Saudi Journal of Humanities and Social Sciences **ISSN 2415-6256 (Print)**
Scholars Middle East Publishers **ISSN 2415-6248 (Online)**
Dubai, United Arab Emirates
Website: http://scholarsmepub.com/

First Industrial Revolution and Second Industrial Revolution: Technological Differences and the Differences in Banking and Financing of the Firms

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Article History
Received: 03.11.2017
Accepted: 19.11.2017
Published: 30.11.2017

DOI:
10.21276/sjhss.2017.2.11.7

Abstract: The industrial revolution is explained in many different ways. It is explained as a rapid growth of the manufacturing industry, it is explained as the structural shift in the economy, the shift in which large population moved away from agriculture sector to the mining and manufacturing sector between mid-eighteenth and mid-nineteenth centuries. One other explanation is that industrial revolution is something where there was a continuous advancement in the national income. There were two industrial revolutions, first industrial revolution stayed from late eighteenth century to early nineteenth century. Then after 1825, the pace of the path-breaking inventions slowed down which marked the end of the first industrial revolution. The major technological developments again picked up in the late nineteenth century which led to the second industrial revolution. In this paper, major technological differences and differences in terms of banking and financing of firms between first and second industrial revolution were analyzed. It was concluded that technological developments like the invention of power loom and stream engine and improvement in the technology of iron making became the major reason behind the first industrial revolution. Technological developments in the industries of gas lightning, chemicals, glass making, transport machine and the paper machine played a major role the second industrial revolution. During the first industrial revolution increase in the number of country banks, the increased network of the joint and country banks and the coming of Bill-workers changed the banking and financing of firms. During second industrial revolution emergence of clearing banks and cheques, declining of bills and the institutions in which people could deposit their savings emerged which revolutionized the banking and financing of firms.
Keywords: First Industrial Revolution, Second Industrial Revolution, Technology, Banking, Financing, Economic History

INTRODUCTION

The term ‘industrial revolution’ is now so familiar that it is enshrined in the English language, most people know roughly what it means, but exact definition is more difficult. Historians explain it in three different ways. Sometimes, it is explained as a very rapid growth of certain sectors like cotton and iron, of the manufacturing industry, from the late eighteenth to the earlier nineteenth century. This involves the growth of factories and the use of steam power. Alternatively, it is explained as the structural shift in the economy between mid-eighteenth and mid-nineteenth centuries, the shift, in which large proportion of population moved from agriculture sector to the manufacturing and mining sector. A final meaning they give is more complex, the revolution, in this case, is seen as one in which the entire economy broke out from a state in which national income grew only intermittently, if at all, into a state in which there was a continuous advance in national income. Let’s compile the three above mentioned meanings of the industrial revolution into one; industrial revolution can be defined as the structural shift of the large proportion of the population from agricultural to manufacturing and mining sector, which caused a growth in manufacturing sector, and ultimately increasing the national income.

In history many revolutions have happened, some happened due to social reasons, some due to political reasons and some due to natural reasons. But what caused the industrial revolution? This is a question of debate. Some say that it happened due to demand-side factors. In which they say that, due to increase in population and foreign trade, the demand in the overall

economy grew, which exerted an upward pressure on prices and therefore gave producers an incentive to produce more by whatever means they thought fit, such as installing machinery. Some say the shift in consumer tastes towards industrial goods might also be a factor. Some say supply-side factors were behind it. They say, forces on the supply side cheapened the cost of production and hence widened the market. And the cost of production became cheaper due to, the more availability of capital, labour, improvement in technology, and finally, entrepreneurship, the willingness to take risks in developing business.

During the period of the late eighteenth century and early nineteenth century, the above-discussed factors took place, the manufacturing industry grew rapidly and every aspect of the economy got affected. And first industrial revolution was the name given to that period. Then after 1825, for some time the rapid rate of path-breaking inventions slowed down. Then again in the period of the late nineteenth century, some major technological developments took place which again affected the economy in a very drastic manner, and that period is remembered as the second industrial revolution.

In this paper, we will first discuss some of the major technological differences between first and second industrial revolution, then, in the second part, about the differences between first and second industrial revolutions, regarding, banking and financing of firms. Lastly, in the conclusion, we will put forward the key findings.

