed basis). Further complications arise at the end of a contract where the transfer of an asset to a new contractor might involve intellectual property rights (e.g. management records and information needed to organise a new competition).
- vii. *Overall, it has to be accepted that no contract is truly complete* since contracts cannot anticipate all events in an uncertain world, nor can they prevent opportunities for cheating (i.e. circumventing the contractual obligations).

### ***The economic case against outsourcing: a public choice perspective***

Like all policies, outsourcing is applied in the political market place, where its implementation will be determined by the behaviour of agents in this market. Vote-sensitive government ministers need to demonstrate that outsourcing is successful: hence, public sector comparisons can be made to appear costly; competition can be limited to the selection of preferred bidders; and cost savings can always be achieved by sacrificing quality, especially where quality is difficult to measure. Where external advice on outsourcing is provided by management consultants, their evaluations will respond to the wishes of their clients and their need to be paid. Overall, it is likely that government personnel undertaking economic evaluations of outsourcing will pursue projects that do not adversely affect their job security, income and status. They will also favour efficiency improvements that offer personal benefits, such as better office buildings and accommodation. Similarly, public sector agents opposed to outsourcing will use their knowledge and skills to be selective in their choice of

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comparators, they can impose restrictions on competition and make the terms of a competition unattractive to private firms; hence, firms will be discouraged from bidding for a contract.

Any evaluation of outsourcing has to ask *who gains and who loses from the policy?* Taxpayers should gain from cost savings, but they will lose if the cost savings fail to materialise. Other gainers include private contractors who win the contracts, banks, which provide funds, shareholders and lawyers who advise both the government and industry on the legal aspects of contracts. There are also possibilities for inter-generational welfare shifting. Current generations of voters and taxpayers benefit from the assets provided by outsourcing, but they bequeath to future generations an older public asset base and contractual commitments to buy outputs from private contractors. Before 2006, losers included public sector workers who lost their jobs or received lower pay as the 'in-house' unit was acquired by a private contractor. This changed in 2006 with the Transfer of Undertakings Regulations (TUPE), which provided public sector workers with protection when services were acquired by a private contractor. These concerns are not confined to outsourcing, and the counterfactual has to be considered. The alternative of a public sector solution leads to state monopolies and higher prices, inefficiency, a failure to innovate, a failure to invest in new capital stock and outcomes determined by trade unions.

Uncertainty is a major challenge for long-term contracting in defence. Unforeseen and unforeseeable events are difficult to include in a legally enforceable contract. The armed forces are confronted with a range of unknown and unknowable future contingencies, ranging from peace to war with a variety of enemies and threats over long time horizons. The result is that long-term contracts require trust, commitment and partnership between both parties. Trust is based on expectations about future behaviour whilst reputation is based on past behaviour and performance. Partnering involves the choice of one or a few long-term suppliers based on reputation and trust instead of competitive contracting. However, where there are few contractors, as is typical of defence, there are risks of collusion and small numbers bargaining. But again, the counterfactual cannot be ignored. The alternative to the challenges of long-term contracting is a public sector 'in-house' unit that is not subject to such contracts but whose behaviour is determined by 'soft budget' constraints resembling cost-based 'blank cheque' contracts.

Once a long-term contract has been awarded, a firm will seek to exploit its monopoly power (it will have an information advantage: opportunism) and earn monopoly profits. It might, for example, economise or default on those parts of the contract, such as quality, which might not have been specified completely. Default can have serious implications for military capability (the ability to fight on the battlefield). Here, the government has some safeguards since, typically, firms will be concerned with their reputation and the desire for future government contracts. Further sanctions are available. For example, governments can impose penalties on private contractors for poor performance, cancel contracts or refuse to renew a contract. But firms are not passive agents and in response to penalty payments, they will recover these costs from their other business activities. These problems need to be compared with 'in-house' units, which are not subject to penalty payments, contract cancellations or the opportunity to award a contract to a new private contractor.

Concerns arise that long-term contracts might impair the adaptability of the armed forces to respond to new threats, new technology and a changing world security position. Here, it has to be recognised that long-term contracts are not new in the defence sphere; they are characteristic of weapons markets and of the employment contracts offered to volunteer military personnel (see Chapter 5). Similarly, it might be claimed that rapid technical change, which is a characteristic of defence, means that long-term contracts are inappropriate and need frequent renegotiation, incurring costs. Examples of technical changes in defence include the jet engine, missiles, nuclear weapons and unmanned air vehicles (UAVs). But technical change is an example of the challenges of contracting under uncertainty. Procurement agencies have a choice in determining contract duration, and this choice will have a cost dimension reflecting the contractor's willingness to supply and the buyer's willingness to pay.

Competition and competitive tendering also have their limitations. Losers in the competition can acquire the winning firm. However, takeovers are subject to the sanctions of the capital market, which promote efficiency through further takeovers (e.g. involving managerial job losses) with the ultimate sanction of bankruptcy.

Outsourcing is believed to promote efficiency in its two forms. First, it promotes technical efficiency by seeking least-cost solutions; competitive pressures mean that firms have to adopt lowest-cost methods to survive. Second, it can promote allocative efficiency, which is more difficult to



achieve. Allocative efficiency requires procurement agents to seek information on the benefits and costs of different *levels* of service provision, embracing both the quantity and quality of various levels of service. Such efficiency requires complex contract specifications. Contractors need to be invited to tender for both different amounts of service and different levels of quality so that their bids reveal the marginal benefits and costs of extra quality and quantities of service. For example, a building cleaning contract might require firms to provide cost data on cleaning options, say, cleaning five, six or seven times a week (the quantity aspect of the contract) with, say, 10, 20 or 50 staff for each cleaning session (the quality aspect of the contract). In principle, such marginal cost and benefit data should allow procurement agents to obtain 'best value for money' from outsourcing. The contrast with 'in-house' units is revealing since these units are not subject to technical and allocative efficiency incentives. There are no competitive tendering pressures to supply at least cost, nor are there cost estimates for different quantities and qualities of service provision subject to competition. However, the UK National Audit Office has opposed efforts to achieve allocative efficiency. Its view is that giving bidders complete freedom might complicate procurement, making it difficult for Government Departments to make fair and thorough comparisons of rival bids; it recommended that Departments limit the range of options before seeking competitive bids (HCP 2008). This is a surprising recommendation from a public-sector audit agency and one that reduces the opportunities for public-sector efficiency improvements.

Cost savings are claimed to be a major benefit of outsourcing. Evidence is needed on the magnitude of such savings. The MoD estimated cost savings of 5 per cent to 40 per cent. In some cases, cost savings were exaggerated and overestimated, and some private contractors were criticised for earning 'excessive' profits on public-sector contracts. Also, it is difficult to assess the reliability of MoD's estimates of cost savings. They might involve quality reductions; there is no indication of the cost base to which the savings apply (e.g. a 40 per cent saving on £50,000 or on £10 billion); and the savings cannot be verified until the contract has been completed, which might be in the long run (e.g. 30-40 years).

Competition means the loss of military capability. In order to win at competitive bidding, a contractor will tender the lowest price, which might be 'too low', so failing to provide normal profits. This is known as the winner's curse, where the winning bidder pays too much and is awarded the contract (the winner is the real loser). The winner's curse can reflect

emotion, incomplete information and errors in the bidding process. The result can lead to disputes over the contract and the need for contract renegotiation. But such behaviour might be a 'strategic game' where the contractor aims to eliminate the military in-house unit and renegotiate the contract as a monopoly with rival contractors unable to enter the market quickly to provide the service. The MoD will need to assess such risks of contractor strategic behaviour and the costs and time required to re-create its military in-house capability. Cases can arise where the loss of in-house capability might involve other output losses not immediately apparent in outsourcing. For example, outsourcing military flying training means that the MoD will lose its internal capability for flying training and the ability to re-allocate training resources to the front line in emergencies and conflicts (i.e. surge capability). It is also feasible for in-house military units to engage in strategic behaviour against private contractors.

