Scotland's Quiet Industrial Revolution: The Lothians, 1822-1872

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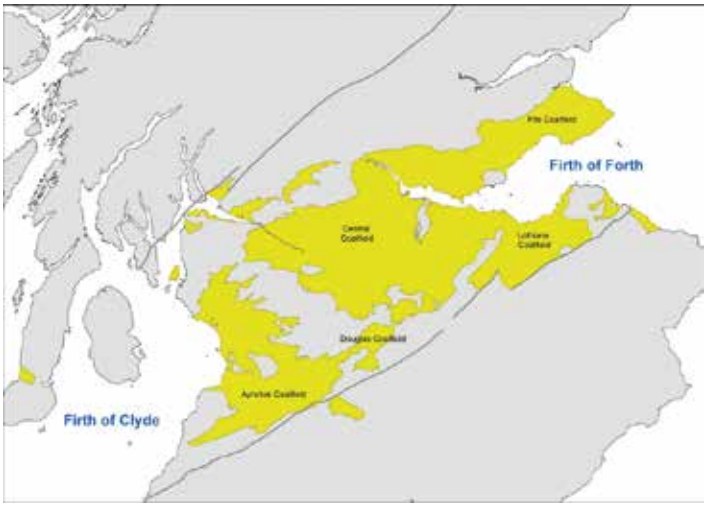
Professor Chris Whatley wrote in 1997 that the received view among Scottish economic historians was that the Industrial Revolution in Scotland 'started later and was more compressed than its English counterpart'[1] – a perspective that has not been challenged in the intervening quarter of a century. The received view was, of course, a characterisation of the national picture, one that Whatley recognised could disguise considerable regional variation.[2] The history of industrialisation in the Lothians shows that the region might be said to have bucked the 'late and fast' trend. Industry here developed at a much slower, fitful pace, before finally integrating with Scotland's broader industrial revolution from the 1850s onwards.

Although the first cotton spinning factory in Scotland was established at Penicuik in Midlothian in 1778, this proved to be a false dawn. The Scottish textiles revolution bypassed the Lothians and settled instead on Glasgow and its environs for cotton, the Borders for wool, and Dundee for linen.[3] Recent scholarship has tended to tie Glasgow's ascendancy in cotton to its position as an Atlantic port, whose merchant elite had already accumulated considerable wealth and market experience through its virtual monopolies over the Scottish trade with the Atlantic slave economies in tobacco and sugar. A new generation of entrepreneurs was able to leverage this legacy to build the cotton industry, whose raw material was again grown by enslaved people in the plantations of the American South and whose finished products were sold back in large quantities to the Atlantic markets.[4]

Having missed out on the textiles revolution, the Lothians could conceivably have hoped to catch the next wave – in ironmaking, heavy engineering and shipbuilding. Yet, despite an abundance of coal and blackband ironstone, the Lothians also failed to capitalise on this opportunity. This article will attempt to demonstrate why and how this came about, and how it was not until the mid-nineteenth century that the constellation of natural resources and transport improvements aligned to give the region an edge in a more established industry, namely papermaking. The chronology picks up the Lothians' industrialisation story in 1822, the year of the opening of the Union Canal, coincidentally also the eve of the sunset of an early industry linked to coal extraction, that of salt-distilling. It follows on with the construction of the primitive 'Innocent Railway' carrying coal between the Midlothian coalfield and Edinburgh in 1831, and the railway mania of the 1840s that finally ended the region's isolation. It ends with a case study that elegantly illustrates the interplay between natural resources, transport and industrialisation, centred on an extraordinary ten-mile stretch of the River North Esk between Dalkeith and Penicuik, home to rich ironstone deposits that never quite fulfilled their promise and eight paper mills that greatly exceeded theirs.

