The British Iron Act 1750: its context and impact

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ABSTRACT: In the Iron Act 1750, the British Parliament sought to encourage the production of iron in America, but to discourage its manufacture into finished wrought iron goods. It thus prohibited the erection or continuance of iron processing works of various kinds. This article examines these processes to provide context for the Act. It also reviews the returns that it required from colonial governors, which provide some details of the American iron industry at that period and particularly of existing works for the prohibited processes, and the extent and significance of iron imports from America.

The Iron Act is one of a number perceived by some American historians as the 'Intolerable Acts', by which the British interfered with the freedom of American colonists to trade with whom they liked; the Molasses Act of 1733 is a more notorious case. Bound up with this is the larger question of the right of the British Parliament to legislate in respect of British possessions overseas and the need of the British government to raise taxes to pay for wars, waged not only for the benefit of Britain, but also of its colonies. Draper (1996) provided a wide-ranging discussion of the subject. These larger questions will not be considered here in detail. The iron-related aspects of British imperial legislation were covered in detail many years ago by Bining (1933), but he does not seem to have discovered the returns by governors considered here. The Act lifted certain duties on iron imports from America but prevented the erection in America of further ironworks of certain kinds. This aspect of the Act may have been suggested by a petition from the ironmongers and smiths of Birmingham (JHC 25, 1038-9). The Act provided:

> 'That such pig or bar iron made in his Majesty's colonies in America may be further manufactured in this kingdom [Great Britain] be it further enacted that after [24 June 1750] no mill or engine for slitting or rolling iron, or any plating forge to work with a tilt hammer, or any furnace for making steel shall be erected or if erected continued in any of his Majesty's colonies in America' (British Statute, 23 Geo. II, c.29, s.9).

It then provided for a penalty of £200 for the erection or continuance of these. It deemed them to be a common nuisance, which governors, lieutenant governors and commanders in chief of any colony should abate, under a penalty for default of £500. They were also to provide certificates of what works already existed, under the same penalty for default (British Statute, 23 Geo. II, c.29).

Processing for manufacture

Iron was in this period usually made by a two-stage process. First iron ore was smelted with charcoal in a blast furnace. This produced pig iron containing 4-5%

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by weight of carbon, silicon or other impurities. This could be cast into pots, kettles, cannon, shot, or other goods. However, to produce a malleable product suitable for making nails, locks, hinges, horseshoes, edged tools and much else, a further process was needed. This was carried out in a finery forge, where iron was remelted in oxidizing conditions in a finery hearth, in effect to burn out most of the other elements. This produced a mass of iron (called a 'loop') which was drawn out into a bar under a powered hammer, the iron being reheated as necessary in another hearth called a chafery. The 'belly-helve' hammer, needed for this typically had a head weighing 5cwt. Iron could alternatively be made, on a smaller scale, direct from its ore in a bloomery, by reducing the ore to iron in the solid state with charcoal (Gordon 1996; Schubert 1957, 122-330; Tylecote 1992, 95-108; King 2020, 2-7).

The bars of iron were not a consumer good nor even yet suitable for use by craftsmen in many manufacturing trades. The final manufacturing processes were manual work undertaken by a variety of smiths and other artisans. Nailers needed rod iron. Cutlers and scythe-smiths managed better if the iron was first reduced to a thinner section than was feasible with a belly helve. Tinplate from a tin mill was the raw material from which tinplate-workers made pots and pans. All these required the iron to undergo further processes to make it suitable for their starting material. It was these processes that the Iron Act prohibitions affected.

There was a limit to what could be achieved with the heavy belly-helve hammer in a finery forge which can be explained by some basic physics. When a piece of metal is struck with a force up to a certain limit it will deform elastically and return to its original shape. Beyond that limit, the force will cause a plastic deformation where the metal will retain its new shape (Rollason 1973, 104). The force required to go beyond elastic deformation is inevitably proportionate to the size of the workpiece. In the case of iron (at least), the limit of elasticity (where plastic deformation starts) is lower at high temperatures (Rollason 1973, 6-7). Thus smiths normally work iron at red or white heat. The size of the workpiece (initially a 'loop' of iron from the finery) was such that a heavy hammer was needed to produce bar iron in a finery forge. However, the stroke rate of these belly-helve hammers was comparatively slow. Another factor is the rate at which the workpiece cools; the smaller the workpiece the faster it cools (Rollason 1973). In practice, it was impracticable to draw a bar down with a standard belly-helve hammer to less than ¾-inch square or a 'narrow flat', ½-inch by 1 inch. This limit was recognized in the practice of the Customs Commissioners, who regarded bars below ¾-inch square as manufactured 'wrought iron' that was subject to a higher rate of duty (TNA, E 190, Hull Port Books, *passim*).

