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Armstrongs and Vickers Become Armament Firms

The Challenges They Faced and the Strategies They Developed

The Industrial Revolution began in Europe and emanated outwards. A key feature of the era was the rapid pace and continuous cycle of military technological change. As David Stevenson recounted, in the century and a half prior to the 1840s naval and land armaments had scarcely changed, but from then on industrialization had a transformative effect on destructive capabilities.[1] The technological and industrial capacities needed to manufacture modern weapons demanded major changes in the way that the British state procured weaponry, with the government turning to private firms to create armaments that had proved beyond their technological – and financial – capabilities and for wartime production surges.[2]

Innovations came especially fast in the naval sphere, with important and costly technological advances in gunnery, speed and torpedoes. Constantly improving seaborne artillery meant that ships needed ever heavier armor, leading to a dependence on private suppliers.[3] As Lord George Hamilton noted, "After 1860 each subsequent decade outdid its predecessor in the improvements and development of power – so much so that fighting ships were almost obsolete before they had completed their first commission."[4] The Admiralty still led in ship design, but even here private firms created designs to catch the eye of the First Sea Lord and to sell abroad.[5]

Determined British entrepreneurs such as William Armstrong, Joseph Whitworth, William Beardmore, Charles Cammell, John Brown, Thomas Vickers and Albert Vickers – and the competition between them – propelled armament developments from 1855 onwards.[6] An incentive for many entrepreneurs (except Armstrong) to begin armaments production was the intense

[1] Stevenson, *Armaments*, p. 15.
[2] After France launched the first ironclad, *La Gloire*, in 1859, the shipbuilding market expanded quickly. Slaven, *British*, pp. 44–45.
[3] Grant, *Steel*, pp. 20–21.
[4] Hamilton "Introduction," in Manning, *William White*, p. v.
[5] Lyon, "Admiralty," pp. 37–64.
[6] Bastable, *Arms*; Harkavy, *Arms Trade*, p. 32; Hume and Moss, *Beardmore*; Scott, *Vickers*; Trebilcock, *Vickers Brothers*.

competition in the civilian iron and steel markets.[7] Our two firms, colloquially known as "Armstrongs" and "Vickers," became vital sources of technological innovation and capital investment in armaments production. They are now discussed in turn.

The Armstrongs Origin Story

William Armstrong's shift into armaments manufacture has been recounted several times.[8] He was "the son of a Cumberland yeoman and born in Newcastle in 1810."[9] Although Armstrong initially trained for the law, his heart was in engineering and in 1847 with friends he formed W. G. Armstrong & Co., with a site at Elswick, to manufacture his innovative hydraulic engines and cranes.[10] The first ever hydraulic crane was installed at the Albert Dock in Liverpool in May 1848, earning the firm £1,000. That year, while the crane business was growing, the firm sought to diversify into locomotive production, but this was a failure.[11] At the 1851 Great Exhibition, Armstrong demonstrated his hydraulic cranes and hydraulic engines (though it was the German firm Krupp's six-pound cannon that won the gold medal).[12] By the 1850s Armstrongs products were transforming docksides.

In 1854, during the Crimean War, the War Office asked Armstrong to design a submarine mine capable of blowing up the Russian ships that had been sunk and were blocking Sevastopol harbor.[13] This he did, and although the War Office did not deploy the mines, "what was important about the incident was that Armstrong had been taught to think about military matters, and had been provided with acquaintances in the War Office."[14] By November Armstrong was turning his mind to guns.

As his longtime associate Stuart Rendel later recounted, William Armstrong's real shift into armaments came out of a combination of problem solving and patriotism. Armstrong and James Rendel, Stuart's father, were animated by newspaper accounts of the problems that British soldiers experienced in moving and firing guns at the 1854 Battle of Inkerman. James Rendel set Armstrong the task of designing a better gun, which Armstrong did quickly and with good effect. "[B]y the following month he had designed a gun on entirely new

[7] Grant, *Rulers*, pp. 4–5.
[8] Rendel, *Personal Papers*; McKenzie, *W.G. Armstrong*; Warren, *Armstrongs*; Bastable, *Arms*; Heald, *William Armstrong*.
[9] Cochrane, *Romance*, p. 166.
[10] Fairbairn, *Elswick* records that the works commenced in 1847, "this date being shewn on weather vane on old blacksmiths shop," VA, Doc. 593.
[11] Warren, *Armstrongs*, p. 256.
[12] Picard, "Great"; Payne, *Private Spies*, p. 129.
[13] Cochrane, *Romance*, p. 167.
[14] Scott, *Vickers*, p. 25.

principles and had also himself interviewed the Duke of Newcastle, then War Minister, who gave him an order to make up to six guns to his design."[15] In all, twenty-three inventors were given money to develop their ideas.[16] William Armstrong received £7,219 toward his work on large, wrought-iron, rifled breechloaders and was aided by the brilliant inventors James Nasmyth and Isambard Kingdom Brunel.[17] His 3-pound model was submitted to the War Office in July 1855, followed by a 5-pound model in 1856; and "within two years he had an 18-pounder."[18] At Elswick Armstrong spent £12,000 on building a gun shop.

