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On the reasons why the First Industrial Revolution was British: a multisectoral and multifactorial approach

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Author: Cristian García-Mascaraque Marín

Supervisor: Nicholas John Edwards

Departament de Filologia Anglesa i de Germanística

Grau d'Estudis Anglesos/Grau d'Estudis d'Anglès i Francès

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To my father, for more than a decade sharing together the endeavour of industrializing. To my supervisor Nicholas Edwards as well, for his exemplary work as a teacher.

ABSTRACT: Throughout the 18th century and the first half of the 19th century, a complex combination of multiple causes in different locations in Great Britain led to a series of progressive and interlocking small and large-scale revolutions, which came to be known as an *Industrial Revolution*, a term documented for the first time in 1799. This historical process did not take off at any single specific moment in time as previously theorised, nor in a homogeneous way all over the territory but on a regional basis, particularly at the beginning. My thesis statement is thus that the *First Industrial Revolution* originated from a variety of sectors and factors in different areas and at different points in time and place nationwide, being in turn the cause of progressive changes in almost every aspect of the social and economic organisation of the society at the time and for the forthcoming generations.

One of the main factors to be addressed is the political and social circumstances in which the *First Industrial Revolution* developed in Great Britain. Among the most important changes in the context of this process was the decline of feudalism, a major socio-political event closely related to another key factor, the agrarian revolution, which was mediated by the removal of the traditional scheme of rights shared between powerful feudal lords and humble peasant farmers and along with other factors such as the enclosures of the land.

Furthermore, this new scenario also facilitated important changes in domestic living conditions due to the new social organisation and the shifting labour market needs, which ultimately had an important influence on two other factors, the urban and the demographic revolutions. The enormous spurt of population growth in Great Britain in the 18th Century will be a matter of discussion as a major factor behind the *First Industrial Revolution* as well as the birth of the big city in contrast to traditional life in the countryside, together with the conditions of most of the population.

At the core of the *First Industrial Revolution* lies a series of interrelated technological innovations associated above all with the discovery of new ways of using natural resources and forms of energy and new forms of organisation of labour. Notably, the introduction of profitable steam power, the replacement of charcoal by coal and the substitution of human and animal labour by new devices in the form of machines. All these aspects will be examined in detail for their great contribution to the *First Industrial Revolution*, particularly in terms of the revolution in transportation and the emergence of the organisation of work in factories.

Keywords: *First Industrial Revolution*, agrarian society, capitalism, cottage, factory, innovation, natural resources, population growth, steam power.

0. Introduction

Among the historical processes that have taken place over the last few centuries, arguably none has been as significant as the *First Industrial Revolution* in terms of shaping the landscape, politics, economy, and society of the United Kingdom. Nevertheless, despite its historical relevance, there are still misconceptions about how this series of transformations unfolded that persist to the present day. The *First Industrial Revolution*, in my view, has been regarded until recent times as a nationwide process of industrialization that purportedly would have triggered from a definite "takeoff" point (Rostow, cited in Osterhammel 641) in British history, which would have occurred around mid-eighteenth century either as a result of the momentum given by the thriving cotton industry to the economy or after a given degree of technological development was reached. My thesis is, conversely, that the *First Industrial Revolution* in Great Britain cannot be explained as the outcome of the dominance of a sole factor or set of factors in a specified sector of the economy, but rather of their interplay, and that in consequence the development of the *First Industrial Revolution* cannot be traced back neither to a single location nor to a specific milestone with historical accuracy. In this regard, the purpose of this dissertation is to provide authoritative evidence to support the conception of a *First Industrial Revolution* in Great Britain of multi-sectoral and multifactorial interrelated genesis which unfolded across several decades and from different geographical locations in the territory of the country.

The term *Industrial Revolution*, already used by Engels in 1845, was popularised by the historian Arnold Toynbee at the end of the 19th century and since then has been subject of controversy. The primary source of contention is the word *revolution*. The question lies in the usage of this word in connection to political revolutions, which are generally a rather quick affair in terms of history that can be identified with specific

locations and dates. The *First Industrial Revolution,* however, had very deep roots in the history of the nation and unfolded comparatively gradually over decades, so in a sense it is not unreasonable to look at it as an *evolution* rather than a *revolution.* (Griffin 00:08:12-00:09:34). At the same time, the total extent of the change that the *First Industrial Revolution* brought about in the course of the nation justifies calling it a *revolution*. Regardless of the case, *First Industrial Revolution,* when capitalized[1], denotes what can be synthesized as "the first historical instance of the breakthrough from an agrarian, handicraft economy to one dominated by industry and machine manufacture" (Landes 1), a broad definition to which a multitude of nuances could be added.

Furthermore, the *First Industrial Revolution*'s industrialization development is inextricably connected to a more ample process known as modernisation. The innovations that sparked the *Industrial Revolution* paved the way for modern democracy and the rise of modern economies. As Humphries points out, "the *Industrial Revolution* represented a portal through which economies accessed modern economic growth." (Bragg, 2016a, 00:02:51-00:02:59). The series of transformations that took place threw society into disarray, uprooting outdated socio-economical interrelations and giving rise to new ones, though sometimes not necessarily for the better. Thus, the population, the social and economic order, politics, and industry were about to change under the influence of a series of revolutionary processes that affected nearly every aspect of life in Great Britain.

1. Political and economic background

Politics in England during the early *First Industrial Revolution* was mainly punctuated by the rise of the modern parliamentary system, which was the outcome of

[1] Written in lower case, the term *industrial revolution* designates nowadays "any rapid significant technological change." (Landes 1).

both the passing of the Bill of Rights[2] by William of Orange's Parliament in the times of the Glorious Revolution and the ideas of the political philosopher John Locke[3]. In the 19th century, nevertheless, politics was above all centred on the tension between the British folk and the Parliament and on the different legal regulatory dispositions that this institution ultimately adopted in response to the multiscale transformations that would take place throughout this process of modernisation.

Regarding national policy, on May 1, 1707, the Kingdom of Great Britain came into being with the union of England, Wales, and Scotland through an Act of Union in which both England and Scotland agreed to disband their respective parliaments and combine them into a new one. The resulting Parliament of Great Britain, nonetheless, sat at Westminster, London, and followed English procedures. With time, the Parliament of Great Britain constituted "an effective, fairly centralized bureaucratic government" (Landes 6). Among the measures adopted by this new Parliament, one was to ensure that the succession to the throne fell to a Protestant monarch, giving the right of succession over Queen Anne to the House of Hanover if she died without an heir. Thus, the crown passed to George I in 1714 after the death of Queen Anne and in January 1801 under the rule of the grandson of George I, George III, the United Kingdom of Great Britain and Ireland was born through the Act of Union of 1801. A number of historians relate the values of Protestantism to the success of the rise of capitalism in what came to be called *Protestant work ethic.*[4]

[2] The Bill of Rights of 1689 essentially limited the power of the king and set the principle of parliamentary sovereignty, reinforcing the rights gained by the Parliament. From this moment forward, the king of England had to rule in partnership with the Parliament.

[3] John Locke came up with the idea that the State was not something given by God to a king through divine right, but rather something created by men for their own benefit and for the sake of the protection of their freedom and property. (Bragg 2001, 00:17:41-00:18:01).

[4] Protestant work ethic stresses diligence, discipline, and frugality as a result of a person's commitment to the Protestant faith. ("Protestant work ethic").

In terms of warfare, in the first half of the 18th century Great Britain faced a series of Jacobite[5] uprisings between 1708 and 1745 and a decade later fought the Seven Years' War. France lost the conflict and in 1763 surrendered control over Canada, thus placing the British Empire as the prevailing power in North America and ushering in an era of British colonial and naval hegemony. Nonetheless, the cost of the war turned out to have been so high that Great Britain had to increase taxes on the American colonies, which eventually rebelled in 1775. The American Revolutionary War ends in defeat and the British Empire loses its North American colonies but retains control over Canada and the Caribbean and settles in new territories such as India and Australia. Furthermore, in 1789 the French Revolution broke out and a few years later in 1793 the new French Republic went to war against Great Britain, remaining in conflict until 1815 when Napoléon lost the Battle of Waterloo. Among the battles fought during this period, the Battle of Trafalgar won by the Bristish against the combined fleets of the French and Spanish Navies is of utmost importance as it cemented the dominance of the Royal Navy and removed the greatest threat to British expansion and trade overseas. ("Industrial Revolution Manchester" 00:09:14-00:09:34).

