ARMAMENTS FIRMS, THE STATE PROCUREMENT SYSTEM, AND THE NAVAL INDUSTRIAL COMPLEX IN EDWARDIAN BRITAIN

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This article examines the relationship between Britain's armament firms and the state's procurement system, presenting a case for a Naval Industrial Complex (NIC) in the years immediately before the Great War. It argues that in Edwardian Britain a nuanced set of institutional networks were established between the Admiralty and a small elite group of armament manufacturers. The NIC demonstrates the close collaboration between the armament firms supplying the Admiralty and between the Admiralty and an elite group of private contractors. This article concludes that the NIC did not lead to profiteering by contactors, and they did supply the warships and naval ordnance that enabled Britain to out build Germany in the naval race.

This paper examines the relationship in Britain between the armaments industry and the military institutions of the state during the years preceding the Great War, when there were intensifying international tensions, and concerns over Britain's defense capabilities. Through an assessment of the War Office (WO) and Admiralty procurement system, we apply John Kenneth Galbraith's theory that businesses may establish institutional networks as "countervailing powers" to mediate business-state relations and, thus, we challenge the proposition that the state acted as a "monopsonist," dominating contractual relations with private armaments firms.[1] We argue that during the years prior to the war, Britain's Naval Industrial Complex (NIC) involved a strengthening collaboration between the British Admiralty and the big armament firms.

Prior to the Great War the standard method for purchasing military equipment was competitive tenders based on official lists of firms capable of meeting Admiralty and WO requirements. The main contractors included prestigious firms such as Armstrong, Whitworth & Co., Asbury's, Cammell-Laird, Coventry Ordnance Works, Hadfields Ltd., Kynochs Ltd., The Projectile Co., William Beardmore & Co., and Vickers, who supplied to both the Army and the Navy. Also on the list were specialist contractors to the Navy such as John Brown & Co., Firth's, and Rogerson. The Contracts Department of the

WO placed invitations to tender for both Navy and Army ordnance. The firms offering the lowest quotation and the quickest delivery secured orders. According to W. F. Wintour, the Director of Army Contracts, "in normal times reasonable prices are secured by the competition of several firms for a limited order which all are anxious to obtain and the allocation of orders can usually be readily made on the basis of the lowest offer which are satisfactory as to delivery."[2] Private armaments firms made up a key component of the procurement system, but they also competed for contracts not only with each other but also with Royal ordnance factories that the state organized and managed. Tables 1 and 2 show the allocation of orders between state ordnance factories and the "trade," as private contractors were known, for the Navy and Army respectively.

Table 1. Allocation of Naval Orders for Munitions and Guns between the Ordnance Factories and the "Trade," 1899 -1914 (£m)

	Ordnance Factories	"Trade"	Percent to "Trade"
1899-1900	1.4	1.0	41.6
1900-01	1.8	1.5	45.5
1901-02	1.7	2.0	54.1
1902-03	1.4	1.6	53.3
1903-04	1.3	1.5	53.6
1904-05	1.6	1.4	46.6
1905-06	1.3	1.3	50.0
1906-07	1.3	1.2	48.0
1907-08	1.2	0.8	40.0
1908-09	1.1	0.8	42.1
1909-10	1.3	0.9	40.9
1910-11	1.3	1.4	51.9
1911-12	1.3	2.3	63.8
1912-13	1.4	2.7	65.9
1913-14	1.5	5.2	77.6

Source: National Archive (NA), WO 395/1, Report of the Director of Army Contracts for year ending March 1904 and year ending March 1914.

Table 2. Allocation of War Office Orders for Munitions and Guns between the Ordnance Factories and the "Trade", 1899-1914 (£m)

	Ordnance Factories	"Trade"	Percent to "Trade"
1899-1900	1.9	3.6	65.5
1900-01	2.6	11.6	81.7
1901-02	2.2	9.8	81.6
1902-03	1.7	5.3	75.7
1903-04	1.5	2.7	64.3
1904-05	1.2	1.6	57.1
1905-06	1.4	2.7	65.9
1906-07	1.2	2.7	69.2
1907-08	1.1	1.4	56.0
1908-09	1.2	1.0	45.5
1909-10	1.0	1.2	54.5
1910-11	1.0	1.2	54.5
1911-12	1.0	1.5	60.0
1912-13	1.1	1.8	62.1
1913-14	1.1	0.7	38.8

Source: National Archive (NA), WO 395/1, Report of the Director of Army Contracts for year ending March 1904 and year ending March 1914.

Orders clustered in two periods: during the Second South African War (October 1899-May 1902) when Army orders rose (see Table 2), and between 1909 and 1914 (see Table 1) when naval orders rapidly expanded. Both clusters involve sharp increases in orders to the "trade," demonstrating the importance of the private sector in periods of accelerated demand. We discuss below the sharp rise in naval orders after 1909, but in the aftermath of the South African War private armaments manufacturers alleged that the state exercised its powers as a "monopsonist," and created uncertainty over future investment outcomes in armaments production. For example, Lieutenant Trevor Dawson who had joined Vickers from the Royal Navy as their Superintendant of Ordnance in 1896, complained in a disposition to the WO that "during the [South African] war we incurred a large capital expenditure on the extension of our works but when the war was over we received practically no further orders from the government although our plant is sufficient to enable us to cope with almost any requirement."[3] As David Stevenson maintains, the WO "left the private firms the crumbs after assuring the needs of the Royal Ordnance Factories."[4] Sir Robert Hadfield, the chairman of the Sheffield specialist steel and armaments manufacturers Hadfields Ltd. in 1915, reflected on the treatment of the armaments firms in the pre-1914 period. He complained to his shareholders that private contractors had been "treated shabbily" after the South African War. He alleged that one could therefore not fault private contractors that the armed forces were under-equipped when war broke out in 1914.[5] For contemporaries such as Dawson and Hadfield, the government acted with parsimony after the South African War, but the main issue of course was the power of the state as a "monopsonist" to concentrate contracts in peace time on the public Royal ordnance factories at the expense of the private sector.