The Armstrong Gun, utilizing a build-up method of construction, was trialed by a commission against models designed by others, including Joseph Whitworth (igniting a bitter rivalry). As the Secretary of War informed Parliament in 1859, "The Report of the Commission was that, after giving the fullest attention to the subject, they considered Sir William Armstrong's invention superior to all others." He explained:

> The great advantages of this gun were its extreme lightness, the extent of its range, and its accuracy. An Armstrong gun throwing a projectile of 18 lb. weighed one-third as much as the guns now in use discharging shot of that weight. The range of a 32 lb. gun, fired with a charge of 5 lb. of powder, was a little more than five miles and a quarter. … The precision of the gun was still more extraordinary than its range. The accuracy of the Armstrong gun at 3,000 yards was as seven to one compared with that of the common gun at 1,000 yards; while at 1,000 yards it would hit an object every time which was struck by the common guns only once in fifty-seven times; therefore, at equal distances, the Armstrong gun was fifty-seven times as accurate as our common artillery. Its destructive effect, also, exceeded anything which had hitherto been witnessed.[19]

Unfortunately, the Crimean War was over before the War Office accepted the Armstrong Gun in 1859. With reports of the gun's success, the Royal Navy requested "in the strongest manner" that the War Office supply them with a "large number" of 70- and 110-pounders.[20] In 1859 Armstrongs' 7-inch, 110-pound, rifled breechloaders were fitted to the Isaac Watts designed HMS *Warrior* without having undergone naval trials. Ultimately the cast iron guns

[15] Fairbairn, *Elswick*, p. 50; William Armstrong, "Report on the Construction of Wrought Iron Field Guns," July 14, 1855. TNA, WO 33/11.

[16] Whitworth was given nearly £13,000 to develop rifling machinery for small arms. Bastable, *Arms*, pp. 28–29.

[17] Armstrong received "by far the largest amount." Bastable, "Breechloaders," p. 218.

[18] Bastable, "Breechloaders," p. 221.

[19] House of Commons Debates, Army Estimates – Supply. March 4, 1859, *Hansard* Vol. 152, c. 1319.

[20] Bastable, "Breechloaders," p. 225. Citing "Report from the Select Committee on Ordnance," *Parliamentary Papers* 11 (1863), p. 5.

could not withstand the shock created by the propellant, exactly as Armstrong had warned.[21]

In accepting the Armstrong Gun, the War Office implicitly acknowledged that it was beyond anything the Royal Arsenal at Woolwich could produce. According to the firm's historian, patriotism dominated Armstrong's motives: He "had not patented his new inventions and furthermore he had declined the £20,000 reward which was offered him, so the Government took out patents in his name for the guns and their complete outfit, and by an Act of Parliament, withheld publication of the patents."[22] Marshall Bastable also sees Armstrong's actions as an astute political move because "[i]n return he demanded a guarantee that the capital investment in the new company would not be lost if the government decided to build all the guns at Woolwich or contract them out to others."[23] In 1859 Armstrong was given a ten-year contract (backdated to April 1, 1856 so as to cover the expenses that he incurred in developing his gun) as Engineer for Rifled Ordnance to the War Office, a knighthood and an annual salary of £2,000, plus payment for the "draughtsmen employed by him" and his travel expenses. His contract specified he was to "give his best attention to the maturing and perfecting of his system of rifled ordnance." It gave him "authority to direct the methods to be adopted and the conditions to be observed in the construction of such articles" at Woolwich Arsenal.[24] As Bastable notes, in addition to training Army engineers to make his guns, Armstrong would use his position to "develop his build-up method for larger guns at government expense."[25]

With Sir William in government service, his former associates in Newcastle formed a new department at Elswick, named The Elswick Ordnance Company, financed with public capital.[26]

> The Partners … were Mr. Cruddas, Mr. Lambert and Mr. George Rendel, while the capital guaranteed by the Government was £50,000, afterwards increased to £85,000. The new Company engaged to work solely for the British Government, and their charges were to be checked by Government auditors … The beginning of this Company can be dated as January, 1859, the date of a formal agreement between the three above-mentioned partners and General Peel, Secretary of State for War.[27]

[21] Bastable, "Breechloaders," p. 225; Armstrong testimony at the Select Committee on Ordnance, 1863.
[22] Fairbairn, *Elswick*, p. 58.
[23] Bastable, "Breechloaders," p. 223.
[24] "Definitions of Sir William George Armstrong's Duties as 'Engineer for Rifled Ordnance' and forms of his appointment," signed by Sir William Armstrong, February 23, 1859. Wiltshire and Swindon History Center, 2057/F8/V/A/32, paragraphs 1 and 4.
[25] Bastable, "Breechloaders," p. 224.
[26] "History of Sir W. G. Armstrong's Introduction of his Gun, with Reports of Experiments &c.," pp. 3–5. TNA, WO 33/9.
[27] Fairbairn, *Elswick*, p. 60.

The Elswick Ordnance Company received a grant to extend the factory and plant, and the government held a monopoly over the Armstrong Guns it produced.[28] Sir William played no active role in the firm, though this was not precluded by his contract.[29] At Elswick "[t]he utmost secrecy was preserved, and the intrusion of foreign observers was rigorously prevented."[30] Stuart Rendel marveled: "Considering … the bitter contentiousness over the private manufacture of rifled ordnance, it is noteworthy that a single private firm should have enjoyed so great and profitable a monopoly without cavil."[31]

In London Sir William was elected to the Athenaeum Club, where his friend James Rendel was already a member. This started a tradition of the firm's management becoming members of that gentlemen's club.[32] Despite this handy connection to the elite, things were hard for Sir William: "[H]e was assailed by inventors over whom he had obtained preference."[33] There was continuing conflict with the indefatigable Whitworth, who complained that "to place him in office at the War Department was to prejudice the fair consideration of all new ideas not emanating from himself" and still refused to accept that Whitworth guns were inferior.[34] Moreover, despite the appearance of advantage, Sir William's experience of government service was frustrating because Woolwich Arsenal was outmoded and – like the War Office – was stacked with conservative figures hostile to innovation. There was also parliamentary concern that Armstrong was now the inspector of the guns made by his former partners at Elswick.[35] Regardless, in three years Sir William had rebuilt Woolwich to independently manufacture Armstrong Guns, leading the government to terminate Elswick's contract. Sir William returned to Newcastle and the new combined company of Sir W. G. Armstrong was formed. With the Armstrongs firm thus established, this chapter now turns to the birth of the firm that became its major rival, Vickers.

