

Entrepreneurship and the Industrial Revolution in Britain

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Introduction

The “New Economic history” has had little patience with entrepreneurial explanations of major economic developments. Ever since the emergence of a cliometric literature on the economic history of modern Britain in the 1970s, economic historians trained in economics have debunked the view that Britain’s late nineteenth century decline could be explained in some way by social factors that led to “entrepreneurial failure.”¹ In this essay I will look at entrepreneurship in an earlier period, the decades of the Industrial Revolution. This subject is at least not nearly as controversial as the “Victorian decline.” The Industrial Revolution has remained a staple of the literature (despite ill-conceived attempts to banish it).² On the Victorian decline, there are now serious doubts that it ever happened at all and that we need a theory of failure in this case.

The fundamental intellectual dilemma in explaining the relationship between the Industrial Revolution and entrepreneurship is well-understood. It is, at base, an identification problem. Does entrepreneurial behavior engender economic progress and technological change, or do potential entrepreneurs naturally respond to opportunities emerging from new techniques, emerging markets, or changing prices, and it is explaining the latter that really counts? It is not a debate that can be decided with an econometric breakthrough, and the answer “both” is not likely to be very satisfying either. Yet something can be learned from the conversation even if no conclusive evidence can be

¹The *opus classicus* remains McCloskey, ed. (1971). More recent works such as Dormois and Dintenfass, eds., (1999) have treaded gingerly around the topic of entrepreneurial factors in the putative decline of the British economy. One prominent book, Wiener (1981) has returned to the theme of entrepreneurial failure driven by cultural factors, but his work has not persuaded the cliometricians, to say the least. For some second thoughts, however, see McCloskey (1998, 2006), who now feels that “to explain how markets live, where technology and taste originate ... we need culture.”

²For a catalog of economic explanations of the Industrial Revolution, see Mokyr (1998, 2002) and more recently Floud and Johnson, eds. (2004).

produced.

In the past decade the overall attitude toward institutional and cultural factors in the economics profession has changed. Once regarded as “soft” and “not amenable to measurement,” institutions have more recently been recognized as important elements in explaining differences in economic attainment.³ In his pathbreaking working on the Medieval commercial revolution, Greif has shown the importance of “cultural beliefs.”⁴ Economists have shown remarkable ingenuity in measuring cultural factors and successfully relating them to economic development.⁵ Economic historians have turned around and have begun to re-think the meaning of culture in changing economies, and to criticize the work of economists as well as other social scientists on culture (Jones, 2006).

The renewed interest in culture and institutions in economic change cannot but have an effect on our thinking about entrepreneurship.⁶ If economics is going to bring culture back into arguments about the sources of economic growth, it will have to return to entrepreneurship as well. Andrew Godley (2001, p. 13) has stated quite appropriately that “culture might be of particular importance when it comes to explaining variations in the supply of entrepreneurship.” The debate between those who felt that the supply of entrepreneurship was exogenous, much like a cultural endowment, and those who argued that entrepreneurship responds to incentives and opportunities and is thus endogenous to other factors can be advanced by the new insights from neo-institutional analysis.

³ See especially Acemoglu, Johnson and Robinson, 2005; Rodrik, Subramanian and Trebbi (2004); Dam (2005). For a critique, see Glaeser et al., 2004. The standard works applying institutional analysis to economic history are North (1990) and Greif (2005).

⁴ The pioneering work on “cultural beliefs” is Greif, 1994. See also Greif 2005.

⁵ See especially Guiso, Sapienza, and Zingales, 2006. Tabellini, 2006.

⁶ I will define here institutions in the Northian way, including the socially-determined “rules” by which the economic game is played and which are given exogenously to each individual, both formal and informal. Culture is simply a set of shared beliefs, attitudes and preferences that are passed on from generation to generation through *non-genetic* (i.e., soft-wired) mechanisms.

Institutions create the incentives and the relative payoffs faced by potential entrepreneurs. These incentives are one of the upshots of the modern interpretation of the impact of institutions on economic development. Once the research on institutions in economic history mostly focused on issues such as secure property rights and “law-and-order”. It is now realized that institutions did and do much more: they channel and direct the efforts of the most creative and resourceful citizens toward their highest payoff, wherever these are (Murphy, Shleifer, and Vishny, 1991; Baumol, 2002). Institutions favorable to growth induce them to apply their efforts in the most remunerative and socially productive ways. In other words, institutions determine whether those efforts will result in the *creation* of wealth or primarily in its *redistribution*. Rent-seeking societies do not necessarily have fewer “entrepreneurial types” than more liberal market-oriented ones. However, the entrepreneurs in the former will apply themselves to activities that seek to create income by redistribution: exclusions and special privileges, through lawsuits and tax-exemptions, and through the manipulation of the political machinery to attain these objectives (Baumol, 1993, 2002). The most destructive form of such activities after predatory raids and other violent crime is the resistance to innovation exerted by incumbent vested interests, trying to protect the value of physical or human capital threatened by innovation with obsolescence.⁷ If successful, resistance will clearly channel entrepreneurs away from innovative activities, as it reduces the expected payoff to an already highly risky activity.

The argument I will make below is that in eighteenth century Britain, perhaps more than anywhere else, institutions were becoming more favorably disposed toward *technologically* innovative entrepreneurship. In the past, these kinds of changes have been associated with formal

⁷On the political economy of resistance to technological progress see Mokyr, 2002.

institutions such as the rule of law, intellectual property rights and government legislation favorable to industrialists (North, 1990). Yet scholars are increasingly recognizing the importance of *informal* institutions, which take the form of accepted codes of behavior, patterns of beliefs, trust relations, and similar social patterns. It is simply not plausible that third-party enforcement was the main institution on which economic progress relied during the Industrial Revolution (Mokyr, 2007). Formal law enforcement in eighteenth century Britain left a great deal to be desired, and if a large number of economic agents had decided to renege on contracts and engage in blatantly opportunistic behavior, it is highly doubtful that the courts and law-enforcement agencies, such as they were, would have been able to dissuade them. They did not have to, however.

Institutions that channel creativity into productive activities are the taproot of entrepreneurial success. But this argument seems just to push the explanation one step back: why do some nations have institutions more suitable to creative entrepreneurship than others? This is not the place to present a full theory of institutions, but four points seem relevant to the issue of entrepreneurship.⁸ First, institutions display a great deal of inertia in history. Societies exist with a certain institutional structure, and in most cases these structures change but slowly, much like culture. Far from arguing that History is Destiny, however, modern approaches to institutions stress that they follow an evolutionary process in which the present is constrained by the heritage of the past and can make at best local changes in the short run. In the long run these can result into rather striking differences between economic performance. Second, as noted, informal norms and codes of behavior are as important as the formal rule of law. It is critical for agents to be somehow persuaded by concerns

⁸The most recent general discussions of institutions as factors in economic development are Greif (2005); North (2005); Acemoglu, Johnson and Robinson (2005).

about morality or reputation to play cooperatively in games of exchange or production. Third, institutions can change more easily and at lower cost when there is a *meta*-institution that has by general consensus the legitimacy to change other institutions and have its decisions accepted even by losers. Britain was almost unique in Europe to have developed such an institution after 1650. Indeed, by 1714 Parliament had acquired a position of legitimacy and power and, at least in retrospect, was gaining more and more in unassailability. Fourth, institutions are intimately related to ideology. Societies will set up institutions that are the outcome of both interests and beliefs. Any simple-minded theory that attributes institutions to material factors alone or to beliefs alone cannot explain the changes in British institutions between 1688 and 1850. Institutions need to reflect not only what serves people's interests but also what they believe is "right" and "just." Here, more than anywhere else, we need to allow for the influence and eventual triumph of Enlightenment beliefs.⁹ As British policy-makers were slowly persuaded that exclusionary arrangements, monopolies, restrictions, privileges, tariffs, bounties, and controls on free markets were harmful, these institutions were reformed and eventually abolished. To be sure, the process was not complete until the mid nineteenth century, but it occurred without violence and within the existing political framework.

Thus the institutional developments in Britain in the eighteenth century were, on the whole, more conducive to entrepreneurship than elsewhere. This is not to say that British institutions were, by some standard, optimal or even very good. However, by the standards of the time it was clearly ahead of the competition. Britain provided opportunities for successful entrepreneurs to have a better chance at reaching financial and social success than elsewhere, and was able to attract a number of

⁹See Mokyr, 2006a, 2006b.

highly creative and successful entrepreneurs from abroad to complement the supply of local talent.¹⁰

The institutional environment was sufficiently superior to provide Britain with a lead in the process of technological progress over other European economies in which institutional change slower and was less smooth.