Private armaments firms, however, did not simply accept the power of the state. They were fully prepared to exploit institutional networks to mediate the relations of the parties in the procurement system. The armaments firms, the Admiralty, the WO, and political elites had established a complex set of networks among themselves. The leaders of the armaments firms were not innocent bystanders waiting to pick up scraps thrown their way by the Contracts Department; rather, "countervailing powers" were at work, and the ability of armaments firms to access a layer of professional and political networks held in check the potential "monopsony" power of the state. For example, Sir Robert Hadfield appointed a number of naval commanders to his board of directors, helping to insert the company in the contracts network. He also paraded these military personnel before shareholders at the company's annual meeting.[6] In 1907 Admiral Sir Archibald Douglas, who was connected with Armstrong, Whitworth & Co., joined the board. Together with Sir Howard Vincent, MP for Sheffield Central, who had joined the board in 1903, they opened negotiations for an amalgamation with Armstrong, Whitworth & Co. Although they eventually dropped this proposal, Douglas helped broker contracts between Hadfields and the Admiralty between 1908 and 1910, and in 1911 secured a contract with the Japanese Imperial Navy.[7]

We also detect institutional networking at Armstrong, Whitworth & Co., where Stuart (later Baron) Rendel played an important role. Rendel joined the firm in the 1860s and became a close confidant of Chairman Sir William Armstrong. After Rendel became an MP in 1880 he enjoyed close friendships with Gladstone, Sir Henry Campbell Bannerman (Liberal Prime Minister, 1905-08), and the Chancellor of the Exchequer in the Liberal Government, David Lloyd George. To reinforce the company's connections to government, Rendel appointed to the board men with experience in the Admiralty, the WO and other state departments. His most influential appointment was Admiral Sir Charles Ottley who joined the company in 1913, after having served as a naval attaché in Tokyo and St. Petersburg before becoming Head of Naval Intelligence at the Admiralty (1906-08) and Secretary to the Committee of Imperial Defense (1908-12).[8] Vickers, the great business rival of Armstrong, Whitworth & Co., was also adept at appointing to its board those who could promote links with the state. One of its most important recruits, Trevor Dawson, studied at the Royal Naval Colleges, Greenwich and Portsmouth and the Royal Artillery College at Woolwich. He had also been an experimental officer at Woolwich Arsenal from 1892. His appointment in 1896 meant that Vickers acquired expert knowledge of the requirement of the users of armaments and someone with the skill to effectively liaise and negotiate with Admiralty officials.[9]

John Brown, Cammell-Laird and the Fairfield Shipbuilding and Engineering Co. collaborated to form the Coventry Ordnance Works (COW) in 1905, attempting to break the duopoly of Armstrong, Whitworth & Co. and Vickers in the supply of large guns to the Admiralty. This attempt illustrates that naval appointments were crucial in the competitive rivalry between armaments companies. COW appointed Rear Admiral Reginald Bacon as managing director (1909-14), after he had served in the Royal Navy since 1874. Between 1901 and 1904 he served as Inspecting Captain of Submarines, and conducted the Admiralty's first submarine trials. Having served as assistant to Sir John Fisher, the First Sea Lord, in 1905, Bacon became a member of the design team that produced the plans for the Dreadnought class of battleship. In 1906 he took office as the captain of HMS Dreadnought, before his appointment a year later as Director of Naval Ordnance. Fisher described Bacon as "the cleverest officer in the navy," and predicted that he would be poached by one of the private armament contractors. On Bacon's appointment to COW, Fisher complained to the First Lord of the Admiralty, Reginald McKenna, that "it's very unpleasant our officers being seduced."[10]

Evidence of formal collaboration between the armaments firms and the state procurement agencies is rarely explicit in company records, but in periods of dispute the relationship between the armaments manufacturers and the institutions of government becomes more transparent. The formation of COW and its competitive challenge to Armstrong, Whitworth & Co. and Vickers for government contracts is a case in point. In 1906, a dispute arose between the Admiralty and the WO over the allocation of contracts for

artillery for the Navy; the Admiralty wanted to concentrate contracts for guns on Armstrong, Whitworth & Co. and Vickers, but the WO Contracts Department objected that "free competition should determine the award of contracts." Making clear that it objected "to any limitation on the source of supply," the WO Contracts Department pointed out that COW could produce small caliber guns and was "engaged in making a considerable portion of the new horse and field artillery" for the Army.[11] Wedded by long ties of loyalty and mutual trust to its two principal suppliers, the Admiralty was not willing to concede to WO demands to break the duopoly of Armstrong, Whitworth & Co. and Vickers, and the Treasury had to adjudicate the dispute. The Treasury sided with the Contract Department, arguing that an "open" procurement system would be more cost effective, would help safeguard supplies in a future emergency, and ruled that COW "would be invited to tender with Armstrong and Vickers for all calibers when it [the Admiralty] desired to place [orders] with the trade."[12]