Concerning the economic background, Allen focuses his thesis on the unique wage and price structure of Britain as "the pivot around which the industrial revolution swung." (Allen 2011: 359) correlating it to the profusion of inventions of the 18th and 19th centuries. Nevertheless, this was not the only factor required for the accumulation of capital, which ultimately impelled the *First Industrial Revolution.* On the hand, the law of primogeniture, which regulated the succession to landed estates, contributed in the early stages to maintain undivided property, thus favouring the emergence of the large

[5] The Jacobites were later supporters of James II who after his deposition by the Parliament during the Glorious Revolution still thought that his descendants should reign.

capitalist farm. On the other hand, as Hartwell puts it, equally significant "were the appearance of the long-term mortgage, the fall in the rate of interest, and the foundation of the Bank of England and a national debt." (Hartwell 1967: 25). Economic policies also changed in resonance with the social class around which power revolved. As power changed from hand to hand in Parliament from landlords to the middle class, trade policies evolved from protectionism to mercantilism, "the necessary matrix which the infant economy had to be coaxed into growth" (Wilson, cited in Hartwell 1971: 181), eventually shifting to the free market in the mid-19th century, which was a sign of "the readjustment of the whole home and foreign, commercial and financial policy of England in accordance with the interests of the manufacturing capitalists – the class which now represented the nation." (Engels 43).

2. **Demography and sociology**

One of the most important factors involved in the *First Industrial Revolution* was the enormous spurt of population growth in Great Britain in the 18th Century. This was not, admittedly, the first time that the population had grown substantially, but until now the Malthusian check[6] had always been reached. During this period, and in an unprecedented manner, the population grew and there was enough wealth to support it thanks to the relatively high wages. As Crafts and Wrigley point out in this sense, "Britain was the first country to break free from Malthusian constraints, with population size and living standards beginning to grow in tandem." (Crafts 1985 and Wrigley 1983, cited in Voigtländer and Voth 2). Even though "Prior to the nineteenth century, English demographic data are incomplete" (Razzell 743) it is known from the parish registers that during this period the British population skyrocketed thanks to the combination of a fall

[6] Malthus specifically stated that "food supply grows arithmetically, but population grows geometrically.". In other words, that the human population size will always expand faster than our ability to feed ourselves.

in mortality together with a rise in fertility in times of relative social and political stability during the first half of the century. These demographic trends are attested by Malthus himself who, as a parish priest, oversaw registering baptisms and burials noticing a significant increase in the number of baptisms, mostly of very poor children, and a lowering number of burials. In this context, "The population of England rose from five and a half million in 1688 to more than eight million in 1801." (Woods ch. 16).

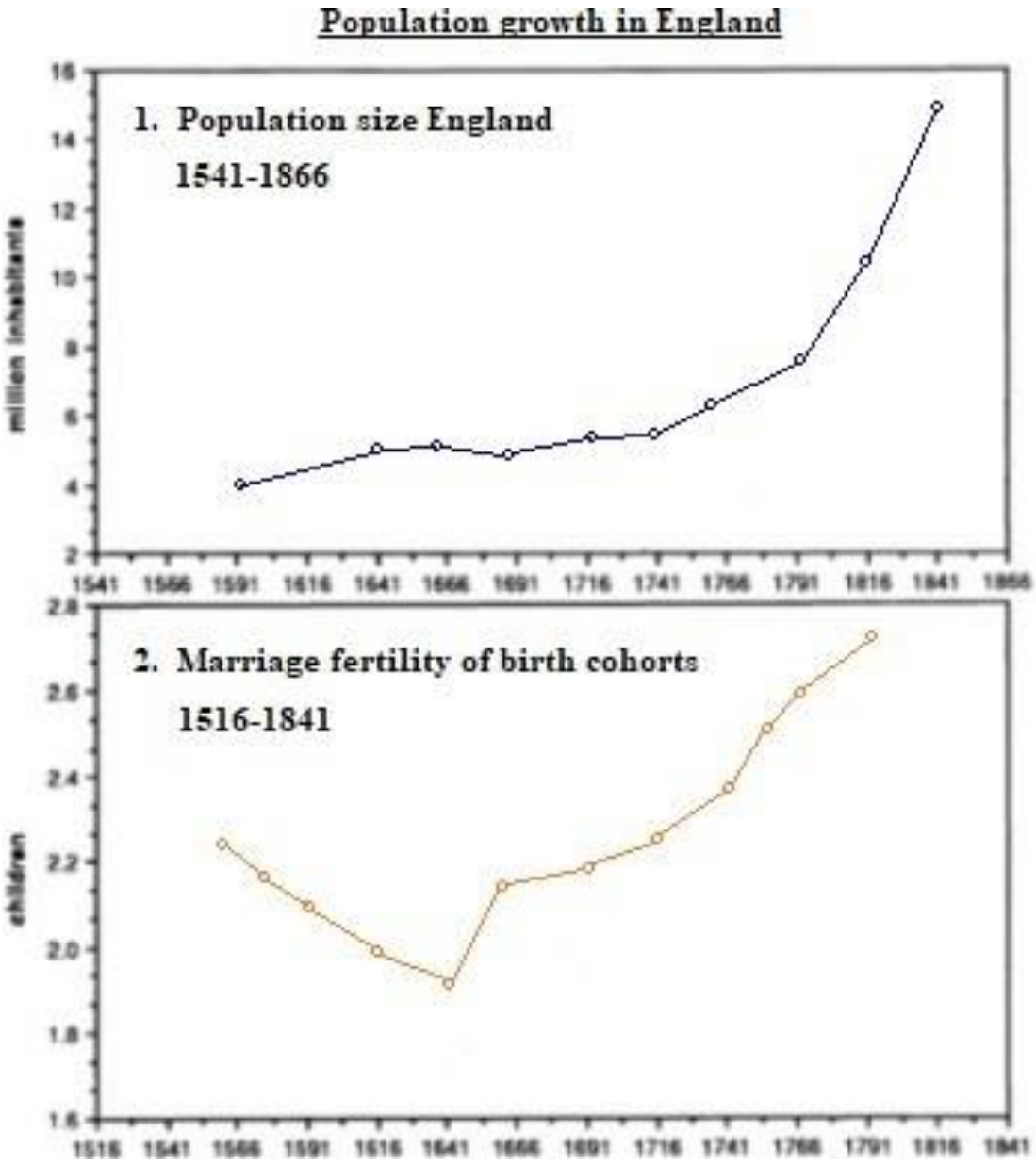

Figure 1**:** Population growth in England. Adapted from Nustelling (1993), which is based on data from Wrigley and Schofield (1983).

Cities grew rapidly in the 18th century with people flocking to them for employment. According to Griffin, until this century it has been "just London as a great big city and then smaller towns like Norwich, Bristol, and Exeter, which were between ten and twenty thousand in size. About the end of the eighteenth century, we got cities with one hundred thousand inhabitants." (Bragg 2011, 00:02:42-00:02:55). A clear example of this is Manchester's population, which grew tenfold in the 18th century, mainly due to a booming textile industry. Also, the case of Birmingham, which went from being a small metal-working town of 7,000 inhabitants to a city of nine times that size, the third largest in the kingdom. (Why the Industrial Revolution Happened Here 00:21:00-00:21:17).

As population growth and urbanization expanded, significant improvement in the domestic hygienic conditions in towns and cities and advances in medicine were instrumental to contain the "repeated visitation of cholera, typhus, smallpox, and other epidemics." (Engels 39). Several key advances in medicine such as the introduction of vaccination, noticeably the smallpox vaccine developed by Edward Jenner in Great Britain at the end of the 18th century, are strongly correlated with this recessive tendency in the spread of epidemics and therefore, with decline in the documented death toll. It is worth mentioning that these factors also enabled the increase in the number of children who lived through childhood, resulting in a future larger national workforce. In addition, the rise in fertility correlates with the reduction in the age at marriage, allegedly thanks to an unprecedented rise in the real income among the population. Whereas adult survival reinforced the economic growth by demographic number, high wages provided the necessary resources to foster the skills and knowledge of the workforce.

Literacy grew significantly during the eighteenth century but almost exclusively for children of well-off families in which it was common for boys to have a few years of

education and even for many girls to receive some schooling. It must be noted that, as C. Cipolla points out, “England could usefully employ in her factories a large number of illiterate and semi-illiterate children. (…) by offering increased opportunities for the employment of children, the *Industrial Revolution* raised the opportunity cost of education and therefore affected negatively the consumption for it.” (Cipolla, cited in Hartwell 1971: 234). Hence, popular education remained stagnant until the middle of the nineteenth century.

3. Agrarian reform

3.1. Pre-industrial Revolution agriculture

Prior to the eighteenth century in England, when feudalism was the prevailing order, agriculture had been organized around feudal domains or ‘manors’, hold and managed by a feudal lord. Characteristically, each manor consisted of a manor house, a parish church and a village surrounded by lands owned by the lord. These lands usually could span hundreds of acres and were divided up into scattered strips of different value, partly as a result of the continued application of the traditional open field farming system. A portion of these lands, known as ‘demesne’, was under the direct control of the lord of the manor who used it to maintain his household, whereas the rest of his holdings was divided into farmland, cultivated by tenant farmers, and ‘common’ and ‘waste’ land, over which landless farmers had certain customary rights.