For more than a century before the “start” of the Industrial Revolution, barriers to entry and exclusionary arrangements in the British manufacturing and service sectors had been breaking down or were being eroded by non-compliance. While Adam Smith may still have been complaining about the economic harm caused by Laws of Settlement or the guilds in 1776, the fact remains that in eighteenth century Britain there were fewer formal or informal barriers to the entry of young lads into a branch they felt they could prosper in than two centuries earlier.¹¹ True, the Statute of Apprentices still formally barred people from exercising many trades without a formal apprenticeship, but long before its repeal in 1809 this was enforced very spottily. Every branch of economic activity was contestable. Barriers to entry into commerce were either ignored or circumvented. Only careers in the military, the civil service, and politics were still by and large reserved to members of the

¹⁰Among those the best-known are the Swiss Aimé Argand, whose revolutionary lamp failed to interest Parisians and who went to Britain in the 1780s, where commercial success eluded him despite the success of his invention. More successful was the Walloon inventor John-Joseph Merlin, whose many patents included roller-skates, musical instruments, a rotisserie, and a wheelchair, and who was the technical genius behind James Cox’s “Mechanical Museum” that opened in 1772 in Spring Gardens near Charing Cross, displaying various wondrous inventions. Successful Germans included Friedrich Koenig, a printer who complained in 1806 that “There is on the Continent no sort of encouragement for an enterprise of this description ... after having lost in Germany and Russia upwards of two years in fruitless applications, I at last resorted to England” (cited by Smiles, 1884, ch. VI). His steam-driven printing press was the first to use cylindrical impression and inking, and the first edition of the Times was printed on a steam-driven press in 1814. Frederic Winsor (né Winzer) played an important role in the exploitation and commercialization of gaslighting. John Jacob Holtzapffel, born in Alsace, settled in London in 1787 and built a successful business making and selling lathes. The great Swedish engineer and inventor John Ericsson came to Britain in 1826 and stayed until 1839 before leaving for the United States. The most important imports from France were the Brunels, a father and son dynasty: Marc Isambard, the father, escaped France in 1793 (he had royalist sympathies and an English wife) and settled in London in 1799. While he found the freedom and opportunities to engage in a large number of innovative projects and became quite eminent, he did not become rich, and depended for income on his wife and later his son Isambard Kingdom, arguably the leading civil engineer of his age.

¹¹The career of Josiah Mason (1795-1881) is a good example. The son of a carpet weaver, he worked as a shoemaker, a carpenter, a blacksmith and a house-painter, before becoming manager of a hardware manufactory in Birmingham. In 1829 he entered the steel-pen business in which he made his fortune, though at a later stage he also entered the electroplating industry.

privileged Anglican land-owning classes. This division, with some exceptions, served the economy well.

The other institutional advantage in Britain was that it was a society in which reliable information and credible commitments allowed exchanges between people who may not have known one another very well and whose interests were not harmonious. The successful entrepreneur in the Industrial Revolution, as I shall argue, was not necessarily a many-sided person who could do it all, as maintained by Charles Wilson (1955, p. 175). What he represented was one side of the business (either technical or managerial), having the ability to identify a need or an opportunity, then cooperate with others who possessed a different comparative advantage to take advantage of it. Such cooperation often took the form of partnerships or market transactions at arm's length, although a personal element was rarely missing altogether. In other cases, it involved hiring an expert, a manager, an overseeing engineer, who could be trusted. Sidney Pollard (1968) has shown that the finding of such personnel was an important skill in and of itself and often a test of successful entrepreneurship. At times, such employees eventually became successful entrepreneurs themselves, Robert Owen being the best-known example. In other cases, such as Boulton and Watt's star engineer, William Murdoch, they remained in the shadow of their masters. Entrepreneurial success was based on such successful transactions, not necessarily on a multi-talented genius who could do it all. Even at the level of the firm, the classical principles of division of labor and comparative advantage held. Successful institutions were the ones that reduced transactions costs for entrepreneurs.

Entrepreneurship and Institutions

The Industrial Revolution is often viewed as the beginning of modern economic growth in

Europe. All the same it bears repetition that the Industrial Revolution was in its first stages a local phenomenon, confined to a fairly limited number of successful industries in a few corners of the kingdom. Sustained economic growth proper did not start until the second quarter of the nineteenth century. The true discontinuity was not so much the successful mechanization of these industries but the unprecedented event that technological progress did not lose momentum when the first round of technological opportunities was exhausted, but instead gathered more and more thrust as time went on. In Britain, more than anywhere else, technological innovation was mostly confined to the private sector, with the state remaining more in the background than elsewhere in Europe, though at times it intervened. The pivotal individuals who facilitated this process were the entrepreneurs. Much has been written about the social origins of entrepreneurship, and its implication for social mobility, but less about the incentives and motives that induced them to do what they did.¹²

It would be easy to maintain simply that the payoff to effort and ingenuity increased in the eighteenth century. But as Murphy, Shleifer and Vishny (1993) and Baumol (2002) have stressed, such effort and ingenuity can be directed toward lobbying government for exclusionary privileges or subsidies, or be aimed at military careers, privateering, and other wasteful efforts. Alternative avenues to wealth had very different implications for economic outcomes, because redistributions through political lobbying was a “leaky-bucket” transfer. Resources were wasted in the process itself. In continental countries, especially France and Prussia, the market was less of an attraction to talent than the enticements of the court, government service, and especially the military. If this was so during the *ancien régime*, it was true *a fortiori* after 1789. Britain’s institutions represent something of a paradox. While Britain was one of the most heavily taxed nations in Europe (far more heavily

¹²The best systematic work on the origins of British entrepreneurs in the Industrial Revolution, definitive in many respects, Crouzet (1985). More limited is Honeyman (1982).

than France or Prussia), the heavy hand of government regulation and continental *dirigisme* was felt less and less. The eighteenth-century British Civil Service was minuscule, justice was administered by mostly unpaid part-timers or volunteers, and police and other services were essentially non-existent. Many of the institutions we associate with public goods, such as roads, schools, and public safety, were farmed out to the private sector. Britain was still far from a pure laissez faire economy, but it was getting closer. The only big government expenditure was defense, that is, wars and the navies and armies to fight them, and the interest payments on debts incurred in past wars.¹³ This effort included some obstreperous parts of Britain itself, such as Ireland. On the whole, however, an ambitious and talented young person in Britain would be far more inclined to seek his fortune in commerce, industry, or finance than he would be elsewhere in Europe.

The result was, above all, the growth of a small but significant economic elite that carried the Industrial Revolution. This elite consisted of a number of subgroups, not all of which can be described as “entrepreneurs” *stricto sensu*. Entrepreneurship and hardware were complementary inputs, and a country that was good at producing hardware (and the people that could use it) provided unique opportunities to those who could take advantage of them. Boulton found his Watt, Clegg his Murdoch, Marshall his Murray, and Cooke his Wheatstone. The couplings of individuals with technical skill and those with commercial acumen personalize the great advantage that Britain enjoyed in this dimension, namely the complementarity of human capital and favorable institutions. Beside the “heroic inventors” whom Samuel Smiles and other Victorians loved to praise and who are immortalized in high school textbooks, the Industrial Revolution could rely on a much larger army of less famous highly skilled craftsmen and instrument makers who could turn original ideas

¹³See especially O’Brien, 1994, 2002, 2006

into a physical reality and actually build the machines that their clever colleagues designed, not just once but over and over again. These mostly anonymous craftsmen and mechanics were the unsung foot soldiers of the Industrial Revolution. These were men of dexterity and experience, who possessed a technical *savoir faire* taught in no school, but whose workmanship constituted the difference between an idea and a product. In Britain, the high quality of workmanship available to support the grand ideas, both local and imported, helped create the Industrial Revolution.¹⁴

The complementarity was symmetric: those with technical ability, whether creative or supportive, needed people who could run a business, understood markets, knew about the recruitment and management of workers and foremen, had access to credit and other technical consultants, and above all, were ready to accept the uncertainties of innovation. Economists understand that such people exist in every society, but that their talents are directed in different directions depending on the incentives set by the institutional framework of society. Successful careers as leaders of mercenary bands or religious organizations required very similar talents.