This disagreement between the two important military departments in 1906, and the conciliatory role of the Treasury, illustrates that we cannot view the state as a monolithic entity, and that the combination of firms in the networking system did not remain unchanged. The WO and the Admiralty had different perspectives of the procurement system, and the move in 1906 to more "open," competitive, contracting widened the network of armaments manufactures and suggests that a NIC was expanding in Edwardian Britain. Since a NIC is a subset of the broader military industrial complex (MIC), to better understand the former, we need to consider the latter. Scholars commonly associate the antecedents of a MIC with Eisenhower's "Farewell Speech" of January 1961, when he referred to the establishment in the US of an "immense military establishment and a large arms industry." Eisenhower worried about the "acquisition of unwarranted influence, whether sought or unsought, by the military industrial complex," which might ultimately "endanger our liberty or democratic process."[13] More recently John Paul Dunn and Elizabeth Skons identified an MIC as "the group within society that benefits from military spending and its growth" but they acknowledged that this definition "is often vague and sometimes inconsistent." In general terms, a MIC combines the power of the arms industry with the military institutions of the state, which promotes a "coalition of vested interests within the state and industry." These vested interests cultivate objectives that are in the interests of the coalition but may, or may not, be in the interests of national security.[14] Dunne and Skons conclude that there is no clear theoretical conception of a MIC, and that it might have more value as a "descriptor rather than an analytical concept," a view that Ben Fine shared.[15] Yet even as a "descriptor," there is no hard evidence for a MIC in Edwardian Britain. The priority of British state expenditure on armaments was naval rather than military following the end of the South African War, as Lloyd George alluded to in a retrospective assessment of the pre-war procurement system. As Minister of Munitions in December 1915, he argued that shortages of shell for the Army was due in large part to private armaments firms geared to

supply the Navy and not the Army with ordnance. A "fact" often forgotten was that the Navy had absorbed an "enormous number of our engineers and a very high proportion of our engineering resources." Prior to the war, between two-thirds and three-quarters of "engineers occupied on munitions production" were producing ordnance for the Navy.[16] Consequently, little evidence sustains the existence of a MIC. However, we believe we can make a case for an Edwardian NIC associated with collaboration and collusion between naval armaments firms and the Admiralty. From 1909, profound changes occurred in the contractual relations between the two.

After 1909 the Admiralty took control of the allocation of naval contracts from the Contracts Department of the WO. Between 1908-09 and 1913-14 Admiralty contracts for naval ordnance increased by just over 250 percent and were 3.7 times that of the Army in 1914.[17] Running parallel to these developments was a significant rise in the allocation of orders to private armaments firms instead of the Royal ordnance factories (Tables 1 and 2). Rising orders for naval ordnance coincided with a sharp increase in the value of orders the Admiralty placed for new capital ship construction (Table 3), itself a panic response by the government to what it considered a dangerous narrowing of the nation's naval lead over other powers, particularly Imperial Germany. The political necessity of maintaining a dominant naval infrastructure was related to three strategic imperatives: the need to keep the sea lanes open, to provide defense from invasion, and to impose a naval blockade on Germany in the event of war. As James L. Garvin, editor of the *Observer*, noted, Britain could not afford "a second class position in sea trade [and] a second class navy ... national policy created sea power, and sea power has not only been the instrument of our defense but it has been the great engine of our progress."[18] The 1909-10 Naval Estimates were consistent with Garvin's pronouncement, and sanctioned the production of four dreadnought class battleships. Following mounting pressure, the Liberal government agreed to a contingency for adding an additional four.[19]

Table 3. Funds Provided for Modern Naval Ship Construction: Great Britain and Germany, 1906-14 (£m).

	Great Britain	Germany
1906-07	10,486	5,167
1907-08	8,849	5,190
1908-09	8,521	7,795
1909-10	11,076	10,177
1910-11	14,755	11,392
1911-12	15,148	11,710
1912-13	16,160	11,491
1913-14	16,139 (voted)	11,010 (voted)
Total	101,134	74,552

Source: NA, CAB 37/118/6 Memo. and Documents on Naval Estimates compiled by Winston Churchill, January 1914.

The British government poured funds into the navy (Table 3), siphoning off most of it to private contractors. This change in the procurement system provides an interesting trend to explore the existence of an Edwardian NIC. A NIC draws attention to patterns of collaboration but, conversely, we must recognize that competitive pressures can build up among armaments firms. Thus, we must consider how firms might accommodate such pressures. As we have seen, the Admiralty's attempt to restrict contracts for naval guns to Armstrong, Whitworth & Co. and Vickers suggests a collaborative business relationship. The Director of Contracts reported in 1905 that "the pattern of the new guns is the result of considerable collaboration between... Armstrong, Whitworth, and Vickers and the Department."[20] Both companies received large orders, each gaining contracts for over 200 guns worth approximately £750,000, while their rival, COW, "took...a rather smaller... order."[21] As collaboration and competition coincided, the more nuanced set of relations between the state and private contractors challenged the close relations between the Admiralty and the two largest firms.

