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The British Gunpowder Industry and the Transatlantic Slave Trade

How did Atlantic slavery stimulate British industry? This article answers that question through a study of five firms that supplied gunpowder to the slave trade. It first demonstrates that the Atlantic slavery trade certainly expanded Britain's explosives industry during the eighteenth century. British merchant capitalists established five plants in the proximity of Bristol and Liverpool to meet African demand, provincializing the gunpowder industry for the first time. The slave trade also inflated the gunpowder industry's volume, with twelve percent of all powder going to Africa before abolition. This article next reveals that supplying the slave trade was likely a lucrative pursuit for British manufacturers, with investors in the five mills earning profits that exceeded those of slaving. The boost given to the explosives industry faded considerably as abolition neared, however, and so this article concludes that Atlantic slavery's stimulus was likely of limited importance for driving the later Industrial Revolution.

Keywords: slave trade, gunpowder, Africa, Atlantic slavery

During the eighteenth century, millions of firearms were shipped from Britain to Atlantic Africa where they were traded for enslaved people. Scholars have argued that this deadly exchange was crucial for the development of Britain's arms industry. Atlantic Africa was a large

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export market for British gun makers, helping to considerably grow the industry's output, especially in peacetime when the state purchased few weapons. The drive to meet Africa's growing demand for low-quality guns also spurred the expansion of the firearms industry beyond London to the emerging industrial center of Birmingham—the center of arms making by the late eighteenth century. The impetus given by the African trade helped to create a private arsenal from which the British fiscal-military state could be supplied in wartime. Arms makers who had grown their businesses via the slave trade continued to thrive after abolition by selling their deadly wares to both the state and export markets, Africa included. The synergistic relationship between the British arms industry and the transatlantic slave trade has therefore been offered as clear evidence of Eric Williams's famous hypothesis that Atlantic slavery was a key driver of Britain's Industrial Revolution.[1]

Much less scholarly attention has been paid to gunpowder—the fuel for the gun-slave engine that was so important to the transatlantic slave trade's operation. While gunpowder comprised only a small proportion of the goods used to acquire slaves—approximately 5 percent by value—it is nonetheless an ideal case study of the relationship between British manufacturing and Atlantic slavery. Unlike textiles, metals, or beads, which were typically re-exported, gunpowder was—like firearms—principally manufactured in Britain through a complex and multi-staged semi-industrial process. The archives of five firms that supplied gunpowder to the slave trade are extant, making the explosive perhaps the best documented good used to purchase slaves.[2] Historians have previously examined these five archives individually to grasp how the businesses operated and gunpowder making's place within regional

[1] W. A. Richards, "The Birmingham Gun Manufactory of Farmer and Galton and the Slave Trade in the Eighteenth Century" (MA thesis, University of Birmingham, 1972); Joseph Inikori, *Africans and the Industrial Revolution in England* (Cambridge, 2009), 457–467; Emrys Chew, *Arming the Periphery: The Arms Trade in the Indian Ocean During the Age of Global Empire* (London, 2012); Priya Satia, *Empire of Guns: The Violent Making of the Industrial Revolution* (Palo Alto, 2019). Eric Williams, *Capitalism & Slavery* (Chapel Hill, 1944); Maxine Berg and Pat Hudson, "Slavery, Atlantic Trade and Skills: A Response to Mokyr's 'Holy Land of Industrialism,'" *Journal of the British Academy* 9 (Nov. 2021): 272–273.

[2] The major collections are for powder mills at Woolley (DD/SH/27, Somerset Heritage Centre [SHC], Taunton, UK); Thelwall (D157/MT, Derbyshire Record Office [DRO], Derbyshire, UK); and Low Wood (DDLO, Lancashire Archives [LA], Preston, UK). The first two collections principally comprise financial accounts; the latter includes both accounts and several hundred letters exchanged between the firm's investors. Smaller sets of records are available for plants at Sedgwick (WD/W, Cumbria Archive Centre, Kendal [Kendal]), UK); and Littleton (Jonathan Barry ed., *The Diary of William Dyer: Bristol in 1762* [Bristol, 2012]). Each firm examined here was named after its partners; Low Wood was Fayrer, King & Co, for example. Because the partnership structures of the companies typically changed over time, I have instead used the names of the mills, in the case of Littleton and Low Wood; or, in the case of Sedgwick, Woolley, and Thelwall, the names of their locales.

economies.[3] While some of these scholars have highlighted the slave trade's importance to the five firms' development, broader studies of Britain's gunpowder industry have concluded that Atlantic slavery was marginal to overall growth, which was driven instead by domestic demand from the military and miners.[4] Exploring the relationship between gunpowder making and the slave trade can therefore help to interrogate the importance of enslavement for the growth of British industry. Focusing on the business histories of the five powder-making firms can simultaneously reveal the identities of the investors who supplied the slave trade, the profitability of making goods used to acquire slaves in Africa, and the fates of the manufactories that fed goods into the trade after abolition—important topics that have received surprisingly scant scholarly attention.[5]

Through an examination of five firms that manufactured gunpowder for the slave trade this article first demonstrates that the Atlantic slave trade did play an important role in expanding the British gunpowder industry. Merchant capitalists—most of them slave traders—established the five new plants in the proximity of Bristol and Liverpool specifically

[3] See Brenda J. Buchanan, "Capital Investment in a Regional Economy: Some Aspects of the Sources and Employment of Capital in North Somerset, 1750–1830" (PhD diss., University of London, 1992); B. J. Buchanan, "The Africa Trade and the Bristol Gunpowder Industry," *Transactions of the Bristol & Gloucester Archaeological Society* 118 (2000): 133–156; Alice Palmer, *Low Wood Gunpowder Company Its Inception and Early Growth 1798–1808* (London, 1998), Robert Vickers, "The South Lakeland Gunpowder Manufacturing Industry, 1764–1936" (PhD diss., Lancaster University, 2003).

[4] For regional studies that emphasize the importance of domestic markets or that ignore the slave trade, see P. N. Wilson, "The Gunpowder Mills of Westmoreland & Furness," *Transactions of the Newcomen Society* 36, no. 1 (1963): 47–65; E. M. Patterson, *Black Powder Manufacture in Cumbria* (Faversham, 1995); A. G. Crocker, Glenys Crocker, M. J. Wilks, and K. R. Fairclough, *Gunpowder Mills: Documents of the Seventeenth and Eighteenth Centuries* (Woking, 2000); Ian Tyler, *The Gunpowder Mills of Cumbria: A History of Cumbria's Gunpowder Industry* (Keswick, 2002). No general study emphasizes the importance of Africa to the growth and spread of gunpowder technology or manufacturing. See, for example, J. R. Partington, *A History of Greek Fire and Gunpowder* (Cambridge, 1960); Brenda J. Buchanan ed., *Gunpowder: The History of an International Technology* (Bath, 1996); G. I. Brown, *The Big Bang: A History of Explosives* (Stroud, 1998); Jack Kelly, *Gunpowder: A History of the Explosive That Changed the World* (London, 2004); Brenda J. Buchanan ed., *Gunpowder, Explosives and the State: A Technological History* (London, 2016).