The Vickers Origin Story

There are fewer published accounts of the origins of Vickers, partly because it is more a story of managerial competence, hard work and the search for profits

[28] House of Commons, "Minutes of Evidence Taken Before the Select Committee on Ordnance," July 2, 1862. *Report of Committees Vol. VI* (1862), question 35, p. 2; Pearton, *Diplomacy*, p. 80.

[29] It stated: "8th Sir William George Armstrong shall remain at liberty to carry on his present business, or any other in which he may think proper to engage." "Definitions of Sir William George Armstrong's Duties," paragraph 8.

[30] "Andrew Noble," p. 266.

[31] Rendel, *Personal Papers*, pp. 271–72.

[32] Wheeler, *The Athenaeum*, p. 27.

[33] Fairbairn, *Elswick*, p. 63.

[34] Rendel, *Personal Papers*, p. 274; Bastable, *Arms*, pp. 75–78; Tennent, *Story*, pp. 333–44.

[35] Parliamentary Question from Sir Frederick Smith, August 3, 1860, *Hansard*, Vol. 160, c. 654; Motion for a Select Committee from Mr. Henry Baillie, House of Commons, June 13, 1867, *Hansard*, Vol. 187, c. 1789.

than a glamorous tale of patriotic endeavor and burgeoning elite connections.[36] According to Douglas Vickers' 1920 *History of Vickers*, there had been a firm with the Vickers name since around 1750.[37] The steel dynasty began with the marriage of miller Edward Vickers (1804–1897) to Anne Naylor (1804–1881) in August 1828. Anne was the daughter of George Naylor, who, along with his son William, was a partner in a local steel melting firm. William Naylor also independently had a rolling mill.[38] In 1828 George Naylor and his new son-in-law, Edward Vickers, founded Messrs. Naylor, Vickers and Company, to produce steel for objects such as cutlery, tools and files, operating two works, the River Don works at Wadsley and the Sheffield Millsands works.[39] Naylor Vickers had an agency in the United States selling steel products, where German émigré Ernst Benzon went to work and flourished.[40] After George Naylor senior retired in 1829, Naylor, Hutchinson & Vickers was formed by his son George Portus Naylor, Edward Vickers and John Hutchinson. The firm operated the Millsands and River Don works, a file manufacturer in Orchard Street and a forge at Wadsley Bridge, and had representation in New York.[41]

Edward Vickers saw the potential of the railways for the nation, as new business for Naylor, Hutchinson & Vickers, and for improving the firm's supply chain. During the 1830s he was involved in committees for the Sheffield and Manchester Railway, the Sheffield and Rotherham Railway, the North Midland Railway and the Doncaster, North Midland and Goole Railway.[42] By the 1840s Edward was an established figure in Sheffield and was continuously active in local politics. Over time his political affiliations moved to the right, in parallel with those of most members of the Sheffield merchant and manufacturing class.[43] He unsuccessfully stood for Alderman in 1843.[44] Edward was the elected mayor of Sheffield in 1847–8 and the 1851 census recorded the merchant and steel manufacturer as being an Alderman and Borough Magistrate.[45] Successive members of the family and managers of Vickers were members of the Sheffield Club, established in 1843, which "acted as a centre for information on political and financial developments

[36] The classic published accounts are Scott, *Vickers* and Trebilcock, *Vickers Brothers*. Scott's *Vickers* is an excellent account, but he provides few citations to the specific documents in the Vickers Archives he drew from, making it hard to trace his primary sources or to check his interpretations.

[37] Vickers, *History of Vickers*, 5th draft, March 18, 1920. VA, Doc. 762, p. 1.

[38] Tweedale, *Giants*, pp. 65–72.

[39] White, *Formation*, p. 68; "1930 Industrial Britain: Vickers-Armstrongs Limited."

[40] Vickers, *History of Vickers*, Older Draft, p. 1, Folio 4. This draft puts the date as the 1860s, but Naylor & Vickers was active in Sheffield in 1852. Tweedale, *Steel City*, p. 51, Table 1.4.

[41] "Naylor," Citing "1933 History and Directory of Sheffield, Rotherham," in "Naylor, Hutchinson, Vickers and Co.," *London Gazette*, August 12, 1834.

[42] "Edward Vickers," *Grace's Guide*.

[43] White, *Formation*, pp. 206 and 220–21.

[44] White, *Formation*, p. 148.

[45] "Edward Vickers," *Grace's Guide*.

in the rest of the country and the world," taking many newspapers and business journals.[46] This was not a gentleman's club, but a functional business organization. In 1854 Edward Vickers was involved in the creation of a "Sheffield Exchange and News Room," where the businessmen of the city could meet and receive their telegrams. On March 2, 1857 he became president of the new Sheffield Chamber of Commerce: "[I]ts aims were to further the interests of Sheffield trade, and to provide a conduit for effective lobbying of Government."[47] In the same year Edward supported a local Tory candidate and signed a petition in favor of the pro-trade government of the Whig Lord Palmerston and, as president of the Chamber of Commerce, personally presented it to the prime minister.[48]

Two of Edward Vickers' sons, Thomas Edward (1833–1915) and Albert (1838–1919), finished their technical schooling in the 1840s with spells in Germany.[49] Thomas studied in Neuwied-on-the-Rhine and Albert in Hamein-on-the-Weser.[50] In 1854 these talented young men joined the family firm. Thomas was an excellent metallurgist and engineer, who by the age of twenty-eight had patents to his name.[51] Albert was an effective manager and salesman for the firm. The firm was flourishing and in the mid-1850s Vickers brought German "melters" to Sheffield to introduce pioneering crucible processes for making complex steel castings, and by 1860 the firm was successfully producing steel bells, steel castings and steel railway tires.[52] Thomas managed the Sheffield plants from about 1855, and Albert "spent a considerable portion of his life in the United States, representing the Firm."[53] It would be a further two decades before Vickers entered the armaments market.

With our two firms now established, this chapter turns to the three main challenges that private firms faced in selling armaments to the British Government and around the world.