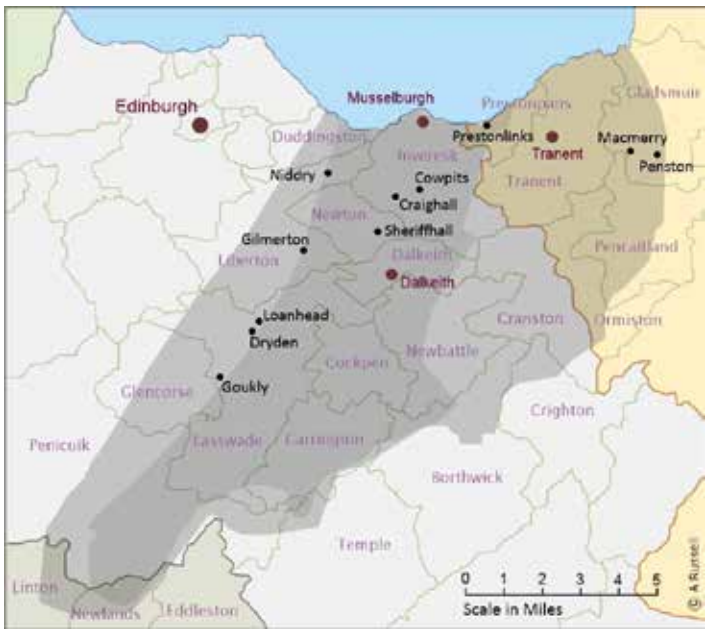
Landscape and coal

The Lothians sit like a collar around Edinburgh along the south shore of the Firth of Forth. They are made up of the historic counties of West, Mid- and East Lothian, also known during the period as the shires of Linlithgow, Edinburgh and Haddington. Together, they form a distinct geographic and landscape region of the Scottish Lowlands, bounded to the north by the Firth of Forth, to the south by the Southern Uplands, to the west by the North Calder Water and to the east by the mouth of Dunglass Burn.[5] The unity of character of the landscape and the central pull of Edinburgh have also defined the Lothians historically as a distinct economic region. There is, however, a strong argument for separating West Lothian from the picture and focussing on Mid- and East Lothian. Situated midway between Edinburgh and Glasgow at its western edge, West Lothian looked both ways, especially after the Forth & Clyde Canal opened in 1790. Mid- and East Lothian would remain



Map 1: The Scottish coalfields, showing the West Lothian field (unlabelled) as part of the central coalfield. The area labelled Lothians Coalfield is the Mid- and East Lothian field. Source: British Geological Survey © UKRI 2024 All Rights Reserved, Permit Number CP24/056.[7]

isolated from the rest of Scotland by the lack of transport links until the beginning of the period under study in 1822. The coalfields of the region were also distinct. The West Lothian coal works were in reality part of the central coalfield (Map 1), while the Lothians coalfield is generally taken to refer to Mid- and East Lothian (Map 2).[6]



Map 2: Detail of the Mid- and East Lothian coalfield, with parishes denoted in pink and some larger pits in bold type. Source: 'Hood Family and Coal Mining' website. © *A Russell. With the author's permission.*[8]