### ***Personnel issues under conflict***

Further uncertainty arises over the willingness of private contractors and their staff to serve close to the frontline during conflict. Whilst efforts are made to ensure that 'key personnel' are made 'sponsored reserves' (i.e. can be called-up in conflict and serve subject to military command), it is not known whether other contractors' staff will be willing to supply their labour in a conflict or potential conflict situation. In these circumstances, consideration needs to be given to the various alternative labour supply options, which broadly range between the extremes of using either contractors' staff or specialist military personnel. Using contractors' staff means relying on voluntary labour supply and wages to compensate for the net disadvantages of conflict; or there are opportunities for generating 'higher purpose feelings' in private-sector employment contracts. However, not all outsourced contracts involve working near the frontline, so that whilst it is a relevant concern, it only applies to a limited number of outsourced contracts (see Chapter 5).

### ***Obstacles to change***

Greater use of outsourcing involves change, and there are major obstacles to change in the MoD. Its procurement policies and procedures are often too detailed, bureaucratic, complex, lengthy and slow. For example, a private-sector commercial contract might require four months from start to contract award; a similar MoD contract might take almost 30 months to contract award. Furthermore, MoD procedures can be barriers to

innovation and cost savings: it prefers to 'micro-manage' contracts and often requires that any new proposals from industry be included in a revised bidding competition (meaning that a firm's property rights in its new ideas are revealed to their rivals). Public accountability and possible criticism from HM Treasury, the NAO and parliamentary committees also create problems for MoD procurement policy, which requires that standard procedures are followed. Overall, there is a view that the MoD needs to be more flexible on innovation and risk (e.g. an attitude of 'tell me what you want and not how to do it'); it focuses on low prices and audit trails rather than value for money in its wider definition; and MoD staff have problems with understanding and accepting profitability (e.g. it is regarded as a 'dirty word'). The MoD also needs to recognise that competitive bidding involves costs (it is not costless) and that increasing costs delay the returns on a firm's investment in competing for defence projects.

MoD barriers to innovation can be illustrated. Defence equipment contracts might be too rigid to allow for mid-life upgrades and spiral development as technology develops. Defence contracts tend to assume the same rate of innovation for all sub-systems and components for combat aircraft, tanks and warships. In reality, sub-systems develop at different rates, which could be leveraged by lower tier suppliers to provide better technological solutions. However, to do so would require the MoD and the tier 1 supplier to amend the contract mid-life or whilst it is being fulfilled, possibly depriving the tier 1 supplier of opportunities to supply its own sub-system. Sometimes, both the MoD and its key defence prime contractors perpetuate risk aversion, stifling innovation. The challenge for policymakers is to develop a procurement system that will improve the situation and lead to a better outcome.

### ***Parliamentary perspective***

The UK House of Commons Defence Committee reported on military outsourcing (HCDC 2022). The Report made a number of criticisms. It found that outsourcing was a relatively unscrutinised area and that the MoD's outsourcing practice was 'not exemplary', with little consideration given to providing services in-house. Contractors were criticised for reducing wages and employee benefits, lowering standards and squeezing staff to raise their profit margins. Nor was the MoD willing to intervene and enforce the expected standards. Also, EU rules prevented any consideration of a contractor's previous performance when assessing bids (this restriction should change with Brexit). Furthermore, there was a view that outsourced

staff felt excluded from the wider defence community. The MoD's contract awarded to Capita for Defence Fire and Rescue Services was used as a case study. This contract was valued at £525 million for twelve years, and the Defence Committee was critical of Capita for reduced standards and a potential reduction in manning levels. Overall, the Committee concluded that the MoD should give more consideration to providing services in-house if doing so gave better value for money; it claimed that in-house services are not properly appraised.

The Defence Committee's criticisms need a response. The main criticism was the apparent lack of evaluation of in-house alternatives. No evidence was presented for such a lack of appraisal, and only assertions were made. If true, the claim suggests that MoD agencies were failing to apply the Treasury's Green Book guidance on project appraisal. This requires an economic evaluation of alternatives using the Treasury's suggested criteria. It would have been more satisfactory if the Defence Committee had provided actual case study evidence of the apparent failure to properly evaluate the alternatives of outsourcing versus in-house provision.

### ***Conclusion***

Comparisons of outsourcing and in-house provision raise methodological issues: are we comparing like with like? Too often there is a tendency to compare perfect socialism with actual imperfect capitalism, or perfect capitalism with actual imperfect socialism. Inevitably, the comparison is between two imperfect institutional arrangements: imperfect socialism versus imperfect capitalism.

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## Chapter 5.

# Weapons procurement: arms markets

Weapons markets have distinctive characteristics. They supply lethal equipment comprising artillery, guns, tanks, combat aircraft, helicopters, missiles, rockets, warships, submarines and nuclear weapons. Within the market, the national government is a major buyer or, in some cases, the only buyer (monopsony). As a major or monopsony buyer, the government can select a protected or open market, each involving procurement choices. There are challenges in introducing market incentives into weapons markets, which can be described as state-dominated imperfect markets. The whole process of managing defence and procurement has been called 'managing the unmanageable' (Sapolsky et al. 2009: 108).

### ***The procurement problem***

When purchasing arms, governments are faced with three choices:

- i. Choice of project:* what to buy? Decisions are needed on whether to buy aircraft, tanks or warships, and within each type of weapon, further choices are needed. For example, for combat aircraft, decisions are needed on its type (e.g. fighter, strike, multi-role); its technical features (e.g. physical form: swept wing, delta, swing wing, stealth); and its speed, altitude, range and capability.
- ii. Choice of contractor:* which firm to buy from? This apparently simple choice is really complex: should there be a competition for the contract, and if so, should it be restricted to UK firms or open to foreign firms?

*iii. Choice of contract:* which type of contract to award? There are various options, such as fixed-price, cost-plus or target-cost contracts.

The UK's procurement of major defence projects is costly, at £26.6 billion in 2019-20. Even with such large expenditure on equipment procurement there was an expected funding shortfall of £7.3 billion for the period 2020-2030, which could be as high as £17.4 billion. A 2022 NAO Report concluded that the MoD's equipment plan was unaffordable with frequent delays, cost increases and programme shortfalls (NAO 2022: 20-22). One explanation was that contractors and the armed forces have incentives to understate costs in the early stages of projects.<sup>2</sup> More importantly, would a procurement agency that continuously recorded cost overruns, delays and poor operational performance survive in a private market?

The UK is not alone in encountering procurement problems reflected in cost overruns, delays, reduced numbers and performance failures. Similar problems arise in the USA with its largest procurement programme for the acquisition of the F-35 strike aircraft, which has been subject to cost overruns, delays and quality failures. The total programme acquisition cost for the F-35 is \$374 billion (2019 prices: GAO 2019), with unit recurring flyaway costs ranging from \$68.1 million for the F-35A version to \$98.4 million for the F-35B version. More widely, an overall assessment of major US weapons systems found that 67 per cent of DoD contracts were awarded without full and open competition and that almost 50 per cent of contracts were awarded to five corporations: Boeing, Lockheed Martin, UTC, Northrop Grumman and General Dynamics (GAO 2019).

Once the sheer complexity of the weapons acquisition process is recognised, it is not surprising that the US and UK weapons acquisition processes encounter problems. Weapons involve solving major technical problems characterised by uncertainty about their technical feasibility, price and delivery schedules as well as political uncertainty about whether governments will continue to fund a costly project. The technical and political uncertainties encourage agents to be excessively optimistic about a new military project: it will be claimed that the new weapons will be superior to the existing ones, and they will be developed quickly and

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2 Criticism was not confined to equipment spending. The Defence Estate was found to be 'too large' and needs disposal. NAO found that the MoD had made little progress in rationalising its Estate and the reasons for this will be examined in Chapter 7 (NAO 2022). Also, the different types of contracts assessed in this section are used for military outsourcing contracts.

cheaper. In the circumstances, it is perhaps amazing that major weapons are actually delivered and operated by each nation's armed forces! Compared with less technically demanding private and public sector civilian projects, military projects compare quite favourably (Sapolsky et al. 2009: ch. 6).

### ***The UK defence equipment market: make or buy?***

As a major or monopsony buyer, the UK government has to decide whether to buy all its defence equipment from national suppliers or from foreign firms. These policy options can be expressed as a buy British or make option versus an import or buy option. As a major buyer, the government can determine the size, structure, conduct, performance and ownership of the national defence industry. The government also finances defence projects through various forms of defence contracts. The supply side of the national defence market is often monopolistic or oligopolistic, with one or a few large suppliers. One buyer and one supplier, or a small number of suppliers, means that market solutions are determined by bargaining in a small numbers environment: the large numbers competitive industry is absent.