Challenge One: *Laissez-faire* and Free Trade Policies

When Armstrongs and Vickers emerged, the British Government was strongly committed to *laissez-faire*, the principle that governments should not control business, and to free trade. Consequently, the government would not help

[46] White, *Formation*, pp. 36–37.
[47] White, *Formation*, pp. 204, 200.
[48] White, *Formation*, pp. 199, 204 and 209.
[49] Tweedale, *Steel City*, p. 150.
[50] "Colonel Thomas Edward Vickers"; "Albert Vickers."
[51] Scott, *Vickers*, p. 14.
[52] Tweedale, *Steel City*, p. 47; "1930s Industrial Britain: Vickers-Armstrongs Limited."
[53] Vickers, *History of Vickers*, 5th Draft, p. 6. This seems an exaggeration of his time in the United States, though he did marry an American. Wilson, *Middle-Class*, p. 41. Albert did not live in Sheffield, though. Census records show he lived in turn in London, Alderminster, London and Eastbourne. "Albert Vickers," *Grace's Guide*.

struggling businesses, provide any subsidies or help firms market overseas. Firms were independent actors and sank or swam by their own efforts. The bastion of *laissez-faire* thinking within the government was the extremely powerful Treasury, though the Foreign Office and Diplomatic Service also strongly upheld the doctrine. The Treasury exercised an iron grip on spending and had no qualms about disciplining a department that might want to stray from the approved line.

The commitment to *laissez-faire* and free trade also empowered the government to give short shrift to the rights of firms. Firms were regarded as something to be used in the interests of the state. For example, in the early part of this era patents seem to have been ignored as often as they were acknowledged. This favored Armstrongs when it was accused of stealing the inventions of Theophilus Blakely. The government's commitment to Armstrongs was absolute and it would not hear the patent complaint or allow competition, leading Blakely to leave Britain in 1863.[54]

In the 1880s the government's commitment to *laissez-faire* was challenged by the Long Depression and resulting mass unemployment. Lord Salisbury appointed a Royal Commission to investigate the causes and consequences of the depression, at which Thomas Vickers appeared as a witness.[55] However, the Commission's eventual report did not stray from *laissez-faire*.[56] The government also investigated Britain's overseas trade, resulting in the "Bryce Memorandum" of July 17, 1886, designed to boost exports.[57] James Bryce suggested "stimulating the interest of our present diplomatic and consular officers in commercial affairs and … giving them both a stronger motive and better facilities for activity in this department of their duties."[58] However, even after this political recognition that exports helped the state, the strong commitment to *laissez-faire* and free trade remained a "formidable" inhibitor to change within the Foreign Office and Diplomatic Service.[59] As a result, armament firms needed to conduct their own foreign policies.

Challenge Two: Class Prejudices

All firms faced a barrier to working with the government: class prejudice. As David McLean reported, in the 1880s there was a "social gulf which still divided the world of business and of British officialdom."[60] The resulting snobbery included distain for anyone who had to accumulate wealth through active

[54] Bastable, *Arms*, p. 36.
[55] Thomas Vickers, *Report of the Royal Commission*, p. 109, Q. 3438.
[56] Howe, *Free Trade*.
[57] "Memorandum by Mr. James Bryce," p. 5.
[58] *Report of the Royal Commission*; Bryce Memorandum, "Correspondence."
[59] Platt, *Finance*, pp. 102–40.
[60] McLean, "Commerce," p. 475.

work, that is, the middle and lower classes. Indeed, the term "trade" was used pejoratively. While social class was a barrier to trade generally, it was doubly so for "dirty" industries such as steel, armaments and warship production. Exacerbating this perception was the fact that many of the armament firms were begun by northern entrepreneurs in Newcastle, Glasgow, Sheffield, Manchester and Liverpool, meaning that most had northern accents, another point counting against them for the southern elite that dominated government and the civil service.[61]

Nevertheless, different attitudes toward Armstrongs and Vickers can be detected in British Government documents and secondary materials spanning this period, with Armstrongs generally more favored. Armstrong had clear patriotic motives for becoming engaged in armaments production, and this was appreciated.[62] His record of government service and his role as a prolific inventor all recommended him to the state. His support for local charities, his innovations at the home he built at Cragside, Northumberland, his connections to Liberal politics and his role in public life all increased his favor with Queen Victoria and the Prince of Wales. Reflecting this burgeoning relationship with the elite was his elevation to a baronetcy in 1887. As J. D. Scott reports, Lord Armstrong "had the gift, so important in British public life, of not seeming to try too hard, and this contributed to the position which the Armstrong firm enjoyed of being something more than a commercial organization, something more like a national institution."[63] The subsequent elevation of Armstrongs' Stuart Rendel to a peerage, the rotation of warship designers between the firm and the Admiralty (see Chapters 2 and 3) and the increasing prominence of the firm meant Armstrongs earned a degree of acceptance from government officials, enhanced by Sir William's courtly manner in all his dealings with the state.

By contrast, Vickers, while earning admiration for its industrial prowess and business savvy, was viewed differently. The firm built its reputation as an innovative steel and armament firm, not as an adjunct to the elite. The Vickers family did not build fancy houses or integrate into the British national elite.[64] Although Vickers supported some local charities this was not done to the same extent or with the panache of Sir William or fellow steelmaker Mark Firth of Sheffield, so did not lead to royal attention or invitations to Court.

[61] The southern English aristocracy's failure to compete with northern industrialists led those "gentlemanly capitalists" to focus on advancing imperialism. Cain and Hopkins, *British Imperialism*.

[62] Bastable, *Arms*, p. 109.

[63] Scott, *Vickers*, p. 89.

[64] Some fellow Sheffielders did pursue these routes: George Wostenholm built Kenwood House, Sir John Brown became a friend of Palmerston and Mark Firth hosted the Prince and Princess of Wales at Oakbrook in 1875 when they opened Firth Park to the public. Tweedale, *Steel City*, pp. 155–56 and 73; Wilson *Middle-Class*, p. 66.