¹⁴British (and especially Scottish) millwrights, to cite one more example, were highly sophisticated: the engineer John Fairbairn, a millwright himself, noted that eighteenth century British millwrights were “men of superior attainments and intellectual power,” and that the typical millwright would have been “a fair arithmetician, knew something of geometry, levelling and mensuration and possessed a very competent knowledge of practical mechanics” (cited in Musson and Robinson (1969), p. 73). John Rennie (1761-1821), who introduced the sliding hatch to the water wheel and built some of London’s greatest bridges, began his career as a millwright, as did his apprentice Peter Ewart (1767-1842), who worked for Boulton and Watt and later for the cotton spinner Samuel Oldknow, and who ended his career as Chief Engineer in His Majesty’s dockyards. Britain was thus fortunate to possess a class of able and skilled people that were hard to find in the same degree elsewhere. The difference was not only in the level or prevalence of mechanical skills but in their nature as well. Among them were mathematically-sophisticated instrument makers such as the optician John Dollond (1707-1761), who started off as a silk weaver and amateur optician, and ended up winning the Copley medal (1761) for his work on achromatic lenses; Jesse Ramsden, a top-notch instrument maker who designed surveying and measuring instruments of unprecedented accuracy and user-friendliness; John Hadley (1682-1744), a mathematician who built a new and more accurate navigational instrument named Hadley’s quadrant (or octant); and Edward Troughton (1753-1835) who became the best instrument maker in London after Ramsden’s death. There were the mechanics Joseph Bramah and his gifted apprentice Henry Maudslay, the fathers of British machine tool industry and Bryan Donkin, famous for his improvements to the basic machine that mechanized papermaking, was also the inventor of the tachometer, a steel nib pen, and the metal tin for canned food. Equally impressive were clockmakers like John Kay (not to be confused with his namesake who invented the flying shuttle) who assisted Richard Arkwright, and John Whitehurst, a member of the Lunar Society and later the keeper of stamps and weights in London.

Norms, Gentlemen and Entrepreneurs

As noted, the supply of these entrepreneurs was in part determined by the payoffs to competing activities. In this regard, what is significant in the decades before the Industrial Revolution is the growth of a set of social norms that, beyond the formal “rule of law” and explicit penalties for opportunistic behavior, made entrepreneurial activities in Britain more attractive. The Industrial Revolution in the final analysis was propelled by technological progress but to succeed its propagators (entrepreneurs, engineers, merchants, financiers, and technical consultants) needed contracts, credit, and credible commitments. Given that third-party (State) contract enforcement was rudimentary at best, what was the source of the cement that held British economic society together? The answer is that besides the formal mechanisms of the state, invoked only in as a last resort, there was a set of social norms that supported entrepreneurial activity to a point not fully recognized. These norms could be called the culture of the gentleman-entrepreneur.

The cultural importance of the concept of a “gentleman” has been the subject of much literature, but its economic importance as a constraint on opportunistic behavior and thus a support for functioning markets has only been stressed by a few perceptive scholars such as Cain and Hopkins (1993, pp. 22-42; see also Daunton, 1989; Casson and Godley, this volume). The difficulty is that the word “gentleman” has taken on two rather inconsistent meanings. One of them is a person with no mercenary interests, without an occupation, and therefore honorable and believable. By that definition a “gentleman of business was an absurdity” as McCloskey (2006, p. 471) notes. It used to be thought that a “gentleman’s mentality” was anti-entrepreneurial, that economic activities were looked at with disdain and discouraged, that *nouveaux riches* were a butt of derision by the real

aristocrats.¹⁵ However, while such views were surely held, they were not the chief impact of gentility on economic life. This is not just because the aristocratic lifestyle needed money, but also and perhaps more so because there was more to this culture than just snobbishness and a high predilection for leisure. The origins of the cultural idea of a gentleman go back to feudalism and the medieval land-owning aristocracy.

By 1700, however, the concept was becoming less one of class as it was of wealth. Defoe famously wrote that “Wealth, however got, in England makes lords of mechanics, gentlemen of rakes; Antiquity and birth are needless here; ’Tis impudence and money makes a peer.” Dr. Johnson, in the same spirit, noted that “An English tradesman is a new species of gentleman” if he prospered sufficiently.¹⁶ Some brewers, paper makers, potters, and iron masters became barons, earls, MP's, and castle dwellers.¹⁷ Many more hoped to be. What matters here is that if everyone could think of themselves potentially as *noblesse*, everyone was *obligé* by a gentlemanly code of behavior. As Mason (1982) notes, the word “gentleman” had acquired a double meaning: a person with some degree of distinction, quite disjoint from the lowest rung of society. The other one was “always suggesting certain standards of behavior.” Christianity, as a code of conduct, was too demanding, yet some standard was necessary, and “behaving like a gentleman” became that standard. A gentleman must behave with consistency and integrity, and above all “must fulfill his obligations to those who

¹⁵As Daunton (1989, p. 125) summarizes the traditional argument, “the more an occupation or a source of income allowed for a life style which was similar to that of the landed classes, the higher the prestige it carried and the greater the power it conferred. The gentleman-capitalist did not despise the market economy but he did hold production in low regard and avoided full-time work.”

¹⁶Defoe (1703, p. 19); Johnson cited by Porter, 1990, p. 50. Men of business could, through money, “advance in rank and contend with the landlords in the enjoyments of leisure, as well as luxuries,” as Malthus (1820, p. 470) put it.

¹⁷Local studies confirm the importance of wealth as a determinant of status. Urdank, in his study of Gloucestershire, found that “between 1780 and 1850 wealth had become a more obvious criterion for defining status than in the past, so much so that men with the humblest occupations might call themselves ‘gentlemen’ if the size of their personal estates seemed to warrant the title” (Urdank, 1990, p. 52).

have obligations to him” (Mason, 1982, pp. 16-17).

In eighteenth-century Britain, a businessman’s most important asset was perhaps his reputation as a “gentleman” even if he was not a gentleman. Landowning parasitic drones were no more “gentlemen” than sword-wielding medieval thugs were “chivalrous.” The ideal and the reality were increasingly divorced. There were certain things that a gentleman did and others he did not; and while such norms were of course no more perfectly followed than formal laws, breaking the rules of gentlemanly conduct was costly.¹⁸ By the middle of the eighteenth century, before the Industrial Revolution, the idea of a gentleman had acquired a meaning of certain behavioral codes that signalled that a person was trustworthy. It was, above all, important not to come across as greedy and rapacious.¹⁹

The economics of the culture of gentleman-entrepreneurs has in the past decade been made considerably clearer by the attempts to formalize ideas associated by some with “social capital.” A good summary is provided by Posner (2000) who points out that cooperation between two mutually trusting agents produces not only a private good, but also an externality or network effect for the entire population. The key to being part of a community of trustworthy people is to send out a costly signal so as to make it credible. For British gentlemen these signals included dress codes, table manners, speaking styles, and personal behavior. It also included membership in organizations that helped transmit and filter signals about the trustworthiness of individuals.

¹⁸McCloskey (2006, pp. 294-96) traces the transformation of the word “honor” from its aristocratic sense (“reputation”) to its more capitalist sense of “honesty” (reliability, truth-telling) at the time when the importance of these concepts began to increase in the eighteenth century.

¹⁹The Shropshire Freemason Wellins Calcott wrote in the 1750s described what he meant by a “man of honour” someone who not only “executes the relative duties of life with Justice and Honour” but does so with the “decorations, embellishments and graces that flow from a fine taste.” A figure drawn from Sallust is “the loyal subject... the merciful landlord, the compassionate master, the generous patron, the unwearied advocate for the poor... in a word, the compleat *fine Gentleman*.” (Calcott, 1759, pp. 155, 59, *emph. in orig.*).

Formalizing such social networks is not hard. One such idea (e.g., Spagnolo, 1999) is the idea of the linkage of two types of games, one a social game that lasts for a long time and the other a one-shot economic game. If two agents face one another in both spheres, the punishment in one game may be used to induce cooperation in the other. Such cooperation is not always welfare-improving, since the trust and cooperation can be used to support socially detrimental organizations and networks. However, in Britain during the Industrial Revolution, with an increasing emphasis on honesty and truthfulness, it supported cooperative equilibria that allowed commercial and credit transactions to be consummated without overly concern with possible defections and other forms of opportunistic behavior. Gentlemen (or those who aspired to become gentlemen) moved in similar circles and faced one another in a variety of linked contexts. These models point to the likelihood that trust can be transferred from a social relation into an economic relation and thus sustain cooperative outcomes in which exchange is sustained and disputes are resolved even without the strict third-party enforcement of contracts by a powerful system of impartial courts or arbiters. It is this kind of environment that created the possibility of voluntary cooperation even when standard behavior in finite games would suggest that defection and dishonest behavior might have been a dominant strategy.