Before picking up on the Lothians' industrialisation from 1822, some background is appropriate. Descriptions of parish after parish in the Old and New Statistical Accounts of Scotland, compiled at the end of the eighteenth century and in the middle of the nineteenth respectively, paint a picture of the Lothians as an important agricultural region, especially for grain.[9] Even as late as 1870, the *Edinburgh County Directory* described the core county, Midlothian, as, 'A maritime and agricultural county … Very few manufactures are carried on within the county, and these are principally confined to Edinburgh and Leith, or their vicinity'. It identified the manufacture of paper as a significant local industry and pointed to 'extensive collieries in the eastern division of the county, employing large numbers of workers'.[10] The role of coal supplies as an important factor in potential industrialisation, as postulated by DC Coleman, was echoed in the Lothians' experience, as was the shift from organic to inorganic sources of energy, as stressed by Tony Wrigley, although in some industries the transition could take decades. For example, in paper manufacture waterwheels and steam engines turned hand in hand well into the 1840s.[11] In any case, neither coal nor the energy transition sparked the kind of dynamic change in the Lothians as was seen in the Clyde basin. It is clear that the Lothians also do not fit the early model of regional proto-industrialisation, developed by historians like Thirsk and Mendel in the 1960s and 1970s, of an upland pastoral economy where livelihoods could only be supported by manufacturing sidelines.[12] As Pat Hudson pointed out, later scholarship established that 'by no means all dynamic proto-industry occurred in regions where agriculture was poor' and that industry could develop where other factors created a pool of available labour at low cost.[13] Just such a process of surplus labour creation appears to have been at work in the Lothians in the eighteenth century, with soil improvement through the application of lime that was produced in limekilns from local limestone, so increasing grain production and leading to a reduction in the labour required to work the land.[14] Most of the surplus labour that became available outside the seasonal needs of agriculture was undoubtedly employed in the numerous coal pits owned by the same large landowners who owned the farmland, principally the Duke of Buccleuch, the Marquis of Lothian, the Earl of Wemyss, and the Hope and Wauchope families.[15] The author has calculated that in 1873 around 5,000 people were employed in mines in the three counties.[16] In short, coal mining *was* the industry of the Lothians.

The principal market for Lothians coal was the Edinburgh domestic fuel market, over which it had a near total monopoly until the mid-1810s. However, coal was also an important input for two significant early industries in which the Lothians attained and then lost a comparative advantage, namely lime burning and salt-distilling. The respective raw materials of these industries, limestone and seawater, were natural resources that were abundant in the Lothians, and, crucially, situated adjacently to the coal supplies that were used to heat both. The role of lime in the Agricultural Revolution has already been mentioned; it was also used in the construction industry and had been widely employed in the building of Edinburgh's New Town from 1767, and was also used as a bleaching agent in the textiles industry, which, as previously noted, did not develop to any great extent in the region. Salt was distilled at coastal sites all along the Forth basin, where the topography was particularly favourable and where coal pits were situated close by. It was produced by burning dross, the poor-quality coal that was useless for domestic heating, to boil seawater in massive salt pans. By the turn of the nineteenth century, the salt industry had outgrown its original use in food preservation and enjoyed increasing demand as an industrial raw material in the production of soda, an alkali which was in turn used in the glass, soap, textile, and other industries.[17] However, the comparative advantage of the Lothians salt industry rested on an insecure foundation, namely the higher duties levied in Scotland on English rock-salt than on Scottish sea salt, a

Fig.1: Joppa Salt Pans, showing the foreshore where the pans would have stood and Rock Cottage in the background. © *A Erginsoy.*

fiscal arrangement that had been introduced as a sop to the Scots after the parliamentary Union of 1707. This advantage disappeared overnight when salt duties on both sides of the border were abolished in 1823, as Cheshire rock-salt cost much less, even factoring in transport costs. In the following decade, the number of salt pans in Scotland fell from 164 to 15 in 1836, all but two of them on the Forth.[18]

Fig.2: Joppa Salt Pans: Rock Cottage, now a private home. © *A Erginsoy.*

Fig.3: Joppa Salt Pans: Plaque at Rock Cottage. © *A Erginsoy.*

It is difficult to dispute Hassan's conclusion that the removal of the peculiar conditions that had given the salt industry on the Forth a comparative advantage was one of two basic reasons that the Lothians never became a great industrial area.[19] The second was the ponderous response of the regional coal industry to changing circumstances and the high relative costs of its output, factors intimately linked to the state of transport.

The transport revolution?