[5] Studies of the businesses supplying goods to the slave trade are remarkable for their absence, although Anne Ruderman's volume should help to redress this. See *Supplying the Slave Trade* (Forthcoming, Yale University Press). More work has been done on the metallurgical businesses that were spurred by Atlantic slavery, the slave trade included, for which see Nuala Zahediah, "Colonies, Copper, and the Market for Inventive Activity in England and Wales, 1680–1730," *The Economic History Review* 66, no. 3 (2013): 805–825; Chris Evans and Goran Ryden, "'Voyage Iron': An Atlantic Slave Trade Currency, Its European Origins, and West African Impact," *Past & Present* 239, no. 1 (2018): 41–70; Nuala Zahediah, "Eric Williams and William Forbes: Copper, Colonial Markets, and Commercial Capitalism," *The Economic History Review* 74, no. 3 (2021): 784–808.

to meet African demand. As with gun making, the slave trade therefore drove the provincialization of British industry. The slave trade also helped to inflate the volume of the explosives industry, with just over a tenth of all powder produced in Britain prior to 1807 going to Africa. This article next reveals that supplying the slave trade was likely a lucrative pursuit: the five plants explored here made powder that was designed specifically for the African market, enabling their investors to earn high profits that matched, and even exceeded, the returns to be made from slave trading. The boost given to powder making by the slave trade faded considerably as abolition neared, however, by which point the works surveyed here comprised a specialized sub-sector of a much larger industry. The slave trade nonetheless lays the foundations for the gunpowder industry in north-west England—which would become a key center for blasting powder production during the nineteenth century. This article therefore concludes that the slave trade did spur the growth of Britain's explosive industry—especially its provincialization—but was by no means that industry's primary driver.

The Slave Trade and the Growth of the British Gunpowder Industry, 1698–1808

Although Africans encountered gunpowder from the moment of European contact, the explosive remained little used until the introduction of flintlock muskets in the seventeenth century. African consumers eagerly embraced these new weapons not only for warfare but also for hunting, as status symbols, and as valuable trade items: by abolition, Britons alone annually brought approximately two hundred thousand weapons to Atlantic Africa. Over the course of the eighteenth century, the volume of powder imports used to fire these weapons increased exponentially: in 1698, the English brought just fifty-four thousand pounds of powder; by 1750, annual imports from Britain had increased sixfold. Captives were acquired with proportionately more powder from the second quarter of the eighteenth century onwards providing a further boost; in the thirty years before abolition, Africans annually acquired a million pounds of gunpowder from Britons, on average—enough ammunition to fire a musket more than twice every second throughout that thirty-year period (Figure 1).[6]

[6] For the firearms trade to West Africa, see Gavin White, "Firearms in Africa: An Introduction," *The Journal of African History* 12, no. 2 (1971): 173–184; R. A. Kea, "Firearms and Warfare on the Gold and Slave Coasts from the Sixteenth to the Nineteenth Centuries," *The Journal of African History* 12, no. 2 (1971): 185–213; J. E. Inikori, "The Import of Firearms into West Africa 1750–1807: A Quantitative Analysis," *The Journal of African History* 18, no. 3 (1977): 339–368; W. A. Richards, "The Import of Firearms into West Africa in the Eigh-

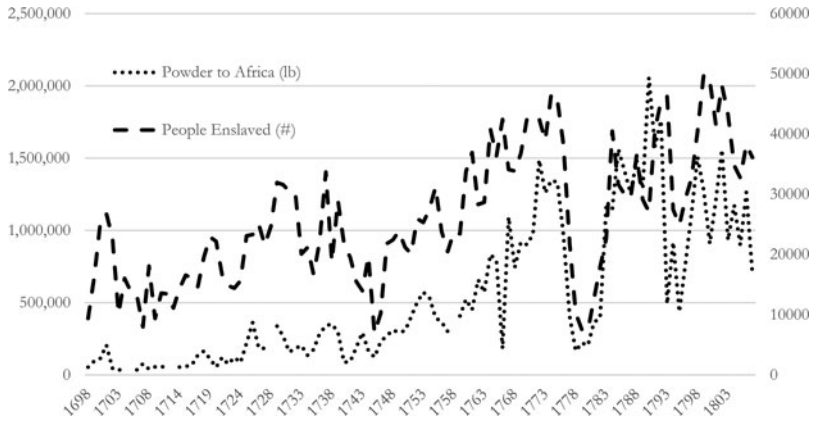

Figure 1. Powder exported to Africa from Britain (lb.) vs. enslaved people carried from Africa in British ships (#), 1698–1808. (Sources: Powder exports are drawn from "Ledgers of Imports and Exports," CUST3/1-82, The National Archives, Kew, United Kingdom [TNA], and "States of Navigation, Commerce and Revenue," CUST17/1-30, TNA, which provide annual totals of the volume and value of commodities exported from Britain c.1698–1807, gunpowder included, with the exception of 1705, 1713, 1728, 1735, and 1745, the ledgers for which are not available. I have downloaded each of the digitized ledgers from the TNA catalog and then extracted powder exports into an annualized series. Numbers of people carried from Africa by Britons is from the Trans-Atlantic Slave Trade Database, "Slave Voyages," accessed 27 Apr. 2023, www.slavevoyages.org.)

African slave sellers demanded a specific type of gunpowder that suited how they employed guns. Gunpowder is comprised of saltpeter, charcoal, and sulfur that is ground together in varying proportions (usually 70:15:15) before being graded according to its fineness. The best-quality powder was of a small grain, producing a sustained charge that was ideal for military and hunting weapons. Europeans discovered that Africans disliked such powder because it absorbed moisture easily in the topics; the explosive power of fine powder also threatened to burst the barrels of low-quality "trade guns" exported to Africa. Europeans therefore devised a specialist product known as "African," "Guinea," or "Trade" powder. While African powder lacked "quickness or strength," one manufacturer observed, it was "large grained, hard dried & of a

teenth Century," *The Journal of African History* 21, no. 1 (1980): 43–59. For the non-violent uses of firearms in West Africa, see especially Saheed Aderinto, *Guns and Society: Firearms, Culture, and Public Order* (Bloomington, 2018). The number of shots per second is based on each musket shot requiring one hundred grains of powder, which is equal to one seventieth of a pound weight. A million pounds of powder—the average annual export to Africa c. 1779–1808—would therefore fire 70 million shots; there are 31.5 million seconds in a year.

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quality that will keep a long time." Trade powder was also cheap at around half the price of the highest-graded products.[7]

Manufacturers in south-east England—the historic center of powder making owing to the army's and navy's vociferous consumption of the explosive—initially met the demand for African powder. Powder production in London was facilitated by the capital's trading links to India, the center of global saltpeter production, and the sulfuric islands of southern Italy. By 1700, approximately twenty works surrounded London, which furnished powder to the military, but also merchants, miners, sportsmen, and wholesalers.[8] The London-based Royal African Company—England's largest slaving company before 1700—ordered powder from these works. The London merchants that elbowed the RAC aside at the turn of the eighteenth century continued to obtain powder from nearby mills while also purchasing the explosive from Holland, itself a major exporter of gunpowder. London mills do not appear to have been founded specifically to supply the slave trade, however; African demand was met by manufactories that also supplied a variety of buyers, especially the military.[9]

Provincial merchants, who supplanted Londoners as the largest British slave traders in the second quarter of the eighteenth century, established new plants specifically focused on producing African powder. Bristol's slave trade grew steadily from 1698 through 1721, a period when the town's merchants laboriously imported their gunpowder from London. To open a more direct supply, a consortium of four Bristol merchants erected a new powderworks in 1722 at Woolley, a hamlet ten miles to the east of the town (Figure 2). In 1749, another

[7] Christopher Wilson to Daye Barker, Kendal, 28 Dec. 1799, Box 2, Bundle 9, DDLO, LA ("quickness"). For the early history of African powder, see Kea, "Firearms and Warfare," 204–205.