To obtain smaller cross-sections of less than half a square inch, other techniques were needed. With smaller workpieces, the elasticity limit (in absolute terms) would be proportionately lower, so a lighter hammer could achieve the desired deformation. This lighter hammer had to work more rapidly, so the deformation could be achieved before the metal cooled. This was achieved with a 'tilt hammer' where the helve was pivoted near its centre, with cams pushing the tail of the helve down to lift the head. In contrast, the belly-helve was pivoted at the end opposite to the head with the lift applied between by cams; both types were water-powered. The helve in each case (in this period) was made of timber. The stresses and strains that a wooden helve could bear are also relevant.

Four prohibited processes

The origin and spread of the tilt hammer are not wholly clear, but it seems to be German in origin; examples included the straining hammers in the wireworks at Tintern (built in *c*1567) by German immigrants for the Company of Mineral and Battery works (Donald 1961, 87-90; Paar and Tucker 1977; TNA, E 134/39 Eliz/Hil 23). Several tilts (as such works were called there) were built at Sheffield in the 1710s (King 2011, 10; 2020, 166-7) where the availability of iron thinner than ½-inch was no doubt useful to its cutlers, but Joshua Newborough built Kings Meadow (later Royal) Forge at Stourbridge in 1666 (King 2020, 378-80). There were plating forges in the frying pan trade even earlier, with two different kinds of forge, but neither necessarily had a tilt hammer (Gerhold 2009). Lighter water-powered hammers were also used in battery works for making brass pots from 'metal prepared for battery', mainly near London and Bristol (Day 1973, 41-4).

Slitting mills were used to cut broad flat bars of iron into rods, suitable for nailmaking. A piece was cut off the bar and heated; it was passed through flat rolls then immediately through grooved rolls, which sheared the resultant plate of iron into rods (Schubert 1957, 308-10). The process was apparently devised in the Liège region in about 1580 and introduced to Dartford in Kent in 1590 (Awty 2019, 164, 435, 712-3). The first slitting mill in the Midlands was built by 1611 near Rugeley, followed by Hyde Mill in Kinver in 1627 (King 1999, 62-4 71). Others followed in other parts of England (King 2020,

passim). The rod iron was bundled and sold to manufacturing ironmongers. They put it out to nailers and marketed the resultant nails. A cluster of slitting mills in the Thames valley seem to have concentrated in the 18th century on producing hoops for barrels, which was done by passing the rod again through flat rolls. This process was probably devised at Crayford Mill in Kent in *c*1680 (King 2020, 81-94; for process see SML, Weale MSS, 371/4, 298) and derives from a patent to Thomas Harvey in 1679 for making round iron for bolts and 'streaks' [strakes] for waggons carts and coaches, and another to his successors William Paulin and John Loggin in 1682 (English Patents, nos 207 and 229).

Tinplate, sheets of iron coated in tin, was a relatively late arrival in England. 'White plates' were largely imported, ultimately from Saxony until the 18th century. A tinplate works existed at Wickham in Hampshire from 1623 (Minchinton 1957, 4, 249; King 2020, 105), though its success is unclear. Following Andrew Yarranton and Ambrose Crowley's visit to Saxony in 1667, Wolverley Lower Mill in Worcestershire was built to make tinplate in *c*1670, but due to patent difficulties this became another slitting mill. Thomas Cooke, the son of the slitter (or roller) there moved to Pontypool where he built a rolling mill for John Hanbury by 1697, producing (untinned) blackplate (Brown 1988; King 1988). The first regular appearance of tinplate in the port books for Gloucester (which recorded trade passing through that port from other ports) was in 1725 (data taken from Hussey 2000). This coincides with the publication in French of Réamur's *Principes de L'art de faire le fer-blanc*, prior to that of an English report of this (Minchinton 1957, 11). This suggests that John Hanbury began tinplate production at Pontypool in 1725. Other tinplate works followed in various places in England and Wales in 1730s and 1740s (King 2020, 490 and *passim*). Tinplate was supplied to craftsmen called tinplate workers who fabricated it into pots, pans, and other consumer goods.