3.2. From feudalism to the capitalist farm

By the end of the eighteenth century, feudalism had almost faded away with the decline of absolutism, and rural society was being completely reorganized by the progressive substitution of the “traditional system of land tenure, with its vestiges of feudal privileges and its tenacious communal rights (…) by one of unlimited ownership of enclosed parcels.” (Landes 8).

3.2.1. Enclosure of the land

Among "many forces (…) speeding up the process of proletarianisation" (Archer 12) were the enclosures of the land. This phenomenon of privatization essentially disinherited villagers of their traditional customary rights over the common such as gleaning after harvest, gathering firewood, or pasturing cattle. Yet, enclosures were nothing new since they had been around for centuries in England, though now a new figure had come into play: the Parliament. Bragg states that by 1600 half of the country's land was enclosed (Bragg 2008a, 00:05:31- 00:05:36), and Wordy adds that "at least 75 per cent of England was already enclosed at the outset of the main waves of enclosure by act of parliament from 1760, and as much as 70 per cent already by 1700" (Wordy, cited in Dimmock 132). The remaining quarter of the country's arable land, as Archer points out, "over six million acres (…) were enclosed under parliamentary acts between 1750 and 1850." (Archer 10).

The enclosures deprived the peasants of that indispensable supplement to their economy to carry on generation after generation, destroying "a way of life for many, stripping the commoners of their independency and 'mutuality' and transforming them into a rural working class." (Archer 12). On the one hand, the consent to cultivate land communally and to provide pasture for livestock had meant for them a relative confidence in securing a minimum supply of food to feed their families. On the other hand, accessing to the common and wastelands to gather firewood had been an invaluable advantage, since fuel, which was essential for cooking and heating the household, was one of the most expensive commodities of the time. In this sense, Archer observes that "wood theft probably became the commonest crime in rural England, particularly during the French wars." (Archer 13).

Moreover, this ongoing process of enclosure not only had these indirect consequences through the removal of customary rights, but it also reduced the available work in the fields, pauperizing innumerable families. Thus, the villagers, who had relied on farming to fend off starvation for centuries, now had three basic alternatives; to lead a serf-like new life as tenant farmers for the wealthy capitalist landowners, to leave the country for the New World or to struggle to get by in the already-crowded industrial cities.

3.2.2. Parliament and landowners

A further hallmark of the agrarian reform during the development of the *First Industrial Revolution* was the passing of the Corn Laws, a series of parliamentary measures enforced between 1815 and 1846 specifically designed to grant a protected domestic grain market for the landowners in Britain, the class held in special regard by the Parliament. As Bertocchi points out, "There are two groups in the population, landlords and land-less workers. At this stage, wealth is land, power is wealth, so land is power." (Bertocchi 3). On the dominance of landowners in Parliament, Paul states that "it was a common idea that all value comes from the land, and this is why society should be based on the landed elite." (Paul, cited in Bragg 2015, 00:22:05- 00:22:18), a thought strongly advocated by the physiocrats[7]. Essentially, the Corn Laws ensured that prices for their domestic products remained high and stable by imposing tariffs on imported cereal grains, which displeased almost every other class and left a big deal of poor people half-starved and destitute. ("Industrial Revolution Manchester").

This state of affairs persisted until the early 19th century when things began to change with the passing of the Great Reform Act 1832[8]. For Engels, this Act represented

[7] The physiocrats were a group of French economists in the Age of Enlightenment who thought the wealth of nations was completely determined by the worth of "land agriculture" or "land development," and therefore that agricultural goods should be highly priced. ("Physiocracy").
[8] The Great Reform Act of 1832 is considered by historians as one of the most important Acts of Parliament of the United Kingdom.

"the victory of the whole capitalist class over the landed aristocracy."[9] (Engels 42). Whereas the repeal of the Corn Laws fourteen years later, in 1846, was "the victory of the manufacturing capitalists not only over the landed aristocracy, but over those whose interests were more or less bound up with the landed interest –bankers, stockjobbers, fund-holders, etc." (Engels 42).

4. Energy and innovation

4.1. Inland natural resources and raw commodities from the colonies

Among the most significant factors behind the *First Industrial Revolution* in Great Britain were its relative abundance in natural resources and the ecology of the British Isles, which in conjunction with the colonial empire overseas provided an exceptional framework to obtain the required productive factors to meet the new needs of the British population in exponential growth. Above all, inland availability of a large supply of a fossil fuel, coal, which according to Wrigley turned to be of "pivotal significance to the development of industrialization" (Wrigley, cited in Hartwell 122), further arguing that the difference in coal production in the eighteenth century between England and the economies of continental Europe is both the cause and the measure of their divergent economic growth. Coal gradually substituted wind and flowing water as the energy source for industry and firwood and charcoal, which had to be obtained from trees, for residential heating and cooking applications. Furthermore, it was essential for the development of the coke smelting industry which produced pig iron, the building material of better quality at that time. This also gave way to the development of the composition of steels, which were made to meet better mechanical properties than iron, thereby enabling engineers and architects to build more robust machines and taller buildings. Also, for combustible gas,

[9] In the sense that it broadened the franchise's property qualification for county voters including now small landowners, tenant farmers, and shopkeepers.

which was initially obtained from coal, and lighted the early public lamps in big-city streets as early as in 1816 rendering them more secure.

The contribution of the British Empire's colonies to the *First Industrial Revolution* in economic terms was both in funding it through a growth of global demand for goods and in its constant supply of commodities. Even though the Dutch and the French also settled colonies in India, Caribbean[10], and North America, they were mainly vanquished in these territories by the British forces. Thus, in the 19th century, Britain benefited from the greatest trading empire that the world had ever seen, which funded and supplied the *First Industrial Revolution*.

4.2. British ingenuity and inventions

Perhaps the best-known feature of the *First Industrial Revolution*, British ingenuity was one of the most important pillars underpinning its development and a major contributor to the modernisation of the nation. The importance of the Scientific Revolution background, remarkably the Newtonian science, and the ongoing Enlightenment of the period have been emphasized in providing knowledge for technologists to exploit. (Jacob and Stewart, and Mokyr, cited in Allen 2011: 358). Nonetheless, inventions did not always originate from the enlightened intellectual elite, which were a minority of people (Bragg 2001, 00:05:01-00:05:43) but, as Smith recounts, emerged from different sources: "A great part of the machines (…) were originally the inventions of common workmen, who, being each of them employed in some very simple operation, naturally turned their thoughts towards finding out easier and readier methods of performing it.", whereas "many [other] improvements have been made by the ingenuity of the makers of the machines, when to make them became the business of a peculiar

[10] At this point in history, the *Caribbean* was better known as West Indies. This region was integrated by islands such as Jamaica, Antigua and Barbados, which concentrated a substantial share of the total number of plantations in the entire British Empire.

trade." Finally, "some [other] by that of those who are called philosophers or men of speculation, whose trade it is not to do anything, but to observe everything." (Smith 115).

Among the latter type of inventors, of particular significance was the role of the learned societies, where industrialists and scientists meet to share their ideas and observations. The most famous of these was founded in Birmingham and known as the Lunar Society, defined as "a gathering of free and fertile minds centred on the remarkable quartet of Matthew Boulton[11], James Watt, Joseph Priestley, and Erasmus Darwin.[12]"(Bragg 2003, 00:00:20-00:00:27). Among its most outstanding members, besides Charles Darwin's paternal grandfather, Erasmus Darwin, was Josiah Wedgwood, his maternal grandfather, who brought his pottery business to the standards of Queen Charlotte by means of innovation and became one of the richest men in the country as a precursor of the consumer revolution.

Considering the political and economic impact of the innovations and the importance of preserving the know-how of the British technology, "Ten major laws were passed between 1695 and 1799 against the emigration of artisans and the export of machinery. They covered the metal, clock, glass, pottery, harness, mining, and certain machine-making trades as well as textiles." (Ben-Atar 13). Nonetheless, as Jeremy points out, "despite the laws, thousands of artisans did go abroad during the French Wars, taking their machine building, operating, and managing skills with them" (Jeremy 34) and, as Osterhammel adds, "Early-nineteenth-century Britain was already swarming with technological spies from continental Europe and the United States." (Osterhammel 640).

[11] Matthew Boulton was a textile entrepreneur who founded the Soho Manufactory in Birmingham, an early factory which pioneered mass production on the assembly line principle. Nevertheless, he is best known as business partner and capital provider of James Watt with whom he founded Boulton & Watt steam engines, an engineering and manufacturing firm that gave an essential boost to factories, as well as later to Birmingham's shipbuilding industry, thanks to the introduction of their steam engine.

[12] For many historians, Erasmus Darwin embodied the qualities of the archetypal English Enlightenment man. (Bragg 2001, 00:25:00-00:26:56).

Therefore, these prohibitory laws "failed signally to stem the flood of technological information spreading abroad" (Jeremy 34).

4.2.1. Profitable steam power

I sell here, Sir, what all the world desires to have – *power*.