[8] For India saltpeter production, see David Cressy, *Saltpeter: The Mother of Gunpowder* (Oxford, 2013), 121–135; Susil Chaudhuri, "Saltpetre Trade and Industry in Bengal Subah, 1650–1720," *Proceedings of the Indian History Congress* 34, no. 1 (1973): 263–270; James W. Frey, "The Indian Saltpeter Trade, the Military Revolution, and the Rise of Britain as a Global Superpower," *The Historian* 71, no. 3 (Fall 2009): 507–554. For sulfur production, see Daniel Cunha, "The Frontier of Hell: Sicily, Sulfur, and the Rise of the British Chemical Industry, 1750–1840," *Critical Historical Studies* 6, no. 2 (2019): 279–302. For powder making around London, see Jenny West, *Gunpowder, Government and War in the Mid-Eighteenth Century* (London, 1991); Crocker et al., *Gunpowder Mills*.

[9] For the RAC's acquisition of powder, see the Committee of Goods' minute books in T70/126, 128, and 131, TNA. The RAC's powder exports are detailed in the company's invoice books outward; see T70/910-935, TNA. Humphry Morice, the largest private London slave trader in the early eighteenth century, ordered his gunpowder from Holland and London mills. See the accountbooks for his ships *Henry, Portugal,* and *Sarah* in The Humphry Morice Papers, Bank of England, London, UK. The London mills that furnished powder to the slave trade also had contracts with the state. See West, *Gunpowder, Government*, 197–211. For a London mill that focused almost entirely on supplying domestic demand, see Crocker et al., *Gunpowder Mills,* 107–172.

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Figure 2. Locations of the principal gunpowder works supplying Britain's slave trade, c.1722–1808.

consortia established a plant named Littleton in a secluded valley six miles to the southwest of Bristol. When Liverpool merchants seriously entered the slave trade in the 1730s, they sourced powder from Bristol, London, or Holland. These various sources apparently sufficed, as Liverpool's slave trade vaulted ahead of Bristol's and London's by mid-century. Limitations on the movement of powder imposed by the Board of Ordnance during the Seven Years' War (1755–1763), including

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an embargo on the shipping of powder from Bristol to Liverpool in 1762, spurred the local production of powder; in 1757, four Liverpool merchants built a new powderworks at Thelwall, a village twenty miles up the River Mersey.[10] In 1764, a group of Kendal businessmen founded another new works at nearby Sedgwick, which was linked to Liverpool via ports at the mouth of the Kent River. After 1764, Liverpool's slaving merchants sourced powder from the new sites at Thelwall and Sedgwick, but also continued to purchase from London, Bristol, and Holland.[11]

The continued growth of the slave trade, especially at Liverpool, encouraged the further expansion of powder production. In the early 1730s, new mills were erected at Woolley, doubling capacity; once expanded, the site could grind a hundred-pound barrel of gunpowder in just two hours. Output was also increased at Littleton in the 1760s through the construction of two new mills at nearby Chew Stoke and Chew Magna. Given that Bristol's slave trade declined after 1740, this capacity was almost certainly opened to supply Liverpool's expanding trade. The northern mills were also enlarged to feed Liverpool: four expansions were made to Thelwall's output between 1764 and 1774; in 1790—the peak year for powder exports to Africa—output at Sedgwick was increased by the construction of a new set of works down the Kent River at Basingill. The growing demand for powder at Liverpool

[10] For the founding of Woolley and Littleton, see Brenda J. Buchanan, "Bath's Forgotten Gunpowder History: The Powder Mills at Woolley in the Eighteenth Century," *Bath History Journal* X (2005): 72–96; Buchanan, "Africa Trade;" Barry, ed., *The Diary of William Dyer,* 7–30. For the transport of powder from Bristol to Liverpool, see West, *Gunpowder, Government*, 125. Dutch powder was typically trans-shipped aboard Liverpool ships via the Isle of Man; between 1718 and 1764, at least 4,650 barrels were sent to Africa from the island. See Frances Wilkins, *Manx Slave Traders: A Social History of the Isle of Man's Role in the Atlantic Slave Trade* (Kidderminster, 1999), 5. For powder embargos during the Seven Years' War, see West, *Gunpowder, Government,* 119–129; Barry ed., *The Diary of William Dyer,* 76–168; "1761-1762 Attempts to Produce Gunpowder for Govt Service and to Obtain Export License," DD/SH/27, SHC.

[11] For the establishment of Thelwall, see "Gunpowder works at Thelwall: Proprietors meetings, accounts and resolutions, 1759–78, with inventory and valuation of stock 1797," D157M/T3554, DRO. For Sedgwick's founding, see Vickers, "South Lakeland," 35–41; Tyler, *Gunpowder Mills,* 27–37. For Woolley supplying powder to Liverpool, see "Gun Powder Annual Accounts," c.1751–1758, DD/SH/27. William Davenport, one of Liverpool's largest slave traders c.1750–1788, principally sourced gunpowder from a mill at Ewell, near London; he also acted as an agent for Chauncy & Vigne, who produced powder at works in Faversham and Oare, near London. See *The Papers of William Davenport and Co., 1745–1797* (Wakefield, 1998). For London mills selling powder in Liverpool, see also Frances Wilkins, *The Hassels of Dalemain: A Cumberland Family, 1736–1794* (Kidderminster, 2003), 44–48. Baker & Dawson, the largest British slaving company c.1783–1793, sourced their powder, which amounted to two thousand to three thousand barrels a year in 1788, from Faversham. See "The Humble Petition of Miles Peter Andrew on behalf of himself and of Frederick Pigou the Elder and Frederick Pigou the younger his partner (1788)," in *American Papers in the House of Lords Record Office* (Wakefield, 1983), 2.23.

spurred the establishment in 1798 of another new plant named Low Wood, ten miles to the west of Sedgwick. Low Wood initially had two mills; in 1803, another was added to meet surging African demand. Britain's slave trade was thus supplied with gunpowder through the erection and then expansion of five new manufactories (two near Bristol, three near Liverpool) and from existing mills in London and Holland.[12]

The establishment and then expansion of the five new works necessitated substantial capital inputs because of the multi-staged and energy-intensive nature of gunpowder making. Each site had a plant that had to be housed within numerous buildings; Sedgwick, for example, had "about twenty different buildings" including the mills, magazines, a blacksmith, cooperage, and a sawmill. Weirs, races, and "cuts" also had to be constructed to channel waterpower to the mills. Constructing a new works hence required teams of hired tradespeople to work for at least a year—a period when the investors received no income. Large sums also had to be spent on powder's three ingredients, especially saltpeter; two of the firms took out bridging loans specifically to purchase precursors.[13] Once a works finally produced powder, sales were made on credits that typically stretched to a year, prolonging the wait for revenue. The sums invested in setting up powder works were consequently large: Woolley's owners had sunk £9,000 into the business by 1746, and Thelwall cost £9,577, of which £3,700 was invested in the plant; £2,203 in inventory, and the remainder—including the firm's profits—circulated as credit sales. Sedgwick and Low Wood were equally as costly at £10,000 and £13,800, respectively. Establishing the five plants thus required approximately £50,000 in capital.[14]

[12] For the expansion of the mills, see Woolley mill partnership agreement, 1733, DD/SH/27, SHC. "Memd relating to Gunpowder works," DD/SH/27, SHC (Woolley); Buchanan, "Africa Trade," 142 (Littleton); "Gunpowder works at Thelwall: Proprietors meetings, accounts and resolutions, 1759–78, with inventory and valuation of stock 1797," D157M/T3554, DRO (Thelwall); Tyler, *Gunpowder Mills,* 28, 33 (Sedgwick). For the slave trade as the motivation for the establishment of Low Wood, see the letters between Christopher Wilson Jr. and his partners, in Box 2, Bundle 9, DDLO, LA. Production was further maximized, especially when demand from the slave trade rose, by having the mills in operation "night & day without intermission." See Christopher Wilson Jr. to Daye Barker, Kendal, 15 Apr. 1800, Box 2, Bundle 9, DDLO, LA.