Outside the charmed circle of the big two, other armaments firms formed associations to break into the naval ordnance business. The most prominent example, mentioned earlier, was COW, an alliance formed in 1905 between John Brown & Co., Cammell-Laird and the Fairfield Shipping and Engineering Co. Brown's and Cammell's were prominent Sheffield steelmakers who diversified into shipbuilding beginning in the late 1890s. The former had shipyards on the Clyde, following its acquisition of the Clydebank Engineering and Shipbuilding Works in 1899, while the latter acquired the shipyards of Laird Bros. of Birkenhead in 1903. Cammell-Laird transformed its business significantly in the decade before the Great War, and produced a wide range of products including armor-plate, gun forgings, some ordnance and merchant and naval ships. Brown's also fabricated armor-plate at its Sheffield works, which supplied its shipyards on the Clyde. Diversification brought the two firms into competition with Armstrong, Whitworth & Co. and Vickers, who both manufactured armor-plate. Armstrong, Whitworth & Co. supplied armor-plate to its Elswick shipyard on the Tyne from its Openshaw works near Manchester, and Vickers its Barrow yard from its Sheffield steel works. After these increases in competition in armor-plate, Brown and Cammell-Laird began to produce heavy ordnance between 1902 and 1906 in a process of forward integration to build and mount large naval guns on their vessels. Consequently, Cammell-Laird purchased the smaller Coventry ordnance works of Mulliner-Wrigley in 1903 and a year later Brown's became part owners in the firm. In late 1905, the two firms collaborated with the Fairfield Shipping and Engineering Co. and renamed Mulliner-Wrigley the COW, with Brown's taking half the share capital and a quarter each allocated to the other two partners.[22] As Table 4 shows, between 1907 and 1912 COW rapidly increased the value of its ordnance work for the Admiralty and its guns and mounting work almost trebled.

Table 4. Naval Ordnance for the Admiralty, COW, 1907-12 (£)

	Production of	Value of work in hand
Aug. 1907	Naval Ordnance	28,840
Jan. 1908		42,656
Nov. 1908		83,332
Jan. 1910	Naval Guns & Mountings	428,413
Nov. 1910		537,183
May 1911		862,285
Jan. 1912		1,117,333

Source: Sheffield Archive (SA), Firth Brown Records, Box 341 A (3) COW Ltd., Sundry Board Papers and Managing Directors' Reports, 1906-13.

Appointing Bacon as managing director in 1909 reinforced the business links between COW and the Admiralty. However, Brown's and Cammell-Laird's establishing COW to challenge Armstrong, Whitworth & Co. and Vickers did not prevent them from collaborating with the two lead firms in other business ventures. For example, in 1900 Vickers, Cammell-Laird and Brown's formed an alliance to establish the Harvey United Steel Co. to manage the British patent rights of Harvey and Krupp's armor steel. The following year the three firms joined with Armstrong, Whitworth & Co. to form the Steel Manufacturers Nickel Syndicate Ltd. to secure "supplies of nickel which was essential for the production of Krupp's armour, from the world's only supplier, the French firm, Le Nickel."[23] These developments remind us that the Edwardian arms industry operated in a global context; British manufacturers both cooperated and competed with German, French, Italian, Belgian, and Russian armaments manufacturers. In 1901, Vickers entered into an arrangement with the large Glasgow armor-plate and shipbuilder William Beardmore, to take a half interest in the Scottish firm. In addition to building merchant and naval ships Beardmore's manufactured ship plate, armor-plate, marine engines and was beginning to produce naval ordnance.[24]

Inter-firm collaboration highlights the changing nature of the NIC in Edwardian Britain, but why did a small group of armaments manufacturers pursue collaborative arrangements? From an economic perspective, we may explain their behavior in terms of bounded rationality, which relates to the capacity of economic agents to design processes that support the management of "the mass of information for making optimal decisions." Lacking complete information about the "preferences and beliefs of others," decision makers faced the problem of asymmetric information and uncertainty. Consequently, collaborating can expand the stock of common knowledge, thereby reducing uncertainty.[25] In the uncertain market environment of the Edwardian period, collaborating became attractive to armaments firms. A

search for naval officials and political figures to join their board of directors reinforced their pursuit of alliances. This search also served to acquire knowledge and expertise, to reduce uncertainty, and to manage the risks in the armaments market associated with high capital costs and dependency on state procurement. Asymmetric information was a key characteristic of the Edwardian procurement system; both procurer and contractor faced limits in their abilities to acquire sufficient common information to make "optimal decisions." For example, in 1909 the three allied firms decided to appoint Bacon as Managing director of COW to improve the flow of information with the Admiralty. Charles E. Ellis, the representative of Brown's on the COW board, was certain that Bacon represented an important asset to the Coventry venture. When he complained that technical "drawings for 12 inch gun mountings had been sitting with the Admiralty with no sign of approval," he was convinced that Bacon "would take the matter up personally with the Admiralty and I have no doubt that very shortly every important drawing will be approved."[26] Ellis was correct and within a month the Admiralty had approved "several of the 12 inch drawings."[27]

