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# Competition and Collaboration in the Provision of Public Services: The Case of the UK Defence Sector

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## Abstract

This paper examines the role of competition and collaboration in promoting value for money in the provision of the key public service of national defence. It is argued that the introduction of competition in the UK defence sector since the 1980s provides only a partial solution to the long-term problem of containing defence costs. Another key element is collaboration amongst defence firms to achieve economies of scale and other benefits. This paper presents some new evidence on the extent of collaboration in the UK defence industry. The results indicate a significant positive relationship between firm size and collaboration, particularly with respect to international collaboration. Consequently, there is a strong case for a policy debate on new institutional arrangements to promote co-operation amongst small firms to enhance their ability to realise the benefits of collaboration and assist the government in containing defence costs.

## Introduction

Defence is an important public service that is provided by most governments in order to ensure a nation's security. As a consequence, defence spending is a significant item of public expenditure in most countries and the financing of defence is a major topic of academic and political debate (Dunne and Smith, 1992). Prior to the Second World War, UK defence spending typically accounted for 2-3% of GDP, although it exceeded this during periods of war. However, in the post-war period defence spending has been relatively high as a consequence of the 'cold war' between the west and Eastern Europe. In the early 1950s, defence accounted for approximately 7% of GDP. Although its importance declined in subsequent decades, it still accounted for 4.5% of GDP by the end of the 1970s. Moreover, throughout this period there was a general rise in real defence spending creating significant problems for the financing of the sector (Kennedy, 1983).

The post-war pattern of UK defence spending underwent a significant change from the mid-1980s onwards with the introduction of policies to contain costs and the 'ending' of the cold war (Bishop, 1995). There has been a significant decline in real spending, whilst defence spending as a proportion of GDP has fallen to below 3%, in line with the typical peacetime level of spending prior to the Second World War. The new policies introduced in the 1980s aimed to introduce more competition into the procurement process by which the government purchases defence goods and services from the private sector. Whilst the government has made considerable claims for the benefits of the new system others are more sceptical and there has been considerable debate concerning the appropriate nature of the procurement system (MacDonald, 1999). One important area of debate concerns the relative merits of competition and collaboration. Indeed, collaboration has been a growing feature of both the demand and supply side of the defence industry in recent decades (Matthews and Parker, 1999). Typically most of the debate concerning competition and collaboration has centred on the large prime contractors. However, small firms play a crucial role in supplying defence goods and acting as sub-contractors on major contracts. Moreover, it is often thought that these firms face major problems in developing collaborative agreements (Anderson, 1995).

This paper examines the role of competition and collaboration in promoting value for money in the UK defence sector with particular reference to the issue of collaboration and firm size. This paper begins with an examination of the traditional UK procurement system and an analysis of the impact of the new competitive system introduced in the mid-1980s. This is followed by a discussion of the benefits and costs of collaboration. Some new empirical evidence on the extent of collaboration in the industry is then presented and it is shown that there is a significant positive relationship between the extent of collaboration and firm size. The conclusion summarises the arguments of the paper and briefly highlights the public policy issues arising from the arguments and evidence presented in the paper.

### **The Traditional Procurement System**

Whilst defence spending is financed by the state, the production of equipment and services is primarily procured from private sector defence firms. Procurement is an important item of defence spending, accounting for around half of the defence budget (UK Defence Statistics, various years). Prior to the mid-1990s, UK procurement policy was based on the twin pillars of non-competitive tendering and cost-plus contracts (Bishop and Williams, 1997). Major contracts were negotiated directly with a small number of suppliers, which could rely upon a steady flow of contracts (Loving, 1993). These companies were largely protected from competition both at the domestic level and internationally through preferential purchasing of British goods (De Fraja and Hartley, 1996). The continual use of a small number of preferred contractors was justified by the MOD on the basis of the need to ensure quality and security in the provision of goods critical to the national interest. The risks of cost overruns were largely born by the state with firms typically receiving payments based on actual costs plus a profit margin rather than costs estimated at the outset of the project. The government justified these contractual arrangements on the basis of the genuine uncertainty surrounding the costs of major projects involving cutting-edge technology (Bishop, 1995).