The fourth kind of plant prohibited by the Iron Act was steel furnaces. Steel was mainly used to provide a hard cutting edge on bladed implements. The normal means of producing steel in England at this period was cementation. Bars of iron were heated for several days in a sealed chest with charcoal. This enabled carbon to diffuse into the iron converting it to steel. The process was introduced to England, probably from Germany in the 1610s (Barraclough 1984, 35-59). Sir Basil Brooke had furnaces for this at Coalbrookdale but he was required to surrender the patent that he held for this in 1618. He may have used iron from works in the Forest of Dean in Gloucestershire where he was at two periods a partner (Hart 1971, 8-60 *passim*; King 2003b; Belford and Ross 2007; Belford 2018). However, by 1630, the normal raw material was Swedish iron; and by later in the century, specifically oregrounds iron, produced in an area north of Stockholm, ultimately derived from ore from the Dannemora mine. In the 18th century the supply of this was controlled by a small group of English merchants through forward purchasing arrangements (Barraclough 1990; King 2003b). Charles Tooker had a steel furnace at Rotherham before the English Civil War. Shortly after the Restoration there were several producers near Sheffield (TNA, C 6/278/29; King 2020, 165, 179-85). Others are known at Stourbridge by 1682, Birmingham perhaps by 1714, and Keynsham, near Bristol by 1725 (King 2020, 346-7, 409, 533).

Iron supply

England and Wales were approximately self-sufficient in iron in the 1620s but the industry had probably reached its maximum sustainable output. The industry was unable to expand for want of any further, economically available charcoal resources. However, the manufacture of ironware was able to continue to expand by using imported iron, principally from Sweden. This trade was sometimes disrupted by war in the 1650s and 1660s, leading to the temporary revival of the Wealden iron industry which was then beginning its long decline. The iron industry was subject to further major fluctuations in the 18th century. First there was an embargo on trade with Sweden in 1717-19 when a temporary shortage of iron for British manufacturers led to the erection of new ironworks. However, the lifting of the embargo and the beginning of imports of Russian iron around 1730 left the British industry with an excess of capacity and in danger of being unprofitable. In 1737 Parliamentary hearings took place following a petition from the Iron Trade. No means were available to restrict the production of iron in Sweden and Russia, but evidence from the Trade suggested restrictions on America (King 1996; 2005). Nothing was done then, so the depressed state of British iron production seems to have lasted until the late 1740s due to the availability of large quantities of cheap Russian iron. When the War of Austrian Succession ended in 1748, despite a new influx of Russian iron, market demand led to growth. This may be related to a decision taken in Sweden in 1747 to limit production there and increase prices. Other iron prices (it seems) rose with the Swedish ones, leading to much of the British industry operating to its capacity and new ironworks being built in the 1750s for the first time in 30 years. This expansion also included the erection (in Shropshire) of the first blast furnaces to produce coke

pig iron as the feedstock for forges (King 2005, 23-4).

Following diplomatic difficulties with Sweden and a Parliamentary debate in January 1749, the 1737 proposal was revived as a proposal to take duty off colonial pig and bar iron and the Iron Act was passed (JHC 25, 946-9; British Statute, 23 Geo. II, c.29: the remainder of this section is often based on this Act). Its objective was to encourage the production of iron (as a raw material) in America, but to discourage its manufacture into finished goods there. To achieve the latter objective, American pig iron could be imported free of the usual import duty. Bar iron could also be imported duty free but only into London; it could not be taken further than 10 miles from London, except to Naval dockyards. It was evidently feared that imports would harm the British manufacturing.

Contrary to the view sometimes expressed, there was no prohibition on production in America and no restriction on the use of belly-helve hammers for producing bar iron, but the expansion of manufacture of bar iron into finished iron goods was rendered difficult by the prohibitions on downstream processes. Pig and bar iron had been produced in America on a substantial scale since 1720, one of the first manufacturers being the Principio Company (May 1945; Robbins 1986). There were various small-scale ventures earlier, at Falling Creek near Richmond, Virginia, and on the Saugus and at Braintree in Massachusetts, all failures (Hatch and Gregory 1962; Hartley 1957; Gordon 1996, 55; 2021). However, the works of Lewis Morgan and others at Tinton Falls, New Jersey, built in the 1670s, seems to have done better (Boyer 1931, 196-9; Brown 1976; Freiday 1976). Considerable amounts of pig iron were exported from Virginia and Maryland to England because they were convenient for ballasting for hogsheads of tobacco (Middleton 1953, 170; King 1995, 15). Elsewhere, comparatively little iron of any kind was exported, though iron was also made in Pennsylvania and other northern colonies. The Act did have the effect of increasing American exports, and trade was increasing significantly during the 1760s (see below). This was no doubt aided by the extension in 1756 of duty-free bar iron imports to all British ports (British Statute, 30 Geo. II, c.16).