Matthew Boulton in 1776

A central characteristic factor behind the process known as *First Industrial Revolution* was the introduction of profitable steam power. While the employment of fast flowing streams played a key role in the first part of the eighteen-century *Industrial Revolution* with many industries built near them in order to take advantage of its power, the later improvement of steam driven machines changed every other aspect in manufacturing. The contemporary use of steam power was pioneered by Thomas Savery with the purpose of tackling the existing problem of the demand for coal caused by the increasing price of timber wood and the requirements of the iron industry, "which was stifling for lack of fuel" (Landes 3). At that time, miners employed horse-driven pumps, which were pretty good for getting water out to a depth of about 90 feet. (Why the Industrial Revolution Happened Here 00:05:27-00:05:31). Savery developed a pump able to raise water by application of heat by means of fire, which was conceived especially for draining coal mines thus being able to dig deeper "until water seepage became a serious hazard" (Landes 2). Nevertheless, its efficiency was indeed very low. Since Savery's engine concept was patented in 1698, Thomas Newcomen had to make agreements with Savery after developing a more advanced design of the steam engine able to raise water from deeper mines, using the piston concept conceived in 1690 by the Frenchman Denis Papin and working purely by atmospheric pressure. Nonetheless, it was not until 1769 when James Watt patented a modification of the Newcomen atmospheric pressure engine adding a condenser to it that steam power became profitable. In words of Anderson, James

Watt's improvements to the steam engine actually "converted it from a prime mover of marginal efficiency into the mechanical workhorse of the *Industrial Revolution*". (Anderson). Consequently, industry was no longer concentrated along sources of flowing water, but increasingly concentrated near coalfields. It is worth noting the role of the steam engine as the archetypal illustration of technological interrelatedness, since an effective condensing engine could not be built until better metalworking technologies enabled the production of precise cylinders. (Landes 2).

4.2.2. Textile entrepreneurship and innovation

Textile industrialists were initially strongly incentivized to look for new solutions by the sharp increase in the labour cost and the availability of cheap energy. The need to meet the great volumes of demand for textile of the new middle class and the uniforms of the army involved in the war with the French and later Napoleonic Wars prompted the mechanization of the production of cotton at the same time as other goods such as candles began to be manufactured in factories. In the mid-1760s, James Hargreaves reshaped the concepts of John Wyatt and Lewis Paul to create the first successful spinning jenny. Not much later in 1767, Richard Arkwright hired John Kay to create the water-powered spinning frame, a machine to transform raw cotton into mass-produced yarn. Samuel Crompton invented the spinning mule combining the two aforementioned technologies and history repeated itself in the two other main branches of the trade: weaving, and finishing, giving to Britain a great competitive advantage over its competitors for decades. As Landes points out, these machines were not only much more productive, but their product was also of better quality: "The best Indian hand spinner could not turn out yarn so fine and regular as that of the mule" (Landes 5). These textile machines were housed in mills, the most famous one is Arkwright's mill factory at Cromford, Derbyshire, the man who later deserved the controversial appellative "father of the modern industrial

factory system" by his organizational skills. As Engels goes on to tell us, James Watt's steam engine was "used for supplying motive power spinning since 1785." (Engels 54). Consequently, several traditional methods such as the early spinning mills were phased out since there were over 100,000 steam engines at work throughout Britain by the end of the nineteenth century. (Trueman).

5. Geographical distribution of industry

A common misconception when considering the *First Industrial Revolution* is to assume that it was a phenomenon that emerged and utterly spread across the nation in a homogeneous way. In this regard, Osterhammel observes that “Whether industry sank root or whether it failed to catch on, whether it began late or was not even attempted: all this depended on complex combinations of multiple causes in specific local settings.” (Osterhammel 638).

Broadly speaking, in the nation's history “everything that happens in this country seems to stem from London, except for that brief period called the *Industrial Revolution* when this country tips up the other way: everything goes North.” (Bragg, 2016a, 00:17:24-00:17:37). A paradigmatic example of this is Lancashire, in North West England, which in 1830 processed 85% of all cotton manufactured worldwide (Gibb 2005, cited in “Lancashire”). Northern regions not only had the necessary material and human resources, but also the intellectual capital in the form of inventors which was lacking in the agricultural regions of Southern and Eastern Britain. This does not mean, however, that London lost its prominence since it acquired the status of the “commercial capital of the world” (Engels 68) and played a very significant role in the commercial import and export flow of commodities, particularly after the adoption of mercantilism and later the free market.

As a consequence of the North–South divide, there was good relatively well-paid work available in the industrial regions of the North but in other large parts of Britain such as the rural South East of England, industrialisation had not yet taken significant effect. The industrial dimension of the North–South divide can be seen in the following table, which shows how in times of Engels there was a strong predominance in industry of the Northern regions of Great Britain:

Overview of the main locations of industry in Great Britain in the 19th Century according to Engels:		
Cloths		
Cotton	Lancashire, Glasgow	
Wool	West Riding of Yorkshire, particularly at Bradford Other places such as Leeds, Halifax, Huddersfield, etc	
Linen	West Riding of Yorkshire Other places such as Leeds, Dorset, Lancashire, etc	
Silk	Cheshire, Macclesfield, Congleton, Manchester, Somersetshire	
Hose	Nottingham, Derby	
Lace	Nottingham, Leicester, Wiltshire, Devonshire, etc	
Metals		
Iron	Mining: Northumberland, Durham	Manufacturing: Birmingham, Shefield

Table 1: Overview of the main locations of industry in Great Britain in the 19th Century according to Engels. Data compiled by the author of this TFG from Engels (1845).

6. Transport and commerce

A determining factor for the viability of the *First Industrial Revolution* process was the "favorable geographical conditions for transportation, especially along the coasts" (Osterhammel 643) of the British Isles. As Hartwell puts it, up to this point markets were limited by the high cost of transportation and small towns, so the canal building, improvement of roads and rivers, and urbanization during the second half of the eighteenth century were most important. (Hartwell, 1971:183). Transport had a great impact not only as a means of carrying people and cargo, but also as a means of disseminating news and scientific knowledge. The technological developments in

transport during this period, in turn, were also instrumental to the progressive democratization of travel.

6.1. Roadways

Before the 18th century, the road network of England had not experienced many substantial additions since the Romans built some over a millennium and a half earlier. (Wilde). As Bellis describes it, "At the time, roads were either dirt paths susceptible to rain and mud, or very expensive stone affairs that frequently broke down not long after whatever event precipitated their construction." (Bellis). Until the *First Industrial Revolution*, parishes[13] were the only institutions involved in road maintenance, so the main roads distant from parishes in use by tradesmen and travelers were, in general, poorly kept. Nevertheless, with the middle-class gaining strength in Parliament, pro-trade legislation began to be seen in a positive light, which materialized in the passing of measures such as the Turnpike trusts. These allowed local businessmen, the trustees, to maintain a set of turnpikes, charging a regulated toll for using them that was to be reinvested in part in road maintenance. This regulatory shift is regarded by some authors as one of the key factors affecting the development of the *First Industrial Revolution*.

Apart from the Turnpike Trusts, roads experienced a very significant improvement thanks to the designs of John Metcalf, Thomas Telford, and John McAdam, which consisted of roadbeds made of a combination of packaged crushed gravel which was also raised an angle to ensure an adequate drainage. As Engels recounts, "From 1818 to 1829, there were built in England and Wales 1,000 English miles of roadway of the width prescribed by law, 60 feet, and nearly all the old roads were reconstructed on the new system of Mcadam." (Engels 60). Furthermore, as Bellis states, this new system had a

[13] This was introduced by Queen Mary Tudor, which passed a law requiring parishes to be responsible for the maintenance of all the roads in their vicinity.

huge impact in the British road network: “By making roads both significantly cheaper and more durable, McAdam triggered an explosion in municipal connective tissue, with roads sprawling out across the countryside” (Bellis).

6.2. Canals

Down to the middle of the 18th century, “navigational improvements had been made to a number of rivers in response to expanding internal trade” (Ville 299). This was enough for a while, as Smith describes it: “By means of water-carriage a more extensive market is opened to every sort of industry than what land-carriage alone can afford it, so it is upon the sea coast, and along the banks of navigable rivers, that industry of every kind naturally begins to subdivide and improve itself.” (Smith 122). Nonetheless, from the second half of the 18th century onwards, the interest turned to the construction of the more efficient canals, which were more efficient as they did not have to follow the irregular and sometimes redundant course of a river. The two most remarkable canal engineering projects of this period were the Sankey Brook Navigation, which connected the coal mines at St. Helens with the River Mersey, and the Bridgewater Canal, which linked the Duke of Bridgewater's mines at Worsley with Manchester:

> Before 1755 England possessed no canals. In that year a canal was built in Lancashire from Sankey Brook to St Helens; and in 1759, James Brindley built the first important one, the Duke of Bridgewater’s canal from Manchester, and the coal-mines of the district to the mouth of the Mersey passing, near Barton, by aqueduct, over the river Irwell. (Engels 60).