By the 1970s, UK procurement was regarded as a highly profitable, low risk business characterised by a 'cosy relationship' between the state and the major defence contractors (De Fraja and Hartley, 1996). Indeed, a number of major defence suppliers including Rolls Royce and British Aerospace were owned fully or partially by the state. However, there was a growing concern that the government was failing to obtain good value for money and the procurement process was characterised by delays, technology inflation (the continual upgrading of technology during the process of production) and cost escalation (HCP 431, 1988). Given the importance of defence expenditure to overall public spending, the perceived inefficiency of the procurement process had major implications for public finances. Moreover, the Conservative government of the 1980s was committed to restraining overall public spending to facilitate a program of tax cuts (Dunne and Smith, 1992). Thus, the scene was set for a radical overhaul of the procurement system.

### **The Reforms**

The reforms of the procurement system which began in the 1980s were motivated by the view of the then Conservative government that competition and private ownership were the best spur to efficiency and increased value for money in the public sector. This view was highlighted in a letter from the DTI in 1991 which noted that 'Experience has shown that direct government intervention in the marketplace is usually ineffective and inefficient. The best solution in the long term, for both managers and employees, is to leave those best placed to make decisions on the future shape of the industry themselves, free to do so unhindered by government interference.' (Nuclear Policy Information Unit, 1991). Within this context, the 'cosy' relationship between government and the defence sector was inappropriate and it was deemed necessary to provide a clearer demarcation between the state as customer and the defence industry as suppliers of defence goods (Macdonald, 1999).

The first sign of the change in policy was the beginning of a process which would eventually result in the privatisation of major defence companies including Rolls Royce, British Aerospace and the shipbuilding industry (Dunne and Smith, 1992). This was followed by a reform of the procurement process in the mid-1980s by introducing widespread competitive tendering, fixed price contracts and an attempt to expand the supplier base to firms not previously involved in the procurement process (Bishop, 1995). In principle, competitive tendering was to apply to both prime contracting and sub-contracting and, apart from in cases where issues of national security were paramount, foreign companies were to be allowed to tender. A further round of changes have been introduced since 1991 as the government has sought to improve 'value for money' to cope with substantial

cuts in the defence budget. This has resulted in a series of initiatives including a greater emphasis on life-cycle costs, measures to improve efficiency on non-competitive contracts, better integration of logistical support and the use of Technology Demonstrator programmes (MacDonald, 1999).

An evaluation of the changes is difficult due to an absence of comprehensive information arising from the need to maintain commercial confidentiality and the security issues surrounding defence (Schofield, 1995). However, an examination of trends in the type of contracts based on data published annually by the government shows that there has been a growth in the proportion of contracts subject to the new procurement arrangements (UK Defence Statistics, various years). Thus, whilst prior to 1984-85 around 70% of the value of contracts placed were allocated on a non-competitive basis, by 1986/87 two-thirds of the value of contracts were awarded on some sort of competitive basis. This pattern has continued since that date with between 70 and 80% of the value of contracts awarded on a competitive basis during the 1990s. However, whilst this implies that there has been a determined attempt to implement the new arrangements, there are some problems involved in interpreting the data (MacDonald, 1999). In particular, some contracts are only subject to 'informal' rather than formal competitive tendering and hence the extent of competition is difficult to assess. Moreover, many contracts are renegotiated with the firm awarded the contract as a consequence of new requirements, technology and unforeseen circumstances. This renegotiation with a single supplier effectively introduces a non-competitive element into the pricing of these contracts. Cooper (1997) argues that these factors substantially reduce the proportion of contracts awarded on a fully competitive basis, possibly by as much as one half.

Whilst the overall trend in contract type is a useful indicator, the impact on costs is ultimately the most crucial aspect of an evaluation of the changes. The government has made considerable claims as to the benefits of the new system in a variety of official publications and studies. For example, the MOD (1991) has stated that there has been a "...significant reduction in the number of projects failing to meet time and cost targets." A 1994 study estimated cost savings of £1bn. p.a. varying between 10 and 70% on individual projects (MOD, 1994). Another study concluded that the cost growth in projects beginning pre-1985 was eight times greater than projects that commenced post-1985 (NAO, 1996).