### ***The UK warship building programme***

The UK warship building programme is a classic example of the MoD's efforts at managing competition. Policy is committed to 'buying British' for all UK surface warships using competition within the UK market. For example, selection of the new Type 31e UK frigate involved a competition between three UK groups, namely, a Babcock team, a Cammell Laird/BAE consortium and Atlas Elektronik, with Babcock winning the competition and the award of a contract for five Type 31e frigates for the Royal Navy. A distinctive feature of the Type 31e contract was the involvement of multiple UK yards in a block building contract for the new frigate. A further feature was the MoD's acceptance that it was too risky for one UK yard to be the lead yard for two major warship designs, which meant that BAE Systems would not be allowed to be involved in developing both the Type 26 and the new Type 31e (Parker 2016). Elsewhere in the UK market, all other naval vessels (e.g. tankers, tugs) were subject to open competition, but defence procurement allowed wider factors to be included in the procurement choice. Nuclear submarines are regarded as a different market sector and are built by BAE at its Barrow yard.

There is a UK National Shipbuilding Strategy (Parker 2016; NSO 2022), which identified the problems facing UK warship building and was the basis for UK policy. Problems were identified with UK warships characterised by cost growth and delays in delivery. The Strategy found that there were no precedents for building two first-class frigates in one yard or one location; hence, the need for a separate lead yard for the new UK naval Type 31e frigate. BAE would undertake work on the Type 26 frigate and on the submarine deterrent, which would allow it to protect the UK's Sovereign capability. The new Type 31e represented a considerable production opportunity for the UK's regional shipyards.<sup>3</sup> Interestingly, the UK Shipbuilding Strategy involved the government taking decisions that would usually be left to markets: for example, whether one yard in one location could build two new frigates.

### ***A case study: Ajax***

Ajax is an armoured fighting vehicle programme for the British Army that illustrates all the problems of UK arms acquisition: cost overruns, delays and unsatisfactory equipment performance. The contract was awarded in 2010, with an estimated delivery date of early 2017. By mid-2022, initial operating capability had not been achieved. The contract was awarded to General Dynamics, UK, and was for the delivery of 589 vehicles at a firm price of £5.5 billion. But the vehicle suffered from major noise and vibration problems, and the UK Public Accounts Committee concluded that the programme '...has gone badly wrong...and was flawed from the outset...' (PAC 2022: 3). Further, the Committee stated that the MoD must determine '...whether noise and vibration issues can be addressed by modifications or whether they require a fundamental redesign of the vehicle' (PAC 2022: 3). By May 2022, the MoD had paid General Dynamics £3.2 billion and had received 26 vehicles. By that date, General Dynamics had built 324 hulls and assembled and tested 143 vehicles. The MoD owed General Dynamics £750 million for the completed work but had not paid the company since December 2020 (PAC 2022). Some of the programme problems arose because the Ajax design was based on an existing vehicle for which the MoD specified 1,200 additional operating requirements. In late 2022,

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3 The complexity of procurement choices can be illustrated by considering the simple choices involved in a house painting contract. Buyers have to decide on the extent of the house needing painting (e.g. does it include the garage and fencing?), what happens if the woodwork is rotten, how many coats of paint are required, and what is the quality of the paint. The choices become more complex if the requirement is for a new building or home extension.



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the programme was under review, with only five out of 27 critical reviews having been resolved. Critics claim that the MoD is often unwilling to cancel a major contract, their argument being that cancellation of major projects would deliver a 'shock effect' to the defence industry and the armed forces. Ajax has been labelled the Army's Nimrod aircraft, a reference to the cancellation of the RAF Nimrod MRA4 anti-submarine aircraft in 2010.

The RAF ordered the Nimrod MRA4 maritime patrol aircraft from BAE in 1996 with a fixed-price contract for £2.2 billion and an in-service date of 2003. The original plan was to convert 21 Nimrod MR2 existing airframes to MRA4 standard. The first flight was scheduled for 2004, with an original order for 21 aircraft later reduced to nine aircraft. The aircraft was cancelled in 2010 after spending £3.4 billion on the project. Nimrod's cancellation was due to it being over budget with cost overruns of £789 million; it was over nine years late and remained flawed, being unable to achieve its operational requirements. It was replaced in 2015 with an order for nine US Boeing Poseidon maritime patrol/anti-submarine aircraft. The MRA4 contract showed the limitations of fixed-price contracts. In February 2003, BAE Systems took a charge of £500 million on the contract, following an earlier charge of £300 million on the MRA4 contract.

Over the period since 1945, a number of major UK defence projects have been cancelled, with the MoD experiencing cancellations involving a complete range of air, sea and land systems. An early casualty was the Swift fighter aircraft with service entry in 1954 and cancellation in 1955 due to a series of accidents. Four major air systems were cancelled in 1964-65, including the Hawker Siddeley P139B AEW aircraft, the AW 681 transport aircraft, the P1154 fighter/strike aircraft and the TSR-2 light bomber. Later, the Nimrod AEW3 aircraft was cancelled in 1986 to be replaced by the Boeing AWACS Sentry aircraft. Amongst sea systems, the aircraft carrier CVA-01 and its Type 82 destroyer escort were cancelled in 1966, and the Type 43 destroyer was cancelled in 1981. Cancellations of land systems mostly involved rifles and machine guns rather than major systems such as armoured fighting vehicles and tanks. Overall, major defence projects were cancelled due to rising costs, defence reviews, the need for savings in defence expenditure (affordability), new technology, as well as changes in operational requirements. A recent major cancellation in 2010 was the Nimrod MRA4 aircraft, which was over budget, over nine years late and remained flawed.

So, why the reluctance to cancel major UK defence projects? A possible explanation is the role of interest groups in the military-political-industrial complex. Predictably, the armed forces will be unwilling to cancel a project that is viewed as the latest equipment aimed at filling an 'urgent' operational requirement. Air force staff derive great satisfaction from flying the latest 'state-of-the-art' fighter aircraft; admirals enjoy commanding large aircraft carriers with the latest naval aircraft; and generals love to operate modern tanks, which appear to offer command of the battlefield. The preferences of the armed forces are reinforced by producer groups in the defence industry, who will lobby the government to continue the contract, claiming that it offers 'major' economic benefits in the form of jobs, technology and exports. Rarely are these economic benefits subject to critical appraisal with supporting evidence. The opportunity cost question arises: what is the alternative use value of the resources allocated to the defence project? Would other uses of the resources generate more jobs, more socially desirable technology and more exports? Cost overruns and delays are the main reasons for project cancellations.

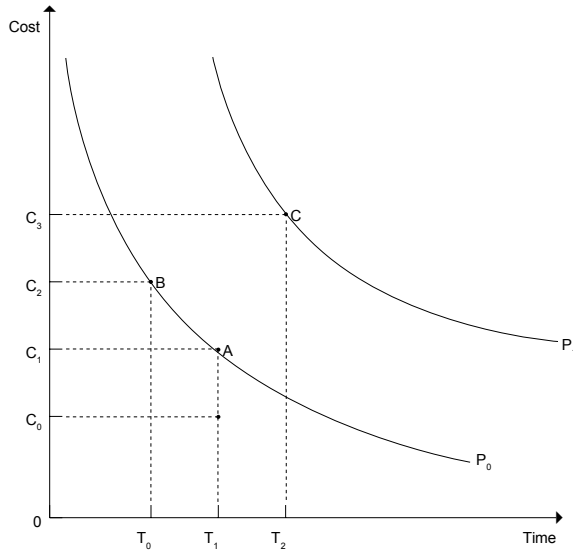
### ***Causes of cost overruns and delays?***

Uncertainty is a starting point for any explanation. At the start of a new defence project, the armed forces formulate an operational requirement stating their broad needs for the new military project (e.g. speed and range of a combat aircraft, or a warship, or a tank). Here, the key point is that often the new defence project does not already exist and cannot be bought 'off-the-shelf' from existing domestic suppliers. Exceptions might occur when similar equipment is already available but only from a foreign supplier on the world market. Or, foreign suppliers might not offer such similar equipment, in which case the armed forces would have to negotiate with a defence contractor for the development and production of the new equipment. This involves negotiations about the technical feasibility of the military requirement (e.g. what is possible?), the possible cost and the likely timescale for completion and delivery. These negotiations involve scientific groups within defence contractors who are able to advise on the technical requirements, cost estimates and delivery schedules. The contractor's estimates can then be checked by internal MoD technical staff prior to the award of a contract.