How should we assess the impact of the culture of gentility on the nature of entrepreneurship? Some entrepreneurs were obsessed with the ideal of becoming country gentlemen through getting rich. Adam Smith still was thinking about Merchants when he wrote that their ambition was to become country gentlemen ([1976], (1776, p. 432). This was equally true for many manufacturers. The famous examples of wealthy cotton masters Richard Arkwright, Jedediah Strutt, John Horrocks, linen manufacturer John Marshall, engineer John Braithwaite, and a few others notwithstanding,

relatively few of the entrepreneurs of the Industrial Revolution achieved this ideal. Yet we cannot be sure that there is no reverse causality at work, that British culture was adapting to changes in the opportunity set of society in the eighteenth century by adapting culture so as to make it possible for markets to work as well as possible.

In some sense, this ideal was a positive thing, creating an incentive for merchants and manufacturers to succeed, since money would buy not just material goods but also social advancement (Perkin, 1969).²⁰ At the same time, by the late seventeenth century, at least some members of the landed aristocracy increasingly swallowed their putative disdain for money-making activities and came to embrace the ideals of a market economy, if mainly through intermediaries such as estate agents. “Improvement” may have meant “improved rent,” and the large landlords — with some notable exceptions — did not normally get deeply involved in agricultural improvements (Mingay, 1963, p. 172). But the movement of rents clearly shows that those who charged them knew what the markets could bear. The polite culture of the land-owning gentry and the acquisitive culture of the merchant merged and created a blend that turned out to be suitable to the kind of economy Britain became in the late eighteenth century. The great legal scholar William Blackstone referred to Britain as a “Polite and Commercial People.”²¹ Politeness was widely equated with law-abiding behavior, and it was intuitively sensed that commercial success depended a great deal on politeness.

²⁰Perkin pointed out perceptively that British society in the century following the Civil War increasingly established a link between wealth and status. Status means here not only political influence and indirect control over the lives of others but also the houses to which one was invited, the partners that were eligible for one's children to marry, the rank one could attain (that is, purchase) in the army, where one lived, and how one's children were educated. In Perkin's view, the quality of life was determined not just by "consumption," as usually defined by economists, but by the relative standing of the individual in the social hierarchy.

²¹“People are apt to be angry at the want of simplicity in our laws: they mistake variety for confusion, and complicated cases for contradictory. They bring us the examples of arbitrary governments, of Denmark, Muscovy, and Prussia; of wild and uncultivated nations, the savages of Africa and America; or of narrow domestic republics, in antient Greece and modern Switzerland; and unreasonably require the same paucity of laws, the same conciseness of practice, in a nation of freemen, a polite and commercial people, and a populous extent of territory.” Blackstone, (1765-69), Book III ch. 22.

As Cain and Hopkins put it, “gentlemanly ideals ... provided a shared code, based on honor and obligation, which acted as a blueprint for conduct in occupations whose primary function was to manage men rather than machines” (1993, p. 26). I should add, however, that the typical entrepreneur during the Industrial Revolution, had to manage both machines and men, as well as to manage the men who ran the machines. These shared codes transmitted through families and were a matter of education and other mechanisms through which culture disseminates, and they correlated with certain forms of etiquette such as clothing, accent, and more generally politeness.

What mattered for the development of the economy was that people that felt constrained by the gentlemanly code of behavior behaved honorably, kept their word, and did not renege on promises. They did not blindly maximize profits. A gentleman, Asa Briggs (1959, p. 411) noted, was someone who accepted the notion of progress but was always suspicious of the religion of gold. In other words, someone who did not play necessarily “defect” even if that might have been in his immediate interest. In other words, gentlemanly capitalism made opportunistic behavior sufficiently taboo so that only in a few cases was it necessary to use the formal institutions to punish deviants. It created the kind of cultural beliefs in which two persons expected the other person to behave honorably. True gentlemen, noted Samuel Smiles writing in 1859, looked each other in the eye and knew each other instinctively (cited by Briggs, 1959, p. 411). For Smiles and his contemporaries, the ideal of integrity was to be to the tradesman, the merchant, and manufacturer what honor is to the soldier. The standard was set by gentlemanly ideals: the gentleman’s “standard of probity is high... his law is rectitude...above all a gentleman is truthful” (Smiles, 1863, ch. VIII, p. 36, Ch. XIII,

pp. 28-29).²² Shorn of their Victorian sanctimony, these ideas did set a norm, and Smiles's success demonstrates that his work struck a sensitive note. These codes of behavior, if observed by enough people, made it possible to trade with strangers and deal with people with whom there might not be repeated transactions at arm's length, without trying to take a short-term advantage from the situation. Gentlemanly enterprise, argue Cain and Hopkins, was strongly personal and held together by a social network (1993, p. 36). In short, gentlemanly enterprise was an informal institution, but one that supported the integrated and soon-to-be national market in Britain. That market may not have created the Industrial Revolution, perhaps, but it was an essential complement to it.²³

Eighteenth century Britain was the setting for the emergence of a set of behavioral codes that made it possible to overcome the kind of free riding and opportunistic behavior that seem to require coercion by formal state institutions. The nation witnessed an unprecedented blossoming of voluntary organizations that created networks that supported market activity. These organizations created the ideal conditions for the linkages that, as we saw, helped bring about cooperative behavior. Social networks of this kind were essential if markets were to exist and contracts to be honored. After all, membership in such clubs and participating in subscriptions for joint projects, commercial ventures, civic improvements or charities, could be undone by free riding. Yet the very numbers of these projects suggest that this was not common. British masonic lodges and friendly societies provided mutual insurance and widows' pensions, but they also cemented commercial relations. Many societies that brought together artisans from different trades introduced rules that only one member

²²Foreign visitors, even the most sophisticated ones, noticed the same thing. Hippolyte Taine, the great historian, who visited Britain in the 1850s, noted in his *Notes sur l'Angleterre* that "'gentleman' expresses all the distinctive features of the English upper class ... a truly noble man, worthy to command, a disinterested man of integrity." (Taine [1874], 1958, p. 145).

²³Langford (1989, p. 71) points to the ambiguities of the term "politeness", which refers to material possessions, as well as to intellectual and aesthetic taste, but above all was that "*je ne sais quoi* that distinguished the innate gentleman's understanding of what made for civilized conduct, but did not inhibit others from seeking more artificial means of acquiring it."

per occupation could be a member with the understanding that fellow members would get priority in any commercial transaction, thus explicitly linking the commercial business-to-business vertical relations with a social connection (Brewer, 1982, p. 222). Membership selection of many of these clubs was neither by religious nor political affiliation, but by codes of behavior that enhanced cooperative outcomes. By creating the kind of linkages that made selfish economic agents overcome their opportunistic instincts (and penalizing the few who did not), these networks were an essential underpinning of British entrepreneurship in this period of transition. Moreover, networks and social connections made reputation mechanisms work; and it is clear that reputational mechanisms were essential if the kind of contractual environment necessary for entrepreneurs to operate was to be sustained. Many of these clubs were purely social, eating and drinking clubs, or devoted to common interests and hobbies, but they clearly functioned as clearing houses for information as well.²⁴

A prime example of the operation of gentlemanly codes were eighteenth century credit markets. An exchange economy depended on a means of exchange. In Britain, like anywhere else, transactions were paid for by some combination of credit and cash. As contemporaries were fully aware, credit was of considerable importance to this economy, especially because the monetary system was by wide consensus inadequate. Contemporaries believed that credit financed the majority of transactions in Britain, and that it was more important than money for that purpose. Charles Davenant wrote in 1695 that “nothing is more fantastical and nice than Credit” and many eighteenth century writers felt that it was the “Jewel of Trade.” However, credit must eventually be settled, and as such it depended to a great extent on beliefs and trust. Credit markets, much like the markets for ideas, depended above all on a set of self-enforcing codes framed by the norms of gentlemanly

²⁴The extent of the spreading of these clubs is reflected by the founding of the Sublime Club of Beefsteaks” devoted to carnivory in 1735. The total number of friendly societies membership in 1800 is estimated at 600,000 (Porter, 1990, pp. 156-57).

conduct. Even with the possibility of imprisonment for debt, seventeenth-century credit market transactions were enforced primarily by reputational mechanisms (Muldrew, 1998, pp. 148-72).²⁵ The importance of reputation was especially marked in the securities trade. In 1734, Barnard's Act outlawed time bargains in securities (i.e., options), and the securities market had to rely on an internally enforced code of conduct, based on reputation and the fear of being excluded from trade if violations occurred (Michie, 2001, p. 31).