Behind the Bridgewater Canal was the engineer James Brindley, who had been commissioned to build the canal by the 3rd Duke of Bridgewater in 1759. Brindley soon became famous and was commissioned for further projects, including the extension of the Bridgewater Canal to Runcorn to move raw cotton from Liverpool to Manchester and the Harecastle Tunnel, one of the longest tunnels in the country, which was built in the Trent and Mersey Canal to bring coal to the Staffordshire Potteries.

6.3. Railroads

Furthermore, the last stages of the *First Industrial Revolution* brought early developments of the steam locomotive which eventually "boomed in the later nineteenth century, affecting industry and social life." (Wilde). The first Act of Parliament for the creation of a 'railway' was passed in 1801, though at this moment it consisted of horse pulled carts on rails. This same year, Richard Trevithick invented a steam locomotive that ran on roads, but it was not until nearly three decades later, in 1829, that Robert Stephenson created the most important locomotive design of the time, known as *Rocket*:

> "The Rocket", made in the Northeast, tested in the Northwest, lunched a new age of speed, changed the idea of time, of social movement, of commerce, and changed the way the world worked. It was the first really successful locomotive, and it played a key part in ensuring that Britain will become the workshop of the world for the best part of the following century. (Bragg, 2016a, 00:00:31-00:00:51).

The *Rocket* "was the eighteenth locomotive built by Robert Stephenson, and his father George, in their Newcastle works (…) famous for a reason –it established the basic architecture for the steam locomotive." (*Journeys of Invention*). The Rocket was chosen in 1830 for the Liverpool and Manchester Railway[14], the first inter-city railway in the world to count with a true steam locomotive and, for decades, many locomotives were based on variations of its design.

The railroad had a great impact on the economy, permitting the rapid circulation of people and commodities promptly boosting the trade and travel sectors. With passengers moved knowledge and news which soon spread throughout the nation. Finally, another change due to this period is the standardized time, which was introduced across the United Kingdom in order for trains to be timetabled. (Wilde).

[14] This route was established in part to overtake the canals as a means of transport, so it mirrored the route of the Bridgewater Canal.

6.4. Steamships

The development of steamships, also known as *steamers*, resulted from an incremental process in scale that began with the incorporation first of Newcomen's engines and later of Watt's engines into small vessels, known as steamboats. In turn, “Iron and then steel provided greater strength, safety, space, malleability and tensility in vessel construction.” (Ville 300), with the first sea-going iron steampship being around since 1821 and the first purpose-built steamer for regularly scheduled trans-Atlantic crossing built by Isambard Kingdom Brunel in 1838. By “1868 did the total tonnage of new iron ships exceed for the first time that of wooden ones launched from British yards.” (Friel, cited in Osterhammel 686).

7. Labour organization

> Men are grown mechanical in head and in heart, as well as in hand.
>
> Thomas Carlyle in 1829

Prior to the *First Industrial Revolution*, labour was organised based mainly on cottage industries divided into different closed guilds. Under this feudal system of labour organisation, production was mostly carried out on a small scale and in a decentralized way by individual families from home and/or in small workshops tied to a given guild. Over time, nevertheless, that system proved to be insufficient to meet the expanding demands of the new markets and “guild-masters were pushed on one side by the manufacturing middle class, division of labour between the different corporate guilds vanished in the face of division of labour in each single workshop.” (Marx and Engels 220). Nonetheless, it was not until the end of the 18th century that Richard Arkwright changed the rules of production forever by establishing in the 1780s in Cromford, Derbyshire, a new kind of large-scale workshop known as *factory*, which

was no longer based on hand-powered production but on Boulton & Watt steam engines and larger productive units of workers running under a modern system of labour organisation:

> Arkwright's mill was essentially the first factory of this kind in the world. Never before had people been put to work in such a well-organized way. Never had people been told to come in at a fixed time in the morning, and work all day at a prescribed task. His factories became the model for factories all over the country and all over the world. This was the way to build a factory. And he himself usually followed the same pattern - stone buildings 30 feet wide, 100 feet long, or longer if there was room, and five, six, or seven floors high. (Hart-Davis, cited in Simkin).

The key feature that made of the factory a much more productive system of organization besides the intrinsic economies of scale[15] was the division of labour, which led to a dramatic increase in the amount of output that a certain number of workers could perform. This was mainly to be attributed to the growing dexterity of the workforce as a result of specialization, the time saving in processes by not having to move from one sort of operation to another, and the development of proper machines that simplified tasks and enabled one operator to do the work of many. (Smith 112). Furthermore, Engels added that under this method of organisation "The productiveness of each hand raised to the highest pitch by the competition of the workers among themselves." (Engels 116). This new scenario also led to the redundancy of many workers, as they were no longer needed, resulting in wages being cut.

Furthermore, not all sectors were equally favoured by the new organisation of labour. As Smith pointed out, "The nature of agriculture, indeed, does not admit of so many subdivisions of labour, nor of so complete a separation of one business from another, as manufactures." (Smith 111), which ultimately led to "relatively larger gains

[15] Economies of scale describe the cost advantages that enterprises achieve from a larger scale of operations, at this time an inherent competitive advantage resulting from the amount of production factors in mills. ("Economies of scale").

in industrial as against agricultural productivity, with a consequent fall in the price of manufactures relative to that of primary products." (Landes 6).

8. The social cost of industrialization

> The condition of the working class is the condition of the vast majority of the English people.
>
> Friedrich Engels in 1848

Life was not easy before the *First Industrial Revolution*. Many people were miserably poor and lived under subsistence economy standards. A great deal of work in the countryside was seasonal and sometimes was spoiled by factors such as bad weather and pests. As Bragg states "the conditions there [in the countryside] were foul" (Bragg 5). Labour conditions in the mines were similar or even more deplorable, in some cases such as that of the colliers in Scotland in the 17th and most of the 18th century amounting to "a state of slavery or bondage" (Colliers and Salters Act 1775) with people being bound to work for life in a coal pit and sold as part of it. These conditions passed from parents to children and were perpetuated through the gift of the 'arles' by the master, whose acceptance represented a binding contract of the child's lifelong future employment. Accidents at work were particularly frequent in these kinds of mines, where the risk of collapse, flooding, exposure to noxious gas mixtures and gas explosions[16] grew dramatically as surface deposits were depleted and miners had to dig deeper.

The process of industrialization was, in a sense, dehumanizing. As argued by Toynbee, population was "torn up by the roots" and, like industry, was dragged "from cottages in distant valleys into factories and cities", there to become a collection of hands, "the living tool, of whom the employer knew less than he did of his steam engine".

[16] The explosive gas in mines may also appear in texts as *firedamp*.

(Toynbee, cited in Hartwell 47). In big cities such as London, Birmingham, Glasgow, Liverpool and Manchester the working-class lived largely crowded together in slums, deprived areas teeming with filth, stench and squalor expressly segregated out of the sight of the people above their station. Many of these men faced each day without knowing where they were going to spend the night. Those who were lucky could afford to pay for a bed in an ill-smelling rooming house, which they had to share with four, five or as many people as could be packed in it, mingling the young and the old, the healthy and the sick. For the less fortunate, they had to overnight as temporary vagrants, trying to find a place where the police and neighbours would let them be left at ease.

Although working conditions were harsh and hours of work lengthy before the First Industrial Revolution, "there is still general agreement that work discipline subsequently intensified." (Hopkins 51). As Allen observes, “Twelve-hour work days were normal in the new factories”. (Allen 2017. Ch.1). With respect to industrial wages, they experienced considerable growth in the early stages of the *First Industrial Revolution* due to the increased need of workforce required to satisfy the expanding demand of goods (Allen 2015: 2), but then they also fell significantly with the new organisation of labour and machinery. The actual evolution of wages during the *First Industrial Revolution* remains a topic of contention because of the significant discrepancies between the data obtained from employers, from workers, and later, from trade unions at that time, an issue already identified by Carlyle. (Carlyle, "Chartism" 129). Furthermore, as Thompson observes, “ 'Truck’, or payment in goods, and ‘tommy shops’ complicate the picture further (Thompson 244). Another characteristic feature of the labour conditions of the times was the “Chronic and cyclical unemployment, though at present only intermittently measurable” which ”was almost certainly extremely high, and in times of crisis

catastrophic."[17] (Hobsbawm 121). Even though there is no consensus on the real evolution of the condition of industrial workers in terms of real incomes during the *First Industrial Revolution*, "there is, however, a large measure of agreement on the condition of the farm labourers who, during the course of the eighteenth century, experienced a progressive deterioration in terms of both their standard of living and their quality of life." (Archer 9).

Concerning the condition of children in labour, most children from poor families in Great Britain had been sent to work during the preceding centuries, and Government had not even cared about it (Griffin). The main difference at the beginning of the *First Industrial Revolution* was the large amount of employment available, especially of jobs that could be performed by children. Working conditions for children in the factories during the *First Industrial Revolution* were, however, extremely harsh. As Engels recounts it, "They were lodged, fed, and clothed in common, and were, of course, completely the slaves of their masters, by whom they were treated with utmost recklessness and barbarity." (Engels 171), which led to great mortality among child factory operatives. The most important step forward on child labour in Britain were the Factory Acts, a series of measures regulating working conditions, introduced starting in 1802. Despite the deplorable conditions of child labour during most of the First Industrial Revolution, Humphries points it out as "a major contributing factor in Britain's industrialization."[18] (Humphries 400).