Economic analysis suggests a time-cost trade-off between development costs and time for any project of a given state of technology. Figure 1 shows that for a given state of technology (e.g. aircraft speed), a project

can be delivered later more cheaply, or faster but at a higher cost. Or, a higher state of technology might be costlier and take longer. Or, the state of technology might not be represented by a single clearly defined time-cost trade-off but by a vague blob where there is a range of time and cost estimates replacing single point estimates. These are all possible explanations for cost and time overruns.

Optimism by the armed forces and defence contractors in a soft budget context presents another explanation. For example, both sets of agents might agree to optimistic cost, time and performance estimates during contract negotiations. The armed forces and defence contractors will support 'optimistic' estimates since projects that appear to be relatively cheap are more likely to be funded by the Treasury. Also, at the bidding stage for a major project, contractor optimism is likely since big defence projects are so rare that contractors face the binary choice of winning or leaving the industry. Once started, projects are difficult to stop: they attract interest groups of military personnel, scientists and technologists, trade unions and local politicians, all of whom benefit from the continuation of the project (e.g. referring to the technology, spin-off, jobs and votes benefits from the project). Revisions to price estimates are more likely with cost-plus contracts, but revised prices are possible even with fixed-price contracts. For example, contractors and the armed forces might agree to revised specifications for the contract and the project, which then requires negotiation of a revised price reflected in cost overruns. The types of defence contracts determine the financial framework for overruns and delays.

**Fig 1. Time-cost trade-offs**

The time-cost trade-offs in Figure 1 show the various explanations for cost escalation.  $P$  shows different performance levels (e.g. speed) and their required cost and time inputs. An initial trade-off of  $P_0$  at point  $A$  shows that if a project is demanded faster than the initial estimate of  $T_0$  it can be achieved at a higher cost of  $C_2$  (urgency), or costs might rise if the initial estimate is 'optimistic', say,  $C_0$  (contractor optimism). Alternatively, if a trade-off of  $P_1$  at point  $C$  is chosen, this involves both higher costs and longer timescales compared with the initial position (point  $A$ : reflecting unforeseen technical problems). Overall, this analytical framework explains cost escalation in terms of urgency, project modifications and unforeseen technical problems, together with contractor optimism and contractor performance.

### ***Contract types: can they improve efficiency?***

The type of contract selected for procurement will determine the efficiency of the outcome. Three broad types of defence contracts are available, ranging from the extremes of cost-plus to fixed-price, with target-cost contracts between the extremes. Cost-plus contracts are cost-based, lacking any financial incentives and have been known as 'blank cheque' or cost-maximisation contracts. They are used where there are massive uncertainties about the project's technology, costs and timescale, and

where firms are unwilling to take the risks of a fixed-price contract (e.g. the early US efforts to land a man on the moon). Under cost-plus-a-percentage profit contracts, all the firm's actual costs are reimbursed plus a percentage profit based on actual costs. They are not contracts that promote efficiency in the sense of minimising costs and have been known as a school for scandal because contractors earn more profit by making their equipment more expensive. These contracts rewarded continuous delays and repeated refinements of the design (Sapolsky et al. 2009).

In contrast, fixed-price contracts provide a fixed price and a fixed lump sum for the project. For example, a fixed-price contract for a new combat aircraft would specify its operational performance (e.g. speed and range), the numbers required and the total price to be paid. The contract then becomes a legal obligation for the defence contractor and the MoD. In theory, fixed-price contracts provide contractors with maximum efficiency incentives. If the contractor beats the fixed price, it retains any excess profits; if costs exceed the original estimates, all losses are absorbed by the defence contractor. Inevitably, fixed-price contracts are criticised for those occasions where they allow excessive profits to contractors, which is an especially sensitive issue during conflicts. In such circumstances, they involve efficiency versus equity trade-offs. Nor are fixed-price contracts such attractive efficiency contracts; they can always be revised and renegotiated to the benefit of one or both parties. For example, the government might require a change to the original specification, which also gives the contractor opportunities for further revisions and the negotiation of a new price.

Target-cost contracts lie between the extremes of cost-plus and fixed-price contracts. They involve a sharing of risks and rewards between the government and the contractor and are used where the project has some uncertainties. A target cost or price is agreed upon with profit rates based on how closely a firm reaches the target variables. For example, if the cost exceeds the target cost, profit rates are reduced, and if costs are below the target, profit rates are increased, with the gains and losses shared between both parties to the contract using an agreed ratio. For example, with a sharing ratio of 80:20 between the government and the contractor, with the government share at 80 per cent and the firm share at 20 per cent, if actual costs exceed the target level, the government bears 80 per cent of any cost overruns and the firm 20 per cent. Target-cost contracts involve both the government and the contractor in a partnership.

The general types of MoD contracts are subject to modifications reflecting efforts to introduce more efficiency incentives into defence contracts. Cost-plus contracts might include cost incentives such as cost plus a fixed fee rather than a percentage profit rate or payment of a fee when, for example, the planned aircraft actually flies. Similarly, there are two variants of fixed-price contracts, namely, firm and fixed prices. Firm prices are usually preferred for contracts of short duration, say, two years, where there are no price variations allowed for inflation. In contrast, where the work is long-term, fixed-price contracts allow price variations for inflation of labour and material costs. Fixed prices are determined by open or selective competition or by negotiation. Target-cost incentive contracts might be subject to a maximum price and/or a minimum fee. Usually, various types of contracts that appear attractive in theory work less well in practice, mainly because human beings can adjust, adapt and play any games. All too often, the government's efforts to impose 'hard budget' constraints on contractors soon develop into 'soft budget' constraints or no constraints at all. Defence contractors do not normally rely on private funds raised on capital markets. Instead, they require governments as buyers of military equipment to provide finance with the ultimate threat of contractor bankruptcy, which is often avoided by a government bailout of the contractor threatened with exit (Sapolsky et al. 2009).

Where contracts are negotiated, there are ample opportunities for game-playing by both government procurement agents and defence contractors. Negotiating a fixed-price contract requires decisions on whether the contract applies to both development and production (total package procurement) or is restricted to production only. Total package procurement is another example of a proposal that appeared attractive in theory but not in practice. Lockheed's experience with such a contract for its C-5A transport aircraft showed the limitations of total package procurement. Lockheed's costs rose and threatened to close not only the C-5A production line but Lockheed's other plants. In the event, the US government resorted to a bailout of the company.

Development work involves considerable uncertainties, which contractors will be reluctant to accept on a fixed-price basis, preferring some form of cost-reimbursement contract. Negotiating a fixed-price production contract or a target-cost contract requires the contractor to estimate production costs, which will be checked by the procurement agency. Here, there is a requirement for the contractor to behave 'truthfully' and reveal accurate cost data rather than some imaginary data. Contract negotiations involve

all types of behaviour, with both parties exhibiting bluffing, brinksmanship and chicken behaviour to achieve an advantage in the negotiations. Each party has different amounts of information and knowledge about production costs (asymmetric information) and about how much effort the contractor is putting into cost and quality control (moral hazard), and defence contractors can also conceal valuable information from the procurement agency (adverse selection: Smith 2022).

Target-cost contracts also involve negotiations about the target cost, the sharing ratio between government and contractor and the maximum price liability. Each party will want to shift risks to the other. Contractors have incentives to bargain for the maximum possible target cost, the maximum possible price liability and a highly favourable sharing ratio for the contractor. The result might be that a contractor's performance on a target-cost incentive contract might reflect its success in the bargaining negotiations with its opportunities for 'playing games' rather than achieving efficient outcomes.

### ***Is competition the answer?***

Contract prices have to be determined, which can be done either by negotiation or by competition. But in defence markets, competition is not always possible. Much depends on the definition and extent of the market. Markets restricted to domestic suppliers have smaller numbers of suppliers than those with wider geographical markets (e.g. UK market v. world market). A competitive market requires a number of alternative suppliers competing for the contract, so that a competitively determined fixed-price results where competition also determines profitability.

But competition is not always the complete answer. The winning contractor might not always be the least-cost supplier; it might bid too low because it did not understand the challenges and complexities of the contract (known as the winner's curse: Smith 2022). Or, a low bid might reflect the belief of contractors that the government buyer will always bail out the producer to complete the project. On this basis, all rival contractors will bid 'too low', and competition fails to identify the most efficient supplier.