A common problem with national histories is that important regional trends can be obscured, leading to dubious national conclusions. This can be seen in Iain Hutchison's *Industry, Reform and Empire: Scotland, 1790-1880*, the most recent volume of the New Edinburgh History of Scotland.[20] After acknowledging the 'broad benefits for economic development' of better transport provision, Hutchison makes the following statement:

> In England, the role of transport was vital for industrialisation, but, arguably, it made a lesser contribution in Scotland to economic modernisation. Almost all the crucial developments in Scottish industrialisation occurred within a very constricted space across the central belt, so that little long-distance transport was required.[21]

This should invite more contention than it has. The only peer-reviewing article on the book, by Catriona Macdonald, does not pick up on it, and the review as a whole is congratulatory.[22] But why should distance determine utility for industrial development? Would the Scottish iron industry around Coatbridge really have developed to its world-leading position between 1830 and 1850 without the mere 12-mile length of the Monkland Canal, or the dense network of short-spur Monkland mineral railways? As will become clear in this section, the 40-odd miles between Glasgow and Edinburgh might as well have been 400 but for the Union Canal (1822) and later the Edinburgh & Glasgow Railway (1842). The direct and indirect effects of these links on the industrialisation of the Lothians cannot be over-emphasised.

Map 3: Lowland canals in Scotland. *Source: James's Canal Pages; with the author's permission.*[23]

The opening of the Union Canal in 1822 finally linked the cities of Edinburgh and Glasgow, via Falkirk and the Forth & Clyde Canal, and to the Lanarkshire coalfield via the Monkland Canal (Map 3). The new canal had two short-to-medium term effects. Firstly, it opened up the Edinburgh coal market to interlopers from Lanarkshire, Stirlingshire and Fife. The promoters of the Union Canal had been the city fathers of Edinburgh, desperate to secure cheap supplies of coal for the capital. Unsurprisingly, none of the aristocratic Lothian coalmasters appeared among the list of 384 subscribers named in the Act.[24] The second effect was to stir the Midlothian coal producers to counter the competition from the west by improving local communications.[25] Foreseeing the competition the canal would bring, the Duke of Buccleuch and others had commissioned Robert Stevenson to prepare a survey for a railway line from the coalfields of Midlothian to Edinburgh, which he duly delivered in 1819.[26] Stevenson warned that a failure to address the situation would 'shut up the works of the Mid-Lothian Proprietors … a consequence which must follow, if things are allowed to remain in their present state, from the disadvantage of an expensive land-carriage, when brought into competition with the waterborne coal of West Lothian

and Fife'.[27] Nevertheless, it would take another twelve years for this imperative to translate into the Edinburgh & Dalkeith Railway (EDR), which opened in stages from 1831. The EDR was very primitive, as it was built of cast iron rails rather than wrought iron and was drawn by horse, gaining the nickname of the 'Innocent Railway'.[28] Branches to the harbours at Leith and Fisherrow and to Niddrie and Dalkeith followed, as well as many private tramway connections to coal districts. Neither did the Lothian coalmasters neglect port infrastructure. The facilities at Leith were insufficient to meet the needs of larger coal carrying vessels, persuading the Duke of Buccleuch to spend the staggering sum of £500,000 – around £80 million in today's money – between 1835 and 1844 to construct a new harbour at Granton, to the west of Leith.[29] The Cadell family of East Lothian, meanwhile, built a harbour in 1835 in Cockenzie, to ship coals from their Tranent pits, for a more modest £6,000.[30]

Fig.4: Terminal tunnel of the Edinburgh & Dalkeith ('Innocent') Railway, at Edinburgh. © *A Erginsoy.*

Of all these projects, it was arguably the EDR that had the greatest impact. Its main effect was to stimulate considerable new mineral activity in hitherto remote areas of Midlothian.[31] It also became the harbinger of the next stage of the transport revolution, namely the railway mania of the 1840s, which finally ended the region's isolation:[32] The Edinburgh and Glasgow Railway (EGR) opened in 1842. In 1845, the North British Railway (NBR) acquired the EDR, altering the gauge and laying stronger tracks. In 1846, the NBR opened a line between Edinburgh and Berwick and between 1846 and 1849 built branches to Haddington, Portobello, Musselburgh, Dalkeith and Tranent; in 1850 it made the first connection to England, at Berwick. In 1848, the Caledonian Railway opened a line from Carstairs in South Lanarkshire to Edinburgh, linking it to the Glasgow-Carlisle line. There followed a frenzy of competition between the Caledonian and the NBR to build new connections. The trains also brought with them the promise of a new industry in the Lothians – iron mining and manufacture.