The Vickers family played roles in local society as members of the Sheffield Club, the Chamber of Commerce, the Cutlers' Company and the Sheffield Exchange and News Room, all of which furthered their business interests and reflected their status as part of the local urban elite (or upper middle class). According to the *Daily Telegraph*, Albert "did not allow his energies to be frittered or his spirits to be disturbed by other pursuits: there were only two things in the world that interested him – his business and his shooting."[65] Albert Vickers' excellent moorlands may have helped cement relations with important foreign customers, and shooting and hunting were also increasingly fashionable among British industrialists.[66] Thomas Vickers was a local Justice of the Peace and a founder of the Hallamshire Rifles, in which by 1861 he and Albert were both Captains; the firm also provided Ensigns Natrop and Mitchell.[67] Tom was made a Colonel in 1884 after twenty-five years of service.[68] He was made a prestigious Sheffield Master Cutler in 1872. He and Albert were described by Scott as "very handsome men, and they had style. They were natural aristocrats, and looked it."[69] This may have been the perception in Yorkshire, but it did not carry to London.

After the turn of the century more of Vickers' management had been in government employment, but they tended to have been in technical, rather than political, positions. Locally Douglas Vickers was made a Master Cutler 1908 and was a Conservative Member of Parliament for Sheffield Hallam in 1918–22, though he "was one of the most silent" MPs.[70] Overall, the family did not interact with the southern elite in the way that Armstrongs' directors did. Moreover, the businessmen of Vickers were at least as interested in keeping strong connections with financiers and bankers as they were in building relations with the British Government.[71] While the directors of the firm were patriotic, they were also strategic in that patriotism and government officials understood that. This perception of Vickers lingered late into the 1920s and the firm had to consistently strategize to overcome these prejudices.

Challenge Three: Departmental Resistance

The final challenge that armament firms faced in dealing with the British Government was the resistance of some departments. Bastable has perceptively

[65] Tweedale, *Steel City*, p. 143. Citing *Daily Telegraph*, July 16, 1919.
[66] Letter Book 12, May 16, 1904, January 4, 1910. VA, Doc. 1004; Albert hosted Grand Duke Michael of Russia at a shooting party in 1910. Trebilcock, *Vickers Brothers*, pp. 34, 128; White, *Formation*, p. 68.
[67] White, *Formation*, p. 85, Table 3.8.
[68] Hamilton, *Misses Vickers*, p. 27.
[69] Scott, *Vickers*, pp. 76–77.
[70] Tweedale, *Steel City*, p. 144.
[71] Trebilcock, *Vickers Brothers*, p. 129.

noted that armament firms experienced different relationships with the state depending on which ministries they were interacting with.[72] Initially the key departments for the armament firms were the Admiralty and the War Office (both in the thrall of the Treasury), and the Foreign Office and Diplomatic Service.

Interestingly, the initial relationship established between armament firms and a military service set up an enduring path dependency for future relationships, and there was considerable variation in paths between the services. From the first the relationship between Armstrongs and Vickers and the Admiralty was broadly positive – though not necessarily intimate – because armament firms were the only sources for resilient armor, heavy guns and mountings, and an increasingly important source for ships' hulls and design personnel. As former First Naval Lord Sir Richard Hamilton made clear in 1896: "It is highly important … for the country that happy relations should be preserved with contractors. Upon this depends the ability to increase upon emergency our constructive means."[73]

The Admiralty's needs drove generally positive relationships, particularly with Armstrongs, who supplied it with a succession of directors of naval construction. Around the turn of the century "relations between Vickers and the Admiralty remained formal and cool. Vickers might have hoped for a more sympathetic attitude from the Board, but their representations of matters directly affecting them were often rejected; as were those of Armstrongs."[74]

The Admiralty made a move early in the era designed to give itself more control over armament firms: It split all armor and ship contracts, even if the firm manufactured both, making delays "less easy to conceal than if they were hidden in the departments of one large firm."[75] This was frustrating to the major firms, who wanted to profit from whole deals. The distance the Admiralty sought from even key suppliers was justified, though, because the private firms had their own agendas; for example, Armstrongs and Vickers had a secret price fixing agreement between 1906 and 1913.[76] Additionally, sometimes firms sought to manipulate the Admiralty: "Not all tenders were genuine, since firms would occasionally tender at absurdly high prices solely for the purpose of gaining insight into the latest Admiralty designs in order to make use of them in their work for foreign navies."[77] This was effectively espionage, the hallmark of an armament firm thinking as a completely independent actor. In turn, the Admiralty sometimes undertook its own espionage, calling for firms to submit designs, ostensibly for production, but in reality to ascertain what innovations

[72] Bastable, *Arms*, p. 14.
[73] Hamilton, *Naval*, p. 179.
[74] Scott, *Vickers*, p. 51.
[75] Lyon, "Admiralty," p. 41.
[76] "Armstrong Whitworth & Co. Ltd: Arrangement with Vickers on Armament Orders 1906–13," VA, Doc. 551, Folios 135–37.
[77] Pollard, "*Laissez-Faire*," p. 107.

they had developed.[78] These design tenders also gave the Admiralty insights into what talent the firms had, and these people were then invited to sit on government committees, as happened to George Rendel of Armstrongs.