For its critics, competition is regarded as the problem and not the solution; but the critics fail to offer a clear, problem-free alternative solution.

### ***UK defence industrial policy***

Current UK procurement policy has moved away from the assumption that global competition is always the best (global competition by default). The majority of MoD procurement with the defence industry is single-source, reflecting the fact that competition is either not possible or inappropriate (e.g. there are too few UK firms: MoD 2021). Instead, the former policy of global competition by default has been replaced by a more 'sophisticated, flexible and nuanced' approach. This new approach requires an assessment of markets, technology, national security requirements, opportunities to work with international partners and prosperity opportunities (MoD 2021: 6). One of the changes inside the MoD will be to ensure that international collaborative opportunities are considered earlier and more systematically. Also, policy identifies capabilities to be retained in the UK (on-shore capabilities) on grounds of strategic importance and operational independence. Strategic capabilities to be retained on shore include nuclear capabilities (submarines, reactors), cyber capabilities and crypt keys (sensitive information and important capabilities). Operational independence involves a considerable list of capabilities, including combat air, rotary wing (helicopters), shipbuilding, land capabilities, complex weapons (e.g. MBDA, Thales), munitions and space capabilities (MoD 2021). Procurement policy recognises the government's social value policy, including the impacts of policy on jobs and skills (HMT 2022). Whilst the new defence industrial policy specifies an impressive list of defence industrial capabilities to be retained in the UK, it neglects the key question of the costs of retaining such capabilities and the necessity of choices: we cannot do everything and something has to go.

### ***Regulation of defence profits***

Defence profits are often the focus of criticism, reflecting the belief that contractors should not benefit from wars and conflict. Nations differ in their approaches to determining negotiated profit rates on defence contracts. There have been instances of defence contractors earning 'excessive' profits, especially during wars. To avoid such situations, governments might reserve the right to renegotiate defence profits. The UK approach uses a Single Source Regulations Office (SSRO), which is responsible for regulating profits on single-source or non-competitive defence contracts (i.e. monopoly defence contracts). Its predecessor was the Review Board for Government Contracts, which recommended profit rates for non-competitive contracts (abolished in 2014-15; Hartley 2018).



The SSRO makes annual recommendations on the baseline profit rate for single-source defence contracts and advises the government on allowable costs. For 2022-23 the recommended baseline profit rate was 8.31 per cent on contract costs, which was a starting point for determining profit rates where the final rate was adjusted for risk, profit incentives, the contractor's capital investment and the costs of maintaining the SSRO. The SSRO provides protection against excessive profits and losses on defence contracts; it adjudicates disputes between the MoD and contractors; it challenges allowable costs of defence contractors; and it advises on any penalty payments (fines).<sup>4</sup> But there remain problems with the SSRO solution. It focuses on a profit regime that represents an administrative solution rather than assessing contractor efficiency. Also, it fails to question whether single-source defence contracts could be opened to international competition.

### ***An open market for UK weapons procurement***

UK weapons markets are characterised by cost overruns, delays and performance failures (i.e. equipment that does not work). These failures are costly, which raises questions about alternative solutions. The current industrial structure means that the supply side of UK defence industries comprises a small number of large firms, which departs from the competitive model. In some sectors, there are UK 'national champions' such as BAE Systems and Rolls-Royce (combat aircraft, aero-engines, nuclear-powered submarines), which are protected in the UK weapons market.

An alternative solution would be to create an open market for defence equipment. Broadly, an open market would require UK procurement agencies to act as competitive buyers shopping around the world for defence equipment. With an open market approach, some nations would not be regarded as acceptable suppliers of defence equipment. These might include potential enemies such as China, Russia and North Korea, which might also be viewed as unreliable sources of resupply in a conflict. Effectively, an open UK market would mean buying more equipment from the USA, which has a competitive advantage from its large-scale funding of development projects and large-scale production of each type.

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4 For example, SSRO recovered £1.3 million from marketing costs on the Rolls-Royce Hawk jet contract.

An open market solution for the acquisition of UK defence equipment requires a more detailed analysis of its benefits and costs. Benefits include the acquisition of much cheaper equipment, reflecting savings in both development and production costs, with production costs reflecting economies of scale and learning. The UK would undertake fewer domestic defence projects, depending on its international competitiveness. Where the UK defence industry is competitive, it would win international contracts. The result would be a smaller but more competitive UK defence industry. Savings in development costs will arise where the UK only has to contribute a small part of a foreign supplier's R&D costs and savings in production costs will reflect the large-scale production of US defence firms. For example, the US national order for the F-35 aircraft totals about 2,456 units, compared with a possible UK buy in the region of 100+ F-35 aircraft. Table 4 presents data on the size of UK defence R&D spending, MoD equipment expenditure and total UK defence industry employment. The numbers illustrate the orders of magnitude involved in an open market solution for the UK defence equipment market. A UK open market would lead to savings in defence R&D and equipment spending as well as fewer UK jobs in the defence industry. Job losses release skilled workers for other uses in the UK economy. But such labour adjustments are not costless. There will be income losses from any unemployment, a permanent withdrawal from the labour force and reduced incomes in replacement jobs (Chalmers et al. 2001). Reliance on the USA for defence equipment means that the USA would be a monopoly supplier, creating problems for the UK in creating a contestable market.

**Table 4. UK defence market, 2021**

UK Defence R&D	£6.6 billion
MoD Equipment Spending	£20.3 billion
Total UK jobs supported by MoD	Direct: 125,000 Indirect: 77,000 Total: 202,000

Notes:

- i. R&D and equipment spending data for 2019-20; jobs data for 2021.
- ii. R&D is defence research and development expenditure and spending total is for four years from 2019-20.
- iii. MoD is UK Ministry of Defence.

**Source:** MoD 2021.

An open market solution involves costs as well as benefits. Costs include the risks associated with buying weapons from abroad and the dependence on foreign suppliers for resupply during conflict (e.g. foreign suppliers might refuse to supply during a conflict not supported by the suppliers' national government). A failure to resupply will have adverse effects on the reputation of the foreign supplier. Buyers can also respond to resupply problems by purchasing sufficient quantities for storage to insure against supply refusals. Such storage costs would need to be included in the cost–benefit appraisal of a UK open market.

Another cost of an open market arises when foreign weapons do not meet the specialised operational requirements of the UK armed forces. Here, some specific UK operational requirements can be included in the foreign equipment purchased, so this might not be an insurmountable problem. Inevitably, there are trade-offs to be assessed, and no solution will be 'perfect' and problem-free. In assessing the option of importing, there are costs to be included in any evaluation of the buy versus make choice. A decision to buy means that the UK MoD as a procurement agency has to assess the value of importing versus a domestic purchase. But the choice has time implications and a 'buy choice' now might mean that the UK will be opting out of a technology for a generation or more. Much depends on views about future technical progress. Evolutionary progress means that each stage in development is a smooth progression and is needed to

proceed to the next stage, but this is not the case where technical progress is revolutionary. But whichever view or judgement is relevant, the UK will still have to undertake a minimum level of defence R&D to remain an 'informed customer.' Nor are these technology choices simple. There are options to enable a nation to retain some technical capability without retaining a substantial domestic defence industrial base. The UK's cancellation of its Nimrod MRA4 aircraft was a good example. Between the cancellation in 2010 and the acquisition of the all-new Poseidon aircraft fleet in 2022, the UK lacked a maritime patrol aircraft capability. It retained a capability by posting personnel to maritime patrol aircraft units in allied armed forces, which allowed the UK to retain a vital operational skills capability. Meanwhile, during the period when the UK lacked a maritime air capability, it took a calculated risk that it could survive without such a national air capability, including the option of relying on its NATO allies to provide the capability. Purchasing foreign equipment is not risk-free. It is not unknown for a nation purchasing foreign equipment to find that it unsatisfactory, leading to cancellation. Again, there are no 'perfect solutions'; choices and costs cannot be avoided.

Further costs arise from reduced defence R&D spending, leading to the UK sacrificing some technology spin-offs; questions arise about the actual losses and their market valuation. Examples of UK spin-offs from defence R&D spending include radar, the civil application of jet engines, avionics and materials, space satellites and the application of helicopter blade technology to wind farms.<sup>5</sup> But a list of examples of UK spin-offs from defence is not persuasive; much depends on whether these applications would have emerged without defence R&D. Also, examples do not provide evidence on the market value of such spin-offs, indicating whether they are worthwhile investments.