Inevitably the Iron Act had supplementary provisions. Iron had to be stamped with some mark denoting the colony or place where it was made; otherwise, duty was due. This was probably no hardship as it was common practice for ironmasters to 'brand' their iron. For Swedish iron, Swedish law required this as a quality control measure, to identify the makers of bad iron (Molander 1987). For pig iron, the stamp was applied to the sand mould in the casting house floor, so that the name of the furnace where it was made stood proud on the resultant pig. Such brands are mentioned in the accounts of British forges, using American pig iron. In some cases, such as the Stour valley in north Worcestershire, the vendors named were local ironmongers. They were no doubt receiving pig iron in part payment for ironware that they or their Bristol correspondents had exported to America (Rowlands 1975, 64-6; Knight a/c).

The prohibitions on operating slitting and rolling mills and plating forges were more serious. Without slitting mills, nails could not easily be made. In theory, bar iron could have been slit with a cold chisel, as was done in England before the introduction of the slitting mill, but this would be expensive. There would be little point in importing rod iron to make nails in the colonies (rather than importing British nails), since labour is likely to have been dearer in America. Without rolling mills tinplate could not be made, so tinplate workers could not manufacture it into pots, pans and other tinned goods. Without steel, edged tools could not be made, though steel could be imported for this purpose. Without plating forges, the production of cutlery, scythes, sickles, and other edged tools would be more difficult. The effect of these prohibitions was thus to limit the expansion of iron manufacture in America.

The British Parliament was generally reluctant to interfere with the existing rights of individuals. The Act accordingly required colonial governors to certify what works of the kinds being prohibited already existed. This provision, added almost as an afterthought (JHC 25, 1099), may have been intended as a means of protecting existing works from being presented as a 'common nuisance' under the Act and thus being abated (ie put an end to). However, the Act was also directed against works being 'continued', which might have caught existing works. This provision was probably to avoid technicalities in prosecutions, as it would be easier to prove that a person was operating an illicit works than that he had built it. Certainly, the pre-Act works in New Jersey seem to have continued in operation uninterrupted (Boyer 1931, 229-30 and 236-8).

Governor's certificates under the Iron Act

This section is mostly concerned with the content of governors' certificates which were returned to the Board of Trade and Plantations, the British government body responsible for colonial affairs. They are preserved

among Colonial Office records in The National Archives in London; a transcript is printed in the Appendix and summarised in Table 1. Originally there was a separate series of papers for each colony, but all those for former American colonies were gathered into a single class, now known as CO 5. These certificates provide a snapshot of the American iron manufacturing industry in 1750 though no attempt has been made to identify sites or their histories. Rhode Island made a nil return, as did the Pennsylvania governor for the counties of Newcastle Kent and Sussex 'on Delaware' (TNA, CO 5/1273, V71 V79). No certificates have been found in TNA for the Carolinas, Virginia, or New Hampshire, but there is no reason to believe that there was any mill or other work to be certified. The certificate for New Jersey is preserved among the State Archives: perhaps the Governor failed to send it to London, as he should have (Boyer 1931, 8-9). No evidence is known of any works being abated under the Act, but perhaps the penalties were so draconian that no one dared built one. The focus on Philadelphia, PA is perhaps to be expected, but the number of plating forges in Connecticut (if correct) perhaps less so.

When the limitation on the import of bar iron duty-free to London was repealed in 1756, a series of returns were sought in respect of the amount of bar iron made in each province, between 25 December 1749 and 5 January 1756. (This slightly odd period is six complete Customs years, as after the adoption of the Gregorian calendar in Britain in 1751, these continued to end at Old Christmas, at 5 January of the new calendar.) The returns for Maryland state that there were eight furnaces and ten forges, one furnace and two forges having been built since 1754, and the total amount of pig and bar iron made. In a separate paper the exports of iron taken from the Naval Officer's books (TNA, CO 5/1275, W16 W23) gives an average output of 71.6 tons per forge per year.