The age of iron

The Scottish pig iron industry had developed fitfully in the Monklands district of Lanarkshire. It was predicated on two discoveries: the first in 1801 of rich blackband ironstone deposits by David Mushet and the second in 1828, namely JB Neilson's invention of the hot-blast process which permitted spectacular savings in fuel costs: 'Production mushroomed from about 37,500 tons in 1830 to almost 700,000 tons in 1849, with Scotland's share of British output rising from five to 25 per cent'.[33] By 1845, out of the 85 furnaces in Scotland, 65 were in or near the parish of Old or West Monkland.[34] But even as this statistic was being published in the *New Statistical Account* (NSA), the deposits of blackband in Monklands were nearing exhaustion, prompting a dispersal of iron firms, both as miners and as manufacturers, to more remote sites in Ayrshire and Fife – and also to the Lothians.[35] The Lanarkshire iron firms first arrived in West Lothian, especially working the slaty band deposits around Fauldhouse.[36] At the same time, a small but significant local pig iron industry developed in the South Forth (number of furnaces in brackets): the Kinneil works (4), established by J Wilson, 1846-1885; Almond (3) by J Russell & Sons, 1855-1881; Gladsmuir (1), in East Lothian by C & A Christie, 1855-1871; and Bridgeness (2), by H Cadell, 1863-1875.[37] All of these were discontinued during the period 1871-1885, because despite its access to good supplies of ore and its promising situation the local iron industry failed to establish a permanent presence and the industry failed to take off in Midlothian. To start with, there had certainly been a great degree of optimism. In a paper delivered before the Royal Scottish Society of Arts on 26 November 1860, Ralph Moore, a mining engineer who would later become the Government Inspector of Mines for the East of Scotland, proposed 'the erection, say of twenty blast furnaces' in the Mid- and East Lothian coalfield. At the time there was only one, at Gladsmuir. Moore declared:

> The quantity of coal in this field … is 5710 millions of tons, and it will not require more than 300 millions of tons to smelt this quantity of iron.
>
> The supply of limestone is inexhaustible.
>
> The North British Railway system already traverses the whole extent, and by short spurs or branches any point of the field could be reached.
>
> There would, therefore, be a most favourable combination of circumstances to the manufacture of Iron, viz: a plentiful supply of minerals, and cheap and efficient transport.[38]

Four months later, Moore was forced to qualify his remarks. Evidently, his earlier prognosis had attracted some objections from landowners: the field was heavily waterlogged, the cost of raising coal as compared with Lanarkshire meant 'there was no chance of successful prosecution of iron making', Gladsmuir had been a failure … and so forth. Moore argued that all of these problems were surmountable and that 'with railway connection and a more favourable supply of coal, Gladsmuir Iron Works could compete with those of Lanarkshire'.[39] Moore's vision of twenty new furnaces was unrealistic and went unrealised. Hassan has identified the main underlying reason for the failure of a local iron industry to take root in the Lothians as the relative decline of the Scottish pig iron industry after 1850, specifically the failure of the pig iron manufacturers to integrate with the malleable iron makers and the expanding steel industry, a point also made by Warren.[40] The lack of integration was not just a

failure of vision – there were also technical reasons. Pig iron smelted from Scottish ores, although fine for cast iron, could not be used in steel production before the invention of the Gilchrist Thomas Process in 1879 – 'But by then Scotland had no greater claim than several other areas to be the supplier of steel makers'.[41] Had the South Forth ironmasters established integrated iron and steel works at a time when imported ores from Spain that did not suffer from the same problem could have been used, things might have turned out differently. Then again, the principal market for iron plate, and later steel, was the Clyde shipbuilding industry, so the accretion of malleable iron works in the Motherwell-Wishaw area was always going to be more logical.[42]