[17] This statement by E. J. Hobsbawm in 1963 is based on textual evidence from the period, e.g. *The Report of the Committee appointed for...relief to the 'working manufacturers'*, London, 1829, and *The Report of the Committee...for the relief of the distressed manufacturers*, London, 1844, as well as additional scattered data from other sources from that time.

[18] Humpries's claim is supported by testimonies from more than 600 autobiographies by working men who lived in the eighteenth and nineteenth centuries.

9. Socio-political reactionism

9.1. Luddism

Among the various forms of industrial protest during the *First Industrial Revolution*, Luddism is the only one whose name still rings a bell today. The Luddite movement emerged from the association of highly trained textile artisans during the Napoleonic Wars and had its roots in Nottingham[19], eventually spreading to Leicestershire, South Derbyshire, the West Riding of Yorkshire and parts of Lancashire and Cheshire in the Northwest (Archer 48). In the 18th century, Nottingham had become the centre of the cotton hosiery manufacturing thanks to the availability in the East Midlands of supplies of both the necessary raw materials and labour at reasonably low prices. The hosiery business had been primarily an outwork industry with only a small share of the production being carried down in factories. (Marsh et al. 1994). Production was coordinated by masters or 'hosiers', who recruited a few journeymen of their own, but mostly outsourced their work to local knitters operating on hand frames at home. As Marsh points out, "A few owned their own frames; most of rented them by the week." (Marsh et al. 1994).

Developing the abilities required to become a renowned knitter took a lot of time. It was a matter of achieving a high level of expertise, and it took several years to be recognized in the production of fabric, cloth, woolen goods, and above all hosiery, which were the major branches of the textile production in Nottingham back then. Luddites, therefore, were not opposed to progress and industrialization as often described, but to the idea that mechanization would threaten their very existence and the skills they had acquired over the years. Thus, while in Nottinghamshire the protests focused mainly on

[19] Nottingham at that point was a small town most known for the Sherwood Forest, which was home to the legendary outlaw Robin Hood and his band of merrymen.

the wage reductions caused by the machinery, in Yorkshire they focused on the employment loss involved.

Although the Combination Act of 1799 forbade collective bargaining and trade unions (Helm 00:09:43-00:09:52), the Luddites engaged in what the historian Eric Hobsbawm defines as "collective bargaining by riot" (Hobsbawm, cited in Archer 43), a kind of sabotage which comprised machine breaking, destruction of property and rioting. There were also attacks on employers, magistrates and food merchants. E.P. Thompson states that Luddism developed a political dimension that was radical and even revolutionary in tone and content and that, as a consequence, it represented an important step forward in the making of the English working class. (Thompson, cited in Archer 48).

9.2. Owenism

Regarded by many as the founding father of British socialism, Robert Owen aimed to a non-revolutionary[20] reform of the industrial capitalist society which not only would improve the conditions of the working class but also would bring about a new moral world[21] destined to regenerate the society and the nature of man. At the age of 21, he was appointed manager of a textile factory in Manchester, resigning two years later to establish his own factory with other entrepreneurs, with whom he eventually bought the New Lanark mill, near Glasgow, in 1799. His direct contact with the working class as a factory owner convinced him that workers should have decent conditions, with particular emphasis on children, as he became radically opposed to child labour[22]. As Miliband puts it, “Hardly anyone, in the age that followed the end of the Napoleonic Wars, was more aware of the evils that the changes which were rapidly transforming Britain into an

[20] Robert Owen did not believe in class struggle, but rather trusted that scientific evidence would open the eyes of the ruling class, resulting in concessions to the workers.
[21] A world of equality with no money and no private property, which turned to be a utopia.
[22] Child labour clashed with his ideas that the formation of character and morals began in education from early childhood.

industrial nation brought in their train, and of the potentialities for good opened up by the new technology." (Miliband 233).

In 1824, Robert Owen moved to America and tried to materialize his ideas of a new moral world in an experimental socialistic community at New Harmony, Indiana, but it collapsed after two years. There were other three main unsuccessful attempts of Owenite communities in the United Kingdom: Orbiston in Lanarkshire, Scotland, Ralahine in County Clare, Ireland, and Queenswood in Hampshire, England, this later created by Robert Owen himself, who also served as a kind of honorary director. Since the dying-out of Owenism, there was a period without Socialism in England (Engels 47), though it later reappeared in a variety of forms.

9.3. The Manchester Patriotic Union Society

In 1793, Great Britain and France clash in the Napoleonic Wars and the conflict lasts until 1815 when Napoléon is finally defeated by the Duke of Wellington at the Battle of Waterloo. As a result, the Duke of Wellington is glorified by the House of Lords, whereas the troops return home just to face high unemployment and misery. That same year, the first Corn law is passed, and food becomes more and more expensive and scarce due to the restrictions and the poor harvests, particularly that of 1816[23]. This conjuncture, together with the example and impact of the success of the Bourgeois Revolution in France in 1789 against the ruling class, "Tomas Paine's Rights of Man, with its accessible language and clear political programme (…) and governmental repressive legislation[24] all combined in varying proportions" (Archer 62) resulting in the increasing politicisation of

[23] The year 1816 is historically known as the *Year Without a Summer* due to severe climate anomalies mainly caused by the massive eruption of Mount Tambora in the Dutch East Indies, nowadays Indonesia, which resulted in major food shortages across the Northern Hemisphere. (" Year Without a Summer").

[24] In particular, two Acts had been enacted to contain political unrest resulting from tensions between the king and the people, the Treason Act 1795 and the Seditious Meetings Act 1795, which were the reaction to the stoning of George III as he was heading to Parliament in 1795.

the people. Debating clubs, reform societies, and union societies started to gather on a regular basis to discuss topics such as the rights of the people, the figure of the king, the political corruption in Parliament with the rotten boroughs[25] or the consequences of the Corn laws. One of the most vindicated claims was the "constitutional reformation of the representation of the people in the House of Commons." (Peterloo, 00:27:14-00:27:20), which was eventually addressed decades later by the Representation of the People Act 1832[26].

Newspapers played a key role in the political protest, particularly *The Manchester Observer*, which was focused on the industrializing North ("Industrial Revolution Manchester" 00:14:52-00:15:02). In March 1819, Joseph Johnson, John Knight and James Wroe, collaborators of this newspaper, formed the Manchester Patriotic Union Society ("Peterloo", Spartacus Educational) and, in the summer of that year, they decided to invite Henry Orator Hunt and other orators to speak at a big peaceful protest meeting. Thus, on 16 August 1819, people from Manchester and all the surrounding towns came to Peter's field to hear radical speaker Henry Hunt campaign for "universal suffrage and the election of a representative for Manchester in Parliament." (Peterloo, 01:30:39-01:30:34). According to the records, "roughly 50 to 60,000 people were estimated to have come to Manchester that day" ("Industrial Revolution Manchester" 00:16:29-00:16:34). Men came with their wives and children; it was to be a peaceful meeting. Then, as Henry Hunt prepared to address the public, the magistrates, terrified by the size of the crowd, ordered the Manchester yeomanry to charge. As Bamford recounts it, "The cavalry were in confusion (...) their sabres were pied to hew a way through naked held-up hands and

[25] One of the archetypal examples of rotten boroughs is Old Sarum, just north of Salisbury, an abandoned Saxon village composed of fields and ancient ruins which was classified as a voting constituency and counted with a Member of Parliament (MP) in the House of Commons. At the same time, booming industrial cities such as Manchester, with 400,000 inhabitants, were strikingly underrepresented with no MPs.
[26] The 'Great Reform Act 1832'.

defenceless heads; and then chopped limbs and wound-gaping skulls were seen; and groans and cries were mingled with the din of that horrid confusion."[27] (Bragg, 2016c, 00:00:35-00:00:52). An estimated 18 people died from sabre cuts and trampling, including women, children and a soldier who had fought at Waterloo. Another 700 people are thought to have been seriously injured. In response to the episode in Peter's field, the government passed the Six Acts, a set of measures designed to quell further political agitation.

9.4. Capitan Swing and other agricultural riots

For various reasons, the Captain Swing movement can be seen as the agricultural counterpart of the Luddites. Whereas Luddism was a protest movement of the industrial North, Captain Swing was mainly a rural Southern and Eastern phenomenon. Between the 1790s and 1815, major demographic pressures combined with a dramatic increase in the price of food, particularly wheat, caused agricultural labourers to move from sharing a table and sleeping under the same roof with their employers to become employed casually on a weekly and daily basis. (Archer 9). Apparently, the Napoleonic Wars had delayed the full impact and consequences of the enclosures until 1816. Thus, by the time of the 1830 Swing Riots, agricultural unemployment and underemployment had become a permanent feature of rural England and wages had followed the same spiraling downward trend. As shown by T.L. Richardson, "wages failed to keep pace with the volatile movement in prices, particularly wheat, and that this had had a dreadful impact on the standard of living of farmworkers." (Richardson 1973, cited in Archer 9).