The Governor of Pennsylvania returned the annual output of eight forges from which returns had been obtained. This was 3,379 tons, giving an average of about 80.3 tons per forge per year worked (allowing for years when not in use). Pine and Glascow Forges had made significantly more than this and some others rather less (TNA, CO 5/1275, W25). The Governor of New York reported that there were two furnaces in the manor of Cortland and several bloomeries, but they had not been worked for several years past. He thus wrote to Robert Livingston who had the only ironworks working in the province, and submitted a statement by Dick Jansen, Livingston's storekeeper of what he made at Aneram in the manor of Livingston. He made 2,016 tons of pig iron, 1,302 tons of bar iron, and 67 tons of cast iron. The furnace output fluctuated greatly from year to year and suggests the furnace may have been in blast twice for periods exceeding a year, making up to 1,000 tons in a blast, perhaps with one shorter blast, whereas the forge output was much steadier, averaging 186 tons per year (TNA, CO 5/1068, M36-M37). Depending on the efficiency of the forge and changes in stock level, the forge may well have absorbed the whole output of the furnace; certainly, no more than 200-300 tons of pig iron can have been sold (calculated on the basis of 26-30cwt pig iron being needed for a ton of bar iron). The Governor of Connecticut reported that 120 tons had been made annually. 'Some of this is made out of pigs and other wrought out of oar without being cast into pigs. The proportion of each, I cannot ascertain' (TNA, CO 5/1275, W17). Only Robert Livingston's ironworks had a forge with an output comparable with most English forges, which had two fineries each capable of producing 120-130 tons per year (King 1996). If Pine and Glascow Forges each had a single finery, they would also be comparable, but production of the rest is much lower. This (if correctly reported) suggests that a single forgeman performed the functions of both finer and hammerman or that working in the forge was not a full time occupation.

Table 1: Information from colonial returns under the Iron Act 1750.

	Slitting or rolling mill	Plating forge	Steel furnace
Maryland		1	
Pennsylvania	1	1	2
New Jersey	1	1	1
New York		1	
Connecticut		7	1
Massachusetts	2	2	
Total	4	13	4

In Massachusetts, the governor evidently had great difficulty in obtaining any information, but his report is of interest in itself. He wrote:

> 'I have made strict enquiry [but] it is more difficult to obtain an account of the quantity of iron that is wrought … Many of the owners or occupiers, keeping no regular accounts, are incapable of rendering such. In general I'm informed that no pig iron is made in the province. All pigs which are manufactured at these works are imported from New York, Pennsylvania or some of the southern governments, besides which

considerable quantitys of bar iron are imported from those colonies and used in this province. There is some small quantity of bar iron made out of bog ore raised in the province for making instruments of husbandry, but the greatest quantity is run into holloware. It is computed that all the forges in the province do not make one with another 10 tons of bar iron in a year.'

He then listed a large number of works with their owners (not published here), some being described as furnaces, but his list may well include many blacksmiths, who were manufacturing iron, rather than making it. He ended by noting that there were two slitting mills in the province, one at Middleborough owned by Peter Oliver and one at Milton owned by Peter Jackson. His covering letter said:

'The enclosed return is the best I am able to obtain … As to the quantities of iron wrought there is no law which obliges the owners to render account and as there is no tax or duty whereby it can come from any books or registers and as the people since the Act restraining the number of slitting mills are extreamly [extremely] jealous of these kind of enquiries. It is impossible to obtain an account to be depended upon. The more earnestly the government should press for such the more they would suspect and if any means were devised they should be forced to give such as would most certainly deceive and evade the intent of the inquiry' (TNA, CO 5/889, Ii59).

The effect of the Act

The effect of the Act in Britain does not seem to be great. No one has found any evidence of proceedings to suppress mills and restricted works apparently continued to exist (Boyer 1931, 9). An additional slitting mill was built in defiance of the law by Samuel Ogden of Newark, NJ at Old Boonton, NJ. When visited by Governor Franklin on the rumour of its existence, Ogden hospitably entertained the governor, who left feeling glad that the report was groundless (Boyer 1931, 42).

Import data is available for England and Wales from Customs Ledgers (TNA, CUST 3), which are the main source for this section (Table 2). These divided trade by colony, but Virginia and Maryland appear together, probably covering the whole of Chesapeake Bay, and New England appears as a single entity. Carolina, Canada and New England appear separately, but hardly feature in iron import data. These three appear together as 'other' in Figures 1 and 2. Figure 1 shows pig iron imports to England and Wales rising from nothing in 1721 to over

Table 2: The impact of American iron imports to England and Wales.

Source of iron	1749	1761	1771
Sweden	14,524	22,683	14,654
Russia	5,697	18,445	26,918
America	4	39	2,215
miscellaneous	2,590	2,275	2,154
Total imports	22,815	43,442	45,941
England and Wales made	18,827	20,937	21,950
Total available	41,642	64,379	67,891
American pig imports	1,757	3,274	5,194
would make bar iron	1,318	2,456	3,896
American bar iron	4	39	2,215
American total	1,322	2,495	6,111
American as proportion of total available	3%	4%	9%

Notes: Data for imports from *TNA, CUST 3*; data for England and Wales from King 2003a, 460-1.