Connections and networks mattered a great deal in entrepreneurial success, as is increasingly recognized for other economies as well (Laird, 2006). For one thing, it reduced risk. Trust made it possible to use partners in an age when incorporation was still not an option, and to access short-term credit, essential for working capital, still the biggest source of demand for capital. In a recent important paper, Pearson and Richardson (2001) have shown that the typical entrepreneur in the Industrial Revolution was heavily diversified. Rather than describing the entrepreneur as a single-minded owner-manager who spent his entire life on the one business, they show the extent to which early entrepreneurs were involved in non-core ventures. Cotton masters and other textile producers in Manchester, Leeds, and Liverpool, for example, could be found as directors of insurance companies, canal- and turnpike companies, gas companies, banks, and other sectors.²⁶

The arguments made by Pearson and Richardson about the networked nature of British entrepreneurs in this era cast an interesting light on the informal institutions of the time. Businessmen

²⁵Daniel Defoe, perceptive as ever, noted that "Credit is a consequence, not a cause...it is produced and grows insensibly from fair and upright dealing, punctual compliance...the Off-spring of universal probity" (Defoe, 1710, p. 9). Elsewhere he noted how essential trade credit was to a merchant when he wrote that "it is the choicest ware he deals in... 'tis current money in his cash chest; it accepts all his bills, 'tis the life and soul of his trade." Reputation was everything here, and "a tradesman credit and a maid's virtue ought to be equally sacred from evil tongues." Defoe (1738, Vol. 1, pp. 195-214) .

²⁶The cotton merchant Benjamin Braidley calculated in his diary that he spent over 36 hours each week "on matters totally unconnected with my own business" (cited by Pearson, 1991, p. 388).

of different religious backgrounds and political convictions were working together in the boardrooms. They had no problem working together in developing local infrastructures, and contributed to charitable works, cultural patronage and voluntary subscriptions (*ibid.*, p. 672). On the local level, of course, reputation was everything, but the shared norms that transcended their differences helped settle disputes and minimize opportunistic behavior. A reputation for solidity, respectability, and probity was a key to success. The informal institutions, in other words, allowed the society to operate far more efficiently than if every player had played pure Nash strategies. That the country was not altogether devoid of Uriah Heep types is quite obvious, but as long as opportunistic behavior remained a minority phenomenon and was dealt with mercilessly, the cultural norms of gentility prevailed amongst British entrepreneurs. Far from being a “neoclassical” profit-maximizing egotist, the British entrepreneur during the Industrial Revolution was very much part of a shared value system that economists have only recently come to appreciate is essential in underpinning a sophisticated market economy (McCloskey, 2006, *passim*).

Gentlemanly codes thus engendered trust. Trust was an essential component of effective markets and a critical ingredient of the environment that created British entrepreneurship. But it was telling that it was not confined to that sphere. It was equally important in the development of British science. In a highly original contribution, Steven Shapin (1994) argued that in scientific progress (much as in commerce), trust was indispensable, and that the hallmark of a gentleman was that he could be trusted, that he spoke the truth. When a scientist reported a set of experiments or observations to a public, his status as a gentleman meant that he could be believed. A set of behavioral codes were held up as the standard that conditioned interactions between strangers and made civil society possible. Such informal codes were far more widespread in British society than

just the world of science, and they were precisely the kind of institution that set up the payoff structures so favorable to entrepreneurial success.

Can we know for sure that higher levels of trust in Britain's commercial and artisanal classes led to improved supply of entrepreneurship? Given that we have no way of measuring the levels of trust in the past, inferences here must remain indirect and speculative. Anecdotal data from travellers seems consistent with the observation.²⁷ Modern data, based on surveys in which people were asked directly about trust (either whether they trusted others or whether they felt that they themselves were trustworthy — the two tend to be correlated) can be used to measure this dimension of what some call social capital. The finding is striking: Guiso, Sapienza and Zingales (2006, pp. 34-36) find not only that the level of trust is strongly correlated with the chance of becoming an entrepreneur (approximated by whether one is self-employed), but also that a comparison of OLS and 2SLS estimates suggests that trust affects the tendency to become an entrepreneur not just through their chosen instruments (religious affiliation and ethnic background) but also through other channels, not fully understood. In other words, modern economic research has concluded tentatively that “better cultural values have a large economic payoff” (ibid., p. 45). It would be imprudent to dismiss such findings for an earlier period such as the British Industrial Revolution; indeed it might be argued that the conclusions should hold *a fortiori* for an earlier period.

More generally, coupling “law and order” neglects the fact that the moral codes of polite

²⁷The French traveler Pierre Jean Grosley noted the “politeness, civility and officiousness” of citizens and shopkeepers “whether great or little” (Grosley, 1772, Vol. 1, pp. 89, 92). The eighteenth century Italian writer and philosopher Alessandro Verri felt that London merchants were far more trustworthy than Paris ones (cited by Langford, 2000, p. 124). One French visitor to early nineteenth century London noted that British shopkeepers were fundamentally honest, and that a child could shop as confidently as the most street-wise market shopper (Nougaret, 1816, Londres vol. ii p. 12, cited in Langford, 2000, p. 125, check). Charles Dupin (1825, pp. xi-xii) went as far as to attribute Britain's economic successes to the “wisdom, the economy and above all the probity” of its citizens. Reputation was critical. Prosper Mérimée, commenting on the open access policies in the British Museum Library in 1857, observed that “The English have the habit of showing the greatest confidence in everyone possessing character, that is, recommended by a gentleman ... whoever obtains one is careful not to lose it, for he cannot regain it once lost” (1930, pp. 153-54).

society were a main mechanism through which a market economy could operate. Order could exist without law, that is, third-party enforcement, as it does today (Ellickson, 1991). Day-to-day security depended more on social conventions and self-enforcing modes of behavior than on the administration of justice by an impartial judiciary. Commercial disputes rarely came to court and were often settled through arbitration. Voluntary compliance and respect for property and rank as social norms may have been as important as formal property rights in making the wheels of the British economy turn. Charles Davenant (1699, p. 55) put it well: “Nowadays Laws are not much observed, which do not in a manner execute themselves.” Civil suits declined in the eighteenth century, and special arbitration tribunals emerged (Brooks, 1989).

Although the Industrial Revolution changed the economic game a great deal, gentlemanly ideals did not disappear and indeed seem to have flourished during the Victorian era. Yet the informal codes of honor became less effective in large urban areas with rising rates of personal mobility, in which it became increasingly difficult to distinguish true gentlemen from opportunists and swindlers (Robb, 1992). As the nineteenth century progressed, formal law slowly but certainly replaced reputation mechanisms and gentlemanly codes of behavior. It was the price of progress. The new industrialists needed to deal with an ever-growing number of people in a market context: suppliers, creditors, subcontractors, employees, customers, and consultants. Access to useful knowledge and best-practice technology became increasingly important, and contracts became more and more complex. Despite the fact that industrialists found themselves less and less aligned with the original “gentlemen,” their behavior remained anchored in the (largely imaginary) standards of decency and honorableness believed to have prevailed in an earlier age.

In the equilibrium that emerged from these standards we find a high payoff to individual

initiative, to innovation, to quick and decisive perception of opportunities, and all the activities we associate with successful entrepreneurship. Such outcomes are, however, *ex ante*. One question of considerable interest is whether entrepreneurship actually paid *ex post*, that is, were perceived payoffs to entrepreneurial activity in alignment with reality. It is to this question I now turn.