North Esk case-study

One theory where Ralph Moore was proved correct was the discovery of significant deposits of blackband ironstone in the Penicuik district of Midlothian in the mid-1860s. The Esk valley from Dalkeith, seven miles south-east of Edinburgh, to Penicuik, a further eleven miles to the south-west, represents an excellent mini-case study of the interplay between natural resources, transport infrastructure and industry in the Lothians. The exploitation of the area's mineral deposits was only made possible by the penetration of railways into the River North Esk valley (see Map 4).[43] The first was the Peebles Railway (pink) which opened from the junction with the EDR (later NBR - green) in 1855. A branch to the coal works at Bonnyrigg followed in the same year. The RBW Ramsay company sank a pit at Loanhead, across the Esk at Polton, in 1855. Blackband was discovered in the area in 1865. The Esk Valley Railway (orange) was extended to Polton in 1867. The Shotts Iron Company of Lanarkshire took over Loanhead and Dryden collieries in 1869 to mine blackband. The new Penicuik Railway opened in 1872. The moving spirits for this line were the owners of a cluster of paper mills on the North Esk around Penicuik.

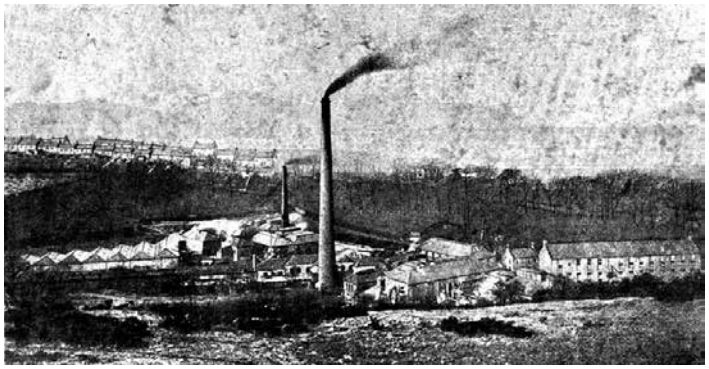
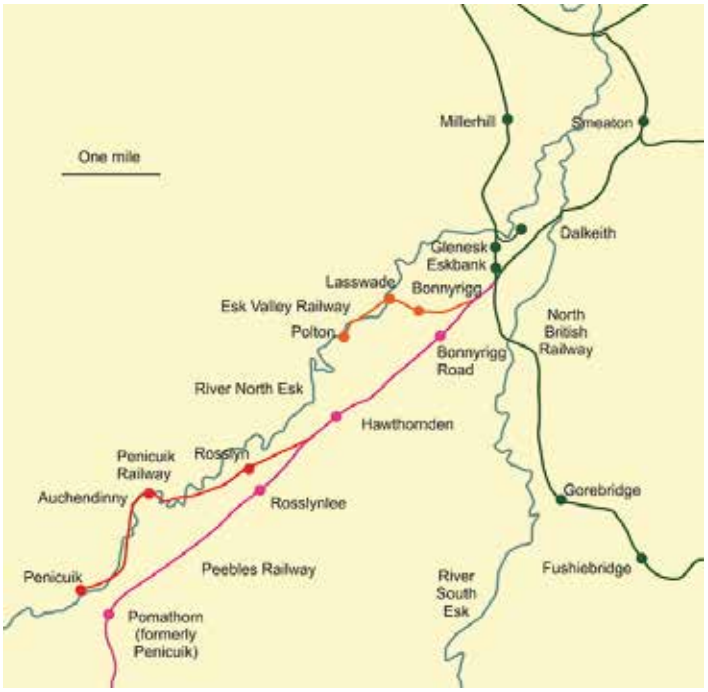


Fig.5: Esk Mills, Penicuik, Midlothian: closed in 1965 and since demolished. Daguerreotype image taken by J Brown, 1887. © *Penicuik Historical Society.*