2,250 tons per year in 1731 and then remaining at about that level until the Iron Act. There was then an increase to an average of 2,900 tons per year until 1768, with further growth in the next few years to average 3,375 tons per year, but the trade largely ceased in 1776 with the outbreak of the American War of Independence. Until 1763, about 90% of imports were from Virginia and Maryland, providing a convenient ballast for the staple crop of tobacco (Middleton 1953, 170).

Little bar iron was imported before 1750. From then until the 1756 Act almost all imports were to London. When that Act lifted the duty on 'outport' imports, increasing amounts went to them so that in the heyday of the trade 1764-75 over 1,300 tons of bar iron was imported annually on average (Fig 2), of which some 43% went to outports. Between 1768 and 1771 New York provided the largest share of this, averaging over 1,000 tons out of 1,900 tons per year.

If the objective of the Act was to reduce British dependence on Swedish and Russia iron, it failed. English bar iron imports increased from nearly 23,000 tons per year in 1749 to nearly 46,000 tons in 1771, the peak of imports from America, with some 2,200 of the latter coming from America (Table 2), resulting in nearly 68,000 tons of bar iron available on the English market in 1771. The 3,375 tons of pig iron should be compared to an estimated 24,500 tons of pig iron (needed for English

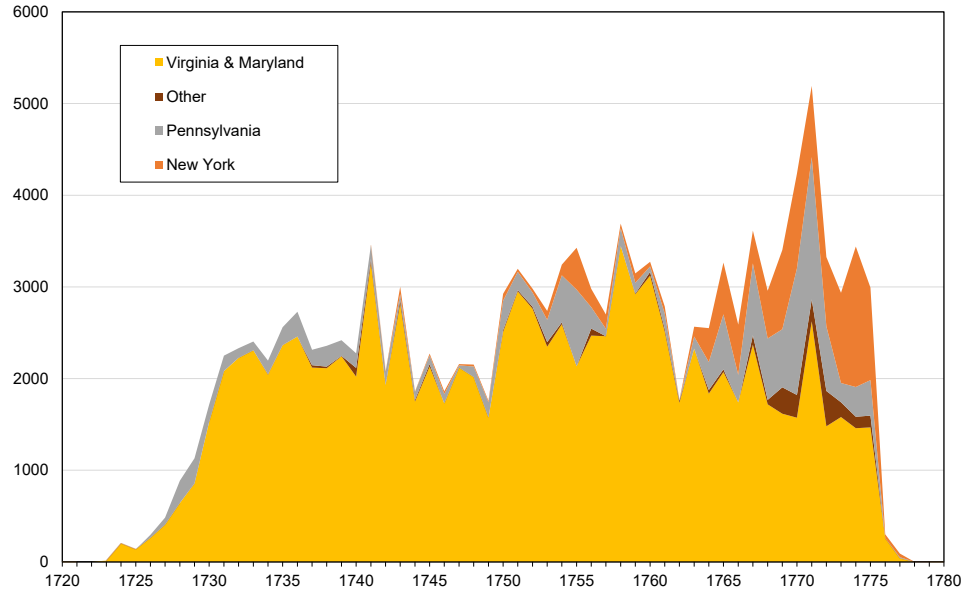

Figure 1: Pig iron imported to England from America (tons per year).