### ***Is international collaboration the solution?***

Current UK defence industrial policy has placed a new emphasis on international collaboration. The economic case for collaboration appears impressive: two or more nations sharing development and production costs for a project should, in theory, lead to major cost savings. The UK has been involved in numerous European collaborative programmes involving combat and transport aircraft, helicopters and missiles (e.g. Eurofighter Typhoon, Atlas military transporter). But reality often departs

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5 In the USA, the Department of Defense had a role in the development of the internet.

from the theory of collaboration. The politics of work-sharing interfere with economic efficiency. Each partner nation demands its 'fair share' of advanced technology work on the project. For example, on a combat aircraft, each partner will require a share of advanced technology work on the airframe, engine and avionics. It will also demand a national flight test centre and a national final assembly line. Work has to be allocated to each nation's national champion firm (e.g. BAE and Rolls-Royce in the UK, Dassault in France and Leonardo in Italy). Inevitably, such work-sharing arrangements mean departures from an economically efficient allocation of work based on competition and comparative advantage rather than political criteria. On this basis, partner nations in collaborations would not be restricted to Europe but would be open to nations from the rest of the world. But by itself, international collaboration is unlikely to 'solve' the long-running problems of UK defence procurement.

### ***Conclusion***

The UK defence equipment market has revealed a series of problems reflected in cost overruns, delays, equipment performance failures and, in some cases, project cancellations. There are no perfect solutions, but alternatives offer some improvement. One possibility would be for the UK to operate an open market for the acquisition of defence equipment. This chapter has explored some of the qualitative implications of this option, but these only show directions of change and lack the quantification needed for a comprehensive appraisal of the costs and benefits of an open market versus traditional support for the UK defence industrial base. There is much we know, much we do not know and lots we need to know to formulate sensible public policies on the UK's defence industrial base.

## Chapter 6.

# The limits to military outsourcing

### *The research question*

Are there any limits to military outsourcing, or can outsourcing be extended to the combat functions of the armed forces? Currently, military outsourcing has been confined to defence support activities. Consideration of further extensions to include combat functions might be feasible. At the very least, exploring such an option would identify any economic limits to outsourcing. The focus is on identifying the economic limits whilst also recognising that there might be other non-economic limits to using private contractors for combat roles (e.g. moral and military objections). It should also be understood that this analysis is viewed as an exploration of a logical possibility without advocating such a solution.

### *Mercenary forces*

Mercenary forces are an obvious example of using private military companies to provide combat missions. There is little published information on the use of mercenaries, so only broad generalisations are possible starting with a simple classification. Often, mercenary forces are labour-intensive land forces that supply specific services to customers ranging from national governments to private firms and households. Services include security guarding of plants, installations, and personal protection, convoy protection of land vehicles and ships, protection of pipelines, training personnel for military roles and consultancy advice. These are instances where the contract can be clearly defined without any ambiguity: undertake a specified activity (e.g. personal protection) in return for a fixed payment.

Some private military companies provide air forces (with used military aircraft) and others provide naval forces. However, the activities of some private military companies are secret and not available in the public domain, so little is known about the economics of the industry (e.g. number and size distribution of firms). Also, some private military security companies might be involved in criminal and illegal activities (c.f. Mafia) involving, for example, the kidnapping or assassination of key personnel where such activities are not reported.

Examples of private military companies include International Intelligence Ltd (UK company), Sandline (UK company that ceased operations in April 2004), Academi (US company formerly Blackwater and part of Constellis Group) and KBR (US company, formerly a division of Halliburton). Private military companies were associated with conflict areas such as Afghanistan and Iraq, Nigeria, other parts of Africa and Colombia. In these areas, their personnel were found to have violated human rights (e.g. murdering of civilians). With the use of mercenaries, the future might be one of contracting, privatising and outsourcing of wars, with 'for-profit warriors' replacing a nation's traditional armed forces (McFate, 2019).<sup>6</sup>

An example of an active mercenary force is the Wagner Group (PMC Wagner) of military mercenaries, which is a private military force fighting for Russia in its invasion of Ukraine. It has been viewed as a private army of the Russian President, Vladimir Putin, and it first appeared in Ukraine in 2014 with its role in the annexation of Crimea. Previously, it was a secretive organisation operating mostly in Africa and the Middle East. Reports of its other operations include civil wars and combat activities in Syria, Libya and the Central African Republic, with examples of guarding, protection and training tasks elsewhere (e.g. Mali, Sudan). Recruits include former Russian military personnel and former prisoners; it receives equipment from the Russian forces, and it uses Russian military bases for training. The unreliability of private military companies was illustrated in late June 2023 when the Wagner Group mutinied and threatened to attack Moscow.

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6 There is another example of market pressures in the armed forces. Increasingly, military personnel are using their own private funds to buy military supplies in private markets. Examples include mobile phones and computers where private markets allow a faster response than a centralised defence purchasing agency.

### ***Private military companies and combat roles: a transaction cost approach***

Inviting private military companies to undertake combat roles can be analysed as a transaction cost problem reflected in the difficulties, problems and costs of specifying and enforcing a contract. As an example, consider the Korean War of 1950-53 to illustrate the challenges which are likely to arise when writing a contract for complex combat missions. Initially, North Korea attacked and invaded South Korea. Assume that South Korea invited private military companies to bid for a contract to protect South Korean territory. Immediately, the contract specification cannot avoid unforeseen contingencies, which creates problems in writing and enforcing complex contracts under uncertainty. For example, the initial contract might require the capture of a town held by North Korean forces, but this becomes far more complicated if another nation, such as China, later enters the conflict to support the North Korean forces, which will change the contract requirements so that there will be a need for a new contract and possibly a new contractor. As a result, firms will not know the resources needed to undertake and complete the contract. A solution to such uncertainty is to negotiate a cost-plus or target-cost incentive fee contract, which changes efficiency incentives and transfers risks from the contractor to the state.

A contract for combat missions might specify only *inputs* in the form of an agreement to provide services such as protection of individuals or facilities, training or consultancy advice. Such contracts are limited to clearly defined activities and are not open-ended and indeterminate; both buyers and sellers agree to undertake specific tasks for a fixed budget. Or, a contract for combat missions might focus on *outputs*, such as the recapture of a city held by enemy forces in return for a lump sum payment. When bidding for such a contract, a private firm has to estimate the likely costs of the mission, where excessive optimism (the widow's curse) might lead to contractor bankruptcy and a failure to complete the mission. Firms will know this and will have incentives to bid low for the contract, knowing that the buyer will always bail out a bankrupt contractor. The government will want to complete the mission and recapture the enemy-held city. Even this apparently simple combat contract is in reality extremely complex.

There are considerable uncertainties about the production function for both the enemy and the private contractor. Each might have access to additional forces from other nations or other private companies, and either might have access to new, secret and battle-winning technologies. The



result is an incomplete contract where not every contingency can be specified in the original contract, so contracts might have to be rewritten or renegotiated with a new contractor selected. Imagine what might happen in a conflict if a new contractor is introduced into the battle. Nor can moral hazard be avoided since the buyer is unable to assess the efforts of the contractor to control costs and quality. As a result, the government buyer might introduce some performance incentives into the contract designed to motivate the contractor to achieve the specified tasks. But performance incentives might have adverse results: for example, health performance incentives requiring patient treatment might lead to the claim that the operation was a success but the patient died! Also, performance results can be manipulated by private military companies to support their results. But such behaviour is not confined to private companies; state-owned military organisations can also manipulate data in their favour.

Asset specificity adds to the transaction costs of negotiating contracts for combat missions. Some military equipment, some military personnel skills and training have little value for alternative civilian uses. Examples include combat aircraft, tanks and warships, nuclear submarine personnel, airborne troops and marines. Firms will be reluctant and unwilling to invest considerable resources in acquiring such highly specialised assets and resources (known as the hold-up problem). The final result is that private military companies will use more transferable assets and resources in their military production functions. A similar reluctance by private contractors to use costly assets in a conflict can arise where firms are reluctant to lose costly and newly acquired items from their balance sheet.