The Penicuik Railway Company's Chairman, RB Wardlaw Ramsay, was enthusiastic about the proposed new line at the Company's half-yearly meeting of shareholders on 25 October 1871. The existing Peebles line was, *The Scotsman* reported him saying, 'absolutely useless to the paper manufacturers', who had to rely instead on horse-drawn carts, whereas 'the Penicuik line was made so as to run right into the works of every one of the manufacturers on the Esk, and the consequence was that it was certain to secure the whole of that traffic'.[44]



Map 4: Network of railways around Penicuik in 1872. Source: 'Rail Archive Website'. CC BY-SA 4.0[45]

The importance of the Midlothian papermaking industry for the economy of Scotland has been overlooked by historians until quite recently. The main driver for this industry was the market represented by Edinburgh, the legal, financial and printing centre of the country, but it was long seen by historians as ultimately a local domestic one. JH Clapham commented, in 1926, that 'The industries round Edinburgh were those required for a capital city. The new industries were round Glasgow and Clydeside'.[46] Even DC Coleman's tome covering 370 years of papermaking in Britain mentions the Midlothian industry on only five pages. Moreover, Coleman cited the North Esk mills as being among several clusters in England and Scotland that remained in their original locations during a more general drift towards sites with better transport and coal supplies, seemingly unaware that the area developed both.[47] Richard Hills's book, covering the British industry between 1488 and 1988, has more useful detail, but is ultimately a national study.[48] Alistair Thomson's 1974 work takes the

Fig.6: Former Paper Mill at Lasswade, Midlothian, today a pub and restaurant. © *A Erginsoy.*

industry in Scotland as its subject matter, but he terminates his narrative in 1861, just as the industry was about to take off.[49] More recently, Ying Yong Ding's unpublished PhD thesis of 2011 has provided a very detailed history of the Midlothian firm of Alexander Cowan and Sons, but this deals mostly with organisational and technological matters, and only mentions the role of transport in one paragraph.[50]

From the early 1700s onwards, paper mills had sprung up in Midlothian on the rivers and burns of the area. The stretch of the North Esk between Penicuik and Lasswade was home to an important cluster, which, according to the *New Statistical Account* (NSA), by 1836 boasted five machines producing 52,800 yards per day and generating £24,000 per annum in revenues from duty for the Exchequer – allegedly as much as was derived from the entire paper industry of Ireland.[51] A sixth machine followed in 1839. The halving of the duty on paper in the same year stoked demand, accelerating the switch from water to steam engines fuelled by readily available local coal supplies. By 1853, a cluster of no less than ten mills were operating, three of them belonging to Alexander Cowan & Sons, by then Scotland's largest paper manufacturer.[52] Another, Esk Mills, owned by James Brown, would go on to become a global exporter of coated papers in the twentieth century.[53] What turned an important local industry into one of global importance seems to have been the arrival of the railway. The extension of the horse worked Edinburgh & Dalkeith coal railway to Dalkeith in 1838 was the start, followed by the upgrading of the line after its acquisition by the NBR in 1845. A branch of the EDR to Leith was already in existence for the import of raw materials and export of the finished product. These operations were greatly improved by the opening of the Duke of Buccleuch's new harbour at Granton in 1838 and railway links into it in 1846 and 1863. Granton gained particular importance after 1861, when several of the Penicuik mills adopted esparto grass as a raw material for their higher-grade paper, instead of rags and old rope, which had become increasingly difficult to source due to an increased demand for paper and competition from other industries.[54] Esparto, cheaper to produce and process, was imported from Spain and North Africa directly into Granton. The 'final mile' to the Penicuik mills, previously traversed by cart, was completed with the opening of the Esk Valley Railway in 1872, bringing coal to the doorstep and an efficient link to domestic and export markets.