Whilst official estimates present a picture of considerable success, some commentators are more sceptical. In a detailed analysis of major contracts 1986-91, Schofield (1995) concludes that MOD claims of massive efficiency savings cannot be substantiated. The study argues that costs have been primarily contained by reducing orders, delaying contracts and outright cancellation, rather than efficiency improvements attributable to the new system. In assessing the impact of the new system it is also important to factor in the costs of tendering, which are estimated to be 3-5% of contract value for tendering companies (NAO, 1994; Schofield, 1995). The MOD also incurs costs in organizing competition and judging tenders. For example, the costs of the MOD Contracts Branch input alone have been estimated at 0.5% of contract value (Matthews and Parker, 1999). Whatever view one takes of the extent of cost savings arising from the new procurement system, it is clear that there are intrinsic features of the defence market that limit the ability of competition to secure efficiency gains. Much defence production involves leading edge technology which develops at a rapid and unpredictable pace. This inevitably results in technology inflation and the need to renegotiate a contract, whatever the original system of tendering and pricing (MacDonald, 1999). Moreover, the existence of substantial economies of scale has inevitably resulted in oligopolistic or monopolistic market structures in many areas of defence production. Indeed, ironically, the introduction of competitive tendering has led to a reduction in the number of major contractors as they have merged or restructured in an attempt to reduce costs.

The impact of the new system on defence R&D is also of some concern. A major objective of the reform was to shift risk to the contractors. Given the inevitable high level of risks involved in many

defence R&D projects, this has led companies to reconsider their levels of R&D spending. Indeed, it has been estimated that there was a 20% cut in defence R&D during the period 1984-1990 as an immediate response to the new procurement regime (House of Commons Defence Committee and Trade and Industry Committee, 1996). The long term consequences of these cutbacks for the quality of defence production and the health of the UK defence industrial base could potentially be of serious concern.

Another factor limiting competition is the role of the government as the major source of demand for the goods of domestic defence firms. As a political entity, any government has interests that go beyond the search for efficiency gains through competition. It is clear, for example, that the new contractual arrangements have not ended protectionism. Indeed, many commentators argue that preferential treatment for UK contractors still operates for most major contracts (Schofield, 1995; Matthews and Parker, 1999; MacDonald, 1999). This is related to the political difficulties that governments face in awarding large contracts to overseas suppliers, the need to consider the impact on particular regions and the desire to maintain a defence industrial base – all objectives which may conflict with the narrow search for value for money. This process of protectionism has been well documented in the case of UK shipbuilding during the 1980s, when contracts were clearly awarded to protect UK yards with overcapacity in depressed areas (Hillditch, 1990). These wider issues are now partly recognised with the MOD now explicitly acknowledging that maintaining a domestic industrial base is important in addition to the objective of achieving value for money (Matthews and Parker, 1999).

### **Collaboration**

Whilst attempts to encourage competition in the defence sector dominated policy in the 1980s, there has been a growing recognition of the limits to competition. Matthews and Parker (1999), for example, argue that the MOD has now recognised that value for money (VFM) can be achieved through both competition and co-operative relationships, noting that 'Although competition remains the key piece in the VFM mosaic, it is no longer the MOD's demi-god'. Indeed, MacDonald (1999) notes that MOD now considers the potential for collaboration in all defence deals.