Not all efforts to influence the Admiralty succeeded. The experience of the William Beardmore shipbuilders, who were half owned by Vickers, differed somewhat. In 1906 Beardmore's completed its naval construction yard at Dalmuir, on the Clyde, and was anxious to receive orders from the Admiralty. Having advanced to Beardmore's £150,000 both to help improve their Parkhead works in Glasgow and facilitate the completion of Dalmuir, Vickers shared their anxiety.[28] In the autumn of 1906, the Admiralty invited tenders for the Bellerophon class of battleship, but to the annoyance of William Beardmore, the Admiralty only asked his company to submit prices for hulls. Determined to use what influence they could to expand the Admiralty contract, William called on the services of the Marques of Graham, who had joined the Beardmore's board in January 1906. Before this, Graham had served as administrative private secretary to Charles Richie, the Chancellor of the Exchequer in the Conservative and Unionist government of Arthur J. Balfour. In November 1906, acting on the company's behalf, Graham attempted to influence the new First Lord of the Admiralty, Lord Tweedsmouth:

> I could only say to you privately that we have sunk an enormous amount of capital in establishing the great naval construction works at Dalmuir, and it is a serious thing to be denied any chance of getting government work to do a particular line ... All I respectively ask is that you may see your way clear to give William Beardmore & Co. permission to tender for engines and machinery as well as for hulls and armor of the new battleship, and so in some degree grant us encouragement in return for the efforts we have made to establish naval construction yards.[29]

Graham's intervention initially seemed to pay dividends and the Admiralty allowed Beardmore's to tender for engines in addition to hulls. However, the concession did not materialize into firm contracts for engines and heavy naval

guns until the upsurge in Admiralty orders after 1909.[30] Political connections could exert influence but clearly had limits.

The expansion of Admiralty contracts after 1909 focuses attention on how much private contractors benefited from this upturn in state expenditures. Profits for the two leading contractors to the Admiralty, Vickers and Armstrong, Whitworth & Co.; indicate a period of considerable business success; net profits trebled and doubled respectively between 1908 and 1913.[31] While the profits show that significant economic rewards were available, the experience of the two largest contractors did not simply mirror that of the trade in general. A case in point was COW, whose business performance, c. 1905-13, provides useful insights into business-state relations on the eve of the Great War.

From 1905, the firms allied in COW constructed a naval ordnance works at Coventry at an estimated cost of £200,000 and set three objectives. First, COW should manufacture large naval guns and mountings, and challenge the duopoly in these products of Armstrong, Whitworth & Co. and Vickers. Second, the new plant should be capable of delivering guns and mountings sufficient for one complete armed battleship per annum. Third, the plant should be capable of extension as the necessity arose.[32] In the event, COW did not secure Admiralty orders for heavy gun mountings until 1909. Management gave great importance to the approval of the Admiralty and complained that such delays hurt its reputation with foreign buyers. For example, in January 1909, the fact that COW "had not received orders from their own government for large mountings" "frustrated" an Italian government contract for large naval gun mountings. Their response to the Admiralty's reluctance to provide contracts drew attention to the merits of collaboration between business and the state, and to the role of COW in increasing competition and reducing the prices the government paid for ordnance. The COW directors argued that the government should be "fully alive to the advantages that resulted from the COW's activities."[33] The directors' hopes were realized; the value of their naval ordnance work increased by 160 percent between January 1910 and January 1912 (see Table 4).

COW and its controlling allied firms benefited greatly from the rapid rise in naval expenditures from 1909, and while they did not act in concert with Armstrong, Whitworth & Co. and Vickers, they were part of the expanding NIC. With the Admiralty now able to place orders to a larger range of private contactors, COW broke the duopoly of the two leading naval armament firms without undermining other forms of business collaboration. A coalition of interests had emerged, and COW secured an increased order book. What proved more difficult, however, was translating more orders into financial success (see Tables 5 and 6). COW experienced losses between 1908 and 1911 and drained the financial resources of the allied firms. COW's financial problems caused tensions between the allied firms, particularly between Brown's and Cammell-Laird over debentures to fund expansion. In 1907, Cammell-Laird had proposed to use debentures, but Ellis, Brown's representative on the COW board, argued that "it was undesirable to go

outside the three partners for further sums that will be required." As the majority shareholder in the venture, his views prevailed.[34]

Table 5. Financial Performance, COW, 1908-11 (£)

	Losses
1908	54,600
1909	89,200
1910	59,900
1911	187,200

Source: Firth Brown, 341 A (1), COW, Managing Directors' Report, 9 November 1911.

In 1911 recorded losses rose substantially (Table 5), but nothing suggests that shortage of Admiralty orders caused COW's dismal profit record. On the contrary, the company's managing director, Bacon, reported in November 1910 that "our works are now ... fully engaged to practically their full capacity on government work, about 90 percent of the machines being employed, besides a considerable nightshift." A buoyant order book persisted into 1912, and Bacon boasted that he had contracts in hand for naval guns and mountings worth over three-quarters of a million and naval armor-plate worth just over a quarter of a million pounds.[35] The problem was inefficient production[36] which failed to convert the full order book into profits. With mounting losses, the company's banks drastically cut COW's overdraft limit from £200,000 to £50,000 and required the allied firms to take "full responsibility ... for its temporary continuance."[37] Eventually, the banks required Brown's to provide £75,000 and Cammell-Laird and Fairfield's to pay £37,500, each in three monthly installments.[38] (see Table 6 on page 34.) The allied firms provided the loans in proportion to shares held, with John Brown contributing half and Cammell-Laird and Fairfield's a quarter each.