[13] Tyler, *Gunpowder Mills*, 27, 33 ("about twenty"). For hydraulics at powderworks, see Buchanan, "Bath's Forgotten Gunpowder History," 82–88. For the work required to establish a powderworks, see the correspondence for 1798–1799 detailing the creation of Low Wood, in Box 2, Bundle 9, DDLO, LA. The land for Thelwall was purchased in September 1757 but the manufactory was not in full operation until 1760. See "Gunpowder works at Thelwall" D157M/T3554. Low Wood's investors took loans of £5,699 by December 1800. See Vickers, "South Lakeland," 43. Woolley's annual accounts show total loans of £10,100 between 1751 and 1774. See "Gun Powder Annual Accounts," c.1751–1774, DD/SH/27.

[14] For the capital invested in the works, see "Gun Powder Annual Accounts from the Year 1746," DD/SH/27, SHC (Woolley); Vickers, "South Lakeland," 36 (Sedgwick), 42–43 (Low Wood); "Gunpowder works at Thelwall" D157M/T3554, DRO (Thelwall). The expansions of

Powder works were especially capital intensive when compared to alternative investments in the Atlantic World. In 1745, for example, nine Bristol merchants fitted out the slave ship *Jason Galley* to drag 450 people from the Gold Coast. The vessel and its equipment cost £1,939 and the cargo added a further £2,676—£4,615 in total, or roughly half the cost of Woolley. Establishing a plant was more comparable to founding Caribbean sugar plantations, which were capital intensive because they likewise involved the semi-industrial processing of raw materials; by 1774, a typical Jamaican sugar estate with a hundred enslaved people cost £10,000. Although equivalent to Caribbean plantations, powder mills were expensive when compared to other provincial investments. In Bristol's surrounds, for example, establishing a mine or paper mill in the late eighteenth century involved approximately £2,000 of fixed capital. The powder mills were likewise some of the most capital-intensive establishments in the northwest; only coke-fired iron works and textile mills exceeded Sedgwick and Low Wood in value. The founder of Low Wood was correct when he described his plant as a "great manufactory."[15]

The large sums used to establish the five works were obtained from two principal sources: Atlantic merchants, especially slavers, and local merchant-capitalists. Each of the five firms was founded by a partnership that ranged in size from three to five individuals, with each usually investing an equal share; twenty people initially founded the firms. Most of those individuals—eleven of the twenty—had previously invested in slave ships; most continued as slavers once the works were in operation. The Cunliffe brothers Ellis (1717–1767) and Robert (1719–1778), for example, enslaved eight thousand Africans as Liverpool merchants before co-founding Thelwall. Joseph Fayrer (1743–1801), an initial investor in Low Wood, raised his capital by captaining ships that carried over four thousand people into captivity. Four of the other twenty founders were connected to the Atlantic slave economy via the bilateral colonial trade; one of the Woolley partners was previously an attorney for Caribbean plantations. The remaining five investors, all of them partners in Sedgwick or Low Wood, were local capitalists who apparently aimed to profit from Atlantic slavery without directly enslaving people. John Wakefield (1738–1811), for example, was engaged in

the sites appear to have been financed through the reinvestment of profits rather than the addition of capital.

[15] Christopher Wilson Jr. to Daye Barker, Kendal, 28 July 1802, Box 3, Bundle 1, DDLO, LA ("great"). Accountbook of the *Jason Galley,* Bristol Record Office. For the price of a Jamaican plantation, see Edward Long, *History of Jamaica* (London, 1774), I, 459–460. For capital costs around Bristol, see Buchanan, "Capital Investment," 206–322. For capital costs in southern Cumbria, see Vickers, "South Lakeland," 33–34.

brewing; textile making; and Caribbean trade but not the slave trade, perhaps because of his Quakerism. He nonetheless profited from enslavement by establishing, and eventually owning outright, the Sedgwick plant. Wakefield's fellow Kendal businessman Christopher Wilson Jr. (1765–1845) likewise eschewed slave ships and plantations, but enthusiastically plunged his capital into producing powder that would be bartered for slaves at Low Wood. At least two women—the widows of deceased partners—also held shares in Woolley between 1753 and 1764. The capital that financed the powderworks thus emerged principally from the Atlantic slave economy but also encompassed individuals who held themselves aloof from the bloody business of slaving.[16]

These investors' collectively expanded the geographic distribution of the British explosives industry. Prior to 1722, gunpowder manufacturing remained entirely concentrated around London; no licensed provisional mill was in permanent operation. By century's end, the erection of five new works to meet the slave trade's demand had spread powder making into south- and north-west England for the first time. The creation of this manufacturing complex enabled provincial powder makers to dominate African markets. For example, in 1767—a peace year when Britain's slave trade was buoyant—just 18 percent of gunpowder exported from London went to Africa, versus 92 percent from the outports (principally Liverpool and Bristol). Londoners instead shipped most of their powder to the Americas (47 percent of exports) Europe (19 percent), and India (17 percent). Outport merchants sent no powder to India, less than 1 percent to Europe, and just 7 percent to the Americas. The expansion of the slave trade from the metropolis to the provinces was therefore mirrored by a simultaneous expansion of manufacturing to supply that trade (Figure 3).[17]

The slave trade also boosted the overall output of Britain's gunpowder industry (Figure 4). Between 1698, when detailed customs records documenting powder exports commence, and abolition in 1808, Africa

[16] For the investors in Woolley and Littleton, see Buchanan, "Africa Trade," 148–150. For the Cunliffes' slaving investments, see the Trans-Atlantic Slave Trade Database (TASTD), accessed 27 Apr. 2023, https://www.slavevoyages.org/voyages/UfElI321. For Ellis Cunliffe, see "CUNLIFFE, Ellis (1717–67), of Saighton Grange, nr. Chester" in *The History of Parliament*, accessed 26 Apr. 2023, https://www.historyofparliamentonline.org/volume/1754-1790/member/cunliffe-ellis-1717-67. For Fayrer's career as a slave ship captain, see TASTD, accessed 26 Apr. 2023, https://slavevoyages.org/voyages/hXrhhWXj/. For his investments as a slaving merchant, see TASTD, accessed 26 Apr. 2023, https://slavevoyages.org/voyages/NwmPFt8x. Fayrer also made substantial sums as a privateer. See Gomer Williams, *History of the Liverpool Privateers and Letters of Marque with an Account of the Liverpool Slave Trade, 1744–1812* (London, 1897), 229, 286. For the financers of Sedgwick and Low Wood, see Vickers, "South Lakeland," 35–45. For Christopher Wilson, see Olive Wilson, *Christopher Wilson of Kendal: An Eighteenth Century Hosier and Banker* (Kendal, 1988).

[17] "Ledgers of Imports and Exports," CUST3/71, TNA.