Technological differences between first and second Industrial Revolution

Throughout the epoch of first and second Industrial Revolution, technology played a very major role in naming those periods as revolutionary. The period of first industrial revolution saw major technological developments in the fields of textile, steam power, iron making and in various other fields. The period of second industrial revolution saw major technological developments in the fields of steel, chemicals, electricity and in various other fields.

Before the period of first industrial revolution, wool was used to make, by individual home workers, doing the spinning and weaving in their home premises. But during the period of first industrial revolution, some innovators like, Richard Arkwright and Samuel Crompton developed mechanized cotton spinning technique, which took energy from water or stream. And this technique increased the output of a worker immensely and changed the textile industry, forever. Because of this invention, cotton manufacture became a mechanized industry and Britain who used to be the net importer of cotton became the net exporter of cotton[1].

In the period of second industrial revolution the textile industry progress was regular and not marked by considerable advances. Some chief developments were the development of sewing machine, development of Donisthrope Nip machine, Heilmann combing machine and the development of traveller. All these developments led to the increase in the productivity, these technologies later came in the use of making shoes and made the quality of product better by using less effort. During the period of first industrial revolution, major technological developments happened in the metallurgy industry, in this era wood and other biofuels were replaced by coal. And benefits of using coal were that, for a certain quantity of heat, coal mine required a considerably smaller amount labor than cutting wood. And in this period only, the technique of Reverberatory Furnace was developed which could crop shaped iron consuming excavated coal. The advantage of this Furnace was that, while mining the coal, burning coal continued to remain unconnected from the iron ore and consequently did not pollute the iron with contaminations like ash and Sulphur. Due to this advantage, iron production increased immensely and also iron got much cheaper than it was before. And this development helped numerous industries, for example those making hinges, nails, wire and other hardware[2].

Leaving behind all the innovations which happened in the field of iron making during the age of the first Industrial Revolution, the phase of second industrial revolution saw the development of steel. Till 1850, the phase of iron had become fully recognized. But for various usages shaped iron was poorer to steel, the wear and tear on shaped iron machine portions made them costly in usage, and for various practices, particularly in construction and machines, shaped iron was inadequately elastic and tenacious. And the difficulty remained to make steel. This difficulty was resolved by Henry Bessemer in 1856. The Bessemer converter took into consideration the point that the contaminations in cast iron contained commonly of carbon, and this carbon can be taken into use as a fuel if air were puffed through melted metal. With this procedure, he prospered in putting the base of steel production. And then numerous other inventions occurred which made the procedure of steelmaking stress-free and class of steel improved. And steel got started to be used in, buildings, ships, and railroad tracks by 1880[3].

During the period of first industrial revolution, the technology was developed which increased the efficiency of steam engines to a great extent and it happened because of the development of the stationary

steam engine. Before that, the major source of power in Britain used to be water and wind. And this innovation of stream engine enhanced the productive capacity of manufacturing industry immensely and also helped industries like coal mining. Leaving behind the innovation of stream engine of first industrial revolution, in the period of second industrial revolution, electricity was developed. Electricity stayed an arena in which completely novel understanding was applied to crack the economic complications. The scientist who developed electricity, his name was Michael Faraday. Faraday established the concept of electromagnetic in physics. It was because of his hard work that electricity became practical for usage in technology. Electrification was a very important invention. It changed the world forever. In that period, electric lights in factories significantly enhanced working circumstances, the probability of fire hazards was reduced to a great extent with the use of electricity, and it eliminated the heat and pollution which used to be caused by the use of gas lighting[4].

Now coming to the transport industry, in the start of the industrial revolution, the Internal Passage was used to be passable by roads and rivers. It's not that railways were not there during that time but railways or wagons were only used for conveying coal to rivers. During industrial revolution, the technology of making canals developed, which allowed bulk material to be easily transported across the country. In the starting of the industrial revolution, road system in Britain was ill maintained by thousands of native communities, then new engineered roads were built in the period of industrial revolution, and on those roads, heavy goods were used to be transported through, broadly wheeled, carts pulled using the team of horses. Lighter goods were transported through smaller carts, stagecoaches used to carry well-off ones, and not-so-prosperous can pay to journey on transporters' wagons. With the development of the technology of making lower cost pig and wrought iron, railways started to expand. High-pressure steam engines made it possible to build steam locomotives. With these developments, rail network did expand and became convenient but still, there were problems, these problems were sorted out during second industrial revolution. Due to the invention of steel and its huge production in that period, rail could finally be able to make from steel at the reasonable cost. Steel was considerably more long-lasting material, had greater strength and that's why lengthier rails could now be easily trundled. All these factors, rail network expanded like never before[5].