The interest in collaboration in the defence sector reflects a wider interest in examining the role, nature and impact of various forms of collaborative behaviour amongst firms (Arita & McCann, 2000; Glaister and Buckley, 1996). This interest has been stimulated by evidence that levels of collaboration are increasing in many industrial sectors, particularly at the international level (Shaw & Kauser, 2000; Glaister & Buckley, 1994; Hergert & Morris, 1988). Many theorists have viewed this growth as a response to rapidly changing market conditions and intensified global competition – developments which clearly have some relevance for the defence sector (Ohmae, 1989; Harrigan, 1988). It can be argued that these developments have enhanced the significance of the traditional motives for collaboration identified in the economic and managerial literature, including accessing new markets, pooling risk, reducing costs and acquiring complementary resources (Kay, 1999; Glaister and Buckley, 1996). In the defence sector, specific possibilities for savings include sharing the huge development costs of many projects, combining orders to achieve economies of scale and learning from longer production runs (De Fraja and Hartley, 1996).

It is important to recognise that, although European governments have traditionally favoured domestic procurement of defence goods, there is a long history of collaboration in the defence sector (Taylor and Hayward, 1989). However, until relatively recently, most collaboration has been project-based and involved a highly politicised process of negotiation between partner governments (Bishop and Gripaios, 1997). Under these arrangements, work was typically shared out between partners to ensure that all countries involved obtained their 'fair share' of the contract – the so-called *juste retour* system (De Fraja and Hartley, 1996). This conflicted with obtaining value for money which might involve awarding work to the lowest cost partner or even closing some

duplicate production facilities. In addition, there are significant transaction costs associated with agreeing the details of the contract and managing the production process. Different partners face, for example, different budget constraints, operational requirements and management approaches. As a consequence of these problems, many commentators have argued that traditional collaborative arrangements have not yielded the expected cost savings (Sandler and Hartley, 1995).

Despite these criticisms of collaboration, the process of collaboration has gathered pace in the recent years (Walker and Willett, 1993). Indeed, by 1996 the UK was involved in almost fifty collaborative projects with France or Germany, twenty with the USA and five with Canada (MacDonald, 1999). Of particular interest is the changing nature of collaborative agreements, which are increasingly involving joint venture arrangements in which new companies are established to rationalise and integrate production across borders. These arrangements are usually instigated by management rather than politicians and help to avoid the costs of the traditional *juste retour* arrangements (Bishop and Gripaios, 1997). Matthews and Parker (1999) conclude that it is increasingly unlikely that the UK government will attempt to sponsor purely national major projects, due to the costs involved and small level of UK demand over which to spread these costs. Thus, in the absence of a free market in defence, collaboration is viewed as an essential element in containing defence budgets.

### **Collaboration and small firms**

Whilst much of the discussion concerning collaboration has concerned major defence contractors, the issue is of some importance for small firms involved in the defence sector. Clearly, many small firms are already involved in collaborative arrangements either directly or through their sub-contract work on major projects. Moreover, MacDonald (1999) argues that collaboration will become increasingly important and apply to even smaller procurement programs. If this is the case then the ability of small firms to develop and participate in such agreements may be critical to their future success.

The issues concerning collaboration and small firms have attracted some discussion in the wider academic literature on collaboration. One view, arising from the theory of flexible specialisation, emphasises the development of collaboration amongst small firms at the local level (Piore & Sabel, 1984; Schoenberger, 1989). Indeed, the development of inter-firm collaborative relationships is often seen as an important element in the economic success of “new industrial districts” in countries such as Italy, Japan and Germany (Harrison, 1992). Oughton & Whittam (1997) have provided a more formal theoretical basis for some of these ideas by emphasising the ability of small firms to realise collective external economies of scale through co-operation, networks and inter-firm linkages. In a policy context, these type of arguments underpin government attempts to promote regional clusters of firms (DTI, 2001).

An alternative view is that collaboration has had its major impact on large firms, which have used it as a strategic mechanism to expand their influence across a wide range of global markets (Anderson, 1995). According to this approach, large firms have a comparative advantage over small firms in developing collaborative strategies. This view is primarily based upon a resource-based approach to the firm, which emphasises the constraints on small firms arising from their lack of access to key resources such as finance, technology and labour (Bishop, 1999; Chetty and Hamilton, 1993). For example, small firms may find it difficult to fund the substantial costs involved in establishing new collaborative arrangements including the costs of searching for a partner and negotiating an arrangement (Kay, 1999). Moreover, they may lack experienced managers who have an understanding of operating in diverse markets. This is likely to be particularly acute for overseas co-operation, which often involves substantial cultural and attitudinal differences amongst potential partners (Reuber and Fischer, 1987). In addition, behavioural approaches to the small firm have

frequently concluded that independence is the major motivation for many small, independent firms (Julien et. al., 1995; Wynarczyk et. al., 1993; Curran, 1986). Thus, collaboration may be viewed as a strategy at odds with the prime motivation of many small business managers.