Transaction costs for private military companies cannot avoid unexpected and undesirable results. For instance, a private firm seeking to minimise costs might inflict collateral damage and costs on the civilian population, and it might deliberately extend the conflict to expand its monetary rewards. There is a further major difficulty with private military companies and mercenaries, namely, whether their personnel have legal rights to kill opponents.

Many of these problems are reflected in loyalty, trust and reputation. Heads of state need to be confident of the loyalty of their armed forces. There is a belief that nationally owned armed forces (publicly owned and financed) are likely to be more loyal and trustworthy than military forces provided by a private military company. National armed forces are more likely to be patriotic and fight to protect the nation's citizens, their property and

freedoms. In contrast, mercenaries are 'hired guns' and will respond to the highest bidder, and might not be willing to die for the nation state. Private military companies can always withdraw from combat contracts or they can change sides in response to an enemy making a higher payment offer. Private military firms that default on combat contracts would suffer reputational effects, although such adverse effects do not help the nation left with the task of protecting its citizens. But alternative, nationally owned armed forces are not counsels of perfection: they can surrender, retreat and mutiny, and usually they are subject to soft budget constraints leading to inefficiency in their behaviour.<sup>7</sup>

### ***Leasing weapons: rent a tank?***

Leasing or renting defence equipment is another privatisation or market option. Under this option, defence equipment might be leased from private defence firms, compared with the traditional solution where the armed forces purchase equipment, own, repair and maintain it together with the associated military bases. Under the renting or leasing option, defence firms would enter into long-term contracts with the armed forces to provide a guaranteed number of operationally available frontline equipment on a daily basis (e.g. combat aircraft, missiles, tanks, warships) where the armed forces would specify the numbers required for frontline operations. The contractor would be responsible for maintenance and repair for the duration of the contract and disposal at the end of the contract. The private sector comparator or equivalent would be car hire companies. The military equivalent might be a tank, where the tank company would be responsible for providing combat-ready tanks for the duration of the contract. There is precedent for the leasing/renting option. For example, the UK RAF acquired its C-17 strategic transport aircraft through a leasing arrangement with the US Boeing Company. Initially, four aircraft were leased from Boeing with an option to buy, and the leased aircraft were subject to operational restrictions. Later, the RAF exercised its option to buy, eventually purchasing a fleet of eight aircraft. Another leasing option occurred with the UK's decision to hire its strategic tanker refuelling capability.

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7 Machiavelli's view on mercenaries was that they were useless and dangerous, and in war they would either run away or march off. They devised rules of war aimed at avoiding hardships, danger and killings and preferred cavalry forces to infantry since large infantry forces required subsistence, whilst a smaller force of cavalry offered rapid success and needed less subsistence (Machiavelli 2004: 69).

Leasing defence equipment raises difficult legal and contractual problems, especially over the use of equipment in conflicts where there are possibilities of damage and complete destruction. Risk assessment would be a major challenge when writing such contracts for the use of equipment in both war and peace. For example, what valuation would be placed on leased equipment destroyed in conflict? These difficulties might lead to the leasing option being applied to support rather than frontline equipment (e.g. air, land and sea transport).

### ***Conclusion***

Using private military companies for combat operations involves the negotiation of complex contracts with massive uncertainties. As a result, private military companies might be unwilling to bid for such combat contracts; they might be dissuaded by the sheer costs, complexity and uncertainty of negotiating and agreeing to such contracts. Instead, they will prefer much simpler contracts, which they can manage and comprehend and where the risks can be assessed and evaluated. Such factors start to identify the limits of outsourcing, namely, where the costs of contracting become too high, but this is too vague for a boundary line.

There is an alternative approach: if there are alternative ways of conducting a business transaction, select the one that consumes the least resources. Here, the armed forces have available a cost-minimising contract, namely, the military employment contract, which requires military personnel to undertake combat missions without continuous re-contracting. Military personnel are subject to military law and discipline; they have to obey orders; and they are liable to be deployed to any area of the world at short notice and for indefinite durations. They might have to operate in hazardous conditions, working for long hours; they have no trade union representation, and their active duty means that they might be injured or killed on combat missions. This is a unique voluntary contract that, in some respects, resembles a contract of slavery. The contract specifies pay, length and conditions of service and establishes ownership rights in military personnel. Compared with the complexity of negotiating contracts for various combat missions, the military employment contract is simpler and cheaper, so it is preferred as a least-cost solution minimising transaction costs which determines the limits of outsourcing.

## Chapter 7.

# Efficiency in the armed forces

Analysis of the armed forces suggests that they are most likely to be inefficient. Inefficiency arises since the armed forces are not subject to competition in product and capital markets and their personnel are not motivated by the search for profits and least-cost solutions (c.f. profit-maximising entrepreneurs). These features need further explanation. It will be shown that the application of economics to an unconventional area such as the armed forces yields useful and novel insights and policy guidance.

### ***Armed forces economics***

Governments award their armed forces an annual budget in return for which they provide defence services in the form of protection, security and peace. The armed forces have the task of converting the defence budget into a force structure capable of protecting a nation's property rights over its air, land and sea domains, ultimately providing protection for its population, their assets and freedoms. Having received a budget, the armed forces will allocate it to air, land, sea, nuclear and space forces. Within each force, resources will be allocated to the relevant unit, such as army regiments for land forces, aircraft squadrons for air forces and warships for naval units, each with a relevant military base (e.g. army barracks, air force bases, ports and dockyards).

In market economies, the corresponding problem relates to industries and firms comprising an industry where decisions are needed on the best size of unit or firm and its allocation between different industries. In market economies, competition determines the best size of firm and the distribution of firms over different industries. For example, some firms will be large and specialised in a single sector, such as motor cars,

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whilst other firms might also be large and involved in a range of different industries (i.e. diversified).

Units in the armed forces and their efficiency can also be analysed as industries and firms. For example, army land forces comprise units or firms specialising in the provision of armoured (e.g. tank forces), artillery, infantry, engineering and signal regiments. Similarly, air force squadrons specialise in fighter, strike/attack, reconnaissance, transport and maritime patrol. Warships are divided into aircraft carriers, destroyers, frigates, submarines and fleet support vessels. Choices about the best size of firm and its distribution between different industries are made by competition in product and capital markets. Competition would determine the best size and market composition of the army, air force and naval units. For example, army infantry units might take over RAF combat and air transport squadrons (and vice versa); army artillery regiments might take over RAF strike aircraft squadrons; and RAF maritime patrol squadrons could take over Royal Navy anti-submarine frigate forces. In this way, competition would decide the best size of military unit and its best distribution over air, land and sea forces. Currently, such choices are made by military personnel, as represented by admirals, generals and air marshals, rather than by efficient markets.

Similar inefficiencies arise with 'top-level' allocations of resources between each of the armed forces. Usually, 'top-level' committees allocate the annual defence budget between equipment for each of the army, navy and air force. Typically, these allocations are based on 'Buggins Turn' where, say, the navy receives an aircraft carrier this year, followed by the RAF receiving its latest 'all-singing all-dancing' combat aircraft next year, with the army receiving its tanks the year after. On this basis, equipment decisions are made by collusion rather than competition. Effectively, when making equipment choices, the Defence Secretary would be operating under a 'veil of ignorance'.

Compare the criteria needed for an efficient allocation of defence resources. Each of the Services would submit to the equipment committee its new equipment proposals, specifying the purpose of the equipment (why it is needed), its costs and timescale (when it will be delivered). The rival Services would be able to question the proposal and its alternatives. For example, the navy's bid for a new aircraft carrier would be critically appraised by the army and the RAF, each identifying military flaws in aircraft carriers as well as suggesting cheaper and, in their view, superior

alternatives. As a result, competition rather than collusion would provide the Defence Secretary with alternative information on the costs and benefits of new equipment. The information provided by competition would allow the Defence Secretary to make informed and efficient choices about new aircraft carriers, new combat aircraft and new tanks.

### ***Criteria for an efficient defence policy***

Economics can be applied more broadly to identify the features of an efficient defence policy. Such a policy will have at least four features formulated as Economic Principles. First, avoid a focus on inputs. Second, consider the opportunities for substitution between different force structures. Third, allow competition to promote efficiency. Fourth, provide military personnel with incentives to identify the least-cost solutions. These features need to be explained.