Furthermore, food costs had soared with the passing of the Corn Laws in 1815, making the situation absolutely untenable for the proletarianized farmers, cottagers and

[27] This excerpt, quoted in Bragg 2016c, comes from Samuel Bamford's *Passages in the Life of a Radical* (1842).

squatters, who now were also disinherited from their traditional customary rights that had helped them to subsist. “The climax to the mounting tensions brought about by agricultural depression and hard winters peaked in late August 1830 at lower Hardres, Kent, when a threshing machine was destroyed. This event marked both the start of the Capitan Swing Riots and announced its most distinctive feature, machine breaking.” (Hobsbawm and Rudé 1973: 71, cited in Archer 16). Apart from smashing machines, their most distinctive method, they had no qualms about open and often daylight displays of collective anger also adopting tactics such as threatening letters[28] and arsons.

Other agricultural protest movements arose in the 19th century, such as the Anti-Corn Law League, which organized grass-roots opinion by distributing pamphlets delivered by correspondence. Furthermore, four years after the 1830 Swing riots, six Dorset agricultural labourers from the village of Tolpuddle, allegedly members of the Friendly Society of Agricultural Labourers, were arrested on trumped-up charges and sentenced to seven years in a penal colony in Australia. This was an exemplary sentence that aimed to be a persuasion for others not to join trade unions.

9.5. Chartism

The campaign for the ‘People’s Charter’, a democratic movement that flourished in the decade after 1838, is arguably the most important mass movement in British history. (“Chartism”, Spartacus Educational). The designation of this national working-class protest group came from the People's Charter[29] pamphlet, brainchild primarily of radical reformer William Lovett of the London Working Men’s Association and published in London in May 1838 ("The People's Charter"). This pamphlet contained the

[28] These were invariably signed as Captain Swing.
[29] This was named after King John's Magna Carta at Runnymede in 1215, which mainly addressed power concerns between the barons and the king but did not consider the claims of the common people.

ideological basis of the Chartist movement outlined in six essential points[30] which were aimed at achieving further democracy, the reduction of corruption in politics and the relief of the suffering of the working-classes. Nevertheless, these six demands were nothing new, having been around since at least 1780s, though they were adopted to form the focus of the movement. (Genealogy Stories 03:45–03:49). As Engels points out, "The working masses of the towns demanded their share of political power – The People's Charter; they were supported by the majority of the small trading class, and the only difference between the two was whether the Charter should be carried by physical or moral force." (Engels 42). The Charter was launched in Glasgow, Scotland, in May 1838, at a meeting attended by an estimated 150,000 people and gained popularity quickly across the nation. The magnitude of the movement was such that "the largest Chartist newspaper, the *Northern Star*, had a peak circulation of around 50,000 copies a week, exceeding even The Times and giving it a claim to be considered the first truly national newspaper in Britain.".

The first Chartist petition, made available at Chartist meetings across the nation, gathered 1,280,958 signatures and was forwarded to Thomas Attwood to present it to Parliament in 1839, though achieve no success. As a result, an armed uprising broke out in Newport, South Wales, which ended up with 22 Chartists dead. Further petitions were presented, the most important of which filed in 1848 with only 15 MPs supported the motion to adopt the Charter. At the very moment when Chartism was bound to assert itself in its full strength, it collapsed internally before even it collapsed externally on the

[30] The six essential points of the Charter were: the right to vote for all men over the age of 21, vote by secret ballot, equal representation in parliament, no property qualification to be a member of parliament, remuneration for the members of parliament, and parliaments to be elected annually.

10th April 1848. (Engels 42). Following the dissolution of Chartism, Britain adopted the first five reforms[31].

10. Conclusions and Further Research

The purpose of this dissertation was to provide authoritative evidence supporting the thesis of a multi-factorial and multi-sectoral genesis of the *First Industrial Revolution* in Britain, thus contradicting those postulates which attempted to explain the *First Industrial Revolution* as the outcome of a nationwide process with a definite starting point in British history triggered by the momentum of a main sector of the economy or the achievement of a particular degree of technological development.

After having analysed a number of sources on the different factors that caused the *First Industrial Revolution* to happen in Britain, the completion of this dissertation leads me to validate my thesis that these processes cannot be explained as the outcome of the dominance of a sole factor or set of factors in a specified sector of the economy, but rather of their interplay, and that in consequence the development of the *First Industrial Revolution* cannot be traced back neither to a single location nor to a specific milestone with historical accuracy.

Further research could be undertaken on this topic concerning the participation of women in the high wage economy during the *First Industrial Revolution* and their work-life balance. Also, it is not yet clear whether the development of transport was a prerequisite for the *First Industrial Revolution* to happen in Britain or the outcome of it. Finally, there is an ongoing discussion addressed in many books and articles on the correlation between the income of workers and the technical change, dating back to the famous debate between Hartwell and Hobsbawm in the 1960s (Allen 2015: 1). Wages

[31] Though, as Crail argues, the first reform was only achieved in part since "it left nine out of ten men and all the women without the vote." ("An Expert Guide To Chartism." 02:00–02:04).

themselves have been the subject of fierce controversy since Carlyle's time (Carlyle, "Chartism" 129) due to remarkable discrepancies between the data collected from workers, employers, and trade unions and, therefore, there is still a lot of work to be done in this field.

Works Cited

Allen, Robert C. “Why the Industrial Revolution Was British: Commerce, Induced Invention, and the Scientific Revolution.” *The Economic History Review*, vol.64, no.2, 2011, pp.357–84. *JSTOR*, http://www.jstor.org/stable/41262428. Accessed 29 April 2022.

Allen, Robert C. “The High Wage Economy and the Industrial Revolution: A Restatement.” *The Economic History Review*, vol. 68, no. 1, 2015, pp. 1–22, http://www.jstor.org/stable/43910008. Accessed 29 April 2022.

Allen, Robert C. *The Industrial Revolution. A Very Short Introduction.* Oxford University Press, 2017.

Anderson, Anthony. "Review: James Watt and the steam engine". *New Scientist*, 685, December 1981.

Archer, John E. Social unrest and popular protest in England, 1780 – 1840. *New Studies in Economic and Social History* 1st ed. Vol. 41. Cambridge University Press, 2000.

Bellis, Mary. "John Loudon McAdam Changed Roads Forever." ThoughtCo, Aug. 26, 2020, https://www.thoughtco.com/john-loudon-mcadam-1991690

Ben-Atar, Doron S. “Knowledge as Property in the International State System” *Trade Secrets: Intellectual Piracy and the Origins of American Industrial Powe*r, Yale University Press, 2014, pp. 1-17.

Bertocchi, Graziella. “The Law of Primogeniture and the Transition from Landed Aristocracy to Industrial Democracy.” *Journal of Economic Growth*, vol. 11, no. 1, 2006, pp. 43–70, http://www.jstor.org/stable/40216087. Accessed 11 May 2022.

Bragg, Malvyn, narrator. “The Enlightenment in Britain”. *In Our Time*, BBC Radio 4, 2001, https://www.bbc.co.uk/sounds/play/p005479m

Bragg, Malvyn, narrator. “The Lunar Society”. *In Our Time*, BBC Radio 4, 2003, www.bbc.co.uk/programmes/p003k9jg

Bragg, Malvyn, narrator. “The Peterloo Massacre”. *In Our Time*, BBC Radio 4, 2005, www.bbc.co.uk/programmes/p003k9l7

Bragg, Malvyn, narrator. “The Enclosures of the 18th Century”. *In Our Time*, BBC Radio 4, 2008a, www.bbc.co.uk/programmes/b00b1m9b

Bragg, Malvyn, narrator. “The Great Reform Act”. *In Our Time*, BBC Radio 4, 2008b, www.bbc.co.uk/programmes/b00flwh9

Bragg, Malvyn, narrator. “The Industrial Revolution”. *In Our Time*, BBC Radio 4, 2010a, www.bbc.co.uk/programmes/b00wqdc7

Bragg, Malvyn, narrator. “Consequences of the Industrial Revolution”. *In Our Time*, BBC Radio 4, 2010b, www.bbc.co.uk/programmes/b00wr9r7

Bragg, Malvyn, narrator. “Malthusianism”. *In Our Time*, BBC Radio 4, 2011, www.bbc.co.uk/programmes/b011zzh6

Bragg, Malvyn, narrator. “The Corn Laws”. *In Our Time*, BBC Radio 4, 2013, www.bbc.co.uk/programmes/b03dvbyk

Bragg, Malvyn, narrator. “The Wealth of Nations”. *In Our Time*, BBC Radio 4, 2015, www.bbc.co.uk/programmes/b052ln55

Bragg, Malvyn, narrator. “Northern Inventions”. *The Matter of the North*, BBC Radio 4, 2016a, www.bbc.co.uk/programmes/b07sy32x

Bragg, Malvyn, narrator. “Manchester: First City of the Industrial Revolution”. *The Matter of the North*, BBC Radio 4, 2016b, www.bbc.co.uk/programmes/b07synwj

Bragg, Malvyn, narrator. “The Radical North”. *The Matter of the North*, BBC Radio 4, 2016c, www.bbc.co.uk/programmes/b07syyrh

Bragg, Malvyn, narrator. “The Poor Laws”. *In Our Time*, BBC Radio 4, 2018, www.bbc.co.uk/programmes/m0001m73

Bragg, Malvyn, narrator. “George and Robert Stephenson”. *In Our Time*, BBC Radio 4, 2020, www.bbc.co.uk/programmes/b09y6zfr

Carlyle, Thomas “Signs of the Times.” *Selected Writings*, edited by Alan Shelston, Penguin Classics, 2015, pp. 29–56.