Although considerable empirical evidence has been gathered on various forms of collaborative activity, most studies tend to examine either alliances amongst major firms or linkages amongst small firms in particular localities, rather than comparative studies of large and small firms (Shaw and Kauser, 2000; Bishop and Gripaios, 1997; Gripaios et.al. (1989); Scott and Kwok, 1989). The defence literature tends to concentrate upon larger firms and there is little explicit analysis of the extent of the involvement of small firms in collaborative agreements (Cothier and Moravcsik, 1991). This study seeks to contribute to the debate by providing some new data on the comparative levels of collaboration of small and large firms in the UK defence sector. The main aim of the study is to ascertain whether there is any evidence of size related differences in the extent of collaboration amongst small and large firms. In addition, the study contributes to the wider theoretical debate on the determinants of collaboration by examining a number of other factors that it has been argued may influence levels of collaboration.

### Method and Results

The data analysed in this paper are derived from a database of a sample of UK defence firms originally constructed in 1996. This database was obtained from the results of a mail survey of all UK defence related manufacturing establishments listed in Jane's Defence Directory. A total of 1169 questionnaires were distributed and 356 usable responses were received after a follow-up questionnaire. In order to test for non-response bias, a wave analysis contrasting the respondents to the initial mailing with respondents to the follow up questionnaire was conducted (Armstrong and Overton, 1977). This technique assumes that the second wave of respondents are more likely to be representative of non-respondents than the first wave. The wave analysis revealed no significant differences amongst the two waves in term of basic characteristics such as size and location. This suggests that there is no obvious evidence of any non-response bias.

The dependent variable in the study was represented by a categorical variable, COLL, defined as '1' if the establishment was currently involved in a formal collaborative agreement with another defence firm and '0' otherwise. Given the binomial nature of the dependent variable, the data were analysed using logistic regression incorporating a maximum likelihood estimation procedure. If 'p' represents the probability of an establishment having a collaborative agreement then the model was specified as:

$$\ln [p/1-p] = a + b_1EMP + b_2OWN + b_3 RD + b_4 DEF + b_5 MS + u \quad (1)$$

The independent variables represent a variety of internal and external characteristics that the literature suggests might influence levels of collaboration (Glaister and Buckley, 1996). Size was defined as the number of employees in the establishment. If the resource-based approach is correct, then a positive relationship between this variable and the probability of collaboration would be expected. A number of other measures of size such as turnover and size bands were also used but made no significant difference to the results and are not reported here.

The second variable, OWN, represents the ownership status of the establishment and is coded '0' for an independent single establishment firm and '1' for an establishment that is a branch of a larger group. This variable can be regarded as partly representing an additional size-related resource effect, as group members are likely to have access to the wider resources of the group to which they belong. However, in addition, it also relates to the behavioural view that independent

firms may be less interested in collaboration than manager-led firms due to the emphasis placed upon independence as an objective.

RD is defined as a categorical variable equal to '1' if the establishment had a specialised R&D function and '0' otherwise. The inclusion of this variable reflects the commonly argued view that sharing R&D resources is a major incentive for collaboration (Glaister & Buckley, 1996). Thus, one might expect the existence of an R&D function to facilitate collaboration.

The sample establishments differ considerably in the proportion of turnover accounted for by defence business. It is likely that greater involvement in the defence sector will increase the probability of defence-related collaboration. To take into account this effect, the variable DEF was included as a measure of the proportion of an establishment's turnover that was defence related.