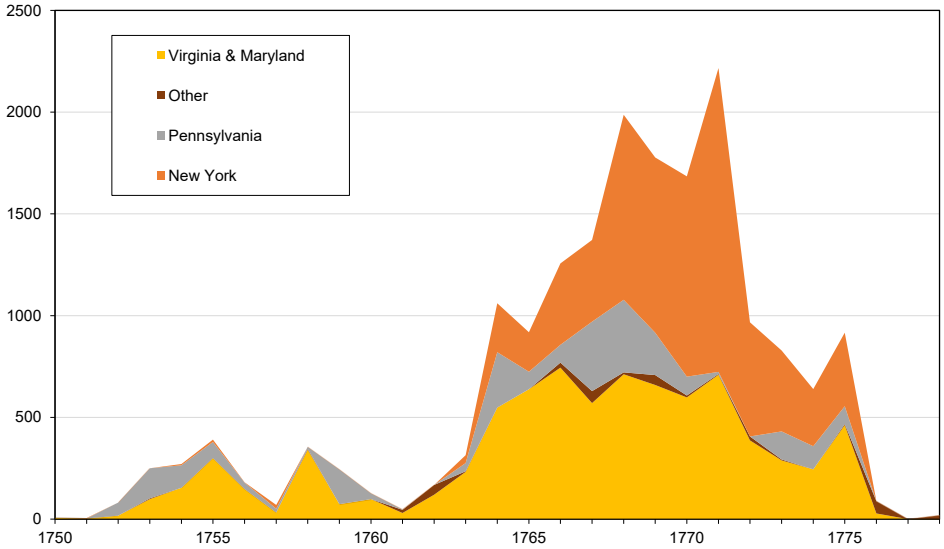

Figure 2: Bar iron imported to England from America (tons per year).

bar iron production) in 1771. On the basis that four tons of pig iron produce three tons of bar iron, America might be estimated to be responsible for 6,100 of the 68,000 tons, about 9% (data from King 2003a, 448-9 and 461, some figures being the average of five years). However, that estimate ignores that some American pig iron was used as the feedstock for English foundries. In 1730, the Bristol merchant Graffin Prankard wrote:

> '… As to pig iron its sold here according as in goodness. Virginia is £5.10.0 English £6.10.0 to £6.15.0, but the best sorts is that made at Colebroke [Coalbrookdale] in Shropshire is £7 per ton, it being esteemed the best and thinnest for casting, especially potts and kettles and is so much esteemed here that without some of it mixt with pigs they scarce presume to make any castings. The Virginia with a small quantity of it will do well for cart boxes, but for furnaces potts and backs, they use larger quantities of it' (Somerset Record Office, DD/DN 424, 17 June 1730; punctuation modernised).

The majority of exports were from Virginia and Maryland, Pennsylvania, and New York. Pig iron was exported from New England from 1737 to 1745 and again intermittently from 1750; and from New York from 1743, in both cases implying that ironworks were operating there, though not where these were, despite the Massachusetts return under the 1756 Act. Canada appears as an exporter of bar iron from 1766 to 1772 and of pig iron from 1772 to 1775. This was presum-

ably the output of Forges du Saint-Maurice in Quebec, which had passed to the British crown on the conquest of Canada and were leased in 1767 to entrepreneurs led by Christophe Pélissier. Pélissier bought out some of his partners in 1770-2, paying in pig iron. This could have been to enable the vendors to export it and receive cash for it in London. The appearance of the army supply contractor Jacob Jordan as an agent at Montreal is interesting (Samson 1998, 28-31; *cf* Unglik 1987), since Walter Jordan advertised in *Aris' Birmingham Gazette* for a keeper for a charcoal blast furnace in Canada. He had then recently been a partner in Melin Griffith Forge near Cardiff and was the son of the ironmaster at Grange Furnace in Staffordshire (King 2020, 384-5, 521), though it is not known if they were related.

In summary, the impact of the Iron Act was only modest. Embargoes associated with the American Revolution brought the trade to an end. The immediate cause of the Revolution was fiscal measures to coerce British colonies in America to contribute to the cost of their defence in the Seven Years' War (1756-63), but the earlier Molasses Act and Iron Act together with the much older Navigation Laws were also factors. The Revolution effectively nullified the Iron Act. Imports from America resumed briefly at a more modest level in the late 1780s, but the increasing use of coke in British ironmaking from that period reduced (and ultimately eliminated) the dependence of Britain's manufacturers on imported iron.

Conclusion

This paper has considered the arrival of certain secondary processes taking place between the production of iron and its manufacture into consumer goods, both in England (and Wales) and (from colonial governors' certificates) in English colonies in America. It has then looked at the impact of American iron on England, concluding this was modest. In doing so it has provided information on a neglected aspect of American industrialisation. It has been unable to provide any critical commentary on the completeness and accuracy of the colonial governors' certificates because the author, being in England, is not equipped to carry out the detailed research required in American archives. Nevertheless, the governors' returns provide a significant source of information, which is worth publishing. It is hoped that this paper will stimulate research by American scholars. A starting point for this might be the Keller Collection at Hagley Museum in Delaware, as suggested by one of the referees for this paper.

Acknowledgement

I am grateful to Alain Gelly of Parks Canada for providing extracts from Samson 1998.

Appendix: Colonial mill certificates

Most certificates contain a preamble setting out what it is and end with a statement that there are no other works to be certified under the Act. These details are not published here. Some of the capitalisation has been modernised.