Overall, working with the Admiralty was a reasonably constructive experience for armament firms. By contrast, as Armstrongs found, producing Army artillery was a tortuous affair. The War Office fundamentally wanted to use products from the Royal Arsenals and disliked having to deal with private firms. Moreover, the procurement system was staffed by "fiscally and technically conservative officers and officials."[79] A major feature of the system from 1855 was the Ordnance Select Committee, which was tasked with both developing weapons indigenously and evaluating armament firms' gun designs, so "Woolwich was now in direct competition with the trade and yet had access to their secrets."[80] They were perfectly willing to harvest the best technologies from the private firms but unwilling to acknowledge ownership of these ideas or pay royalties. "The accusations made in the 1850s that the War Office stole designs from private inventors, were confirmed in the 1860s. After rejecting the designs of private inventors, the War Office and Admiralty coolly used them to build their own mix-and-match versions."[81] In response to these outrages, the armament firms eventually turned to politics and to the courts to gain redress. Moreover, "as Whitworth discovered in 1863–64, even a definitely superior product might not be accepted by procurement officials".[82] The relationship clearly posed dilemmas for firms: In putting forward design proposals to the War Office they risked them being stolen for the Arsenals, but the firms did not want to ignore potential sales opportunities. As Richard Davenport-Hines puts it: "Relations between these privileged manufacturers and their client were a strained mixture of wary collaboration and mutual exploitation."[83]

The relationships the Admiralty and War Office's air branches established with the emerging private aircraft producers shows path dependency from their existing relationships with armament firms. The Army controlled production, with the Royal Aircraft Factory at Farnborough playing a dominant role in Army aircraft design and manufacture. Armstrongs and Vickers only produced for the Army using designs from the factory.[84] For the Army, the

[78] Between 1859 and 1880 the Admiralty called for ship designs on five occasions. From all these competitions, the Admiralty approved only one design, and then reluctantly, the Lairds-built *Captain* designed by Cowper Coles, which unfortunately sank on her maiden voyage, taking her inventor with it.
[79] McNeill, *Pursuit*, p. 278.
[80] Bastable, *Arms*, p. 28.
[81] Bastable, *Arms*, p. 37.
[82] McNeill, *Pursuit*, p. 278.
[83] Davenport-Hines, "British," p. 147.
[84] Hayward, *British*, p. 10.

private sector's role was just to provide talent they could harvest. By contrast, the Admiralty's more positive view of private industry endured. Keith Hayward records: "The Admiralty … tended to look both to private industry and to the Royal Aircraft Factory for aircraft for the Royal Naval Air Service."[85]

The challenges that Armstrongs and Vickers experienced with the services were only magnified in their dealings with the Foreign Office and the Diplomatic Service, which were institutionally disinclined to help firms trade internationally thanks to a difficult combination of ideology, snobbery and organizational culture. Their strong commitment to *laissez-faire* and free trade was a significant barrier to their providing any trade assistance. The most diplomats would do was to try and ensure equal treatment for British firms in foreign competitions and to speak out against the imposition of tariffs on imports. Of course, *laissez-faire* was also a convenient excuse for diplomats disinclined to act for firms.

The Foreign Office and Diplomatic Service were bastions of snobbery. Martin Horn highlighted the Foreign Office's "dominant aristocratic ethos," which denigrated finance and trade.[86] The Foreign Office recruited mainly from the upper classes. The 1914 Royal Commission on the Civil Service found that the Foreign Office was the second most expensive in the world – and the most snobbish. As late as 1919 half of the clerks on the Foreign Office list had been to Eton, though Sir John Tilley commented defensively that "the critics have been too ready to assume that the Service suffered in consequence."[87]

Zara Steiner reported: "The Diplomatic Service, an entirely separate service, was even worse, more exclusive than the Foreign Office in social background and education. Diplomats spent almost all of their professional lives abroad, moved only in restricted social circles and took little or no interest in commercial affairs."[88] Until 1919, men without a minimum private income of £400 a year were barred from joining the Service. Candidates were also expected to know at least two languages, which generally meant having spent several years studying abroad, limiting the pool to the rich and well-connected. Diplomats were also expected to personally pay for any losses incurred on Diplomatic Allowances due to currency fluctuations. This was only changed, with some difficulty, during the Great War.[89]

Francis Hirst, editor of the *Economist*, gave a "violently critical account" of the Diplomatic Service in testimony before the 1914 Royal Commission, claiming that the "only commercial agents received at the Embassies abroad were the agents – normally aristocrats, ex-officers, or officials – of the great armament companies" and that other branches of trade were not afforded such Embassy

[85] Hayward, *British*, p. 9.
[86] Horn, *Britain*, p. 15.
[87] Tilley and Gaselee, *Foreign Office*, p. 88.
[88] Steiner, "The FCO," p. 20.
[89] Tilley and Gaselee, *Foreign Office*, pp. 68 and 87.

hospitality.[90] There is evidence that Armstrongs and Vickers' representatives were received at some – but far from all – British Embassies abroad.

The Foreign Office and the Diplomatic Service organizational cultures emphasized the practice of "high" politics, shunning commercial diplomacy. Substantive evidence of this had been gathered by Bryce and influenced his 1886 memorandum to Embassies.[91] The Foreign Office delegated trade issues down to the Consular and Commercial Attaché Services and there was no sympathy between them; retired Consul-General Sir Roger Casement bemoaned that "nobody in the Foreign Office has ever been a consul, or knows anything about the duties of a consul."[92] The Consular Service provided retrospective compilations of trade statistics, which, Bryce had noted, were not produced sufficiently regularly and were likely out of date before they were published.[93] The Service also avoided dealing with individuals or firms.[94] Rather, the armament firms relied mainly on their own intelligence gathering and local networks in their search for sales and consistently complained that the governments of other countries – such as Italy, Germany and the United States – gave their armament firms much more help. It was not until the early twentieth century that "the Foreign Office was willing … to put traders in touch with possible markets by means of introductions through consular officials."[95]

Intervention on behalf of individual firms therefore fell to the – extremely reluctant – Diplomatic Service. In 1907 Foreign Secretary Sir Edward Grey asked all British missions overseas to delegate one person to assist British businesses. This had little impact.[96] David McLean has suggested that the Foreign Office operated on two levels during the nineteenth century, the "official" and the "unofficial," arguing that while it was hard to move the Foreign Office officially, diplomats did more unofficially to aid British trade in China.[97] There is some evidence of Armstrongs and Vickers getting some unofficial help, but usually the firms were completely autonomous. Prior to 1914 any government help abroad was unsystematic; it depended on the willingness of individual diplomats to informally act for firms and on the ability of the firms' representatives to find those amenable diplomats. According to Davenport-Hines, "The relations of a company like Vickers with the Foreign Office were always those of a government supplier dealing with a department of its main