Luck, Uncertainty, and the Industrial Revolution

Institutions, formal and informal, supported entrepreneurship in the Industrial Revolution by setting incentives. Yet it is a hard question whether entrepreneurship *actually* paid off for the actors themselves. If it did not, this does not necessarily mean that the incentives did not work. We know, of course, that the entrepreneurs of the Industrial Revolution, together with the engineers, the skilled craftsmen, and the inventors, created a modern sector in which technological progress thrived and which eventually turned into the modern economy. The general belief is that entrepreneurs had a high tolerance for uncertainty or for uninsurable risk in the Knightian sense, a strong ability to cope with ambiguity, and a lack of the kind of regret and the paralyzing fear of making the wrong decision that afflicts others.²⁸ Risktaking, of course, was a scarce resource, and the tightly knit network of elites was able to create what Pearson (1991) has called *collective diversification* allowing British cotton-masters to spread their investments over a substantial number of projects with low cross-correlations, such as insurance, canals, railroads, utilities, and banks. In this way, the trust generated by the social capital of the British middle class elites allowed them to weather the rigors and shocks of the first

²⁸To paraphrase F. Scott Fitzgerald, the hallmark of a good entrepreneur is the ability to hold two opposing ideas in one's mind and yet retain the capability to function. Cited by Kamien (2005, p. 2).

half century of the mechanized cotton industry.

Whatever else, the entrepreneurs of the British Industrial Revolution were hard workers, technically and (usually) commercially adept, courageous and perseverant, who devoted themselves to their work and rarely engaged much in the frivolous leisure activities that occupied much of Britain's privileged classes. But did they themselves necessarily gain? Were entrepreneurs actually rewarded for the risks they took and the efforts they invested? To be sure, for incentives to work what mattered was what they expected *ex ante*, not what they received *ex post*. But if the two differed a great deal, the system was out of equilibrium and eventually, economic theory suggests, expectations would have adjusted and the entire momentum of the Industrial Revolution would have slowed down.

The question of the rate of return to entrepreneurial activity is not easy to settle empirically. There is a substantive view that maintains that the only reason entrepreneurs can function is that they systematically overestimate their own ability. This view was most forcefully expressed by John Nye (1991) in a pathbreaking paper, in which he argued that the entrepreneur is a "somewhat overoptimistic fellow who has systematically overestimated the returns to a given innovation or research project (or underestimated the risk)" (p. 134). Adam Smith in a famous passage thought this was a more general property of people, and while he did not make the inference that this kind of behavior can explain innovative and entrepreneurial behavior, he noted that this bias led people to gamble despite the odds and to under-purchase insurance.²⁹ Yet, as Nye and Kamien (2005) both stress, entrepreneurial activity has the element of a lottery ticket, with the odds against you (see also Baumol, 2005). Equilibrium analysis suggests that if entrepreneurs were in a high-risk occupation,

²⁹The famous quote is "Their absurd presumption of their own good fortune is ... still more universal [than people's overestimating their own abilities]... the chance of gain is by every man more or less over-valued, and the chance of loss...undervalued" (Smith [1776], 1996, p. 120).

their earnings should be *higher* to compensate them for the higher riskiness. Such a finding, however, assumes that everyone assesses the risk to be the same, which evidently is not the case.

The empirical problem for the historian, as will be readily apparent, is one of truncation. We do not observe the tail of the distribution of would-be entrepreneurs whose failure was so immediate or so complete that the historical record contains no crumb of evidence pointing to their existence. Indeed, we do not know for sure that this population only constitutes a *tail* of the distribution; it may well be that *most* of the people who by some definition qualify as entrepreneurs failed and never made it to the history books. Nye suggests provocatively that the rate of return to entrepreneurship, corrected for this kind of truncation, may well have been negative. For entrepreneurship to have been a positive factor in economic development in a social welfare sense, he submits, there must have been significant externalities, that is, positive social value created by such people that they themselves did not capture.

The anecdotal evidence of the business failures during the Industrial Revolution seems to indicate that in the more spectacular cases, such externalities could be very large indeed. Some of the better-known cases are those of great inventors who, unlike James Watt, tried their hand at both the business side and the technological side of the Industrial Revolution. Thus the Scottish chemist and inventor John Roebuck, the founder of the Carron Ironworks near Falkirk and famous for his invention of lead chambers to manufacture sulphuric acid, went into business with two of the pivotal figures of the Industrial Revolution, Samuel Garbett and James Watt, but neither of these two ventures was a success. Richard Trevithick, the inventor of the high-pressure steam engine and Richard Roberts, possibly the greatest mechanical genius of the early nineteenth century, were both failed entrepreneurs who died essentially penniless. These people, and others like them, created huge

externalities in the sense that others were able to capture the fruits of their efforts even if they were not. At times, these efforts were recognized in limited ways by the authorities, tacitly recognizing the gap between social and private returns.³⁰

Yet the somewhat pessimistic view of Nye needs to be qualified in a number of ways. First, the costs of “failure” here are somewhat ill-defined and hence the size of the survival bias in the historical record in underestimating the cost of failed entrepreneurship is uncertain. There surely must have been a considerable number of people who invested heavily in entrepreneurial careers that did not pan out, and who therefore found themselves in the truncated portion of the distribution of returns on entrepreneurship (which presumably is largely in the negative quadrant). However, the exact opportunity costs of these efforts are far from clear. How many of them really wasted their entire career and invested their assets in a failed business is hard to know. Many failed independent businessmen, presumably, fell back on their next-best alternative and found employment or other careers as managers or consultants and while their failure surely was a disappointment, the magnitude of the net costs to themselves, let alone to society, are not obvious.³¹ Some of the more notable

³⁰Both Samuel Crompton, the inventor of the mule, and Edmund Cartwright, the inventor of the power-loom, were rewarded by Parliament with considerable sums, though they captured but a minute fraction of the social surplus that their inventions eventually created. A petition for the estate of Henry Cort was denied by Parliament, but the fact that other ironmasters entered a subscription for the benefit of Cort’s widow demonstrates that contemporaries sensed significant spillovers here. The pioneers of the paper-making machines, Henry and Sealy Fourdrinier, too, were awarded a grant of £ 20,000 by a Parliamentary committee (after many manufacturers testified that the continuous paper machines had been of huge benefit to their respective branches), though this amount was later reduced to £ 7,000 and paid in 1840, when Henry was already in his seventies. Edward Jenner was voted a grant of £ 30,000 in 1815. The scientist William Sturgeon, one of the pioneers of electrical technology in the 1830s, fell on hard times toward the end of his life, and was awarded a one -off payment of £200 plus a small pension by Lord John Russell’s government. In all these cases, and many others, there was an explicit recognition that these people had added to the well-being of the realm, in other words, they had produced positive externalities.

³¹John Roebuck, as we have seen, failed in 1773 in a classic case of failed backward integration: in trying to supply his ironworks in Carron with coal, he bought a coal mine, which turned out to be beyond his technical capacities and he was forced to declare bankruptcy. Yet he remained manager of his works and lived the life of a Scottish gentleman of some means, though at his death his widow was left penniless. Samuel Clegg, one of the pioneers of gas-lighting in the early nineteenth century joined an ill-fated Liverpool engineering firm and “lost everything he possessed,” yet had a good career as a consulting engineer afterward and served, among others as a consultant to the Portuguese government, and as one of the surveying officers for conducting preliminary inquiries on applications for new gas bills. Samuel Oldknow, the weaver of muslins, as is well-known, died insolvent after his business empire collapsed in 1792, owing Arkwright over £200,000. But would that have made him a “failed entrepreneur?” After

entrepreneurial figures who failed tried again and again and in the end landed on their feet.³² While we cannot be sure how often this was the case, indirect support for this view comes from Crouzet's findings that most industrialists and successful entrepreneurs came from a class of people that were already involved in some fashion with some industrial pursuit. About half of all "founders" were either merchant-traders or involved in manufacturing as a manager, craftsman, skilled worker, or manager. It stands to reason that such men, if they failed to strike it rich as self-employed entrepreneurs, could return to employment and have a decent middle-class life even if they did not get rich.³³ Finally, it bears stressing that by any definition of entrepreneurs, only a small minority of the entire population of entrepreneurs in Britain at the time of the Industrial Revolution were actually at the technological frontier. The others, businessmen, contractors, financiers, and merchants in traditional goods, may have been producing a great deal of social value and done so under conditions of heavy risk. But they were not the ones that propelled the Industrial Revolution. The latter comprised the small minority of pioneers on whose shoulders the rapidly growing economy of the second half of the nineteenth century stood, but they may have been self-selected and not representative.