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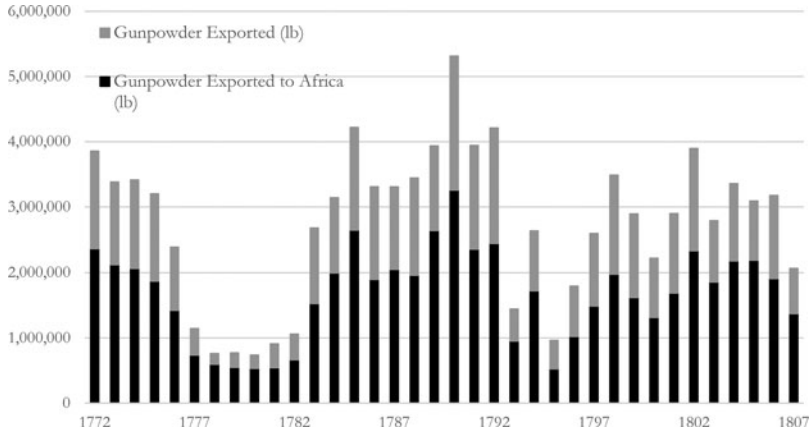

Figure 3. Gunpowder exported from Britain (lb.) versus gunpowder exported to Africa (lb.), 1772–1807. Note: The data are based on customs ledgers that provide total powder exports from Britain broken down by destination. The customs records prior to 1772 take a different format that makes it difficult to calculate the export markets for powder with the same level of precision. (Source: "States of Navigation, Commerce and Revenue," CUST17/1-30, TNA.)

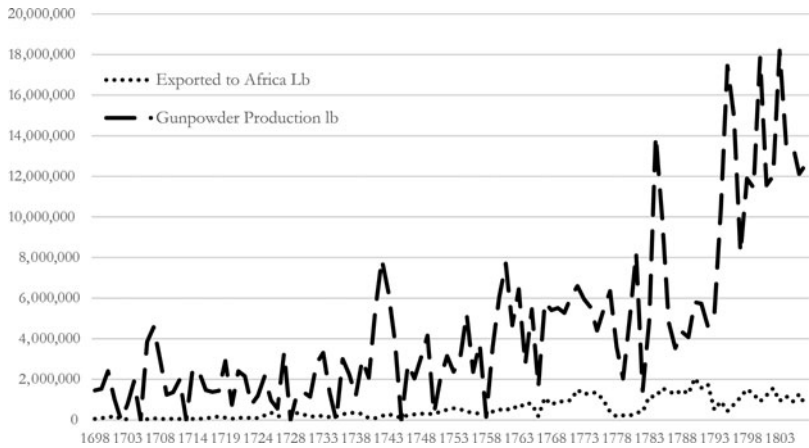

Figure 4. Total production of gunpowder (lb.) versus gunpower exported to Africa (lb.), 1698–1807. Notes: Saltpeter (which was principally imported from India) was almost entirely used for the production of gunpowder, and so the volume of powder produced in Britain can be determined by extracting the annual volumes of saltpeter imports (less any re-exports) from the customs ledgers and then multiplying those totals by 1.43—the ratio of gunpowder to its saltpeter content, by weight. The volume of powder exported to Africa annually is drawn from the same records. (Sources: "Ledgers of Imports and Exports," CUST3/1-82, and "States of Navigation, Commerce and Revenue," CUST17/1-30, TNA.)

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absorbed at least fifty-eight million pounds of British powder—twelve percent of total production. Across that period, Africa was by far the largest export market: between 1772 and 1807, 63 percent of exported powder went to Atlantic Africa—almost three times the quantity that was shipped to the Americas, the next largest zone. Africa's importance rose over the eighteenth century: at the opening of that century, the slave trade absorbed just 5 percent of British powder production; by mid-century, Africa imported twice as much of Britain's increased output; and between 1786 and 1792—the peak of the slave trade's importance—Africa consumed a third of production. Africa was an especially significant peacetime market, with 18 percent of output headed there in peace time versus just 8 percent in war. The slave trade's significance to the powder industry reduced considerably after the 1793 outbreak of the French Revolutionary Wars, though, as output was massively increased by London mills to supply the military; in the decade before abolition, Africa once again received around 8 percent of output. The slave trade was thus certainly important for growing the overall size and extent of the British gunpowder industry during the eighteenth century, but it was by no means the primary driver of growth.

Supplying the Slave Trade, c.1722–1807

British merchant-capitalists established new works because they hoped to profit by satisfying the slave trade's voracious demand for gunpowder. Earning those profits was not straightforward, though. Powder makers needed to convert their working capital into a product that had to meet the exacting standards of African consumers; sell it into a slave trade that fluctuated in volume year on year; and extend their capital, via credit sales, into a notoriously precarious business. Manufacturers who successfully navigated these myriad challenges stood to make large sums, though, offering an alternative way to profit by Atlantic slavery that bypassed the risks and moral opprobrium of owning slave ships or enslaving people.

Mill owners began the long process of earning profits by first processing saltpeter, charcoal, and sulfur into finished gunpowder. Gunpowder was a "perishable article" and so manufacturers set production targets based on forecasted African demand and ordered in precursors accordingly. Charcoal was usually obtained locally; Low Wood, for example, was supplied by wood coppiced from local forests that also fueled nearby iron furnaces. The other two ingredients came from Britain's expanding empire: sulfur was principally acquired from Sicily, where forced child laborers mined the volcanic element; and saltpeter,

which comprised 70 percent of gunpowder by weight, was sourced from India via London, where the East India Company held a twice-annual auction of the substance.[18] Having obtained the ingredients, a small team of mill workers set about converting them into gunpowder. Saltpeter and sulfur were refined to remove impurities and then tumbled together with charcoal to produce a "green charge." The charge moved into the incorporating mill—the heart of the plant—where heavy water-powered edge-runners ground the precursors together over several hours into a compacted "mill cake." A worker then forced chunks of the cake through a series of hair sieves of increasing fineness. The largest resulting grains were graded as African powder, and the remainder were categorized by a series of Fs to indicate increasing levels of fineness: with F the lowest, followed by FF, and so on. The graded powder was "glazed" by tumbling it in barrels and then dried for at least two days, with African powder dried for a longer period to ensure durability. The finished product was loaded into one-hundred-pound barrels and stored far from the works to await shipment to Bristol or Liverpool.[19]

Powder makers found customers for their finished product via agents working in Liverpool and Bristol, who were either partners within the powder-making firm or outsiders hired on commission. The two Bristol firms initially competed for local customers via their respective owners, most of whom were slaving merchants; Woolley also obtained custom in Liverpool via two agents, both slavers. In 1758, Woolley and Littleton combined their competing sales arms to form a single concern that had a permanent marketing office in the Bristol Exchange; the manufacturing arms remained distinct.[20] The new firm

[18] For the stockpiling of ingredients in anticipation of rising demand from the slave trade, see Christopher Wilson Jr. to Daye Barker, Kendal, 5 Nov. 1800, Box 2, Bundle 9, DDLO. Mill owners laid off workers or, in extremis, halted production when demand from the slave trade fell. See, for example, Barry, ed., "Diary of William Dyer," 81; Christopher Wilson Jr. to Daye Barker, Kendal, 21 Mar. 1800, Box 2, Bundle 9, DDLO. For the supply of charcoal, see Christopher Wilson Jr. to Daye Barker, Kendal, 24 and 28 Dec. 1799, Box 2, Bundle 9, DDLO. African powder was made with either oak or alder, which was cheaper than the "savin coal" that went into higher-quality products. For sulfur mining, see Cunha, "Frontier of Hell." For the shipping of sulfur, see Christopher Wilson Jr. to Daye Barker, Kendal, 31 Aug. 1799, Box 2, Bundle 9, DDLO; Barry, ed., "Diary of William Dyer," 12, 82.

