

**Financial institutions and the British Industrial Revolution:
Did financial underdevelopment hold back growth?**

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ABSTRACT

This scoping article addresses the role of financial institutions in empowering the British Industrial Revolution. Prominent economic historians have argued that investment was largely funded out of savings or profits, or by borrowing from family or friends: hence financial institutions played a minor role. But this claim sits uneasily with later evidence from other countries that effective financial institutions have mattered a great deal for economic development. How can this mismatch be explained? Despite numerous technological innovations, from 1760 to 1820 industrial growth was surprisingly low. Could the underdevelopment of financial institutions have held back growth? There is relatively little data to help evaluate this hypothesis. More research is required on the historical development of institutions that enabled finance to be raised. This would include the use of property as collateral. This article sketches the evolution of British financial institutions before 1820 and makes suggestions for further empirical research. Work in this direction should enhance our understanding of the British Industrial Revolution and of the preconditions of economic development in other countries.

1. Introduction: the conventional wisdom

Financial institutions include lending intermediaries, banks, financial markets, and the legal, customary and state foundations of finance.¹ Conventional wisdom has it that entrepreneurs could draw on their savings or borrow from family and friends if needed. The esteemed economic historian Michael Postan (1935: 2-3) wrote:

At the beginning of the Industrial Revolution ... on the whole the insufficiency of capital was local rather than general ... there were enough rich people in the country to finance an economic effort far in excess of the modest activities of the leaders of the Industrial Revolution ... the reservoirs of savings were full enough, but conduits to connect them to the wheels of industry were few and meagre ... the pioneers of the factory system had to draw almost entirely on their private savings, or on the assistance of friends ...

Similarly, Herbert Heaton (1937: 4) wrote: ‘external supplies of capital were, however, less important than the personal or family funds which the industrialists scraped together and ventured in the new productive equipment.’ Heaton mentioned one case of raising a mortgage, by the famous Matthew Boulton. Otherwise, his account suggests that the entrepreneurs drew on their savings or borrowed largely from family or friends. This became the conventional wisdom. As Alex Trew (2010: 988) put it: ‘The general argument runs that an individual entrepreneur, especially a good one, could find the start-up capital required or use reinvested profits to expand as and when conditions allowed.’

The purpose of this essay is not to overturn this conventional wisdom. Using savings or borrowing from family and friends may have been the norm. But we need a fuller picture and there are some grounds to be sceptical. Thomas Ashton (1961: 26, 180) expressed doubts: ‘It is true that self-financing was a marked feature of the period, but it would be an error to consider it as universal ... The country dealer or manufacturer often needed more capital than could be obtained from his own resources or those of his partners and friends.’ Rondo Cameron et al. (1967: 11, 55) also questioned the ubiquity of self-financing: they pointed out that short-term credit was sometimes used to finance fixed investment in buildings and machinery. Peter Mathias (1969: 177) noted wryly: ‘As more case histories reveal the number of instances in which this generalization about banks not financing industrial investment was broken, the generalization may itself come under some suspicion.’ But still we do not have adequate evidence to dismiss the conventional wisdom.

Especially beyond the trusted circle of family and friends, larger loans often would require collateral, as with a mortgage. Legal and other institutional arrangements for mortgaging evolved only slowly, yet there is some evidence of loans obtained via mortgages. The records of attorneys that have been consulted show substantial mortgaging activity in the eighteenth century (Anderson, 1969a; Miles, 1981). In her study of the financing of the West Riding Woollen Industry, Pat Hudson (1986: 85) demonstrated that the mortgage market ‘developed rapidly in the eighteenth century through the activities of intermediaries such as attorneys, and much mortgaging and land transfer was occurring by the end of the century.’ But Robert C.

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Allen (1992: 104) noted the lack of estimates of the overall volume of mortgaging. We know relatively little about the extent and nature of borrowing before the nineteenth century, or for what it was used. A general picture of the role of finance is lacking.

The seventeenth and eighteenth centuries saw expanding British trade and colonization. There were many expensive and risky overseas ventures that required long-term finance. If financial institutions were sufficiently developed to provide this, then it is difficult to understand the claim that they were not also deployed in aid of entrepreneurial activity in the homeland.

The role of finance in the modern era was underlined by Joseph Schumpeter (1934). Later empirical research underlines its importance. In a macroeconomic study, Peter Rousseau (2003) amassed evidence for the Dutch Republic (1640-1794), England (1720-1850), the United States (1790-1850), and Japan (1880-1913). His econometric analysis indicated that, in all cases, the emergence of financial institutions including financial markets were crucial in enabling growth and industrialization.

Pointing to experiences in many countries, Trew (2010: 988) noted that the conventional wisdom concerning finance in the British Industrial Revolution ‘runs against the large body of empirical evidence ... that suggests that financial development is strongly correlated with, and perhaps leads, the level of economic growth.’ Multi-national evidence was surveyed by Ross Levine (2005: 865) who concluded:

While subject to ample qualifications and countervailing views, the preponderance of evidence suggests that both financial intermediaries and markets matter for growth and that reverse causality alone is not driving this relationship. Furthermore, theory and evidence imply that better developed financial systems ease external financing constraints facing firms, which illuminates one mechanism through which financial development influences economic growth.²

The role of finance is crucial because it no longer limits economic growth to the flows of savings and profits. With finance, entrepreneurs can expand more rapidly. Was Britain an exception? Did it manage to take off industrially without the extensive help of financial institutions?

Britain pioneered industrialization. Because they faced British competition, the countries that followed were under greater pressure to restructure (Gerschenkron, 1962). Their states were impelled to intervene more extensively in their economies, and to promote the development of banking and financial markets. But this still leaves open the question on whether underdeveloped financial institutions restrained British growth.

There is at least one way of reconciling the conventional wisdom with the evidence on the important role of financial institutions. Borrowing from family and others might have been prevalent partly because of the underdevelopment of financial institutions and their inability to supply adequate loans. Postan (1935: 2-3) hinted at this possibility in the quote above. Philip Cottrell (1980: 33) and Joel Mokyr (1993: 104-5) speculated that if the imperfections in Britain’s capital markets had been reduced earlier, then the Industrial Revolution might have been boosted. Larry Neal (1994) stressed the interconnection of finance and industry and pointed to the slow development of banking and stock markets. Despite the Financial Revolution of 1660-1720 (Dickson, 1967; Roseveare, 1991; Carruthers, 1996; Wennerlind,

² See also King and Levine (1993).

2011; Hodgson, 2017), the relatively immature and precarious state of financial institutions and financial markets may have acted as a hindrance on economic development during the eighteenth century (Hoppit, 1987; Williamson, 1987).

This may be described as the Schumpeterian hypothesis, because of his emphasis on the role of finance in supporting innovation. Schumpeter (1934: 69, 73) stressed that an innovating entrepreneur ‘must resort to credit ... which cannot like an established business be financed by returns from previous production.’ This source of finance is not ‘purchasing power which already exists in someone’s possession’ but may be ‘supported by securities which are not themselves circulating media’. With appropriate financial institutions, credit based on collateral can create new purchasing power, as if ‘out of nothing’. Schumpeter may have placed too much stress on the strict necessity of finance for innovation. But the hypothesis captures the spirit of his broader argument.

As yet, we have insufficient data to test this hypothesis. This scoping paper provides no new empirical evidence, and it does not resolve the foremost issues of dispute. Instead it frames the argument and points to some key areas and empirical resources where research needs to be done to begin to answer some key questions. Later work is needed to devise strategies for testing the hypotheses involved.

2. The Schumpeterian hypothesis in perspective

The Schumpeterian hypothesis might help to explain that, despite growing innovation and industrialization, Britain’s overall rate of growth from 1760 to 1820 was very slow – in the region of 0.2 per cent per annum in GDP per capita. In the same period, industrial output per capita increased by an average of 0.7 per cent per annum. Many innovations took place from 1760 to 1820, but they did not stimulate growth above one per cent. In part this was due to the relatively small size of the innovating sectors in the early years. But it is likely that their growth was constrained. In the following 50 years growth picked up significantly. From 1820 to 1870, GDP per capita growth averaged 1.1 per cent and the growth of industrial output per capita roughly trebled to 2.0 per cent.³

Growth was held back before 1820 for several reasons. The Bubble Act of 1720 put severe restriction on the formation of joint stock companies. It was not repealed until 1825. In 1714 the highest legal rate that could be charged for a loan was lowered to 5 per cent and this ceiling lasted until the 1820s, when the most restrictive usury regulations were repealed. The usury laws created disincentives to lend money. Unable to charge high risk premiums on loans, credit was rationed, and lenders were more inclined to ask for commensurate collateral (Temin and Voth, 2013). Progress with land registration was belated and slow, thus inhibiting the use of landed wealth as collateral. (More on that below.) Patenting inventions was cumbersome and expensive.

Another factor was war. Britain was involved in military conflict, with at least one other major power, in 86 of the 127 years from 1689 to 1815 inclusive. Then followed 98 years of Imperial hegemony and Pax Britannica. War has positive and negative economic effects. Military procurement can stimulate innovation, industrial production, and employment. For example, a more accurate method of boring an iron cannon was patented in 1774. For Boulton and Watt this innovation was vital for the development of their steam engine (Roll, 1930: 25).

³ Data from Broadberry et al. (2015: 241-4). Some earlier studies report higher growth rates (Mokyr, 1993: 9).

On the negative side, war exacerbates uncertainty. Some economic historians have argued that state spending and borrowing for war crowded out industrial and other private investment.⁴

The spread of financial markets is constrained by communication technology. The English state began to develop a postal network in the sixteenth century, facilitating the conveyance of documents and valuables (Heblich and Trew, 2019). Until the nineteenth century brought the railways and the telegraph, nationwide communication of information was no faster than the speed of a horse.