These entrepreneurs, moreover, were not only driven by the profit motive. As Schumpeter (1934, p. 93) noted, they were also driven by the joy of creating, by the satisfaction of a job well-done, and by the triumph of getting a problem solved. Greed, of course, played an important role in

his bankruptcy in 1792, he became a successful farmer in Derbyshire during the Napoleonic Wars, high sheriff of his county and chairman of its Agricultural Society.

³²The Scottish chemist and industrialist James Keir at age 45 had failed in his attempts to add a chemical side to Boulton and Watt and to market his own patented alloy, "Keir's metal" (an alloy of nonferrous metals). Yet he persisted, and his alkali factory near the Birmingham canal, to which he applied his practical knowledge of chemistry, became a success, and he died worth £ 250,000.

³³One interesting case is that of Birmingham iron master Samuel Garbett, who declared bankruptcy in 1782, and then became the chief lobbyist for British manufacturers in Parliament, as head of the General Chamber of Manufacturers founded by himself and the potter Josiah Wedgwood. Garbett left £ 12,000 at his death, so clearly he was not destitute and his career as a businessman was still the source of income through the experience and connections he had acquired. See Norris (1958).

the incentives of the British entrepreneurial class in this age, but for many others ambition and the need to impress one's peers may have been just as important.³⁴ In a world of commerce and finance, in which entrepreneurial activity had largely the character of arbitrage, non-pecuniary motives may not have been of great significance. But in the Industrial Revolution, the entrepreneurs at the technological cutting edge of the Industrial Revolution were building a new world, and they became increasingly aware of it.³⁵ Many of the best mechanical talents and practical skills tried their hand at entrepreneurship in one form or another, but their interests lay primarily elsewhere.³⁶ Baumol (2005) attributes the willingness of entrepreneurs to be consistently underpaid to general over-optimism as well as the “psychic benefits” of being an entrepreneur, although the question whether these benefits extend to the entrepreneurs who are unambiguous financial failures remains.³⁷

³⁴The famous passage in Smith's *Theory of Moral Sentiments* is worth citing again: “To what purpose is all the toil and bustle of the world . . . the pursuit of wealth, of power, and preeminence? Is it to supply the necessities of nature? The wages of the meanest labourer can supply them. . . . What then is the cause of our aversion to his situation? . . . Do the rich imagine that their stomach is better, or their sleep sounder in a palace than in a cottage? The contrary has so often been observed. . . . What are the advantages [then] by that great purpose of human life which we call bettering our condition? . . . It is the vanity, not the ease of the pleasure, which interests us. But vanity is always founded upon our belief of our being the object of attention and approbation. The rich man glories in his riches, because he feels that they naturally draw upon him the attention of the world. . . . Everybody is eager to look at him. . . . His actions are the objects of the public care. Scarce a word, scarce a gesture can fall from him that is altogether neglected. In a great assembly he is the person upon whom all direct their eyes. . . . It is this, which . . . renders greatness the object of envy and compensates . . . all that toil, all that anxiety, all those mortifications which must be undergone in the pursuit of it” (Smith, 1759, pp. 50-51).

³⁵Josiah Wedgwood, the very epitome of an enlightened entrepreneur, wrote in 1767 to his friend, the merchant and later partner Thomas Bentley that a “revolution was at hand” and urged him to “assist in, proffitt by it” (Wedgwood, 1973, Vol. 1, pp. 164-165). Robert Owen (1815, pp. 120, 121) added that “The general diffusion of manufactures throughout a country generates a new character in its inhabitants... This change has been owing chiefly to the mechanical inventions which introduced the cotton trade into this country... the immediate effects of this manufacturing phenomenon were a rapid increase in the wealth, industry, population, and political influence of the British Empire.” It was an exciting time to be alive, and of course pure bliss if one also got rich in the process.

³⁶For example, the London instrument-maker Francis Hauksbee, a maker of optical instruments, balances, and pumps, and much active as a scientific lecture, was also engaged in a substantial number of business ventures, some of them unrelated to his mechanical skills (such as the sale of a new therapy for venereal disease).

³⁷Interestingly, research on contemporary data (Hamilton, 2000) has equally concluded that the median income of entrepreneurs is about a third less than that of equally qualified and experienced workers, which he interprets as a compensating differential for the non-pecuniary benefits of being an entrepreneur. His definition of an “entrepreneur” is quite different that the one employed here: it consists basically of self-employed workers. This kind of definition will, of course, not do for the period of the Industrial Revolution. It is interesting to note that despite the care with which Hamilton analyzes his data, he does not test for the possibility that part of the explanation may be that “entrepreneurs” systematically overestimate their chances of doing well *ex ante*.

Moreover, there was no contradiction between the ideal of following a gentlemanly culture and experimentation. Although not many of the industrialists in Britain came from the landowning ranks, there were clearly enough gentlemen amongst the cutting edge of science and technology to demonstrate that it was no longer frowned upon to be excited by innovation.³⁸

On the whole, being such an entrepreneur in Britain at this time shared some elements with buying a ticket in a lottery; part of the reason why people buy such tickets despite the odds against them is Smith's explanation that they misjudge their own abilities or luck. The thrill of playing and the dream of winning, moreover, must also have played a role. However, Nye is correct in pointing out that entrepreneurship is not wholly like playing the lottery because the probability of success is not predetermined but rather is conditional on what the person does. In that sense, the comparison between an entrepreneur and a lottery-ticket buyer is misleading.

The amount of uncertainty was certainly compounded by the fact that a set of new technologies came on line after 1760, with which people had no experience and little sense of how to produce and market. This was obviously true for cotton goods and railroads, but equally for gaslighting, machine tools and instruments, food preservation, paper-making, bleaching, glass- and pottery manufacturing, printing, and other industries in which radically new technologies were introduced. When experience provides little information about how likely a new idea is to work, the potential innovator has little to go by and thus only a vague idea about the distribution of the payoffs. As noted, this could be an advantage, since it could create an exaggerated sense of optimism, but

Yet his results imply that this may be the case, because the *mean* income of the self-employed is quite high due to the presence of a few superstars who win the "lottery."

³⁸One thinks of the popularity of Coke of Holkham's annual sheep-shearing ceremony and Lord Kames's writings on agricultural technology, to say nothing of the admittedly eccentric Earl of Dundonald or Henry Cavendish

there is little doubt that it was costly in terms of disappointment and wasted effort.³⁹ All the same, entrepreneurs were not fools, and many of the more successful ones diversified in other branches, thus reducing the chances of failure.

Entrepreneurial failure and entrepreneurial success in the Industrial Revolution

The Nye hypothesis — that the average rate of return on entrepreneurship may well have been negative in the economists' sense, that is, less than they could have earned if they had chosen other available occupations if estimated on the *entire* population, cannot be tested directly because the historical record only mentions the more spectacular failure cases or the failures of those who became known in another context. Needless to say, a lot depends on the exact definition of the population. If we take, as do Barton Hamilton (2000) or Gelderblom (this volume), the population of entrepreneurs to be the population of all self-employed workers whose income was derived from market activities, we would obtain very different results than if we confined it to a population of leaders, innovators, and people whose economic activity affected a substantial number of others. After all, by the wider definition many of the domestic industrialists who were part of the *Kaufsystem* — that is, sold their own wares rather than worked for a putting-out merchant-manufacturer — would be counted as entrepreneurs, and clearly for these people the Industrial Revolution was a disastrous era.

³⁹Payne (1978, p. 191) has argued that the technological risks of new techniques could be exaggerated because the technological frontier was limited so that the points at which improvements could be made were fairly obvious. He fails to realize that the risks were compounded because new equipment and materials embodied the new techniques, and if they malfunctioned, repair and adjustments were themselves a costly source of trial and error. Complementary inputs of human capital that could maintain and fix new and unfamiliar equipment and work with new substances were scarce and any downtime was obviously a significant cost. Moreover, the new technology required novel and unfamiliar forms of organization, above all the “factory system”, whatever is precisely meant by that. New technology, by its very nature, creates uncertainty not only on the demand side but also on the management and equipment end, and even microinventions could introduce serious risks of disruptions and shocks in steady production.