While Bacon's Admiralty connections brought government orders, he lacked business acumen, and his authoritarian style grated on other senior managers.[39] COW's performance of COW demonstrates the value of business networks with the Admiralty, but also shows that networks did not guarantee success. COW's experience is also a reminder that the idiosyncratic behavior of key actors also mediates networks. While armaments manufacturers experienced mixed profits as naval contracts expanded from 1909, a balanced assessment of the NIC requires evaluating the Admiralty's position on contracting, and realizing that as a public trustee, the Admiralty had to balance receiving value for money and national security.

In a January 1914 memorandum, Winston Churchill, then First Lord of the Admiralty, reflected on how from 1909 the renewed German naval

Table 6. Loans made to COW by Allied Firms, 1906-10

	Loan amount	Comment
Jan 1906	50,000	
March 1906	40,803	Profit due to Cammell-Laird, converted to 4% loan
Nov. 1906	50,000	
July 1907	120,000	Included 11,875 dividend owed to John Brown
May 1907	100,000	
June 1907	40,000	
Sept. 1907	60,000	
Nov. 1907	10,000	
Jan. 1908	20,000	
June 1908	20,000	To prevent COW breaking bank overdraft limit
Jan. 1909	10,000	
June 1909	50,000	To prevent COW breaking bank overdraft limit
Jan. 1910	20,000	To prevent COW breaking bank overdraft limit
Sept. 1910	40,000	

Source: Sheffield Archive (SA), Firth Brown Records, Box 341 A (3) COW Ltd., Sundry Board Papers and Managing Directors' Reports, 1906-13.

shipbuilding program presented the Admiralty with a series of challenges. Reviewing the period since 1910, Churchill provided reasons why the Naval Estimates had risen. These reasons included a new ship construction program, an increase in the size, speed, armaments and equipment of war ships, a series of innovations associated with oil fuelled ships, air services and wireless telegraphy, wage and commodity (oil, coal, steel) inflation, and "arrears of shipbuilding in 1910-11 and 1911-12 related to delays in executing the shipbuilding programme." Churchill was particularly concerned that the fact that British construction "had been retarded and our present establishments are congested by that retardation" had compromised the readiness of the High Seas Fleet.[40] To illustrate his argument he compared the number of warships sanctioned since the Liberal government had come to power and the actual number of ships delivered to Britain and Germany (Table 7).[41]

Rear Admiral Troubridge, Chief of the Admiralty's War Staff, echoed Churchill's concerns in the summer of 1912. He referred to the limits of the British shipbuilding program, particularly if they wished to maintain a viable fleet in the Mediterranean: "the capacity of the country for shipbuilding, especially for the manufacture of gun mountings, makes it a programme impossible of fulfillment, unless our shipyards build for us exclusively, or unless we acquire the vessels now building for foreign powers."[42] As early as

Table 7. British Warships Sanctioned and Delivered 1906-07 – 1914 and German Warships Delivered

Type	No. of British warships Sanctioned 1906-07-1914	No. of British warships delivered 1914	No. of German warships delivered 1914
Dreadnought class	35	21	17
Light Cruisers	38	19	10
Destroyers	124	89	84
Submarines	96	66	49

Source: NA, CAB 37/118/6, Memo. and Documents on Naval Estimates compiled by W. S. Churchill, 10 June 1914.

1911, Churchill had predicted Troubridge's gloomy overtones, observing that the new German Naval Laws were going to place "a period of exceptional strain on British shipbuilding capacity," and that in order to maintain the 60 percent ratio of British to German dreadnoughts, agreed during Reginald McKenna's tenure at the Admiralty, that two dreadnoughts allocated to Australia and New Zealand should be allowed to be kept in British home waters until autumn 1915 "in order to aid the Mother country during the maximum tension in shipbuilding."[43]

The challenges facing the Admiralty were not just matters of building and arming the dreadnought class and maintaining the 60 percent ratio, but also assuring the "quality" of the fleet. Technological developments had rendered a number of capital ships obsolete and the Admiralty, particularly under Fisher as First Sea Lord, recognized the need to "modernize" its naval assets.[44] These combined demands placed increasing pressure on naval shipbuilding and armaments firms. The Admiralty eventually met its goals, but only in part. British government and private yards could produce dreadnought class warships faster than Germany, but the delivery/order ratio in Britain for warships was 60 percent compared to 68 percent in Germany.[45] According to an Admiralty Memorandum produced for Churchill, British government dockyards and private yards could construct dreadnought class battleships in 27 months, compared to 36 months in Germany.[46]

Nevertheless, complaints concerning congestion in British yards focused particularly on government-controlled dockyards and involved very harsh criticism. For example, before the upsurge in naval expenditures, in 1908 *The Engineer* complained that "the bald facts are that the existing [Royal] dockyards are unable to cope with the fleet's upkeep" and it demanded "the laying down of dreadnoughts in each of the principal private yards — in frank imitation of the means adopted in Germany in her bid for

the naval empire of the world."[47] Was the *Engineer* justified in advocating the prowess of the private sector?