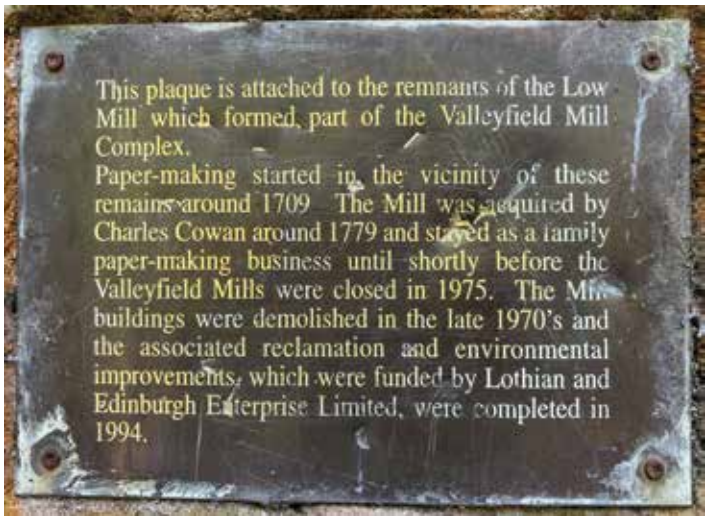


Fig.7: Plaque on the site of Valleyfield Mill, Penicuik. © *A Erginsoy.*

It is difficult to quantify the effect of these transport improvements on the business performance of the North Esk mills. In the case of the largest of these concerns, Alexander Cowan & Sons, very scant financial records have survived for the period between 1840 and 1880. However, using company records held at the National Records of Scotland, Ding has compiled a table of cash balances held at British Linen Bank, Edinburgh, by Alexander Cowan & Sons between 1847 and 1875.[55] In the absence of information on profits and capital balances during this period, the cash balances are a good indicator of the firm's growing prosperity. Mapping the figures to significant events appears to support this conclusion. For example, the company's cash balance grew from £22,561 in 1856 to £54,243 in 1869. In the interim, esparto was widely introduced in papermaking in 1861 and the rail link to Granton Middle Pier opened in 1863. In the year that the Esk Valley Railway opened in 1872, the cash balance jumped to £93,035 from £56,180 the year before. While it would be methodologically unsound to draw a direct causal link between such events and increasing cash reserves, a correlation is clearly visible. Improved transport links and access to sources of supplies may have given the company the confidence to bid for larger contracts, or to ramp up production.

Fig.8: The Cowan Institute: gifted to the community by the Cowan family, owners of Valleyfield Mill, in line with the instructions of Alexander Cowan (1775-1859). Today houses Penicuik Town Hall. © *A Erginsoy.*

Conclusion

Throughout the period from 1822 to 1872, the Lothians exhibited a wide but relatively shallow industrial base that was lacking (except in the papermaking industry) in the kind of concentrated regional specialisation that sparked the explosive growth of the cotton and iron industries in the Clyde basin. Despite favourable natural resources, notably coal and ironstone, industrialisation in the Lothians did not follow the same path as in the west of Scotland. The Lothians were hampered by poor communications and the region's isolation did not fully end until the close of the 1840s. Nevertheless, the full exploitation of the Lothians' rich mineral resources would not have occurred without the development of railways and harbour facilities from the 1830s onwards, challenging Hutchison's claim that transport made a lesser contribution to Scotland's economic modernisation.

The discovery of blackband ironstone and the establishment of a dense network of mineral railways led to new iron ore mining operations and to the development of a small local pig iron industry. The failure of the latter to take hold shows that rich natural resources and favourable communications are no guarantee of success. Conjuncture is also important. The Lothians iron industry failed because by the time it was ready to expand, the pig iron industry had moved on and malleable iron and steel were the new frontier. By the time a technical process with potential to enable Lothians ironstone to be used for this purpose had been discovered, the local iron industry had lost any comparative advantage it might have had.

The upward trajectory of the Esk Valley paper industry shows that take-off in regionally specialised industries could occur at any stage, even as late as the second half of the nineteenth century. Improved transport infrastructure allowed the North Esk paper mills to fully exploit the geographical advantage inherent in their proximity to the major printing and publishing centre of Edinburgh, and to use this as a springboard to build a thriving export industry. This again belies Hutchison's pronouncement. The routes to industrialisation are manifold and the quiet revolution of the Lothians was one of them.

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