[19] Christopher Wilson Jr. to Daye Barker, Kendal, 21 Mar. 1800, Box 2, Bundle 9, DDLO, LA ("perishable"). For the process of gunpowder making, see Crocker et. al., "Gunpowder Mills," 5–20. Each mill only had a small number of employees; Woolley had twelve men in 1747, for example. See "Memd relating to Gunpowder works," 1747, DD/SH/27, SHC. For the long drying of African powder, see the run of letters from Christopher Wilson Jr. between March and April 1800, in Box 2, Bundle 9, DDLO.

[20] The two Bristol companies were tied into the town's compact network of slave traders via their principal partners, most of whom invested directly in the ships or were related to slave traders. Abraham Hooke and Edmund Baugh—two of Woolley's founders—were both slave traders, as was Baugh's relative Stephen. Later investors in Woolley were likewise some of Bristol's largest slave traders. Littleton was founded by Jeremiah Ames, William Miller, and Isaac

continued to employ its Liverpool agents, who competed for business with representatives of the London and northern mills. In addition to making sales, agents also forwarded information on anticipated demand and feedback from African consumers—which could be used to set future production targets and adjust manufacturing methods. Sales agents were thus crucial links in a chain that tied British manufacturers to African buyers via slaving merchants; one agent observed that he could not sell "a single barrel" of powder if he was not "on the spot" in Liverpool.[21]

The presence of agents from numerous gunpowder mills in the major slaving ports made for a competitive market. While Woolley and Littleton apparently enjoyed a monopoly on gunpowder sales in Bristol, competition was fierce at Liverpool, with eleven different companies selling powder there by century end. Unlike London makers, who formed a price-fixing trust, the provincial powder makers ruthlessly cut prices to gain business. Slaving merchants understood this well and they drove hard bargains by playing agents against each other. In 1801, a three-year price war erupted between the northern mills, which drove out most of the Bristol and London makers. Their competitors gone, the three northern mills sold between 80 percent and 87 percent of all the powder vended in the town between 1801 and 1807. While supplying the slave trade was a cutthroat business, specialized firms that could produce a low-priced product that met stringent African demand thus thrived. Once an agent for a powder maker secured an order, they usually sold their powder on credits extending to a year. As the slave ship departed for Africa, the powder was winched aboard from magazines at the mouths of the Mersey and Avon Rivers. Crewmen then laded the explosive into small kegs holding between a pound and twenty pounds of powder, which were

Elton, all of whom were slave traders; members of Elton's family were slavers too. Woolley's Liverpool agents were Benjamin and Arthur Heywood. For the Heywoods' extensive investments in the Liverpool slave trade, see TASTD, accessed 1 May 2023, https://www.slavevoyages.org/voyages/j5dbgOGK. For the union of the Bristol mills, see Buchanan, "Africa Trade," 150.

[21] Joseph Fayrer to Daye Barker, Liverpool, 6 Feb. 1800, Box 21, Bundle 4, DDLO, LA ("a single," "on the"). Thelwall stationed Charles Craven, one of its partners, as an agent in Liverpool's center; Sedgwick likewise employed a full-time agent in Liverpool, who was later admitted to be the "Best" powder salesman in the town. See "Annual valuation and memoranda," 1759–1778, D157/MT, DRO; Joseph Fayrer to Daye Barker, Liverpool, 12 Mar. 1800, Box 2, Bundle 5, DDLO, LA. For Low Wood's agents, see Vickers, "South Lakeland," 45–-72. For changes to production in response to intelligence received from Africa, see the long series of letters from Joseph Fayrer in Liverpool to Christopher Wilson Jr., in Box 2, Bundle 5 and Box 21, Bundle 4, DDLO, LA. To further ensure their product met African demand, makers visited other mills to examine their production methods and compared prototypes to their competitors' wares.

used to purchase enslaved people in Africa. The ship next proceeded to the Americas, where the captives were sold, usually for bills of exchange drawn on a British banker. At the conclusion of the allotted credit period—by which time the ship had often returned—the slaving merchant finally paid for their powder, usually with a new bill of exchange drawn at three months but sometimes with bills from colonial slave sales extending to two or even three years. A year or more after the powder had been made, the manufacturer finally received revenue.[22]

Although lengthy, the completion of this cycle of production, sales, and debt collection was typically lucrative. Viewed in the aggregate profits at all the powder companies were high: Woolley returned 16 percent per annum, on average, between 1746 and 1807 (Figure 5). Profits at the other mills were equally impressive. Thelwall averaged a 21 percent annual return in its first eight years of operation, c.1761–1767; within four years of its founding, the partners had doubled their money. The accounts changed after 1768, making it difficult to track annual profits. Even so, the partners paid themselves a £900 dividend in 1774 and resolved to pay further dividends annually, indicating that the business remained healthy. After drawing out dividends, the company was still, by 1797, worth £23,959—a hefty return on the £9,577 initially subscribed. Accounts for Sedgwick show equally rapid growth: between 1788 and 1809, the company's capital value quadrupled. The nearby Low Wood works also thrived: by abolition—just eight years after the company was founded—the firm had cleared its loans and paid substantial dividends; by 1814, the partners' capital was fully repaid via dividends, and the company was worth £34,102—almost three times the initial investment.[23]

While profitable in the aggregate, annual returns from powderworks fluctuated considerably, especially between peace and wartime. Although provincial powder makers did not supply the military

[22] Extant accountbooks for Bristol slave ships all show powder being sourced from either Woolley or Littleton. See Accounts of the Molly Snow, SMV/7/2/1/25, Bristol Archives; Voyage accounts for the Swift (1759–1760). . ., 39654(2), Bristol Archives; Accountbook of the slave ship Hector (1756) for three voyages, AML/Y/1, National Maritime Museum; Accountbook of the Snow Africa, 1774-1776, G2404, Bristol Archives. See also, Barry, ed., "Diary of William Dyer." For competition at Liverpool, see Wilkins, *Hasells of Dalemain*, 44–48 and the Liverpool correspondence from Joseph Fayrer to Christopher Wilson Jr., in Box 2, Bundle 5 and Box 21, Bundle 4, DDLO, LA. For the market share of powder makers at Liverpool, c.1800–1807, see Vickers, "South Lakeland," 53. For the lengths of credits issued for sales and the receipts used to settle debts, see "Bill Book," 1799–1821, DDLO, LA. The Liverpool slaver *Earl of Liverpool* carried 155 barrels of powder, which was transferred into 10,075 powder kegs on its 1797 voyage to Bonny. See MS.10.50, Liverpool University Library. Each keg therefore held just over 1.5 pounds of powder.

[23] For Thelwall's profits, see "Gunpowder works at Thelwall: Proprietors meetings, accounts and resolutions, 1759–78, with inventory and valuation of stock 1797," D157M/T3554, DRO. For Sedgwick's and Low Wood's returns, see Vickers, "South Lakeland," 40, 45.