Private contactors were not without their deficiencies and contributed to the "congestion" to which Churchill alluded. By 1912, the shipyard of Vickers at Barrow suffered heavy criticism; an internal report on the yard referred to lack of discipline and supervision and recorded that there "had been misrepresentations made concerning the progress of ship construction." The following year, a survey revealed that technical deficiencies and organizational disarray at Barrow caused "continuous breakdowns and stoppage of work."[48] More than a decade earlier, the Barrow yard had been one of the finest in the world. Given these problems, Warren has challenged Trebilcock's assertion that the Vickers' enterprise was superior to that of Armstrong, Whitworth & Co. Trebilcock has robustly defended Vickers' management, arguing that when the company's main board "received evidence of Barrow's ill-health, the directors had been very far from accepting it passively." In 1913 Vickers spent £29,525 on "rectifying" the problem of power supply at the yard and allocated £130,777 toward new machinery there.[49] The executives of Vickers were not complacent, as they responded quickly to re-modernize the yard, and spent considerable sums to improve its efficiency. But why had Barrow previously deviated from best practices? Warren justifiably asserts that the evidence relating to Barrow "does at least show ... that any attempt to represent the yard as a streamlined, super efficient operation in comparison with the outdated methods of Elswick [the shipyard of Armstrong, Whitworth on the Tyne] is an oversimplification and possibly an exaggeration."[50] Thus, in the era of rapid naval expenditures on the eve of the Great War the two most prominent naval armaments firms also suffered serious shortcomings.

The NIC was of course wider than Armstrong, Whitworth & Co. and Vickers and it would be a misrepresentation to describe the performance of the private contractors only in negative terms. For instance, private contractors did respond robustly to the upsurge in Admiralty orders from 1909. Activity increased rapidly on the Clyde and the Tyne; by 1910 the principal firms on the Clyde such as Brown's, Beardmore's and Fairfield's had healthy order books. *The Engineer* observed "at no period in the history of [Brown's] or any other Clyde engineering establishment has naval work been in so much evidence."[51] A similar picture emerged on the Tyne,[52] and the increased activity stimulated investment in building and armament capacity. Armstrong, Whitworth & Co. was constructing a new naval yard, downstream from Elswick and in early 1911 spent £500,000 clearing a 70 acre site; Fairfield undertook "extensive improvements" in its fitting out basin, and Brown's paid the Clyde Trust £100,000 to help widen and deepen the river opposite its shipyard. Following a different strategy the Palmer Shipbuilding and Iron Co. (Jarrow) in early 1911 had absorbed R. Stephenson & Co. (Hebburn-on-Tyne). Palmers' chairman, Lord Furness, had complained that his firm could not effectively compete with the integrated armaments firms and acquiring Stephenson's provided Palmer with armor-plate and armaments capabilities

allowing it "to place itself in the most favorable position for competing for Admiralty contracts."[53]

There is solid evidence of collaboration both among the large armaments firms themselves and between the firms and the Admiralty. The notion of a NIC has value in the last few years of Edwardian peace. Indeed *The Economist* asserted that the Naval Estimates were coming under the control of Admiralty officials rather than their political masters. The journal maintained that the consequence of slackening "ministerial control over naval armaments" was "the increased power of private interests to control public expenditure." It further warned that the growing influence of officials was "accompanied by the growing influence of the contractor," the inference being that the relationship between the two was one of collaboration rather than that of buyer and seller engaging in a purely market context.[54] By 1914 Britain possessed a tightly-meshed complex of private armaments firms closely tied to supplying Admiralty contracts; the paradox was that World War I was largely a bloody land war rather than a maritime war.

NOTES

1. John K. Galbraith, *The Essential Galbraith* (Boston: Houghton, Mifflin, 2001), 5.
2. National Archive (NA), MUN 5/6/24, Memorandum on War Office Contracts Branch, 1915.
3. Cited in Clive Trebilcock, *The Vickers Brothers: Armaments and Enterprise, 1854-1914*, (London: Europa Publications, 1977), 75-6.
4. David Stevenson, *Armaments and the Coming of War: Europe 1904-14* (Oxford: Oxford University Press, 1996), 26.
5. Sheffield Archive (SA), Hadfields Records, Box 55, AGM, 5 March 1915.
6. Myrddin J. Lewis, Roger Lloyd-Jones, Josephine Maltby and Mark Matthews, *Personal Capitalism and Corporate Governance: British Manufacturing in the First Half of the Twentieth Century* (Aldershot: Ashgate, forthcoming 2011), Chapter 3.
7. Hadfields Records, Volume 93, Board Minutes No. 2, 1904-1936, 18 November 1907, 6 March 1908, 8 November 1910, 9 May 1911.
8. Marshall J. Bastable, *Arms and the State: Sir William Armstrong and the Remaking of British Naval Power, 1856-1914* (Aldershot: Ashgate, 2004), 240.
9. Trebilcock, 46; Geoffrey Tweedale, "Vickers, Thomas Edward (Tom), 1833-1915", *Oxford Dictionary National Biography* (Oxford: Oxford University Press, 2004), 421-2.
10. Kenneth Warren, *Steel, Ships and Men: Cammell-Laird, 1824-1933* (Liverpool: Liverpool University Press, 1998), 147-8.
11. NA, WO 395/2, Report of Director of Army Contracts, Year Ending 31 March 1906.
12. Ibid.