Maryland 27 September 1750

That in the year 1747 there was finished and is now in use at the head of Northeast River in Cecil County one plating forge with two tilt hammers and George Rock of the said county is proprietor thereof (TNA, CO 5/1273, V71).

New Jersey 10 November 1750

One mill or engine for slitting and rolling iron situate in the township of Bethlehem in the County of Hunterdon on the southern branch of the river Rariton the property of Messrs William Allen and Joseph Turner of Philadelphia, which is not now in use.
One plateing forge which works with a tilt hammer situate on a small brook at the West End of Trenton in the County of Hunterdon aforesaid the property of William Yard of Hunterdon, which is now used.
One furnace for the making of steel situate at Trenton in the County of Hunterdon aforesaid the property of the aforesaid Benjamin Yard, which is not now used.
And all erected before the twenty-fourth day of June last as appears by returns annexed. (Boyer 1931, 8-9).

Pennsylvania and Delaware 18 October 1750

That on [24 June 1750] One mill or engine for rolling and slitting iron, one plating forge to work with a tilt hammer and two furnaces for the making of steel were erected in Pennsylvania.
That the said mill or engine for rolling and slitting iron … was erected and now stands in Thornbury Township in Chester County in this colony of Pennsylvania and on that day used by John Taylor of the same township gentleman, who was sole proprietor thereof.
That the said plating forge to work with a tilt hammer … was erected and now stands in Biberry Township in the County of Philadelphia within the said Colony and John Hall of the same township and county is proprietor thereof and the same was not in use on the said 24 June or for nine months before.

That one of the said furnaces for the making of steel was erected and now stands in the City of Philadelphia in the said colony and on that day was used by William Branson of the same city iron-master who was sole proprietor thereof.
That the other furnace for the making of steel … was erected and now stands in the said City of Philadelphia in the said colony and on that day was used by Stephen Paschall of the same city smith, who was then sole proprietor thereof (TNA, CO 5/1273, V74).

New York 27 December 1750

That there is erected within the said province in Orange County at a place called Wawayanda about 26 miles from Hudson's River one plating forge to work with a tilt hammer, which belongs to Lawrance Scrawley of the same county blacksmith, has been built 4 or 5 years ago, and is not at present made use of (TNA, CO 5/1063, Hh132).

Connecticut 28 May 1751

There is in the Town of Killingworth and County of New London a furnace for making steel erected there in the year 1744 with forge to work with a tilt hammer erected there in the year 1746, both continuing in use. Owners are Jarad Eliot, Benjamin Gale and Aron Eliot.
There is in the Town of Woodstock and County of Wendham, a forge to work with tilt hammer erected there in the year 1742. It continues in use. The owner is David Wallis.
There is in the Town of Plainfield in the County Wendham a forge to work with a tilt hammer erected there in the year 1732. It continues in use. The owner is William Denn.
There is in the Town of New London and County of New London a forge to work with a tilt hammer erected there in 1747. The owner is George Sheffield.
There is in the Town of Stonnington and the County of New London a forge to work with a tilt hammer erected there in the year 1732. The owner is John Denn.
There is in the Town of Groton and the County of New London a forge to work with a tilt hammer erected there in 1747. The owner is Thomas Pelton.
There is in the Town of Say-brook and the County of New London a forge to work with a tilt hammer erected there in the year 1732. The owner is Samuel Williams.
There is in the Town of Stonnington and the County of New London a forge to work with a tilt hammer erected there in the year 1748. The owner is Elijah Bachley (TNA, CO 5/1273, V88).

Massachusetts Bay in New England 10 October 1750

That there is a mill or engine for rolling and slitting iron (now in use) as also a plating forge to work with a tilt hammer (not at present in use) in the town of Middleborough within the County of Plymouth owned by Jeremiah Gridley esquire of Boston and Peter Oliver esquire of Middleborough aforesaid.
That there is also in Hanover within the County of Plymouth a smiths works now in use in which there is a small hammer called a trip hammer, used for the plating of iron in the occupation of Joseph Josslyn and Thomas Josslyn both of Hanover aforesaid.
And that there is also in the Town of Milton within the County of Suffolk a mill for slitting and rolling iron (now in use) owned by the heirs of Jonathan Jackson late of Boston deceased and Edward Jackson of Boston (TNA, CO 5/886, GG36).

Note on units of measurement

The dimensions given are those in use in the 18th century. The approximate metric equivalents are:
1 inch = 25mm
1cwt (hundredweight) = 51kg
20cwt = 1 ton
1 mile = 1.6km

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