#### **i. Principle I. Avoiding a focus on inputs**

Often debates about defence policy and defence reviews become obsessed with protecting specific force structures. For example, it will be claimed that the country needs an army of 80,000 soldiers, a 25-ship navy and a 50-squadron air force. This is the wrong focus since the emphasis is on inputs rather than defence outputs as reflected in protection, security and peace. Here, we encounter a major problem, namely, the lack of a reasonable measure of the value of defence output. Traditionally, defence output was measured by inputs, and it was assumed that inputs equalled outputs. More recently, defence outputs have been measured by defence capabilities such as the ability to maintain a certain size of military force overseas for a specific period, say six months. An example might be a force of 10,000 soldiers deployed in the Middle East for six months with a supporting force of ten warships and ten aircraft squadrons.<sup>8</sup> Whilst defence capability measures represent an improvement, they are not a true representation of the money value of defence output. There is a continued absence of an appropriate measure of the value of defence output. A study by Rand outlined possible approaches to measuring defence output. These included Protection Adjusted Life Years (PALYs), the value of a statistical life (VSL), insurance methods, logic models and discrete choice experiments (Rand 2022). The Rand approach was

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8 This is a simple example. A continuous overseas deployment is more complex, requiring much larger numbers of military personnel. Personnel deployed overseas might be away for six months with, say, two years between deployments.

exploratory rather than conclusive, requiring much more research to reach a definitive conclusion.

ii. Principle II. Opportunities for substitution

This Principle recognises that there are alternative methods of achieving protection. There are many examples of substitution possibilities in the armed forces. These include nuclear forces replacing conventional forces; reserve forces replacing regular forces; women replacing men; helicopters replacing tanks; cruise missiles replacing manned bomber aircraft and long-distance artillery; surface-to-air missiles replacing manned fighter aircraft; land-based combat aircraft replacing carrier-borne aircraft; maritime patrol aircraft replacing anti-submarine frigates; and uninhabited aircraft and drones replacing manned aircraft (e.g. for maritime patrol roles). It is not suggested that these are all examples of perfect substitutes; some are imperfect and limited substitutes.

Economists would predict that the armed forces would substitute relatively cheaper forms of protection for costlier ones. This prediction is independent of the traditional property rights of each of the Services. For instance, air force helicopters might replace army tanks regardless of the fact that tanks have always been the 'property' of armies. Such change happens in the private sector of the economy where there is a continuous search for cheaper production methods, new products and new markets. New technology might mean equipment replacing labour: machines replacing workers and computers replacing secretaries. But in private sector economies, the incentive to substitute cheaper production methods is provided by competition, the profit motive and the 'policing' role of the capital market.

iii. Principle III. The role of competition

Competition and rivalry promote efficiency. Defence offers massive opportunities for introducing and extending rivalry and for creating contestable markets. Opportunities for more competition include:

- a) Competition or rivalry between the armed forces. There are opportunities for reducing entry barriers reflecting the traditional monopoly property rights for each of the Services, creating contestable markets. Why not allow the army with its land-based guided missiles to compete with the RAF with its manned fighter aircraft for the air defence of the UK?

- b) Competition between the armed forces and private contractors. There are considerable opportunities for further experimentation with military outsourcing.
- c) Competition between firms seeking defence business. A competitive procurement policy would require the MoD to 'shop around' for equipment and other defence products, requiring the removal of barriers to entry and exit to and from the UK defence market.

iv) Principle IV. Making military personnel cost-conscious

The search for cheaper substitutes depends on the motivation and behaviour of individuals and groups of military personnel. Individuals and groups have no incentive to improve efficiency if they bear all the costs and receive none of the benefits (i.e. are made worse off). Typically, individuals and groups in the armed forces have incentives to spend since there are no rewards for economising. Savings by, say, the navy might benefit the army by allowing it to buy more tanks or allowing the RAF to buy more aircraft; or worst of all, the savings might benefit the Treasury!

***Conclusion: barriers to improving efficiency***

Some nations, such as the UK and USA, have made efforts to improve efficiency in their armed forces. Examples include military outsourcing, budgetary and management arrangements, cost-effectiveness analysis and performance-related pay, but barriers remain. All too often, critics and opponents of efficiency improvements in defence will claim that national security is too important to be determined by economists. But these 'terrible economists' are merely pointing out that resources are scarce and that the limited resources allocated to defence need to be used efficiently, otherwise the country's national security will be weakened.

The policy proposals presented in this chapter outline possible efficiency improvements in defence policy, but they are not without their challenges. Problems arise in creating product and capital market competition in the armed forces and in revising employment contracts. Some changes will involve costs such as revising military employment contracts where efforts to introduce performance-related pay will clash with traditional military criteria for promotion (e.g. battlefield performance).



## Chapter 8.

# Conclusions: the future

### *Future prospects for the armed forces?*

Do the armed forces have a future, and what might it look like? Will there be an army, navy and air force in 2050? How large might they be and what equipment might they be operating? Norman Augustine observed the continuously rising unit costs of fighter aircraft by a factor of four every ten years and famously forecast that by 2054 the US defence budget would purchase just one aircraft (Augustine 1987: 143). Other commentators have similarly forecast a future of a single-ship navy, a single-tank army and the Starship Enterprise for the air force (Kirkpatrick and Pugh 1983). The high and continuously rising costs of new defence equipment suggest that future wars will be unaffordable.

The basic question of whether there will be armed forces in 2050 depends on future threats. In the absence of a peaceful world, continued military threats to national security will require an armed response. Uncertainty about the form of future threats (e.g. from which nations or non-state actors) using which types of weapons makes it difficult for nations to determine their response. Technical progress is a further complication. By 2050, new technology will mean new types of weapons and new force structures (c.f. aircraft which developed as a new technology in 1903, resulting in the creation of air forces: Hartley 2014).

Rising unit costs of new defence equipment mean smaller armed forces. Future military forces will be characterised by smaller quantities more complex equipment and the emergence of space forces. The defence industries will become smaller and more research-intensive; their production lines will also be smaller as they cater for smaller quantities of each new

type of weapon. Military personnel servicing and repairing complex equipment will be more skilled and capable.

Economics will remain important to the military. Defence budgets will remain limited, so the efficiency and market principles outlined in this study will continue to be relevant. The future is uncertain, and no one can predict it accurately. Today's winners will be tomorrow's losers and today's sunrise industries are likely to be tomorrow's sunset industries. By 2050, there will be new developments in economics to be applied to national defence. These are unknown and unknowable, but what is known is that resources will remain scarce, so choices will still be required. The necessity for choices means that defence policy and the armed forces will continue to need the advice of economists. Proposals for more experimentation with more competition and outsourcing will provide new insights and opportunities for efficiency savings in defence. A failure to exploit such opportunities for efficiency savings will mean 'weaker' defences and less protection for the UK's citizens. Outsourcing compels the armed forces and defence ministries to think of the 'unthinkable.' Examples might be the outsourcing of large 'chunks' of military activities, such as private firms managing groups of military bases across all three services.

Not all military outsourcing will be successful, but it will create new market opportunities. Genuine competition will be a voyage of discovery, leading the UK's armed forces to new ideas and possibly avoiding defeat in future conflicts.

## Data appendix

Defence burdens for a sample of countries represented by defence spending as a share of GDP are shown for 2021 and 2022. The countries shown are major European nations, the USA, Russia, China and Ukraine. The data show the impact of the Russian invasion of Ukraine on defence spending shares for a group of countries that provided military assistance to Ukraine. For most countries, defence shares increased following the Russian invasion of Ukraine, with Ukraine showing a massive increase in its defence burden. These costs are in addition to all the other conflict costs borne by Ukraine.

**Table A1. Data on defence burdens, 2021-22**

Country	Defence share (%) 2022	Defence share (%) 2021
China	1.60	1.61
France	1.94	1.92
Germany	1.39	1.33
Italy	1.68	1.72
Poland	2.39	2.22
Russia	4.06	3.72
Spain	1.47	1.37
Sweden	1.31	1.19
UK	2.16	2.23
Ukraine	33.5	3.23
USA	3.45	3.46

Note: Defence share is defence spending as a share of GDP.  
Source: SIPRI 2022.

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The Institute of Economic Affairs  
2 Lord North Street  
London SW1P 3LB  
Tel 020 7799 8900  
email [iea@iea.org.uk](mailto:iea@iea.org.uk)



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Institute of  
Economic Affairs