Peter Temin and Hans-Joachim Voth (2013) emphasized the negative effects of government restrictions on interest rates, banks and joint stock companies. Adverse government policies impaired financial institutions, which in turn restrained growth. As Temin and Voth (2013: 185) concluded: ‘The apparent paradox of slow growth in times of rapid technological change disappears when we examine the role of private finance.’

If government had played more of an enabling, rather than a constraining role, then by how much would the rate of development of financial institutions increased? On current evidence it is difficult to say. And were such changes in government policy feasible? They would have required major shifts in ideology and understanding. While government policies are important – for good or ill – they are not the only causal factors. Britain was ‘paying the penalty for having been thrown into the lead’ (Veblen, 1915: 132). The development of financial institutions depends on detailed knowledge and experimentation, which is often painstakingly slow. Other countries learned from the British experience and developed more rapidly.

Cameron et al. (1967: 32-5) estimated that the capital invested in English banking (excluding the Bank of England) increased by a factor of 2.2 from 1775 to 1800, and again by a factor of 1.5 from 1800 to 1825. Total banking assets, as a proportion of English national income, increased from 15.2 per cent in 1775, to 27.9 per cent in 1800 and to 29.6 per cent in 1825. These figures show a large rise in the size of the financial sector in the final quarter of the eighteenth century.

Another rare depiction of the overall size of the British financial services sector appears in Stephen Broadberry et al. (2015: 164) with estimates at 50-year intervals. According to their data, the volume of financial services was about the same in 1700 than it was in 1650. But from 1700 to 1750 this sector increased by a factor of 2.6. This suggests some growth in financial services *before* the beginning of the Industrial Revolution. From 1750 to 1800 it tripled by a factor of 3.1. From 1800 to 1850 the increase was again a factor of 2.6. This is consistent with later evidence from other countries that the growth of financial services and markets precedes and enables industrial growth (Levine, 2005).

More evidence at the microeconomic level may offer a way forward. A geographic microeconomic analysis of data from 1817 to 1881, by Stephan Heblich and Alex Trew (2019), found evidence of causal mechanisms through which banks enabled industrial growth. Their work suggests that industrial employment was positively related to the activity of the country banks. At present we are unable to test the Schumpeterian hypothesis definitively because too little empirical work has been done for the eighteenth century. But we can summarise existing knowledge and identify needed areas of empirical research.

⁴ Williamson (1984) and Temin and Voth (2013) provided evidence that government war expenditures ‘crowded out’ private borrowing. But Heim and Mirowski (1987) contested Williamson’s argument. Ventura and Voth (2015) constructed a model showing how government debt could first restrict and then stimulate growth.

Note that the Schumpeterian emphasis on financial institutions largely concerns the conditions and enablers of innovation, not its drivers. The hypothesis is compatible, for example, with the stress by Joel Mokyr (2009) on the energizing role and innovative potential of Enlightenment science and culture. It can also be dovetailed with the emphasis on the roles of ideas and innovations in the work of Deirdre McCloskey (2010, 2016a, 2016b) as long as her over-hasty dismissal of institutions is annulled.

The Industrial Revolution has been a foremost topic in economic history for well over a century, but our knowledge of seventeenth- and eighteenth-century financial institutions and activities is still very patchy. Temin and Voth (2013: 4) noted that, with some exceptions ‘banks and other forms of intermediation are hardly ever mentioned in modern treatments of the Industrial Revolution.’

The possibility of a ‘shortage of capital’ is considered in the following section. The article then moves on to consider the evolution of key institutional underpinnings of finance before 1820. There is a particular focus on the growing alienability of land and on the legislation that made mortgaging more practicable.

3. Was there ‘no shortage of capital’?

We need to flag up the ambiguity of the word *capital*. As several authors have noted, it can mean several different things. Most prominent is the confusion between *capital goods* and *finance capital*.⁵ Terms like ‘the rate on return on capital’ perpetuate this ambiguity. In this section we consider whether or not eighteenth-century industrial entrepreneurs faced a shortage of funds.

Some researchers have looked at interest rates, on the presumption that they are affected by monetary supply and demand (Pressnell, 1960; Clark, 1996; Quinn, 2001). If interest rates were high, then this might indicate a shortage of finance capital. Low rates might indicate a surplus. This exercise has not brought a clear verdict. Sidney Pollard (1958: 221-2) pointed to the early lack of integration of British financial markets and concluded that interest rates were a poor guide. Stressing the restraints of usury laws, Temin and Voth (2013) came to a similar conclusion. Fluctuations in interest rates were often related to political crises or wars. Overall, the determinants of monetary supply and demand were unstable, uneven nationwide, and constrained by usury laws and other legislation.

We should also remind ourselves of the economic meaning of *demand*. It means neither need nor want. As Adam Smith (1976 [1776]: 73) put it: ‘A very poor man may be said in some sense to have a demand for a coach and six; he might like to have it; but his demand is not an effectual demand’. Any ‘effectual’ demand for finance must be backed by security or means of future payment. An entrepreneur may be in dire *need* of additional finance, but unable to express an economic *demand* for it, because of a lack of secure collateral or of perceived repayment capacity. Collateral was often crucial in creating demand. Any unbacked *need* for money would have no discernible effect on interest rates.

⁵ Among others, this ambiguity was noted by Menger (Braun, 2020), Veblen (1908), Mitchell Innes (1914), Hobson (1926: 26), Fetter (1927, 1930) and Schumpeter (1954: 322-3). See also Hodgson (2014, 2015a, 2021). The mistaken treatment of finance as a ‘factor of production’, and the confusion of *capital goods* with *finance capital* is commonplace in economic history. See for example, Pollard (1964) and Williamson (1987).

Nevertheless, several prominent economic historians remained assured that capital was available. François Crouzet, (1965: 187-8) argued that ‘the eighteenth century capital market seems, to twentieth century eyes, badly organized, but the creators of modern industry do not seem to have suffered too much from its imperfection . . . English industry ... seems to have overflowed with capital’. Accordingly, H. John Habakkuk (1962: 175) argued that if there had been a greater need for finance, then financial institutions would have grown up to satisfy it:

financial institutions adapt themselves to meet the principal economic needs of their period and that English banks concentrated on the provision of working-capital because that was what industry needed; if there had been a large unsatisfied demand from industry to finance fixed capital, financial institutions would, with relative ease, have adapted themselves to meet this need, or new institutions would have arisen for the purpose.

Note that Habakkuk confused need with demand. His claim that financial institutions automatically grow up to meet needs is countered by more recent, extensive evidence from several countries (Rousseau, 2003; Levine, 2005, Emenalo et al. 2018). An economic demand for finance cannot be expressed without the legal and institutional machinery of property, collateral, pricing and contract. As argued below, this institutional machinery was partly and crucially dependent on a series of legislative acts, which were neither easy nor automatic.

Another approach was to look at the comparative usage of fixed and variable capital goods in the early phases of the Industrial Revolution. For Pollard (1964: 304), in his seminal study, fixed capital is ‘buildings, machinery, etc.’ and circulating capital is ‘stocks, stores, etc.’. So here by *capital* he meant *capital goods*. The argument is that greater deployments of fixed capital goods would require greater tranches of long-term finance. Perhaps the fixed capital goods could act as collateral for the loan. But that is not made clear. Pollard (1964: 313) concluded: ‘the need for fresh capital, especially for fixed assets, has been less than is often supposed, since much capital could be generated from within the existing domestic manufacturing and associated credit systems.’ Fixed capital goods of lower value were taken to imply a lesser need for long-term finance.

Pollard (1964: 308) concluded that ‘the banks provided little long-term capital because little long-term capital was demanded.’ Pollard thus endorsed Postan’s (1935) supposition that internal savings or loans from family and friends were the prevalent sources of finance. Neal (1994: 152) called this the ‘Postan-Pollard story’. But Pollard went further than Postan, by suggesting that savings or loans from family and friends were adequate, as well as the normal means of finance. Likewise, Ronald M. Hartwell (1965: 173) claimed that ‘the capital needs of early industrialization were modest’. Similarly, Sushil Khanna (1978: 1889-92) asserted that ‘the requirements of fixed investment were very modest and the threshold of entry into factory production quite low ... there was no “capital scarcity” in 18th century England.’ Noting ‘how low the capital-labour ratio was during the industrial revolution’, Khanna (1978: 1897) then claimed that ‘capital equivalent to about four months' wages was enough to start a firm.’ Then in parenthesis: ‘Boulton and Watt, who had the monopoly of steam engines for 25 years, launched their firm in 1775 with a capital of only £3370.’

The celebrated Matthew Boulton and James Watt partnership has been studied in detail (Roll, 1930; Cule, 1935). Does the fact that their steam engine enterprise was launched with ‘only £3370’ confirm that finance was adequate for their industrial ambitions? No. When they started in 1775, Boulton and Watt did not themselves manufacture many steam engines. Instead, they generally patented their designs and allowed others to manufacture the engines on licence. They drew up and sold plans and acted as consulting engineers. According to Eric

Roll (1930: 24-6), the ‘most important’ reason for this delegated arrangement ‘was undoubtedly the lack of sufficient capital’ to finance and set up a works themselves. It was not until 1795 that they focused on manufacturing steam engines for sale.