Finally, there is some evidence to suggest that rates of co-operation differ considerably across industrial sectors (see, for example, Shaw & Kauser, 2000). Whilst this remains to be fully explained, it may reflect different competitive conditions which in turn influence the incentives for collaboration (Kay, 1999). For example, a highly competitive market dominated by small firms may indicate the absence of substantial economies of scale and this may eliminate one of the main motives for collaboration. To a certain extent, competitive conditions are held constant in the present study which is confined to a single sector. However, the defence sector is fairly heterogeneous with firms involved in a variety of industrial activities including aerospace, electronics and construction. Thus, the competitive conditions in which the firms operate may differ. This was taken into account by including a variable representing market structure on the right hand side. Thus, MS was defined as the proportion of employment in the SIC category to which the establishment belonged accounted for by firms with under 10 employees.

Due to missing responses for some of the variables in the model, only 317 questionnaires were available for the final analysis. The results of the estimation are presented in Table 1. The overall fit of the model is satisfactory with the likelihood ratio test (LRT) indicating that the model is a significant improvement on an intercept only model. The pseudo-R<sup>2</sup> statistics are also reasonable for a cross-section model. The results indicate a significant positive relationship between size and the probability of collaboration. The presence of an R&D function also has a significant positive impact upon the probability of collaboration. Both of these results offer some support for the resource-based approach to the firm. In addition, greater levels of defence specialisation, as represented by DEF, are also positively related to the probability of defence collaboration. The market structure variable is also significant and is negatively related to collaboration. This implies that establishments in more competitive markets are less likely to be involved in collaboration and could indicate the absence of economies of scale motives for collaboration. The only insignificant variable is ownership. This is interesting as it conflicts with the behavioural view that independent firms are less interested in collaboration than manager-led firms due to the emphasis placed upon independence as an objective.

If the results of equation 1 are related to the resource constraints facing small firms, one might expect these problems to be even more severe for international collaboration. Thus, amongst those involved in collaboration, larger firms may be more likely to be involved in international collaboration than their smaller counterparts. In order to test this hypothesis, the sample was restricted to those establishments which were involved in collaborative agreements and equations estimated for three dependent variables - COLLUK, COLLEUR and COLLUS. These variables were coded '1' if the establishment had a collaborative agreement with, respectively, a partner in the UK, Europe and the USA, and '0' otherwise. Although collaborative agreements were in place with other regions, the number involved was relatively small and precluded sensible statistical analysis. Similar independent variables were used to those included in equation 1, although DEF is excluded from the results as it proved to be insignificant in all cases.

**Table 1**  
**Estimates of Equation 1**

Variable	Coefficient (standard error)	Likelihood
EMP	0.0014 ** (0.0005)	1.0014
OWN	0.3410 (0.3010)	1.4063
RD	0.9133** (0.3121)	2.4924
DEF	0.0213** (0.0047)	1.0215
MS	-0.0002* (0.0001)	0.9998
Constant	-2.2733 (0.3829)	
LRT	94.798**	
R <sup>2</sup> (M)	0.23	
R <sup>2</sup> (VZ)	0.41	
N	317	

Note: \* = indicates significance at the 10% level; \*\* indicates significance at the 5% level; LRT is the likelihood ratio test; R<sup>2</sup> (M) is the McFadden pseudo-R<sup>2</sup>; R<sup>2</sup> (VZ) is the Veall and Zimmerman pseudo-R<sup>2</sup> (see Veall and Zimmerman (1996) for a full discussion of pseudo-R<sup>2</sup> measures); N is the number of observations.

The results reported in Table 2 indicate that the overall fit of the three equations is satisfactory. Interestingly, size has no significant influence on the probability of a collaborative agreement with a UK partner but has a positive impact on the probability of overseas collaboration in both Europe and the USA. Thus, the major difference between small and large firms is in the international rather than domestic arena. The pattern of significance of the other variables is mixed with no clear pattern emerging.