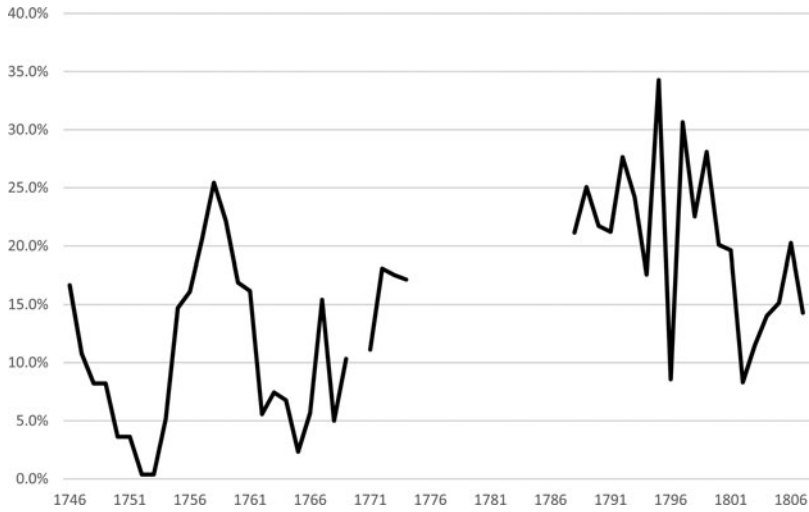

Figure 5. Annual profits of the Woolley gunpowder works, c.1746–1807. Notes: Gaps in the data are where annual profits accounts are not extant. (Sources: "Gun Powder Annual Accounts from the Year 1746," DD/SH/27, SHC; letters from George Dyer to Henry Strachey Jr, 1795–1801, DD/SH/27.)

because their product was of too low quality, the state's voracious demand for powder nonetheless bid up prices and with it the makers' profits. Woolley's profits soared during the Seven Year's War, for example, and again during the French Revolutionary Wars; the investors made a 34.3 percent return in 1795 alone (Figure 5). The quadrupling in the capital value of Sedgwick also occurred during the French Revolutionary Wars. Although often beneficial, war was not a guarantee of success in the competitive gunpowder-making industry, though, because war also depressed the slave trade. Thelwall's profits flattened considerably during the American Revolutionary War; in 1779—a nadir for Liverpool's slave trade—the firm suffered a deep loss. Low Wood likewise made little after its initial founding during the depths of the French Revolutionary Wars; in 1799 and 1800, loans were taken out and the partners subscribed additional capital. Joseph Fayrer, the company's Liverpool-based partner and agent, feared in early 1800 that the new firm would still not "yeald a profit or Incom sufficient for me to rely upon" and so he returned to captaining slaving voyages; he died in Africa. In the same period, Woolley's profits were squeezed by a combination of the collapse of Bristol's slave trade and the loss of market share at Liverpool. Although demand from the slave trade grew in peace years, the price of powder usually fell as the state withdrew from the market.

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Profits in peace years could hence be low, with Woolley's investors receiving just 0.4 percent on their capital in the years 1750 and 1751, for example. Although every powder company produced healthy returns for their investors in the long run, each firm's fortunes hence fluctuated, indicating that supplying the fickle slave trade was a volatile business.[24]

Although fickle, the profits of manufacturing for the slave trade likely exceeded those to be made via investing in the trade itself. Annual profits from slave ship investments averaged 10 percent—a third less than the average returns reaped by Woolley's investors. Profits in the slave trade were, however, even more unpredictable than in powder making: returns ranged from bonanzas of 100 percent or more through catastrophic losses. Powder making was certainly not without risk: the African export market was highly unpredictable and the business was uniquely vulnerable to accidental explosions destroying the investors' capital. Even so, manufacturers still made consistent returns by comparison to the slave trade; Woolley's partners, for example, never made a loss in the forty-four years for which accounts are extant. Supplying the slave trade must have thus been an important hedge against that trade's notorious risks as well as one of the most lucrative uses for provincial merchant capital.[25]

After abolition, 1800–1830. Historians have argued that African slave sellers faced a "crisis of adaptation" after abolition in 1807, as commercial slaving networks had to be reoriented toward the "legitimate" trade in tropical commodities. Powder makers confronted a similar

[24] Joseph Fayrer to Christopher Wilson Jr., Liverpool 2 July 1800, Box 21, Bundle 4, DDLO, LA ("yeald"). For powder prices, see "Gun Powder Annual Accounts from the Year 1746," DD/SH/27, SHC; Sales and Stock Accounts, c.1801–1808, Box 5, Bundle 13, DDLO. Unlike gunmakers, who shifted from selling to the slave trade into selling to the state in wartime, provincial makers could not meet the Ordnance Board's exacting standards for military-grade powder; Woolley and Thelwall attempted to produce such powder during the Seven Years' War, for example, but the Board rejected their samples. See "1761–1762 Attempts to produce gunpowder for Govt Service and to obtain Export License," DD/SH/27, SHC; West, *Gunpowder, Government*, 18. For Thelwall's profits, see "Gunpowder works at Thelwall: Proprietors meetings, accounts and resolutions, 1759–78, with inventory and valuation of stock 1797," D157M/T3554, DRO.

[25] For the slave trade's profitability, see David Richardson, "Profits in the Liverpool Slave Trade: The Accounts of William Davenport, 1757–1784," in *Liverpool, the African Slave Trade, and Abolition*, ed. Roger Anstey and P. E. H. Hair (Liverpool, 1976), 60–90. Woolley was one of the most profitable enterprises in Bristol's surrounds. See Buchanan, "Capital Investment," 315. Powder companies could not take out insurance on their works, and so a catastrophic accident could potentially ruin the business. For the risks of explosion, see Christopher Wilson Jr. to Daye Barker, Kendal, 25 Aug. 1802, Box 3, Bundle 1, DDLO, LA. The works were also prone to natural disasters; Sedgwick suffered a catastrophic flood in 1802 that temporarily halted production, for example.

crisis, as they were forced to pivot their business away from the slave trade, which had previously absorbed around 90 percent of their output.[26] The search for new markets began as abolition loomed, when powder makers targeted the mining sector. Miners had embraced the use of blasting powder (a slightly higher-graded product to African powder) during the early eighteenth century, but the sector nonetheless remained small at perhaps a third of the demand from the slave trade at mid-century. On the eve of abolition, though, the demand for blasting powder was growing exponentially as miners sought the coal and metals that would fuel Britain's Industrial Revolution. Provincial powder makers sought a share of this growing market as an alternative to the slave trade before abolition. Sedgwick, for example, sold blasting powder to nearby coal, lead, and copper mines by drawing on its owners' connections to Quaker miners; nearby Low Wood sold powder to a similarly expansive network of customers that collectively absorbed a tenth of the mill's output by abolition. Mining proved a stronger lifeline to the Bristol mills after they were squeezed out of the Liverpool market: by 1802, nearby tin and limestone miners annually consumed between 1,200 and 1,500 barrels of powder, a fraction of the six thousand to eight thousand barrels previously channeled into the slave trade by the two mills, but a sufficient market to sustain Littleton's operations; Woolley was nonetheless mothballed in 1803. Powder makers more fully embraced the mining market after abolition. A year after the slave trade ended, Sedgwick was, according to one historian, "working 24 hours a day, 6 days a week" making blasting powder. By the 1820s, Low Wood was likewise selling to mines and quarries across northern England and had begun to make inroads into Scotland. While mining could not entirely make up the loss of the slave trade, it did generate sufficient sales to sustain the mills through the initial post-abolition period: even with its Liverpool sales reduced to just 845 barrels

[26] For the "crisis of adaptation," see Paul E. Lovejoy and David Richardson, "The Initial 'Crisis of Adaptation': The Impact of British Abolition on the Atlantic Slave Trade in West Africa, 1808–1820," in *From Slave Trade to 'Legitimate' Commerce: The Commercial Transition in Nineteenth-Century West Africa*, ed. Robin Law (Cambridge, 1995), 32–56. For Low Wood's pre-abolition domestic sales, see the account ledger in Box 23, Bundle 3, DDLO, LA; Vickers, "South Lakeland," 49. The other works vended similarly small quantities of powder to domestic buyers before abolition. In 1777, for example, 89 percent of Thelwall's inventory in Liverpool was African powder, and the remainder was principally powder for the defense of slave ships and privateers. See Gunpowder works at Thelwall: Proprietors meetings, accounts and resolutions, 1759–78, with inventory and valuation of stock 1797," D157M/T3554, DRO; "Memorandum book of John Stanton," [1779–1784], D157M/T3373, DRO. Between 80 and 90 percent of Woolley's inventory c. 1746–1755 was likewise African powder. See "Gun Powder Annual Accounts from the Year 1746," DD/SH/27, SHC. For Low Wood's sales and powder prices, see the six-monthly accounts in Box 5, Bundle 13, DDLO, LA.