Hence, apart from their Soho premises near Birmingham, Boulton and Watt owned limited fixed capital goods in the early years. But that did not mean that their financial needs were met. The early decades of their business were fraught with financial difficulties. Roll (1930: 38) noted their ‘serious lack of capital which ... hampered the growth of the business and more than once presented the partners with the prospect of immediate collapse.’ Postan (1935: 4) also wrote on the precarious state of the Boulton-Watt partnership in its early years:

Boulton had to sink into the venture nearly the whole of his fortune, including £25,000 brought him by his wife and sums raised by the sale of his estate and the mortgage on his father’s property. In the most critical period in the history of the firm, the bankers who financed him by short-term loans failed him, and more than once he had to depend, even for short-term accommodation, on the assistance of clients and friends, including Wilkinson and Wedgwood.

J. E. Cule (1935: 28, 83) recorded several mortgages by Boulton – in 1769 raised in Amsterdam with the premises near Birmingham as partial security, another in 1778, and yet another in 1787 or 1788. Addressing other entrepreneurs, Heaton (1937: 4) noted that ‘fixed capital requirements’ were not necessarily large: ‘Yet they were frequently large enough to harass and perplex those who needed funds for building or equipping a plant of their own; for they were often the last straw on a back that already bore a heavy load.’ Heaton added in a footnote: ‘We know of ... the strain on Boulton’s resources when he was erecting his Soho factory.’ Heaton (1937: 5) summed up Boulton’s desperate need for finance. The firm survived ‘after many years of grim abstinence, of pared family budgets, and of frantic efforts to find supplementary funds outside.’

The assumed relationship between fixed capital goods and the need for finance capital, seems partly driven by the ambiguity of the word *capital*. Fixed capital and circulating capital goods are seen to relate to long-term and short-term finance, respectively. In reality, the connection is much looser. The example of Boulton and Watt shows clearly that the ratio of fixed to circulating capital is at best a weak indicator of the need for finance. It also demonstrates that, contrary to Habakkuk (1962: 175), financial institutions did not spring up to rescue entrepreneurs in dire need.

Robert Allen (2009) showed that England (compared with France and elsewhere) had a relatively high-wage economy for some time before the Industrial Revolution. Allen also noted that Britain had abundant cheap sources of energy, particularly coal. He claimed that interest rates provide little indication of a need for finance. Instead, Allen turned to the substitution of capital goods for labour, prompted largely by the lower price of the former relative to the latter.

In his criticism of Allen’s argument, Mokyr (2009: 268-72) pointed to evidence suggesting that relatively few inventions were designed to save labour. Firms will try to save on all costs, not simply those from the relatively expensive inputs. Above all, innovative effort is always constrained by the extent of useful knowledge.

Thomas Newcomen produced an early steam engine in about 1710. Its main use was to pump water out of mines. Hundreds of these engines were installed in the eighteenth century. Watt greatly improved the Newcomen engine by adding a separate condenser, more than doubling its fuel efficiency. But Boulton and Watt ‘had little prospect of supplying many of

their engines to collieries where coals were cheap and where the saving of fuel was of little importance' (Roll, 1930: 67). The cheapness of coal was here a barrier, not a spur, to technological progress. Boulton and Watt got around this problem by offering their engines to the Cornish tin and copper mines. Unlike the Midlands and North of England, there was no coal in remote Cornwall: it was shipped there from South Wales. The local expensiveness of coal gave the Watt engine an advantage. But also in that county, there was a severe shortage of the skilled labour required to assemble and maintain the engines (Roll, 1930: 60-66). Parts for their steam engines had to be transported by road or canal to Bristol, from where they were conveyed by coastal vessels to their Cornish destinations. There, the superior Watt engines quickly replaced the Newcomen machines. This strategy established the Boulton and Watt business before they developed and manufactured rotative steam engines after 1795.

Relative prices of factor inputs clearly mattered. But this story is not about substituting relatively cheap capital for relatively expensive labour. A Cornish tin mining enterprise circa 1780 had the choice of a Newcomen engine, or a slightly smaller, equally powerful, more expensive, and hugely coal-saving engine by Boulton and Watt.⁶ There are several kinds of capital goods involved in these options, including coal, and two types of steam engine. Both skilled and unskilled labour are relevant. Neither capital goods nor labour are homogenous. The oversimplified rhetoric of *capital* obscures this heterogeneity.

We have no way of ascertaining the price of aggregated capital goods without knowing their individual prices. As Piero Sraffa (1960) showed, the value of aggregate capital goods is not independent of relative prices, wage levels and profits. Yet it is relative prices that are said to drive the choice of combination of *capital* and *labour*. The reasoning is circular. The forgotten Cambridge capital theory debates showed the severe limitations of $Q = f(K, L)$ and of the related idea of marginal substitutions between these aggregated factors of production (Harcourt, 1972). Aggregated prices of 'capital' relative to 'labour', as displayed by Allen (2009: 138-9), are highly problematic for this reason. As Mokyr (1994: 15) pointed out:

factor-saving biases can only be identified in models in which labour and capital are comparatively homogeneous. If technological change replaces skilled artisans with proletarians, or replaces one form of capital with another, the measurement problems can become insuperable.

Capital goods are needed for production through time. They can also be used as collateral for borrowing money. Yet much of the focus of economic historians has been on savings, which come out of profits, as the main options for raising finance. The relative neglect of possible collateralization of fixed assets is unfortunate. Collateralization requires developed financial and legal institutions to deal with property and debt.⁷

4. The institutional foundations of modern finance

Financial institutions have a very long history. Bank depositories existed in Babylonian temples and in India almost four thousand years ago. They were also found more than two

⁶ Brunt (2006: 89-90) quoted the cost of an early Watt engine as £2,000 (which is equivalent to over £250,000 in 2019 prices). But the savings in coal costs for Cornish clients, compared to the Newcomen engine, were estimated at £2,000 per annum.

⁷ De Soto (2000), Steiger (2006, 2008), Arruñada (2012, 2017), Heinsohn and Steiger (2013), Hodgson (2015a, 2015b).

thousand years ago in ancient Greece, the Roman Empire and Qin Dynasty China. These ancient banks stored gold and other portable wealth for clients, provided credit and kept records. Their lending function was constrained, partly because non-portable wealth was more difficult to use as collateral. From the twelfth century, banks in Italy acted as money changers and provided credit using future agricultural outputs or mercantile profits as security. Fractional reserve banking emerged later, in the Netherlands. It spread to England in the seventeenth century. Banknotes and cheques were developed, avoiding the need to transport gold or silver (Neal, 2015).

Noting the ancient roots of banking, McCloskey (2010: 138) concluded: ‘Finance and saving and investment cannot have been crucial’ for modern development, as places such as Florence, Athens or Beijing ‘would have innovated us into the modern world.’ This overlooks the primitive state of banking, by modern standards, in ancient China, ancient Greece and even medieval Florence. Neal (2015) saw the beginnings of ‘modern finance’, with stable currencies and long-term public debt, in Genoa in the fifteenth century. But political fragmentation and wars prevented the full development of a modern financial system in medieval Italy. Finance-driven economies build on both experience and legislation to establish contractual rules, concepts and templates to deal with complex financial obligations. Craig Muldrew (1998) explained how these institutions developed in England from the sixteenth century. Modern banking systems also depend on central banks and markets for debt. Created in 1668, the Swedish *Riksbank* was the world’s first central bank. The Bank of England followed in 1694.

Rather than supporting industry or commerce, the primary reason for the establishment of the Bank of England was to finance state expenditures, particular for war. Nevertheless, Neal (1994: 180-1) described the Bank of England as helping to develop a ‘web of credit ... anchored securely in the City of London’. The number of banks increased. There were about 24 London banks in the 1725, 52 in 1785 and 70 in 1800. In the UK provinces there were about a dozen country banks in 1750, 119 in 1784, and 280 in 1793, reaching to a peak of 707 in 1812. Country banks played an important and growing role, but they were often insecure, and their numbers fluctuated, due to failures and amalgamations.⁸

Institutions to establish land as collateral for loans, and markets for debt, were limited in the UK until well into the eighteenth century. Crucial was the emergence of institutions making debt itself saleable or ‘negotiable.’ Limited markets for debt had appeared centuries earlier in China, France, Italy and the Netherlands, but their legal basis was then underdeveloped. Contracts ordinarily involve legal obligations to deliver goods or services in exchange for money. Exchanges of promissory notes involve instead the purchase of a promise, and originally this was not recognized as a valid contract in law: the selling of debt was not sanctioned by legal recognition of the transfer of the obligation to its purchaser. Major legislative changes were necessary to make this possible.

In England in the seventeenth century the ‘blundering attempts’ (Beutel, 1938: 840) of common law courts to deal with the negotiability of debt led businessmen to press Parliament for robust legislation. Repeated statutory legislation and experiences of case law up to the 1750s were required to consolidate negotiability (Lawrence, 2002).

⁸ See Dawes and Ward-Perkins (2000, vol. 1: 6), Kindleberger (1984: 77-9), Matthias (1969: 169), Pressnell (1958), Heblich and Trew (2019).

Modern finance involves a complex web of contractual obligations. Fractional reserve banking has a cumulative effect on money creation by commercial banks as it expands the money supply beyond the scale of the deposits alone. Any debt is funded by current assets, or by claims owed by a third party. The purchaser of debt receives the right to an asset that itself can be used as collateral to borrow. Credit money thus feeds on itself. But this all depends on a legal structure of enforceability, a fractional reserve system backed by private and state assurances, and sufficient confidence that debt can be redeemed. Once legal institutions supporting collateralizable property, credit money, and the sale of debt were in place, a new dynamic was unleashed.

But this new system is vulnerable to waves of speculation, causing unsustainable booms and damaging slumps. In his history of central banks in several countries, Charles Goodhart (1988) noted their movement from being bankers for the government, to taking responsibility for the whole financial system. Then the central bank no longer treats other banks as rivals but takes some responsibility for their welfare.