**Table 2**  
**Estimates of collaboration equations for UK, Europe and the USA**

Variable	COLLUK		COLLEUR		COLLUSA	
	Coefficient (standard error)	Likelihood	Coefficient (standard error)	Likelihood	Coefficient (standard error)	Likelihood
EMP	-0.00002 (0.0002)	1.000	0.0008* (0.0004)	1.0008	0.0005* (0.0003)	1.0005
OWN	-0.8047* (0.4537)	0.4472	1.4992** (0.4994)	4.4781	0.5479 (0.4572)	1.7297
RD	-1.2763** (0.5572)	0.2791	0.5759 (0.5228)	1.7788	1.6537** (0.6009)	5.2263
MS	0.00007 (0.0002)	1.0001	-0.0007** (0.0003)	0.9993	0.0003 (0.0002)	1.0003
Constant	1.9631** (0.6543)		-1.3847** (0.0297)		-2.5460** (0.7053)	
LRT	10.568**		36.56**		21.20**	
R <sup>2</sup> (M)	0.07		0.23		0.14	
R <sup>2</sup> (VZ)	0.15		0.42		0.28	
N	114		114		114	

Notes: COLLUK, COLLEUR and COLLUSA are binary variables defined as '1' if a firm had a collaborative agreement with a partner in, respectively, the UK, Europe or the USA and '0' otherwise.

## Conclusions and Policy Discussion

The relatively cosy relationship between the government and the defence sector that persisted in the UK for much of the post-war period clearly needed a major overhaul. The decision to introduce more competition into the system was a serious attempt to deal with the problems of the procurement system. Indeed, such a policy change was perhaps inevitable given the ideological disposition of the government and the desire to contain public expenditure to allow tax cuts. However, it is difficult to come to a firm conclusion concerning the extent to which the new policies have achieved their objective of promoting greater value for money given the conflicting views of official studies and academic commentators. Nevertheless, it is clear that the changes were partly responsible for a major restructuring of the industry as companies sought to reduce their costs to compete effectively in the new environment.

Whilst competition is an important mechanism that can help to drive down costs, there are a number of limitations to the establishment of a free market for defence goods that arise from intrinsic features of the market. Technology inflation, contract renegotiation and the existence of substantial economies of scale are factors that will continue to influence the structure of the market and limit the extent of fully competitive tendering. Moreover, despite the emphasis on the value for money objective associated with the reforms, it is clear that the government continues to place value on other objectives including regional policy and the maintenance of a domestic defence industrial base. These objectives frequently conflict with and override the search for the most cost-effective solution to defence procurement. Given the inevitable involvement of the government as the major source of demand in the market and the regulator of the procurement system, this conflict is likely to continue.

Given the limits to competition in the defence sector and the rising development costs of major projects, the renewed emphasis on collaboration is scarcely surprising. On the one hand this may be cause for concern as previous collaborative arrangements have not always achieved efficiency gains as a consequence of the *juste retour* system and the high transaction costs involved in negotiating the contracts. However, the changing nature of collaborative arrangements which are increasingly being instigated by firms rather than governments, provides some hope that new arrangements will avoid some of the mistakes of the past and provide real economic benefits. If this is the case, then collaboration may help rather than hinder the search for value for money in public services.

The empirical results presented in this paper indicate that size has a positive impact upon a firm's involvement in collaborative activities particularly within the context of international collaboration. This offers some support for the resource-based view of the firm, which emphasises the problems that small firms may have in developing collaborative agreements. In addition, it concurs with the literature on exporting, which emphasises a positive link between exporting and firm size (Chetty and Hamilton, 1996). The empirical results lend some credence to Oughton and Whittam's (1997) call for the development of institutional arrangements to facilitate greater co-operation and networking amongst small firms to assist in the realisation of collective economies of scale. This may be of particular relevance to the UK with its large small firm sector which, despite significant growth since the 1970s, has a considerable productivity gap with the large firm sector (Oughton and Whittam, 1997). Moreover, if MacDonald (1999) is correct and collaboration becomes the norm in smaller defence contracts, then small firms with little experience of collaboration may need assistance in developing the skills and resources essential to successful collaboration. A policy debate on the issues surrounding the promotion of networking, co-operation and linkages amongst the small firm sector may hence be of some importance to the future vitality of the defence sector.

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