[90] Platt, *Finance*, p. XVIII; Royal Commission on the Civil Service, *Parliamentary Papers*, Cmnd. 7749.
[91] "Correspondence," Part I.
[92] Royal Commission on the Civil Service.
[93] Platt, *Finance*, p. 140.
[94] Platt, "Role," pp. 494–97.
[95] Platt, "Role," p. 504.
[96] Boyce, "Economics," p. 11.
[97] McLean, "Commerce," pp. 464–76.

customer. There was deference, and the Foreign Office always dictated the pace and direction of events."[98]

After the turn of the century the "the ripples of government circled ever wider."[99] Now in addition to maintaining relations with the military services and the Foreign Office and Diplomatic Service, the armament firms had to build relationships with a wider range of departments, including those in charge of factory inspections and taxation. This expansion of government involvement was somewhat eased for manufacturers by the growing presence of a new generation of civil servants, one drawn from a broader swath of British society and less susceptible to the class prejudices of their predecessors.

Armament Firms' Strategies and Tactics

To deal with these perennial challenges and other issues that arose, Armstrongs and Vickers developed a suite of strategies and tactics.

Strategy One: Building and Maintaining Relationships in Britain

Cultivating relationships with the British state was vital for both firms. A benign – but ideally favorable – relationship with the British Government was necessary not only for facilitating domestic purchases and for official legitimation of their products, but also, once regulation of armaments exports began, for permission to sell abroad. Two types of relationships in Britain were important for armament firms. First, the relationships with elites, such as senior politicians, members of the aristocracy and the royal family; and second, the relationships with civil servants and the military, including the members of the services who oversaw trials and competitions, dealt with procurement and increasingly visited factories. These latter relationships were significant as civil servants held a lot of power in procurement decisions and their behavior toward armament firms early in the era reflected official distain for firms' profits, patent rights and survival. Armstrongs excelled at elite relations. Vickers would have liked to pursue an elite strategy, but impermeable upper-class resistance and institutional snobbery initially made that impossible. Instead, they built relations with key civil servants and military officials. From their unique experiences the two firms developed the following appropriate tactics:

Tactic 1: Relationship Enhancement through Interchanges of High-Level Personnel
Armstrongs focused on developing relations with the elite, enhancing those relationships through a tactic of interchanging high-level personnel, particularly with the Admiralty. Chapters 2 and 3 show Armstrongs' implementation of that strategy and Vickers' attempts to emulate it.

[98] Davenport-Hines, "British," p. 168.
[99] MacDonagh, "Nineteenth-Century," p. 17.

Tactic 2: Relationship Building through Selective Intelligence Sharing
Vickers did not have the elite connections of Armstrongs and found it harder to create them. Instead, Vickers tried to be useful as a substitute for being acceptable and sought to earn government respect by providing intelligence. Chapters 2–5 show this tactic in action.

Strategy Two: Building and Maintaining Relationships with Elites in Other States

Building relationships with elites in other countries was considered vital for securing foreign sales. Armstrongs and Vickers constantly conducted international diplomacy, aiming to build consistent relationships with foreign governments.[100] They had to be attuned to shifting politics in buyer countries. Following local politics was particularly important in the coup-prone countries of South America (see Chapter 6), in China (Chapter 7) and in Turkey (Chapter 8), all places where politics could change fast. In international markets Armstrongs and Vickers needed extra tools to build these relationships, especially given international competition. Two tactics were normal practice and considered vital by Armstrongs and Vickers:

Tactic 1: Using Agents for International Diplomacy
The firms relied on agents to cultivate relationships with well-placed figures within foreign military and political establishments to gain consideration of their products. Successful "traveling ambassadors" for the firms were effective communicators; they were usually cosmopolitan by nature and credible to foreign governments thanks to either prior military service, technical expertise or connections. The firms also used lawyers who understood local laws – and the actual practices – in the countries where they were selling armaments.[101]

Tactic 2: Commissions and Bribery
Providing bribes and commissions in markets where they were a normal part of business was routine for Armstrongs and Vickers.[102] All types of firms paid bribes and commissions. These business methods looked unsavory from the vantage point of well-regulated democratic systems, and certainly damaged the reputation of Vickers-Armstrongs during the 1930s. However, the British Government never cut ties with the firms over bribery and in the case of Venezuela in 1950 endorsed Vickers-Armstrongs' payment of bribes to the military junta (see Chapter 6).

[100] Krupp of Germany had a similar strategy for exports, involving agencies, representatives, bribes and presents, "though their success was mostly limited. Like its British rivals, Krupp could thus neither create demand nor decisively influence governmental decisions about armament contracts." Epkenhans, "Military-Industrial," p. 17.
[101] Miller, *Britain*, p. 142.
[102] Scott, *Vickers*, p. 81.

Strategy Three: Excluding Competitors

Armstrongs was a first mover in armaments production, but by the mid-1880s Vickers was beginning to compete. Ideally, Armstrongs wanted to keep Vickers out of the domestic market and limit the firm's impact on the international market. However, that proved impossible. By the early twentieth century the two firms had pragmatically set aside many areas of competition and now worked together to try to exclude other firms from the domestic market. This strategy was in Armstrongs and Vickers' interests but was directly opposed to those of the British Government, which wanted to keep the oligopoly loose, as competition kept prices down and encouraged innovation.