Crucially, the Bank of England did not become established as the institutional lender of last resort until about 1760, after a series of financial panics. ‘On the eve of the industrial revolution it took its first step towards the assumption of the powers and responsibilities of central banking ... the lender of last resort [was] a function of much greater significance than its former role as a fiscal arm of the crown’ (Lovell, 1957: 15-17).

It is reasonable to describe what was consolidated in Britain in the eighteenth century as *capitalism* (Hodgson, 2015a). Contrary to McCloskey (2016b: 93) – who again dismisses too speedily – *capitalism* is not defined as the accumulation of capital goods, or ‘piling brick on brick’ as she put it. It is finance that is definitionally central to capitalism. In part, as Schumpeter (1939: 223) explained, ‘capitalism is that form of private property economy in which innovations are carried out by means of borrowed money, which in general ... implies credit creation.’ Accordingly, as Geoffrey Ingham (2008: 73) concluded: ‘Capitalism is distinctive in that it contains a social mechanism by which privately contracted debtor-creditor relations ... are routinely monetized.’⁹

To consider whether the slow development of the British financial system restrained industrial growth until sometime in the nineteenth century, we need evidence on the extent of creation of credit through the use of financial institutions in the eighteenth and nineteenth centuries. Security or collateral are the foundations of credit. The main store of wealth was land. Among other things, we need evidence on potential and actual mortgaging by entrepreneurs and shareholders.

Economists have paid insufficient attention to the institutional conditions required to mortgage assets or use them as security for loans. For example, in ‘the economics of property rights’ property is regarded as mere possession or control. Legal title is seen as significant only if it aids control of the asset. Otherwise, ‘property’ is simply what you control, and you have a ‘property right’ even if you have stolen it (Alchian, 1965; Furubotn and Pejovich, 1972; Barzel, 1989). Critics point out that de facto possession does not necessarily constitute a right. This dismembered view of property ignores its multi-faceted legal nature (Honoré, 1961; De Soto, 2000; Cole and Grossman, 2002; Steiger, 2006, 2008; Heinsohn and Steiger,

⁹ Schumpeter (1954: 78 n.) dated the rise of capitalism to the sixteenth century. By his own criteria, this is too early. Extensive ‘borrowed money’ and ‘credit creation’ required institutions to allow the practicable mortgaging of wealth. These did not emerge in England before the 1670s. A more precise definition of capitalism is proposed in Hodgson (2015a).

2013; Hodgson 2015a, 2015b). Possession (*usus*) is only part of the real story. Ownership is not simply a matter between buyer and seller, but it requires some legal authority. As John R. Commons (1893: 110) put it: ‘in the end, the actual title to property rests on the sovereign power of the state to enforce its decrees.’ Consequently, the ‘economics of property rights’ places no emphasis on the possible use of property (including land, buildings and patents) as collateral. The concepts of collateral and mortgage are absent from the works of Armen Alchian (1965), Eirik Furubotn and Svetozar Pejovich (1972), Yoram Barzel (1989) and others in this genre. But they are vitally important for economic development.

5. Land alienability and mortgageability in England before 1700

If land cannot be sold or its use-rights transferred, then it cannot be used as security for loans. Much English land was bought and sold, at least from the twelfth century. Four county-based studies in England from the thirteenth to the fifteenth centuries suggest that sales of land were increasingly frequent, among free peasants from the twelfth century onwards (Harvey, 1984). Habakkuk (1981: 213) noted that the land market developed during the sixteenth century, but ‘the general series do not enable one to judge whether more land was sold in, say, the 1720s than in the 1620s, or compare the level of sales in the eighteenth century as a whole with the level in the century before 1640.’ Here too have little information to go on.

While the essays in P. D. A. Harvey’s (1984) book show peasants trading in freehold land growing from the twelfth century, there is no mention of any piece of land being mortgaged. Neither ‘mortgage’, ‘collateral’ nor ‘security’ appear in the index of the volume. Studies in the book edited by Chris Briggs and Jaco Zuijderduijn (2018) confirmed that mortgaging in medieval England was rare. When it occurred it was almost always between geographically proximate lenders and borrowers. Institutional arrangements for mortgaging generally favoured the lenders: the borrowers ran severe risks of losing their land.

Some medieval mortgages involved the transfer of both *usufructuary* rights and legal title to the lender, for the period of the loan (Briggs and Zuijderduijn, 2018). One reason for this arrangement was to circumvent the usury laws. Before sixteenth century legislation that made limited interest payments legal, such *usufructuary* mortgages were among the rare cases of mortgaging.¹⁰ Peasant freeholdings changed hands, but much other land was not alienable. There were enduring restrictions on selling landed property, known as entails. Many entails enforced primogeniture, ensuring that a landed estate passed from one generation to another through the eldest son. But even when the courts limited the scope of entails in 1614, these were replaced by voluntary and widespread ‘strict settlements’ that had similar effects, and prevailed until the nineteenth century (Beckett, 1984; North et al. 2009: 89-9; Allen, 2012: 65).

Entails and strict settlements ‘restricted the uses to which land could be put. ... Holders could seldom sell, swap, or mortgage property under their control’ (Bogart and Richardson 2011: 245). Strict settlements stubbornly endured, largely because the wealthy elite wanted and protected them. Owners were disinclined to sell or mortgage buildings or land that had been in their family for generations. Loss of land meant loss of status and privileges.

Much land was set aside as commons. Around 1700, about one-quarter of arable land in England was held as commons, where villagers shared rights to the use of pastures, water

¹⁰ *Usufructuary* mortgages are still used today in the Indian Subcontinent.

sources, or woods (Bogart and Richardson 2011: 247). This land could not be sold or mortgaged.

Parliament became involved in the process of making more land alienable. Estate acts undid strict settlements. Statutory authority acts were used to develop infrastructure. Not all enclosures resulted from acts of parliament, but many did. Dan Bogart and Gary Richardson (2011: 249-50) gathered data on the numbers of estate, statutory authority and enclosure acts from 1700 to 1830. They showed that legislative reform of landed property rights was sluggish from 1700 until about 1750 and then took off rapidly, with the strongest growth trends coming from enclosure and statutory authority acts. The annual rate of legislative activity to make land saleable increased about fivefold from 1750 to 1810. Further research into land sales and mortgaging in this period would be helpful to confirm or deny the dramatic picture suggested by the legislative data.

In the seventeenth century the mortgaging of inheritable copyhold lands became more common. The lord of the manor owned the land but passed lifetime or inheritable *usus* and *usus fructus* rights to a copyholding tenant, who paid a nominal rent. If the copyhold were inheritable, then it could be sold on or mortgaged, under the jurisdiction of the manorial court. Hence copyhold transfers were open and under scrutiny, and the manorial court registered the land and the transactions upon it. In contrast, freeholder mortgages lacked any land registry or assembled public record.

Juliet Gayton (2018) found no evidence of a copyhold mortgage before the seventeenth century. She saw this absence as due to the unreformed usury laws. Using a sample of manorial records, she found a pronounced rise in the number of copyhold mortgages from 1606 to the time of the Restoration. She noted that most borrowers and lenders lived within fifteen miles of each other. There was little recorded use of financial intermediaries. In Gayton's sample there was a decline of recorded copyhold mortgages after 1660. This could reflect a shift of mortgage proceedings from the manorial to the common law courts, particularly after the reform of mortgage laws in the 1660s, as discussed below. Other studies do not show a decline in copyhold mortgages (French and Hoyle, 1999).

We lack information on how much land was alienable in the seventeenth century. But we do know that even if it could be sold, obtaining a mortgage on freehold land was prohibitively risky and expensive before 1670. Allen (1992: 102-3) explained:

It was possible to mortgage freehold land, but the arrangements were so unsatisfactory that money was raised by a mortgage only in dire circumstances. In such mortgages the freehold in the property was conveyed to the mortgagee, who advanced all the money. Repayment was normally to be made in six months. If default occurred by even so much as one day, the title remained permanently with the mortgagee. Moreover, the mortgagor was still indebted to the mortgagee for the repayment of the loan. The mortgage was thus not a device for long-term finance and was at best a risky procedure for raising long-term funds.

The seventeenth century saw the first steps in developing modern mortgage law. Numerous landowners petitioned the courts for more favourable legislation. But mortgage law 'remained confused at least into the 1670s'. Allen (1992: 104) continued:

It was not until the end of the [seventeenth] century that mortgages became automatically and indefinitely extendable, as long as the mortgagor regularly paid interest. Only then did the mortgage become a routine device for using land to raise long-term finance.¹¹

As David Sugarman and Ronnie Warrington (1995) pointed out, there is some irony in the fact that privileged landowners lobbied so hard for a change in mortgage law that would boost their hold over their landed estates, and yet it would eventually lead to a release of finance capital that would help the rise of the rival industrial bourgeoisie to power.

Empirical research by Grajzl and Murrell (2021a, 2021b) into English case law shows that the rules of mortgaging became under greater court dispute from about 1640 and deliberation upon them rose until 1690. Subsequently, disputes remained at around that level, to begin to fall after about 1720. This indicates that mortgage law became substantially settled before the middle of the eighteenth century.

From the seventeenth century, forms of mortgaging evolved in attempts to get around the legal encumbrances tied up with landed property. One option was to obtain a mortgage on leasehold rights, rather than on the legal title to the property, as collateral (Anderson, 1969a; Neal, 1994: 163; Clark, 1998: 60). But such transactions were still fraught with difficulties. Eventually, as the legal encumbrances to alienation diminished, mortgaging based on legal title as security became more prominent.