The above mentioned technological developments, during the period of first and second industrial revolutions, are those which I feel had the most important effect in not only making those periods as revolutionary but also in making the future of the whole world. But there were many other technological developments happened during those periods. Let's discuss them also, briefly.

During first industrial revolution, the technology of making chemicals was developed and large-scale production of chemicals used to happen, during the period of first industrial revolution. These chemicals include Sulphuric acid, alkali, sodium carbonate, sodium sulphate, hydrochloric acid, potash, bleaching powder, concrete and many others. These chemicals were being used in many things like in making glass, textile, soap, bleaching cloth, etc. in the period of second industrial revolution, also many chemicals were developed, like, synthetic dye, mauveine, etc. and they also had their own uses. During the period of first industrial revolution, some other technologies such as gas lighting, glass making, and paper machine were also developed. The gas lightning process consisted, hefty scale gasification of coal in blast furnace, the cleansing of the gas, and its storage and distribution. Gas lighting had an influence on the communal and manufacturing organization since it permitted stores and factories to continue to open for lengthier hours than earlier when the factories used to rely on oil or tallow candles. Its introduction permitted night life to flourish in towns and cities as streets and interiors could be well-lit on a large scale than earlier. The cylinder process, the new process of glass making was developed during this period. Earlier it was used to create sheet glass, with which windows and plate glass used make. Then with the improvement in technology, larger planes of glass were started making without any interruption, which was then started to come in use in buildings, houses etc. during this period, with the development of the paper machine, paper making also got started. Nicholas Louis Robert, Sealy and Henry Fourdrinier, were some who contributed to the development of this technology. The period of second industrial revolution also saw some other technological developments in the petroleum industry, maritime industry, rubber industry, automobile industry, telecommunication industry and fertilizer industry. In this period, in the petroleum industry, the technology of production and refining developed. James young, by setting up a refining of crude oil, gave kerosene to the people, which started to come in the use of lamps and heaters. In the same period, maritime technology was also developed. The credit of developing this maritime technology goes to, Francis Pettit Smith, who exposed a novel method of building propellers by coincidence. Due to that accidental invention of technology, the first seagoing iron steamboat was built in that period. After that invention, many developments in maritime technology took place like, invention of the surface condenser, invention of multiple expansion steam

engines, the invention of the oscillating engine, etc. All these latter inventions helped in making long sea journeys possible, consumption of less coal during the journey, etc. In that time, the ships not only came in the use of carrying passengers or luggage but also in battleships[2].

Then came the invention of rubber, Charles Goodyear and Briton Thomas Handcock in the 1840s invented the technology aimed at making rubber, which was an important invention as without rubber, so fast and convenient transport would not get possible. Another important technological invention which took place in this period was in the field of telecommunications. Due to Sir William Fothergill Cooke, Charles Wheatstone and Sir James Anderson, the telegraph technology became able to be used. And Alexander Graham Bell in that period gave telephone which can never be forgotten. But at that time the telephone was only used for business purposes. Guglielmo Marconi successfully commercialized radio, and Sir John Ambrose Fleming developed the vacuum tube, which strengthened the progress of new electronics and radio broadcasting. All these developments in the telecommunication industry changed the art of communication forever. People felt more connected than ever, the ideas were exchanged at a lightning speed. All these developments not only helped in the business but also affected the day to day life of the people [6].