13. "Military-Industrial Complex Speech, Dwight D. Eisenhower, 17 January 1961," in *Public Papers of the Presidents*, http://www.h.net.org/~hst306/documents/indust.html, accessed on 22 October 2010.
14. John Paul Dunne and Elizabeth Skons, "The Military Industrial Complex" (Stockholm International Peace Research Institute, 3 May 2009), 3: 1-17.
15. Ibid, 4; Ben Fine, "The Military Industrial Complex," *Cyprus Journal of Economics* 6, no. 1 (1993): 25-51.
16. NA, WO 79/74-82, Papers of Sir Stanley Von Donop, citing Lloyd George, December 1915. See also James E. Edmonds, *History of the Great War: Military Operations in France and Belgium* (London: Imperial War Museum, 1995), 15.
17. NA, WO 395/3, Report of Director of Army Contracts, Year Ending 31 March 1914.
18. James L. Garvin, "The Principle of Constructive Economics," in *The Compatriots' Club Lectures* (London: Macmillan, 1st series, 1905), 12. See also Paul Kennedy, *The Rise and Fall of British Naval Mastery* (London: Penguin, 2001), 216-41; Eric W. Osborne, *Britain's Economic Blockade of Germany, 1914-1919* (London: Frank Cass, 2004).
19. Trebilcock, 81.
20. NA, WO 395/2, Report of Director of Army Contracts, Year Ending 31 March 1905.
21. Trebilcock, 79.
22. Warren, *Steel, Ships and Men*, 123-4; Geoffrey Tweedale, *Steel City. Entrepreneurship, Strategy, and Technology in Sheffield 1743-1993* (Oxford: Clarendon Press, 1995), 123.
23. John R. Hulme and Michael S. Moss, *Beardmore: The History of a Scottish Industrial Giant* (London: Heinemann, 1979), 53.
24. Ibid., 52, 55.
25. See Edward H. Lorenz, *Economic Decline in Britain: The Shipbuilding Industry, 1880-1914* (Oxford: Clarendon Press, 1991), 19-20.
26. SA, Firth Brown Records, Box 341 (A), C. E. Ellis to John Brown & Co., 30 November 1909.
27. Firth Brown, Box 341 A (1), C. E. Ellis, Coventry Report, December 1909.
28. Hulme and Moss, *Beardmore*, 56.
29. Ibid., 78-9.
30. Ibid., 79.
31. Trebilcock, 82.
32. Firth Brown, Box 341 A (1), COW, Managing Directors' Report, 12 November 1905.
33. Firth Brown, Box 341 A (1) COW, Board of Directors' Minutes, 8 January 1909.
34. Firth Brown, Box 341 A (3) Coventry Report for John Brown & Co. Ltd by C. E. Ellis, 26 September 1907.
35. Firth Brown, Box 341 A (1), COW, Managing Directors' Report, 10 November 1910; Box 341 A (3), 11 July 1912.

36. For the technical and administrative problems at COW see Warren, *Steel, Ships and Men*, 123-4.
37. Firth Brown, Box 341 A (3), C. Gow, General Manager London Joint Stock Bank to W. J. Davis, Secretary COW, 25 July 1912.
38. Firth Brown, Box 341 A (3), W. J. Davis to R. Middleton, John Brown, Sheffield, 13 September 1912.
39. Kenneth Warren, *Armstrong of Elsworth. Growth in Engineering and Armaments to the Merger with Vickers* (Basingstoke: Macmillan, 1989), 95.
40. NA, CAB 37/114/11, W. S. Churchill, Summary Draft Naval Estimates, 1 January 1914.
41. This was a rather paradoxical position taken by Churchill, for in 1909, prior to his appointment to the Admiralty, he had joined the Chancellor, David Lloyd George, in attacking the naval estimates. See John Grigg, *Lloyd George. The People's Champion, 1902-11* (London: Penguin, 2002), 98.
42. NA, CAB 37/111/83, Memo. by Rear Admiral E. C. M Troubridge, 28 June 1912.
43. NA, CAB 37/105/17, Memo. by W. S. Churchill on the Naval Estimates, 3 February 1911.
44. Kennedy, *The Rise and Fall of British Naval Mastery*; Andrew Lambert, *Admirals: The Naval Commanders who Made Britain Great* (London: Faber and Faber, 2008), 289-334.
45. NA, CAB 37/118/6, Memo. by W. S. Churchill on Naval Estimates and other documents, 10 June 1914.
46. NA, CAB 27/118/6, The Battleship Programme 1914-15, Memo. prepared by the Sea Lords for Churchill (Enclosure 1), 18 December 1913. *The Engineer*, 17 August 1908, gave a slightly shorter construction period for a British built dreadnought battleship of 24 months, but confirmed the 36 months for a German one.
47. *Engineer*, 105, 3 January 1908: 17.
48. Warren, *Armstrong of Elsworth*, 93-4.
49. Trebilcock, 87.
50. Warren, *Armstrong of Elsworth*, 95.
51. *Engineer*, 8 April 1910: 363.
52. *Engineer*, 11 March 1910: 249.
53. *Engineer*, 17 February 1911: 144-5.
54. *Economist*, 14 January 1911: 47.