Data on land sales gathered by Clark (1998: 74-76) cover the period from 1500 to 1910 but show no instance of a mortgage before 1680. Allen (1992: 104) wrote: ‘The volume of finance raised by mortgage grew rapidly in the late seventeenth century.’ He referred to William Petty (1927, vol. 1: 247) who had estimated in about 1660 that capital raised with land as security equalled only 2.5 per cent of the value of English real estate. Allen further noted that in the mid-1690s Charles Davenant had estimated that loans secured on land amounted to £20 million, which equalled about 8 per cent of the value of English and Welsh property. Allen regretted the lack of later estimates.

In 1690 the economist Nicholas Barbon helped to develop the National Land Bank, which would mortgage real estate. But, opposed by the Treasury and Parliament, this scheme foundered in 1697 (Clapham, 1966: 33-4; Rubini, 1970). It took several decades to build up financial institutions under which alienable land could be readily mortgaged. Much land in the 1690s could not yet be used as collateral. Further changes in land ownership and land registration were necessary, and these were slow in coming.

Contrary to Douglass North and Barry Weingast (1989) and Daron Acemoglu et al. (2005), the key change in property rights due to the Glorious Revolution of 1688 was not an improvement in their *security*. In England, landed property was relatively secure from the twelfth century (McCloskey, 2010; Fukuyama, 2011: 418-20; Hoppit, 2011; Ogilvie and Carus, 2014). Increased rights of *alienability* (normally a precondition of mortgageability) imply changes in the nature of landed property rights. Evidence suggests that possibilities for alienability increased, noticeably after 1750 and into the nineteenth century (Hodgson, 2017). Property was relatively secure. What was needed was increased opportunities for land alienability combined with other institutional arrangements to facilitate the use of land to obtain credit.

¹¹ These developments in mortgage law were also noted by Simpson (1961: 226-9), Mingay, (1963: 36) and Van Bochove et al. (2015).

6. Raising mortgages in the eighteenth century

As Benito Arruñada (2012) explained, there need to be safeguards to ensure that the mortgagor has genuine title to the land, and its boundaries are not under dispute. A partial solution is the formation of land registries, as Hernando de Soto (2000) has pursued in contemporary Peru. But as Arruñada (2017) further elaborated, an operable system of land registration requires trustworthy financial intermediaries plus legal and administrative institutions that are efficient and relatively free of corruption. Even today, only a minority of countries fulfil these conditions (Dam, 2006).

By 1663 a land registry was in operation called the Bedford Level, covering 703 square miles including the whole of the Isle of Ely and adjacent areas with Huntingdonshire, Norfolk and Suffolk. By 1700 there was some clamour for further land registries, to facilitate land mortgaging and the raising of capital. Land registries, with records of conveyances and mortgages, were established in the West Riding of Yorkshire in 1704, the East Riding of Yorkshire in 1707, Middlesex in 1708 and the North Riding of Yorkshire in 1735. Remarkably, these records seem rarely explored by economic historians.¹² By comparison, the Low Countries had a more extensive and much better organised system of land registration as early as the seventeenth century (Van Bochove et al., 2015). In the UK, local systems of land registration proceeded very slowly and took centuries to develop. Progress was patchy. But from the end of the seventeenth century there is even some evidence of mortgaging in parts of England that lacked land registries.

Mortgages did not always finance industrial investment or entrepreneurship. Much land was mortgaged to pay for conspicuous consumption, buildings, marriage settlements and idle pleasures (Joslin, 1960: 176; Cannadine, 1977, 1980).

In the eighteenth century the Bank of England had little to do with mortgages (Joslin, 1954: 175-7). An Act of Parliament of 1708 prevented private banks with more than six partners from issuing bank notes. Some private banks developed a limited but growing mortgage business. In their study of Hoare's Bank in London, Temin and Voth (2013: 50) reported: 'Mortgages were the single most important security offered in the years before 1710'. Joslin (1960) also noted several cases of lending via mortgages by the London private banks in 1739-84. But again the evidence is limited. What is certain is that all UK private banks remained small until after the Joint-Stock Bank Act of 1826, which replaced the 1708 Act and heralded a more effective banking system.

In his study of country banking, Leslie Pressnell (1958: 344) noted the growing need for long-term finance, including for major agricultural improvements: 'Loans by way of mortgage were procurable in London, from banks and insurance companies and through the multitudinous lawyers of the capital.' Pressnell (1960: 187) concluded: 'Much the most important means of raising money privately in the eighteenth century was the property mortgage.' Mathias (1969: 175-6) cited several enterprises that obtain loans from banks, but without detailing whether there was any mortgage or collateral. His list includes the Duke of Bridgewater, who opened the Lancashire canal in his name in 1761, plus Richard Arkwright and other industrial entrepreneurs. The evidence we have so far is very patchy, but it reveals

¹² Tate (1944), Sheppard et al. (1979) and Sheppard and Belcher (1980) are exceptions.

cases where mortgages were raised on land or other assets to finance industry or infrastructure.

Infrastructural development was crucial to prepare the ground for industrialization. In her study of the English turnpike trusts, Brenda Buchanan (1986: 230) noted the early development 'of the concept of the "mortgage" beyond its landed origins. ... Before 1793 the tolls formed the only security, and these were assigned to three landed trustees. Each mortgagee had "all the Right Title and Interest in and to the said Tolls".' J. R. Ward (1974) found a similar innovation in mortgaging arrangements in the early canals and river improvements, where the rights to the barge tolls were sometimes mortgaged. He noted a mortgage on a landed estate for river improvements as early as 1698. His data also show that the Sun Insurance Company provided some mortgages.

To whatever use the loans were put, mortgage activity was significant. By using the records of attorneys, B. L. Anderson (1969a, 1969b) established that mortgaging occurred in Lancashire throughout the eighteenth century, and M. Miles (1981) and Hudson (1986) found significant evidence post-1750 of borrowing and mortgaging in the West Riding of Yorkshire. Anderson (1969b: 18) noted examples of mortgages on urban dwellings in Lancashire: 'it is clear that the practice of borrowing and lending on mortgage had taken root among all classes right from the beginning of the [eighteenth] century.' Mortgaging became no longer the exclusive device of the rich.

The impressive study by Philip Hoffman et al. (2019) of peer-to-peer lending from 1740 to 1899 in France, serves to warn us of the amount of 'dark matter' that may be out of sight, in Britain and elsewhere. Hoffman and his colleagues showed that peer-to-peer lending in France was huge, in rural as well as urban areas, almost a century before French industrialization and the rise of its banks. In 1770 about one third of French families borrowed money. Much of this lending involved mortgages and was facilitated by the use of *notaires*. This borrowing was not generally from family and friends. It could not rely on trust alone. As well as acting in their capacity as state officials to authorize and record contracts, the *notaires* often served as financial intermediaries, by matching lenders with borrowers and arranging loans. Before 1850, lenders and borrowers were rarely more than a day on horse apart, because the lender might have to visit the borrower to retrieve the debt. Nevertheless, lending flourished.

Hoffman and his colleagues were able to access data on the extent of this lending because of surviving central records. The closest equivalent positions in Britain are the attorneys or scribes. But these have never been state officials and no central British records of such lending exist. Finding comparable data of peer-to-peer lending in Britain will be a much harder task. But the French case suggests that much British financial activity, while legal, may be hidden in the archives.

This raises the question if finance was available in 1740, why did France not industrialize until well into the nineteenth century? The answers are beyond the scope of this article, but may lie in pre-1789 state despotism alongside a fragmented legal system, revolutionary turbulence from 1789, the slow development of larger private companies, or the underdevelopment of wider financial markets, including markets for debt (Carruthers, 1996: 23).

In Britain, when peer-to-peer and bank lending were inadequate, borrowers approached other financial institutions. A. H. John (1953: 155) highlighted the role of insurance companies in providing mortgages: 'In the first half of the [eighteenth] century the only office to make great use of mortgages was the Sun Fire, to be followed later by the Equitable.' The

mortgaging function of insurance companies expanded after 1750. G. E. Mingay (1963: 37) noted: 'By the end of the eighteenth century the Equitable and Sun Fire Offices alone had some £776,000 invested in mortgages.'

Further archival research might help to resolve some important questions. For instance, it is clear that as the Industrial Revolution progressed, many joint stock enterprises were financed by shareholders. But where did the shareholders obtain the money to buy their shares? It would be interesting to see how many shareholders mortgaged land or buildings to finance their investments.

More land could be mortgaged as enclosures of common lands progressed. Pressnell (1958: 350) wrote:

Most enclosure Acts contained a clause which permitted the commissioners to mortgage the land in order to finance the work of enclosure. ... No trace of bankers' having lent on mortgage for this purpose, or indeed of anyone else having done so, has been found in the course of this study; but, in view of the monotonous recurrence of this clause in private Acts, it is surely likely that such lending occurred. The evidence doubtless awaits disinterment from the piles of mortgage agreements in county record offices and solicitors' offices.

Much of this evidence has not been disinterred, despite the analysis of enclosures having been a hot topic for economic historians. Mingay (1963: 97-8) and Liam Brunt (2006: 87) noted the option of mortgaging enclosed land. More sceptically, Michael Turner (1981: 236, 237) pointed out that the extensive use of enclosed land to raise funds by mortgage 'has yet to be demonstrated' and 'yet to be investigated'. Turner suggested that Pressnell may have overestimated the likelihood of this happening. But we simply do not know, because adequate research has not been done.