Banking and financing of firms during the period of first and second industrial revolution

During the first industrial revolution i.e. the period of late eighteenth and early nineteenth centuries, saw a heavy increase in number of country banks in Britain, By 1810, there were over 600 such banks, including such now-famous names as Barclays and Lloyds, In England and Wales, only the bank of England could be a joint stock bank, All other banks were limited to six partners, due to bubble act prohibitions, But in Scotland there were no such prohibitions, as a result there, few big joint stock banks were present, Apart from issuing notes, the basic function of most banks were to borrow short and lent short, One other function of these banks was, these banks used to purchase from the businessmen the bills which the latter has received from other businessmen in payment for goods and services received, This process, known as discounting. And this function of banks used to immensely help firms and businessmen in financing their expenses. In this period, the network of banks got increased and thus the banks became able to transfer surplus of savings of some area to the people who are in need of funds. This mainly used to happen between the agriculture sector and industrial sector. This was done first in England by the intermediation of private London banks, which took bills from industrializing areas and sold them to the banks in the agriculture areas. At the turn of the century, specialist intermediaries known as bill brokers started to take over this function. The development of London banks and bill-brokers as intermediaries between agricultural and industrial areas was important because it provided circulating capital for industrialists and merchants, but while the supply of credit adequately met the demands of industrialists, it might have been better than adequately met if there had been more effective means of providing long-term fixed capital[7].

During, the period of second industrial revolution, there was a growth in banking, bankers became more involved in the sale of securities to finance investment outside Europe, the structure of banking changed, and the money market that is, the provision of short-term trade finance and inter-banking dealings grew rapidly from its small beginnings with the bill- brokers in the early nineteenth century. Unlike from the period of first industrial revolution, in this period the use of cheques got increased and the use of bills declined. Unlike from the period of first industrial revolution. This period also saw the emergence of clearing banks, the main function of the clearing banks used to be raising the short-term deposits, and the provision of short-term finance for trade, industry and agriculture, rather than long-term investments in the industry. The sale of securities to provide for transport and other capital-hungry projects was one of the main growth areas of the nineteenth century. Joint stock companies with limited liability had been the standard form of organization for canals, and railways followed this pattern, which was suitable for projects where large sums of money had to be raised from investors with no personal interest in the business. Railways were typically financed by a mixture of fixed-interest stock for those requiring security, and equity stock for those willing to bear more risk. Putting money into the stock exchange was the prerogative of the wealthier investor, but during this period unlike from the period of first industrial revolution, other financial institution developed to provide savings opportunities for the working and lower middle classes. Among these were the Post Office and Trustee Saving banks, and building societies. Savings in all these were, however, only a small part of total savings. Far more members of the working class subscribed to friendly societies and industrial insurance companies, whose premiums constituted a form of saving. The former were voluntary associations in origin, although some of them, such as the quantity named Manchester Unity of Odd Fellows, grew quite large. The latter, of which the Prudential was the best known, were commercial companies. Both provided various types of benefits, such as sick and funeral benefit, in return for a regular subscription.

They were inefficient as a form of saving because the expense of collection and the risk of subscriptions lapsing were both so high, but nevertheless subscribing to them may have been a rational response, given the financial position of many working class[8].

The changes in banking in the nineteenth century made it a more central part of economic activity then it had been earlier. However, it did not, at least in Britain, have a predominant role. Banks and industry largely kept each other at arm's length, and where there were amalgamations in industry, banks in Britain did not, as they did in some countries, play any special part. Banking's growing importance can be attributed to certain long-term factors. These included the benefits of specialization, which led to people entrusting their financing to banks rather than looking after them personally. Thus bank took over activities, such as the making of loans, from the non-specialized intermediaries such as solicitors who had provided such services in the past[9].

CONCLUSION

During the period of first industrial revolution, major technological developments like the invention of power loom in the textile industry, the invention of steam engine, improved technology of iron making, happened. And some other technological developments happened in the industries of chemicals, gas lighting, glass making, paper machine and transportation. People say that increase in population and other demand-side factors were the reasons behind industrial revolution. But I strongly believe that these technological factors played the strongest role in the industrial revolution. I even believe that all those factors were the result of these technological developments.

The invention of electricity, steel were some developments without whom, the second industrial revolution would not have gained so much pace that it gained during the period of latter half of the nineteenth century.

The increase in a number of country banks, the increased network of joint banks and country banks, the coming of Bill-brokers, and all these factors changed the banking and financing of firms, during first industrial revolution. The emergence of clearing banks, declining of bills, the emergence of cheques and emergence of other institutions in which people could deposit their savings, all these factors influenced the banking and financing of firms during the period of second industrial revolution.

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