Carlyle, Thomas “Chartism.” *Selected Writings*, edited by Alan Shelston, Penguin Classics, 2015, pp. 119–202.

Carlyle, Thomas “Past and Present.” *Selected Writings*, edited by Alan Shelston, Penguin Classics, 2015, pp. 227–252.

“Citizenship” The National Archives, www.nationalarchives.gov.uk/pathways/citizenship Accessed 29 April 2022.

Dimmock, Spencer. "Periodising the Origin of Capitalism in England: The Early Modern Transition." *The Origin of Capitalism in England, 1400–1600.* Brill Publishers, 2014, pp. 132-139.

“Economies of scale” Wikipedia, Wikimedia Foundation, 9 May 2022, https://en.wikipedia.org/wiki/Lancashire

Engels, Friedrich. *The Condition of the Working Class in England.* Penguin Classics, 2009.

Griffin, Emma, host. “The Industrial Revolution: everything you wanted to know”. *History Extra Podcast.* BBC History Extra, 2021, *www.historyextra.com/period/industrial-revolution/industrial-revolution-everything-you-wanted-know-emma-griffin-podcast/*

Harrison, J.F.C. *Robert Owen and the Owenites in Britain and America: The Quest forthe New Moral World*. Routledge and Kegan Paul, 1969.

Hartwell, R. M., editor. *The Causes of the Industrial Revolution in England.* Routledge Library Editions: The Industrial Revolution, 1967.

Hartwell, R. M., editor. *The Industrial Revolution and Economic Growth.* Routledge Library Editions: The Industrial Revolution, 1971.

Helm, Sally, narrator. "The Luddites Attack". *History This Week*, History magazine, 2022,https://podcasts.apple.com/us/podcast/the-luddites-attack/id1493453604?i=1000557900620

Hobsbawm, E. J. "The Standard of Living during the Industrial Revolution: A Discussion." *The Economic History Review*, vol. 16, no. 1, 1963, pp. 119–34. *JSTOR*, https://doi.org/10.2307/2592521. Accessed 26 May 2022.

Hopkins, Eric. "Working Hours and Conditions during the Industrial Revolution: A Re-Appraisal." *The Economic History Review*, vol. 35, no. 1, 1982, pp. 52–66. *JSTOR*, https://doi.org/10.2307/2595103. Accessed 6 Jun. 2022.

Humphries, Jane. "Childhood and Child Labour in the British Industrial Revolution." *The Economic History Review*, vol. 66, no. 2, 2013, pp. 395–418. *JSTOR*, http://www.jstor.org/stable/42921562. Accessed 1 May 2022.

Jeremy, David I. "Damming the Flood: British Government Efforts to Check the Outflow of Technicians and Machinery, 1780-1843." *The Business History Review*, vol. 51, no. 1, 1977, pp. 1–34, https://doi.org/10.2307/3112919. Accessed 15 May 2022.

"Lancashire" Wikipedia, Wikimedia Foundation, 21 Apr. 2022, https://en.wikipedia.org/wiki/Lancashire

Landes, David S. *The Unbound Prometheus: Technological change and industrial development in Western Europe from 1750 to the present.* Cambridge University Press, 1988.

Marsh, Arthur, et al. *Historical Directory of Trade Unions*. Vol. 4, Routledge, 1994.

Marx, Karl and Engels, Fredrich. *The Communist Manifesto*. Penguin Classics, 2002.

Miliband, Ralph. "The Politics of Robert Owen." *Journal of the History of Ideas*, vol. 15,no. 2, 1954, pp. 233–45. *JSTOR*, https://doi.org/10.2307/2707769. Accessed 26 May 2022.

Mokyr, Joel. *The Enlightened Economy. Britain and the Industrial Revolution 1700- 1850.* Yale University Press, 2009.

Nustelling, Hubert P. H. "The Population of England, 1539-1873: An Issue of Demographic Homeostasis." *Histoire & Mesure*, vol. 8, no. 1/2, 1993, pp. 59–92, http://www.jstor.org/stable/24566043. Accessed 8 May 2022.

Osterhammel, Jürgen. *The Transformation of the World: A Global History of the Nineteenth Century*, translated by Patrick Camiller, Princeton University Press, 2015.

"Physiocracy" Wikimedia, Wikimedia Foundation, 28 Apr. 2022, https://en.wikipedia.org/wiki/Physiocracy

"Protestant work ethic" Wikimedia, Wikimedia Foundation, 10 May 2022, https://en.wikipedia.org/wiki/Protestant_work_ethic#cite_note-3

Razzell, Peter. "The Growth of Population in Eighteenth-Century England: A Critical Reappraisal." *The Journal of Economic History*, vol. 53, no. 4, 1993, pp. 743–71, www.jstor.org/stable/2122638. Accessed 9 April 2022.

Simkin, John. "Chartism" *Spartacus Educational*, Sep. 1997, https://spartacus-educational.com/chartism.htm . Accessed 28 May 2022.

Simkin, John. "The Luddites" *Spartacus Educational*, Sep. 1997, https://spartacus-educational.com/PRluddites.htm . Accessed 22 May 2022.

Simkin, John. "Peterloo Massacre". *Spartacus Educational*, Sep. 1997, https://spartacus-educational.com/PRpeterloo.htm . Accessed 1 June 2022.

Smith, Adam. *The Wealth of Nations: Books 1-3*. Penguin Classics, 1982.

"The People's Charter." The British Library, *www.bl.uk/collection-items/people-charter*. Accessed 7 May 2022.

Thompson, E. P. *The Making of the English Working Class.* Vintage: 1966.

Trueman, Chris. "Factories in the Industrial Revolution". *History Learning*, *https://historylearning.com/great-britain-1700-to-1900/indrevo/factories-industrial-revolution/* . Accessed 22 Apr. 2022.

Ville, Simon. "Transport". *The Cambridge Economic History of Modern Britain: Industrialisation, 1700-1860*, edited by Floud and P. Johnson 2004. 295-331.

Voigtländer, Nico, and Hans-Joachim Voth. "Why England? Demographic Factors, Structural Change and Physical Capital Accumulation during the Industrial Revolution." *Journal of Economic Growth*, vol. 11, no. 4, 2006, pp. 319–61. *JSTOR*, http://www.jstor.org/stable/40216109. Accessed 10 May 2022.

Wilde, Robert. "The Development of Roads in the Industrial Revolution." ThoughtCo, Aug. 29, 2020, https://www.thoughtco.com/development-of-roads-the-industrial-revolution-1221647

Wrigley, E. A., and R. S. Schofield. "English Population History from Family Reconstitution: Summary Results 1600-1799." *Population Studies*, vol. 37, no. 2, 1983, pp. 157–84. *JSTOR*, https://doi.org/10.2307/2173980. Accessed 10 May 2022.

Wood, Michael. *The History of England*. Penguin Books, 2011.

"Year Without a Summer" Wikimedia, Wikimedia Foundation, 19 Apr. 2022, https://en.wikipedia.org/wiki/Year_Without_a_Summer

Filmography

"An Expert Guide To Chartism." YouTube, uploaded by Genealogy Stories, 18 March 2021, https://www.youtube.com/watch?v=2mPRqEakMGY&t=2618s

"Industrial Revolution Manchester" *Britain's most historic towns*, presented by Alice Roberts, Season 7, Episode 7, IWC Media / Channel 4, 2020

Peterloo. Directed by Mike Leigh, performances by Rory Kinnear and Maxine Peake, Entertainment One, 2018.

Why the Industrial Revolution Happened Here. Directed by Charles Colville, performance by Jeremy Black, BBC Four, 2013. BBC Four, www.bbc.co.uk/programmes/b01pz9d6

Other electronic sources

London Science Museum. *Journeys of Invention*. Computer Software. *Apple App Store.* Version 2.0.1. The Red Green & Blue Co Ltd, 2014. November 2021.