In summary, it seems that that there was substantial mortgaging activity by end of the eighteenth century. But mortgage risks were high. For example, as Ellis Powell (1915: 118, 124) noted: 'The lending of money on farm mortgages for agricultural improvements was the principal case of the failure of 240 country banks in 1814, 1815, and 1816'. In the crisis of 1825-26, 60 country banks failed (Cameron et al., 1967: 27). The emergencies of war and successive banking failures led to reforms and restructuring of the banking system, including the Country Bankers Act of 1826. Such observations are consistent with the Schumpeterian hypothesis that the rickety and constrained state of British financial institutions was one of the factors that held back growth during much of the Industrial Revolution.

7. Conclusion

The conventional wisdom, laid down by Postan (1935), developed by Pollard (1964) and endorsed by many others, is that finance was provided by savings, or by borrowing from family and friends, and that financial institutions otherwise played a minor role. This jars against widespread international evidence of the importance of financial institutions in economic development. Some economic historians, such as Mathias (1969), have paid more attention to mortgaging activity, but they had insufficient evidence to challenge the conventional wisdom. While the 'Postan-Pollard story' may have an empirical foundation, at least in the early years of the Industrial Revolution, it may also be that the nascent state of British financial institutions restricted borrowing, hindered entrepreneurship and helped to

account for the remarkably slow rate of growth of industrial output from 1760 to 1820. This is the Schumpeterian hypothesis.

Research into the viability of this hypothesis raises a number of questions for which we do not yet have adequate answers. An alternative source of finance to borrowing from family and friends, once the legal and other institutional conditions were in place, might have been the mortgaging of property, including land and buildings. This essay has established that there was a significant amount of mortgaging activity after 1670, but the overall extent cannot yet be gauged. Too little research has been done. The land registries of Middlesex and Yorkshire, existing from the early eighteenth century, have not been explored systematically with the issue of mortgaging in mind. The surviving records of the seventeenth century insurance companies, country banks, attorneys or scriveners – with a few notable exceptions – seem likewise little disturbed by such queries. We seem more in the dark about the extent of mortgaging in the eighteenth century than Petty was in 1660 and Davenant in the 1690s. We need more evidence to assess the Schumpeterian hypothesis.

Future empirical research on financial activity in eighteenth century Britain should attempt to estimate the following:

1. The extent to which finance for entrepreneurship was provided out of savings or by borrowing from family or friends.
2. The extent to which finance for entrepreneurship was provided through peer-to-peer lending intermediaries, banks or other financial institutions, where measures were typically in place to minimize and rectify default on the loans.
3. In particular, concerning (2), we need to gauge the extent to which landed and other property could or was used as collateral to obtain loans.
4. The overall degree to which the underdeveloped state of financial institutions acted as a constraint on industrial growth.

Note that (1) is logically independent of (3) and (4). If the conventional wisdom concerning (1) were confirmed, or disconfirmed, then this would not determine the answer to (3) or (4). All four questions are in want of systematic empirical assessment.

Why have research efforts in this direction have so far been insufficient? The mental models and metaphors that dominate the work of many economic historians might have diverted attention away from the questions raised here. Much of economics is framed by a vision of physical inputs, forces and outputs, a notion that precedes the formulation of the production function by neoclassical economists. Adam Smith ([1776] 1976: 282) changed the meaning of *capital*, from the everyday business and accounting usage as the ‘sum of money which is to be invested, or which has been invested in certain things’. Instead of their money value, ‘Smith makes it the things themselves’ (Cannan, 1921: 480). This radical redefinition of *capital* from a monetary evaluation to a physical asset has infused economics ever since. It has led to a confusion between *finance capital* and *capital goods*, that confounds the arguments of many economic historians.¹³

Relatedly, the ‘economics of property rights’ sees property as a matter of physical control over an object, thus neglecting the question of legal title and the multiple types of property right, including rights of alienation or use (Honoré, 1961). It is thus unable to focus on the

¹³ Hodgson (2014, 2021). Notably, Piketty (2014) reverted to a pre-Smithian definition of capital.

legal and other institutions required to mortgage property – to use it as collateral for loans to finance investment or fund consumption (De Soto, 2000; Steiger, 2006, 2008; Heinsohn and Steiger, 2013; Hodgson, 2015a, 2015b; Deakin et al., 2017).

As Carol Heim and Philip Mirowski (1987: 129) argued in the *Journal of Economic History*: ‘The idea that “the economy” consists of a unified pool of potentially mobile resources – rather than distinct and possibly nonintersecting sets of economic relationships – is so standard in neoclassical theory that many economists take it for granted.’ Even the Cambridge critics of the aggregate production function used a disaggregated formulation based on physical inputs and outputs (Sraffa, 1960).

The physicalist perspective in economics has also meant that historically specific features – particularly institutions – are sometimes downplayed. In particular, the debate about the role of finance in the industrial revolution has been overly distracted by discussions of (physical) fixed capital. The Industrial Revolution was a turning point in human history. Any explanation of its origins must point not only to eternities – like land, labour and capital goods – but also to novel institutions, circumstances and ideas that enabled the transformation.

Multiple legal changes were required to develop a modern financial system. Legal advances were neither automatic nor always responsive to business demands. Some legislation – such as that limiting interest rates, bank size and corporate formation – inhibited economic development. But other legislation and case law made more land saleable, enabled mortgaging, buttressed credit markets, and reinforced other financial institutions.

The stress on institutions does not rule out other factors such as the influence of Enlightenment ideas (McCloskey, 2010, 2016a, 2016b; Mokyr, 2009). But ideas always need institutions to be noticed, filtered, selected, adopted, laid down in habits, promoted and empowered. We need to look more closely at key institutional developments in the eighteenth and nineteenth centuries. There is much empirical research still to be done to determine the role of financial institutions in the British Industrial Revolution.

References

- Acemoglu, Daron, Johnson, Simon and Robinson, James A. (2005) ‘Institutions as a Fundamental Cause of Long-Run Growth’, in Philippe Aghion and Steven N. Durlauf (eds) (2005) *Handbook of Economic Growth: Volume 1A* (North Holland: Elsevier), pp. 385-472.
- Alchian, Armen A. (1965) ‘Some Economics of Property Rights’, *Il Politico*, 30, pp. 816–829.
- Allen, Douglas W. (2012) *The Institutional Revolution: Measurement and the Economic Emergence of the Modern World* (Chicago: University of Chicago Press).
- Allen, Robert C. (1992) *Enclosure and the Yeoman* (Oxford: Clarendon Press).
- Allen, Robert C. (2009) *The British Industrial Revolution in Global Perspective* (Cambridge and New York: Cambridge University Press).
- Anderson, B. L. (1969a) ‘The Attorneys and the Early Capital Market in Lancashire’, reprinted in Crouzet, François (ed.) (1972) *Capital Formation in the Industrial Revolution* (London: Methuen), pp. 223-55.

- Anderson, B. L. (1969b) 'Provincial Aspects of the Financial Revolution in the Eighteenth Century', *Business History*, 11(1), pp. 11-22.
- Arruñada, Benito (2012) *Institutional Foundations of Impersonal Exchange: Theory and Policy of Contractual Registries* (Chicago: University of Chicago Press).
- Arruñada, Benito (2017) 'Property as sequential exchange: The forgotten limits of private contract', *Journal of Institutional Economics*, 13(4), December, pp. 753-83.
- Ashton, Thomas S. (1961) *An Economic History of England: The 18th Century* (London: Methuen).
- Barzel, Yoram (1989) *Economic Analysis of Property Rights* (Cambridge: Cambridge University Press).
- Beckett, J. V. (1984) 'The Pattern of Landownership in England and Wales, 1660-1880', *Economic History Review*, 37(1), February, pp. 1-22.
- Beutel, Frederick K. (1938) 'The Development of Negotiable Instruments in Early English Law', *Harvard Law Review*, 51(5), pp. 813-845.
- Bogart, Dan and Richardson, Gary (2011) 'Property Rights and Parliament in Industrializing Britain', *Journal of Law and Economics*, 54(2), May, pp. 241-74.
- Braun, Eduard (2020) 'Carl Menger: *Contribution to the Theory of Capital* (1888), Section V', *Journal of Institutional Economics*, 16(4), August, pp. 557-568.
- Briggs, Chris and Zuijderduijn, Jaco (eds) (2018) *Land and Credit: Mortgages in the Medieval and Early Modern European Countryside* (London and New York: Palgrave Macmillan).
- Broadberry, Stephen N., Campbell, Bruce M. S., Klein, Alexander, Overton, Mark and Leeuwen, Bas van (2015) *British Economic Growth, 1270-1870* (Cambridge and New York: Cambridge University Press).
- Brunt, Liam (2006) 'Rediscovering Risk: English Country Banks as Proto-Venture Capital Firms in the Industrial Revolution', *Journal of Economic History*, 66(1), March, pp. 74-102.
- Buchanan, Brenda J. (1986) 'The Evolution of the English Turnpike Trusts: Lessons from a Case Study', *Economic History Review*, 39(2), May, pp. 223-243.
- Cameron, Rondo, Crisp, Olga, Patrick, Hugh T. and Tilly, Richard (1967) *Banking in the Early Stages of Industrialization* (Oxford and New York: Oxford University Press).
- Cannadine, David (1977) 'Aristocratic Indebtedness in the Nineteenth Century: The Case Re-opened', *Economic History Review, New Series*, 30(4), November, pp. 624-650.
- Cannadine, David (1980) 'Aristocratic Indebtedness in the Nineteenth Century: A Restatement', *Economic History Review, New Series*, 33(4), November, pp. 569-573.
- Cannan, Edwin (1921) 'Early History of the Term Capital', *Quarterly Journal of Economics*, 35(3), May, pp. 469-481.
- Carruthers, Bruce G. (1996) *City of Capital: Politics and Markets in the English Financial Revolution* (Princeton NJ, Chichester UK: Princeton University Press).
- Clapham, John H. (1966) *The Bank of England: A History. Volume One, 1694-1797* (Cambridge: Cambridge University Press).