(down from 4,459 barrels in 1807), Low Wood's investors still made a 5 percent profit in 1810–1811 by vending to miners.[27]

Liverpool's resurgent Africa trade provided a second prop to the northern mills. Small quantities of palm oil had been imported from West Africa before abolition, but demand for the product soared after the slave trade ended as Britons found uses for the product in soap, candles, and as an industrial lubricant: British palm oil imports, most of which entered Liverpool, rose exponentially from 2,233 hundredweight in 1807, to 75,049 hundredweight in 1819. Gunpowder was, by value, one of the most important goods used to acquire palm oil: at the key oil market of Bonny, for example, purchasing a hundred tons of oil in 1822 required an assortment worth 17,500 bars (the Bonny currency), 10,500 bars of which was gunpowder. The growth of the palm oil trade enabled the northern mills to eventually rebuild their African market: in the 1820s, Low Wood's sales to Africa had recovered to pre-abolition levels. Selling to both African and domestic markets allowed the northern mills to continue operating profitably well beyond abolition. In 1810, for example, Thelwall's sales to Liverpool's Africa merchants still accounted for most (491.5 barrels) of its business. But mining now represented an equally important (440.5 barrels) market. These sales collectively generated an annual profit of 28 percent—equivalent to the large sums made before abolition. The mills in the southwest fared less well, likely because Bristol did not seriously enter the palm oil trade and the nearby mines absorbed relatively little powder: the two works were absorbed by a larger London competitor and, in the 1820s, shut down; Littleton has since been converted to private residences and Woolley is now a farm. With both mills gone soon after abolition, the slave trade therefore did little to implant the explosive industry in south-west England.[28]

[27] For the merger of the Bristol works, see the series of letters for 1803 in DD/SH/27, SHC. Tyler, *Gunpowder Mills of Cumbria*, 32 ("working"). For the use of blasting powder, see Ignacio Gonzalez Tascon, Juan Carlos Barrientos, Dolores Romero Munoz, and Amaya Saenz Sanz, "Black Powder in Mining: Its Introduction, Early Use, and Diffusion over Europe," in *Gunpowder*, ed. Buchanan, 205–218. Between 1756 and 1763, at least 14,232 barrels of powder were shipped to mines—just over a third of the powder exported to Africa in the same period—mostly from London mills. See West, *Gunpowder, Government,* 224–225. For the search for mining custom, see Vickers, "South Lakeland," 59–67; George Dyer to Henry Strachey Jr., Bristol, 17 Aug. 1802, DD/SH/27, SHC. For Low Wood's sales c.1802–1830, see the two accountbooks for the Liverpool magazine in Box 10, Bundles 17 and 27. For Low Wood's profits in 1810–1811, see Box 23, Bundle 6, DDLO, LA.

[28] For the growth in the African palm oil trade, see Jonathan E. Robins, *Oil Palm: A Global History* (Chapel Hill, 2021); Martin Lynn, "The West African Palm Oil Trade in the Nineteenth Century and the 'Crisis of Adaptation,'" in *From Slave Trade,* ed. Law, 57–57; B. K. Drake, "Liverpool's African Commerce before and after the Abolition of the Slave Trade" (MA thesis, University of Liverpool, 1974), 57–77. For the annual volume of palm oil imports to Britain, see Vickers, "South Lakeland," 58, 172 ("largest"). For the importance of gunpowder in acquiring

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The three other mills' success, by contrast, helped to establish a thriving powder-making industry in north-west England. Thelwall continued in operation until 1855, when a massive explosion flattened the site. Prior to the explosion, the adjacent village had been transformed by wealth flowing from the powderworks. Sedgwick and Low Wood survived longer and grew considerably; by the mid-nineteenth century, they were two of the principal manufactories in the Lakeland region. The profits flowing from the mills were channeled into textile making, brewing, and banking, spurring the economic development of the area. The mill owners also erected substantial country residences, helping to beautify a region that is now famous for its attractive countryside. Production of high explosives, cartridges, and fireworks continued at both Low Wood and Sedgwick until the 1930s, when the works were both closed. Prior to their closure, the two mills' success had encouraged the establishment of five new powder works—making Lakeland "the largest, most geographically concentrated center for the production of blasting powder in Britain" by the end of the nineteenth century. The Lakeland gunpowder industry's roots in manufacturing for the slave trade have been largely forgotten, however; Low Wood and Sedgwick are still remembered as having been founded to supply the region's miners. A clock atop Low Wood purportedly dating from before abolition nonetheless remains as a mute testament to north-west England's long history producing gunpowder for the slave trade.[29]

Conclusion

Britain's gunpowder industry received a clear and direct impetus from the transatlantic slave trade. The growing African demand for gunpowder spurred the establishment of at least five new manufactories, and these works collectively moved powder making away from London—laying the foundations of a provincial gunpowder industry that would continue to produce powder for African markets and miners long after abolition. Gunpowder works generated healthy profits for their owners, most of whom were slaving merchants, indicating that supplying the slave trade was perhaps more lucrative than the trade itself. Africa

palm oil and other tropical commodities in West Africa, see John Adams, *Sketches Taken During Ten Voyages to Africa between 1786 and 1800* (Liverpool, 1822), 116. For Thelwall's sales and profits in 1810, see "Valuation and costs of Thelwall Gunpowder Mills. . .," 1810–1811, D157M/T3553, DRO. For the closing of the Bristol works, see Buchanan, "Africa Trade," 152.

[29] For the destruction of Thelwall, see Vickers, "South Lakeland," 96. For the importance of the investors in Sedgwick and Low Wood to the wider Cumbrian economy, especially in banking, see, for example, Wilson, *Christopher Wilson*. For Sedgwick and Low Wood in the nineteenth and twentieth centuries and their importance for growing the Cumbrian explosives industry, see Tyler, *Gunpowder Mills*, 38–82, 106–154.

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also constituted the key export market for British powder makers throughout the eighteenth century, especially during peace times. The slave trade thus played an important and hitherto largely unacknowledged role in growing Britain's explosives industry. Atlantic slavery was not the explosive industry's main driver, though. The slave trade only absorbed twelve percent of gunpowder production prior to abolition, making Africa a major but not essential market. The slave trade's significance also fell considerably as abolition neared, indicating that Atlantic slavery's importance to British manufacturing was, as recent scholarship has argued, likely highest prior to the onset of Britain's Industrial Revolution.[30] Unlike gun making, there was also little connection between the slave trade's demand for gunpowder and the growth of Britain's fiscal-military state; none of the works surveyed here supplied the state before abolition because they made a specialized and low-quality product specifically for the African market. The slave trade's longer-term impacts were also geographically limited, with only the explosives industry in Lakeland growing out of the mills that were first established to meet the slave trade's demand. The example of gunpowder therefore indicates that Atlantic slavery's importance for stimulating British manufacturing before abolition is clear, but slavery's role in driving Britain's later Industrial Revolution is less obvious.

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[30] Trevor Burnard and Giorgio Riello, "Slavery and the New History of Capitalism," *Journal of Global History* 15, no. 2 (2020): 225–244.

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