Strategy Four: Cooperating and Colluding with Other Firms

While Armstrongs and Vickers initially competed fiercely with each other and with other domestic and foreign firms, at times there was cooperation, and even collusion. While many of these secret alliances were domestic, some were international. Domestically, these alliances were usually to keep prices comparable (for example, for armor plate) and were regarded as a defensive strategy against British Government attempts to play firms off against each other in procurement competitions. In lean times, the arrangements sometimes included creating "rings" or "trusts" for setting high prices and splitting the profits with unsuccessful bidders to keep them in business, meaning that the appearance of competition was a chimera. Sometimes the British Government tolerated these behaviors. Revelations about these collusive strategies badly rebounded on armament firms in the 1930s, but for decades these behaviors served them well.

Strategy Five: Diversifying

When business was lagging, armament firms undertook various strategies of diversification, including:

Diversification into Exports:
A major diversification strategy was into foreign markets. Basil Collier noted that armament firms sought to sell abroad to compensate for a lack of orders at home.[103] This problem certainly brought Armstrongs into the international market (see Chapter 2). Diversification into exports could help smooth out the peaks and troughs of domestic procurement cycles. However, according to Clive Trebilcock, when orders for Vickers were scarce at home they were also scarce abroad.[104] This was certainly true for all firms during the 1908–11 recession and again during the interwar period.

[103] Collier, *Arms*, p. 4.
[104] Trebilcock, *Vickers Brothers*, pp. 76–77.

Once export relationships were established, international connections were retained for their intrinsic value and profits; they became essential to the firms' strategies. Between 1868 and 1927, 42 percent of Armstrongs' warship tonnage was exported. Sidney Pollard noted that in the 1880s the profits from ship exports were larger than those from domestic sales, increasing the incentives to export.[105] From Vickers' entry into the warship market in 1896 to the 1927 amalgamation, Barrow was more tied to the Admiralty and exported only 18.4 percent of its warship production.[106] Krupp of Germany found that "In contrast to the domestic market, where aggressiveness and high prices could seriously affect the relations with the army or the navy, the foreign market did not know any such restrictions."[107] The effort put into foreign relations by Armstrongs and Vickers is evidence that the economic rewards of international exports were consistently important to them. But what if protectionism locked them out of a foreign market? Firms then turned to different diversification strategies.

Diversification through International Subsidiaries and Partnerships:
Diversifications into subsidiaries and partnerships were strategic decisions for Armstrongs and Vickers, involving forming long-term relationships within – or even with – a particular state, and rested on their assessments of future procurement decisions and likely profits. These were initially completely independent decisions. Even after 1889, if nothing breached the new Official Secrets Act, the British Government had no say in them. These diversifications carried significant risk, requiring that a firm transfer technology, plant and knowhow to a recipient country.[108] A partnership might involve sharing these with another firm, possibly an erstwhile rival. Forming a local subsidiary or partnership was therefore usually a defensive strategy to maintain market access.

Technological and Sectoral Diversifications:
These could be into adjacent armament fields (near diversifications) – for example, the move from guns into gun mountings. They could be along their supply chain – for example, buying a coal mine or a railway used by a yard (backwards integration) – or into producing the warships, tanks or aircraft to carry the guns they manufactured (forwards integration). Diversification could also be into completely new technologies or sectors (sectoral diversifications) – for example, Armstrongs and Vickers' moves into railway equipment and motor car production, and their interwar forays into various civilian markets (far diversifications).

[105] Pollard, "*Laissez-Faire*," p. 107. Citing evidence to the 1887 Government Committee on Contracts.
[106] Brook, *Warships*, p. 19, Table 1/5.
[107] Epkenhans, "Military-Industrial," p. 20.
[108] Krupp refused to establish subsidiaries, refusing to enable "other countries to manufacture good artillery material themselves." Epkenhans, "Military-Industrial," p. 19. Citing Memo, "Erfahrungen im Kriegsmaterial-Gescha ft mit dem Auslande," p. 73.

Strategy Six: Financing

In terms of finance for private firms to develop and produce armaments, the British Government provided no upfront capital (the development of the Armstrong Gun being a notable exception). Firms were expected to fund research and development themselves. Financing for innovations in armaments therefore came from the fruits of private firms' own labor, either from the profits made on contracts or from raising private capital. Those latter investments initially came from the families and friends of entrepreneurs. Later, wealthy backers, including prominent politicians, military leaders and industrialists, bought preferential shares in armament firms. If the armaments they developed were successful, a firm might then receive a British Government contract.

A notable feature in international markets was that the states that wanted armaments were often short of money. This made working in the international market very different – and much riskier – than making domestic sales. Therefore, financing strategies were often a make-or-break element for securing and completing an export. This was Vickers' forte and providing recipients access to finance was a very successful strategy for the firm.

Strategy Seven: Innovating

Existential to all private armament firms' survival was the need to create products that attracted new orders. While both Armstrongs and Vickers began as innovative and nimble firms, after 1900 Armstrongs gradually lost its innovative edge and became weighed down by internal disputes. By contrast, various technologically risky moves by Vickers paid off handsomely in armament orders. This developed into a unique Vickers organizational culture; they consistently innovated in times of poor orders – at considerable risk – developing new products and building new machinery so that they were ready to secure new business when the opportunity came.

Summary

For a century, Armstrongs and Vickers and the amalgamated Vickers-Armstrongs consistently pursued all these strategies: building and maintaining relationships with the British elite and civil servants; developing international relationships; competing or collaborating with other firms; diversifying when necessary; financing sales; and innovating.

Importantly, though, the ways in which the two firms were perceived by the state had an impact on the emphasis each firm placed on individual strategies and tactics. Armstrongs put more emphasis on elite relationships, naval sales abroad and exchanges of personnel with the Admiralty, whereas Vickers put

more emphasis on investing in research and development, generating financing and providing intelligence to the government. Ultimately it was Vickers that survived and Armstrongs that went under in the brutal downturn of the interwar period, the better businessmen winning out over a firm with more elite connections. The next four chapters chart the fortunes of our two firms in dealing with their most important customer, the British Government.