- Clark, Gregory (1996) 'The Political Foundations of Modern Economic Growth: England, 1540-1800', *Journal of Interdisciplinary History*, 26(4), Spring, pp. 563-588.
- Clark, Gregory (1998) 'Land Hunger: Land as a Commodity and as a Status Good, England, 1500-1910', *Explorations in Economic History*, **35**, pp. 59-82.
- Cole, Daniel H. and Grossman, Peter Z. (2002) 'The Meaning of Property Rights: Law versus Economics?' *Land Economics*, 78(3), August, pp. 317-330.
- Commons, John R. (1893) *The Distribution of Wealth* (London and New York: Macmillan).
- Cottrell, Philip L. (1980) *Industrial Finance, 1830-1914: The Finance and Organization of English Manufacturing Industry* (London: Methuen).
- Crouzet, François (1965) 'Capital Formation in Great Britain During the Industrial Revolution', *Proceedings of the Second Conference of Economic History*, The Hague. Reprinted in Crouzet, François (ed.) (1972) *Capital Formation in the Industrial Revolution* (London: Methuen), pp. 162-222.
- Cule, J. E. (1935) 'The Financial History of Matthew Boulton: 1759-1800', PhD Thesis, University of Birmingham.
- Dam, Kenneth W. (2006) 'Land, Law and Economic Development', University of Chicago Law and Economics, Olin Working Paper No. 272. Available at SSRN: <https://ssrn.com/abstract=876659>.
- Dawes, Margaret and Ward-Perkins, C. Neville (2000) *The Country Banks of England and Wales*, 2 vols (Canterbury: Chartered Institute of Bankers).
- De Soto, Hernando (2000) *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else* (New York: Basic Books).
- Deakin, Simon, Gindis, David, Hodgson, Geoffrey M., Huang, Kainan, and Pistor, Katharina (2017) 'Legal Institutionalism: Capitalism and the Constitutive Role of Law', *Journal of Comparative Economics*, 45(1), February, pp. 188-200.
- Dickson, Peter G. M. (1967) *The Financial Revolution in England: A Study in the Development of Public Credit, 1688-1756* (London: Macmillan).
- Emenalo, Chukwunonye, Gagliardi, Francesca and Hodgson, Geoffrey M. (2018) 'Historical Institutional Determinants of Financial System Development in Africa', *Journal of Institutional Economics*, 14(2), April, pp. 345-372.
- Fetter, Frank A. (1927) 'Clark's Reformulation of the Capital Concept', in Hollander, Jacob H. (ed.) (1927) *Economic Essays Contributed in Honor of John Bates Clark* (New York: Macmillan), pp. 136-56.
- Fetter, Frank A. (1930) 'Capital', in Edwin R. A. Seligman and Alvin Johnson (eds) *Encyclopaedia of the Social Sciences* (New York: Macmillan), Vol. 3, pp. 187-90. Reprinted in the *Journal of Institutional Economics*, 4(1), April 2008, pp.127-137.
- French, Henry R. and Richard W. Hoyle (1999) 'The Land Market of a Pennine Manor: Slaidburn, 1650-1780', *Continuity and Change*, 14(3), pp. 349-83.
- Fukuyama, Francis (2011) *The Origins of Political Order: From Prehuman Times to the French Revolution* (London and New York: Profile Books and Farrar, Straus and Giroux).

- Furubotn, Eirik G. and Pejovich, Svetozar (1972) 'Property Rights and Economic Theory: A Survey of Recent Literature', *Journal of Economic Literature*, 10(4), December, pp. 1137-62.
- Gayton, Juliet (2018) 'Mortgages Raised by Rural English Copyhold Tenants 1605-1735', in Briggs, Chris and Zuijderduijn, Jaco (eds) (2018) *Land and Credit: Mortgages in the Medieval and Early Modern European Countryside* (London and New York: Palgrave Macmillan), pp. 47-80.
- Gerschenkron, Alexander (1962) *Economic Backwardness in Historical Perspective: A Book of Essays* (Cambridge, MA: Belknap Press).
- Goodhart, Charles A. E. (1988) *The Evolution of Central Banks* (Cambridge, MA: MIT Press).
- Grajzl, Peter and Murrell, Peter (2021a) 'A Machine-Learning History of English Caselaw and Legal Ideas Prior to the Industrial Revolution I: Generating and Interpreting the Estimates', *Journal of Institutional Economics*, 17(1), February, pp. 1-19.
- Grajzl, Peter and Murrell, Peter (2021b) 'A Machine-Learning History of English Caselaw and Legal Ideas Prior to the Industrial Revolution II: Applications', *Journal of Institutional Economics*, 17(2), April, pp. 201-16.
- Habakkuk, H. John (1962) *American and British Technology in the Nineteenth Century* (Cambridge: Cambridge University Press).
- Habakkuk, H. John (1981) 'The Rise and Fall of English Landed Families, 1600-1800: III. Did the Gentry Rise?' *Transactions of the Royal Historical Society*, 31, pp. 195-217.
- Harcourt, Geoffrey C. (1972) *Some Cambridge Controversies in the Theory of Capital* (Cambridge, Cambridge University Press).
- Hartwell, Ronald M. (1965) 'The Causes of the Industrial Revolution: An Essay in Methodology', *Economic History Review*, New Series, 18(1), pp. 164-82.
- Harvey, P. D. A. (ed.) (1984) *The Peasant Land Market in Medieval England* (Oxford: Oxford University Press).
- Heaton, Herbert (1937) 'Financing the Industrial Revolution', *Bulletin of the Business Historical Society*, 11(1), February, pp. 1-10.
- Heblich, Stephan and Trew, Alex (2019) 'Banking and Industrialization', *Journal of the European Economic Association*, 17(6), December, pp. 1753-96.
- Heim, Carol E. and Mirowski, Philip (1987) 'Interest Rates and Crowding-Out During Britain's Industrial Revolution', *Journal of Economic History*, 47(1), March, pp. 117-39.
- Heinsohn, Gunnar and Steiger, Otto (2013) *Ownership Economics: On the Foundations of Interest, Money, Markets, Business Cycles and Economic Development*, translated and edited by Frank Decker (London and New York: Routledge).
- Hobson, John A. (1926) *The Evolution of Modern Capitalism: A Study of Machine Production*, revised edn. (London: Walter Scott, and New York: Charles Scribner's).
- Hodgson, Geoffrey M. (2014) 'What is Capital? Economists and Sociologists have Changed its Meaning – Should it be Changed Back?' *Cambridge Journal of Economics*, 38(5), September, pp. 1063-86.

- Hodgson, Geoffrey M. (2015a) *Conceptualizing Capitalism: Institutions, Evolution, Future* (Chicago: University of Chicago Press).
- Hodgson, Geoffrey M. (2015b) 'Much of the "Economics of Property Rights" Devalues Property and Legal Rights', *Journal of Institutional Economics*, 11(4), December, pp. 683-709.
- Hodgson, Geoffrey M. (2017) '1688 and All That: Property Rights, the Glorious Revolution and the Rise of British Capitalism', *Journal of Institutional Economics*, 13(1), March, pp. 79-107.
- Hodgson, Geoffrey M. (2021) 'On the Limits of Markets', *Journal of Institutional Economics*, 17(1), February, pp. 153-70.
- Hoffman, Philip T., Postel-Vinay, Gilles and Rosenthal, Jean-Laurent (2019) *Dark Matter Credit : The Development of Peer-to-Peer Lending and Banking in France* (Princeton, NJ and Woodstock, UK: Princeton University Press).
- Honoré, Antony M. (1961) 'Ownership', in Guest, Anthony G. (ed.) (1961) *Oxford Essays in Jurisprudence* (Oxford: Oxford University Press), pp. 107-47. Reprinted in the *Journal of Institutional Economics*, 9(2), June 2013, pp. 227-55.
- Hoppit, Julian (1987) 'Financial Crises in Eighteenth-Century England', *Economic History Review*, 39(1), February, New Series, 39-58.
- Hoppit, Julian (2011) 'Compulsion, Compensation and Property Rights in Britain, 1688-1833', *Past and Present*, 210(1), February, pp. 93-128.
- Hudson, Pat (1986) *The Genesis of Industrial Capital: A Study of the West Riding Wool Textile Industry c. 1750-1850* (Cambridge and New York: Cambridge University Press).
- Ingham, Geoffrey (2008) *Capitalism* (Cambridge: Polity Press).
- John, A. H. (1953) 'Insurance Investment and the London Money Market of the Eighteenth Century', *Economica*, 20(78), May, pp. 137-158.
- Joslin, D. M. (1954) 'The London Private Bankers, 1720-1785', *Economic History Review*, New Series, 7(2), pp. 167-86.
- Joslin, D. M. (1960) 'London Bankers in Wartime 1739-84', in Pressnell, Leslie S. (ed.) (1960) *Studies in the Industrial Revolution* (London: Athlone), pp. 156-177.
- Khanna, Sushil (1978) 'Capital and Finance in the Industrial Revolution: Lessons for the Third World', *Economic and Political Weekly*, 13(46), 18 November, pp. 1889-98.
- Kindleberger, Charles P. (1984) *A Financial History of Western Europe* (London: George Allen and Unwin).
- King, Robert G. and Ross Levine (1993) 'Finance and Growth: Schumpeter might be Right', *Quarterly Journal of Economics*, 108(3), August, pp. 717-737.
- Lawrence, William H. (2002) *Understanding Negotiable Instruments and Payment Systems*, (Newark NJ: Matthew Bender).
- Levine, Ross (2005) 'Finance and Growth: Theory, Mechanisms and Evidence', in Philippe Aghion and Steven N. Durlauf (eds) (2005) *Handbook of Economic Growth, Volume 1* (Amsterdam: Elsevier), pp. 865-934.

- Lovell, Michael C. (1957) 'The Role of the Bank of England as Lender of Last Resort in the Crises of the Eighteenth Century', *Explorations in Entrepreneurial History*, 10(1), October, pp. 8-21.
- Mathias, Peter (1969) *The First Industrial Nation: An Economic History of Britain 1700-1914* (London: Methuen).
- McCloskey, Deirdre N. (2010) *Bourgeois Dignity: Why Economics Can't Explain the Modern World* (Chicago: University of Chicago Press).
- McCloskey, Deirdre N. (2016a) 'Max U vs. Humanomics: A Critique of Neo-Institutionalism', *Journal of Institutional Economics*, 12(1), March, pp. 1-27.
- McCloskey, Deirdre N. (2016b) *Bourgeois Equality: How Ideas, Not Capital or Institutions, Enriched the World* (Chicago: University of Chicago Press).
- Miles, M. (1981) 'The Money Market in the Early Industrial Revolution: The Evidence from West Riding Attorneys c. 1750–1800', *Business History*, 23(2), pp. 127-146.
- Mingay, G. E. (1963) *English Landed Society in the Eighteenth Century* (London and Toronto: Routledge and Kegan Paul, University of Toronto Press).
- Mitchell Innes, Alfred (1914) 'The Credit Theory of Money', *Banking Law Journal*, 31, December-January, pp. 151-168.
- Mokyr, Joel (ed.) (1993) *The British Industrial Revolution, An Economic Perspective* (Boulder, CO: Westview Press).
- Mokyr, Joel (1994) 'Technological Change, 1700-1830', in Floud, Roderick and McCloskey, Deirdre (eds) (1994) *The Economic History of Britain Since 1700: Volume 1: 1700-1860*, 2nd edn. (Cambridge and New York: Cambridge University Press), pp. 12-43.
- Mokyr, Joel (2009) *The Enlightened Economy: An Economic History of Britain 1700-1850* (New Haven: Yale University Press).
- Muldrew, Craig (1998) *The Economy of Obligation* (Basingstoke: Palgrave).
- Neal, Larry (1994) 'The Finance of Business During the Industrial Revolution', in Floud, Roderick and McCloskey, Deirdre (eds) (1994) *The Economic History of Britain Since 1700: Volume 1: 1700-1860*, 2nd edn. (Cambridge and New York: Cambridge University Press), pp. 151-81.
- Neal, Larry (2015) *A Concise History of International Finance: From Babylon to Bernanke* (Cambridge and New York: Cambridge University Press).
- North, Douglass C., Wallis, John Joseph and Weingast, Barry R. (2009) *Violence and Social Orders: A Conceptual Framework for Interpreting Recorded Human History* (Cambridge and New York: Cambridge University Press).
- North, Douglass C. and Weingast, Barry R. (1989) 'Constitutions and Commitment: The Evolution of Institutions Governing Public Choice in Seventeenth-Century England', *Journal of Economic History*, 49(4), December, pp. 803-32.
- Ogilvie, Sheilagh and Carus, André W. (2014) 'Institutions and Economic Growth in Historical Perspective', in Philippe Aghion and Steven Durlauf (eds) (2014), *Handbook of Economic Growth, Vol. 2A* (Amsterdam: Elsevier), pp. 403-513.
- Petty, William (1927) *The Petty Papers*, ed. Marquis of Landowne, 2 vols (London: Constable).

- Piketty, Thomas (2014) *Capital in the Twenty-First Century* (Cambridge, MA: Belknap Press).
- Pollard, Sidney (1958) 'Investment, Consumption and the Industrial Revolution', *Economic History Review*, New Series, 11(2), pp. 215-226.
- Pollard, Sidney (1964) 'Fixed Capital in the Industrial Revolution in Britain', *Journal of Economic History*, 24(3), September, pp. 299-314.
- Postan, Michael M. (1935) 'Recent Trends in the Accumulation of Capital', *Economic History Review*, 6(1), October, pp. 1-12.
- Powell, Ellis T. (1915) *The Evolution of the Money Market (1385-1915): An Historical and Analytical Study of the Rise and Development of Finance as a Centralised, Co-ordinated Force* (London: Financial Press).
- Pressnell, Leslie S. (1958) *Country Banking in the Industrial Revolution* (Oxford: Clarendon).
- Pressnell, Leslie S. (1960) 'The Rate of Interest in the Eighteenth Century', in Pressnell, Leslie S. (ed.) (1960) *Studies in the Industrial Revolution* (London: Athlone), pp. 178-214.
- Quinn, Stephen (2001) 'The Glorious Revolution's Effect on English Private Finance: A Microhistory 1680-1705', *Journal of Economic History*, 61(3), September, pp. 593-615.
- Roll, Eric (1930) *An Early Experiment in Industrial Organisation: Being a History of the Firm of Boulton and Watt 1775-1805* (London and New York: Longmans, Green).
- Rubini, Dennis (1970) 'Politics and the Battle for the Banks, 1688-1697', *English Historical Review*, 85, No. 337, October, pp. 693-714.
- Roseveare, Henry G. (1991) *The Financial Revolution, 1660-1760* (Harlow: Longman).
- Rousseau, Peter L. (2003) 'Historical Perspectives on Financial Development and Economic Growth', *Federal Reserve Bank of St. Louis*, July-August, pp. 81-106.
- Schumpeter, Joseph A. (1934) *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*, translated by Redvers Opie from the second German edition of 1926 (Cambridge, MA: Harvard University Press).
- Schumpeter, Joseph A. (1939) *Business Cycles: A Theoretical Statistical and Historical Analysis of the Capitalist Process*, 2 vols. (New York: McGraw-Hill).
- Schumpeter, Joseph A. (1954) *History of Economic Analysis* (Oxford and New York: Oxford University Press).
- Sheppard, Francis and Belcher, Victor (1980) 'The Deeds Registries of Yorkshire and Middlesex', *Journal of the Society of Archivists*, 6, April, pp. 274-86.
- Sheppard, Francis, Belcher, Victor, and Cottrell, Philip (1979) 'The Middlesex and Yorkshire Deeds Registries and the Study of Building Fluctuations', *London Journal*, 5, November, pp. 176-217.
- Simpson, A. W. B. (1961) *An Introduction to the History of the Land Law* (Oxford: Clarendon Press). [Notes that mortgages were punitive until the mortgage law reforms of the seventeenth century.]
- Smith, Adam (1976) *An Inquiry into the Nature and Causes of the Wealth of Nations*, 2 vols, originally published 1776, edited by Roy H. Campbell and Andrew S. Skinner (London: Methuen).

- Sraffa, Piero (1960) *Production of Commodities by Means of Commodities: Prelude to a Critique of Economic Theory* (Cambridge: Cambridge University Press).
- Steiger, Otto (2006) 'Property Economics versus New Institutional Economics', *Journal of Economic Issues*, 40(1), March, pp. 183-208.
- Steiger, Otto (ed.) (2008) *Property Economics: Property Rights, Creditor's Money and the Foundations of the Economy* (Marburg: Metropolis).
- Sugarman, David and Warrington, Ronnie (1995) 'Land Law, Citizenship and the Invention of "Englishness": The Strange World of the Equity of Redemption' in John Brewer and Susan Staves (ed.) (1995) *Early Modern Conceptions of Property* (London and New York: Routledge), p. 111-144.
- Tate, W. E. (1944) 'The Five English District Statutory Registries of Deeds', *Historical Research*, 20, issue 60, pp. 97-105.
- Temin, Peter and Voth, Hans-Joachim (2013) *Prometheus Shackled: Goldsmith Banks and England's Financial Revolution after 1700* (London and New York: Cambridge University Press).
- Trew, Alex (2010) 'Infrastructure Finance and Industrial Takeoff in England', *Journal of Money, Credit and Banking*, 42(6), September, pp. 985-1010.
- Turner, Michael (1981) 'Cost, Finance, and Parliamentary Enclosure', *Economic History Review*, 34(2), May, pp. 236-248.
- Van Bochove, Christiaan, Deneweth, Heidi and Zuijderduijn, Jaco (2015) 'Real estate and mortgage finance in England and the Low Countries, 1300-1800', *Continuity and Change*, 30(1), pp. 9-38.
- Veblen, Thorstein B. (1908) 'Professor Clark's Economics', *Quarterly Journal of Economics*, 22(2), February, pp. 147-95.
- Veblen, Thorstein B. (1915) *Imperial Germany and the Industrial Revolution* (New York: Macmillan).
- Ventura, Jaume and Voth, Hans-Joachim (2015) 'Debt into Growth: How Sovereign Debt Accelerated the First Industrial Revolution', NBER Working Paper 21280, National Bureau for Economic Research, Cambridge MA.
- Ward, J. R. (1974) *The Finance of Canal Building in Eighteenth-Century England* (Oxford: Oxford University Press)
- Wennerlind, Carl (2011) *Casualties of Credit: The English Financial Revolution 1620-1720* (Cambridge MA: Harvard University Press).
- Williamson, Jeffrey G. (1984) 'Why Was British Growth So Slow During the Industrial Revolution?' *Journal of Economic History*, 44(3), September, pp. 687-712.
- Williamson, Jeffrey G. (1987) 'Did English Factor Markets Fail during the Industrial Revolution?' *Oxford Economic Papers*, New Series, 39(4), December, pp. 641-678.