Turning to the more conventional definition, examples of highly successful entrepreneurs and of spectacular failures can be found without too much difficulty, but how to add them up in a meaningful way is problematic. All the same, something can be learned from taking a closer look at the historical records of the *dramatis personae*, keeping in mind that survival bias is only one problem in making this judgment. For instance, we need to ask who, exactly should count as a “failure” in this case. Does a person who spends six months trying to start a business, gives up, and returns to his old job count as a “failed entrepreneur”? Is a person who makes a fortune and then loses it again in bankruptcy after a while a “failed entrepreneur?” Formally speaking, we should compute the returns to entrepreneurship by comparing the net wealth accumulated over a lifetime due to entrepreneurial activity with the opportunity costs of that activity, but in practice it is impossible to measure this with any accuracy.

Much of the literature on the economics of entrepreneurship in the British Industrial Revolution has dealt with the question of “origins”. Were they dissenters or members of the Church of England? What were the advantages of belonging to minority groups? Were they of middle class origins, well-connected with merchants?⁴⁰ But the answers to these questions at the end of the day shed little light on the all-important issue of incentives, and whether entrepreneurship paid. One imperfect measure of “success” is wealth at death. This information is quite frequently provided in the *Dictionary of National Biography* which is now accessible online. In principle, this value should be compared to wealth at birth, which in some cases can be guessed, at least approximately, from the occupation and socio-economic status of the parents. By this measure, at least, there were some

⁴⁰The conclusions reached by Crouzet (1985) that the bulk of the entrepreneurs came from the lower middle class of small merchants and artisans. The importance of dissenting religions in the Industrial Revolution in supplying a much larger than proportional number of captains of industry is beyond question, though it is hard to disentangle purely ideological causes from the exclusion of dissenters from careers in the public sector before 1829.

spectacular successes. John Marshall, the Leeds flax spinner, left at his death in 1845 about £2,000,000; he inherited from his father exactly exactly £ 9,000 (a tidy sum, to be sure). The only manufacturer who left a known sum larger than that was William Crawshay, the iron-master, but he was of course born into a successful business. In cotton, besides the textbook example of Arkwright, we know of the successful Jedediah Strutt, his erstwhile partner and son of a “small farmer and maltster,” who left £160,000 in 1797. John Horrocks (whose father was “a small quarrymaster” cf. Crouzet, 1985, p. 131) left £ 150,000 and quite a few lesser known spinners left estates valued at £40,000 or more.

Even those who died insolvent, as I argued above, should not necessarily be written off as failures. Some obvious candidates for “failure” in the cotton industry can, of course be found. One was William Radcliffe, a Derbyshire “improver of cotton machinery,” who bought Samuel Oldknow’s mill after the latter’s bankruptcy, and apparently died poor after a roller-coaster career; another was Samuel Hall, a cotton-spinner and engineer who died in “very reduced circumstances.” The cotton merchant Thomas Walker had to live his final years from a bequest. Perhaps the most spectacular example of a failed entrepreneur was the highly eccentric Archibald Cochrane, earl of Dundonald, who spent his family’s fortune on an ill-fated chemical business. More than anything else, however, Cochrane was unlucky.⁴¹ Somewhat comparable was the case of Henry Fourdrinier, a well-to-do London stationer who gambled on the main innovation in paper-making of his age, spent £ 60,000 on the business and failed in 1810. Both Cochrane and Fourdrinier are thus examples of a significant negative private return on entrepreneurship, hardscrabble lives ending in poverty that

⁴¹His coal-tar, intended as a sealant for ship-bottoms, was rejected by the admiralty. On the whole, however, coal-tar was to prove, as Dundonald had foreseen, a valuable raw material.

might have given the entrepreneurial career a bad name. But how typical were they?

What makes the idea of “failure” ambiguous, however, is that many of the cases that would qualify as entrepreneurial failures during the Industrial Revolution were engineers, businessmen, and manufacturers who had started from the bottom, then worked their way up enough to earn entries in the *DNB* or in any of the other sources on which Crouzet relied, but eventually died in modest or even penurious circumstances. Some of the most famous figures in the Industrial Revolution fall in that category: the inventors Richard Roberts, Richard Trevithick, and Henry Cort, the wool manufacturer William Hirst, and the ironmaster David Tanner. As noted, it is hard to place an exact social cost on these failures; some of these men appear to have had little interest in enriching themselves; while others were simply too absorbed by their technical work to pay much attention to the financial side of things; still others simply were unlucky or naive. It is not altogether certain whether such people ought to be regarded as entrepreneurial “failures.” Would they have been better off if they had lived their *entire* lives in obscurity and poverty?

To produce a more systematic picture of the returns to entrepreneurship during the Industrial Revolution, I have created a database of 1249 personalities active in Britain at this time and who could be regarded as entrepreneurs or potential entrepreneurs (including architects, engineers, inventors, instrument makers, and similar occupations). Rather than focus on the origins of these people, I simply asked: how well off were they at the end of their lives? Apart from the *DNB*, we tracked the names and information that appeared in Crouzet (1985) and Honeyman (1983) and followed many of their sources. The people selected were those described as businessmen, merchants, bankers, industrialists, as well as inventors, architects, engineers, publishers, and mechanics. For intellectuals to be included in the population checked, they had to have some

economic or business venture, so pure academic scientists were excluded. Thus a few individuals whose fame may have been in some other activity were still included because of some activity that could be regarded as entrepreneurial.⁴²

The data in this database are in some ways quite incomplete. Only for a subsample do we actually know from probate records the wealth of the person at death. Even here there are ambiguities: the probate records, on which the DNB evidently relied, listed “personal property” and excluded real estate wealth (Rubinstein, 1981, pp. 35, 59). Large settlements made to family members may have exceeded the total assets, as was the case with the Glasgow tobacco merchant and cotton spinner John Glassford. Yet he left unentailed assets valued at £40,000, so while his finances may have been chaotic, he surely was not “destitute.” For many others, no data exist to document their exact wealth at death, but some statement by their biographers indicates their situation. William James, a railway developer and land agent at his death in 1837 left “his family unprovided for.” The Butterley iron master Benjamin Outram left his affairs even more chaotic when he passed away in 1805. “His wife and family ... were reduced to near poverty when the rashness of some of his actions became clear after his death.” The data problem is amplified by the ambiguity in assigning occupations: no fewer than 75 of the 706 individuals declared two (or more professions) and it became ambiguous how to classify them. The lines between merchants, bankers, and industrialists were fluid, and as we noted above, many individuals diversified their activities. This ambiguity underlies the difference between tables 1a and 1b below.

To create some order in these biographies, we divided all entries of would-be entrepreneurs

⁴²Thus we included in the sample the physicist George Green (1793-1841) because he was also a miller and the engraver John Oldham (1779-1840) because he was also the inventor of a machine for individually numbering banknotes to prevent forgery as well as a system of propelling ships by means of steam-driven paddles.

born between 1700 and 1799 in the *DNB* and other sources into three categories. First, for those who actually left a probated estate specified in money terms, we counted as unsuccessful ($W=1$) those who left estates under £ 1000, as successful ($W=2$) those who left estates between £1000 and £10,000, and as highly successful ($W=3$) those who left estates over £10,000. For those who left estates that were not specified in monetary value but whose biographers left us a clue as to how well-off they were we followed more subjective rules. On the whole this turned out to be feasible: many entrepreneurs were described as “destitute” or “living in reduced circumstances” which earned them a $W=1$. Those who were described as Wealth unknown, but bequeathed an apparently profitable business at death were awarded a $W=2$. Examples are the St. Helens chemical manufacturer Josias Gamble who left his firm to his son David or the Cornish merchant and industrial entrepreneur Robert Were Fox, who before 1810 consolidated his company's position in the rich Gwennap copper mines in Cornwall, or the West Bromwich hardware maker Archibald Kenrick who left a business to his children that at the time of his death employed 200-300 workers. Finally, entrepreneurs such as the brewer William Worthington who “left his sons and widow substantial property in Burton, farms at Hartshorne and Gresley, and a considerable fortune” were awarded a $W=3$. That this kind of scoring is somewhat subjective and that a few ambiguous cases may have been misclassified goes without saying. All the same, it is the first systematic attempt to look at the wealth left by the individuals who made enough of a mark to make it to the *DNB*. Beside the 706 persons who could be classified by their wealth-at-death status, the sample yielded 543 people about whom no definite judgment could be made.

Despite the truncation bias inherent in this kind of analysis, it is quite astonishing how successful entrepreneurs were in leaving substantial wealth at death. On the whole, the mean value of W for the entire sample is somewhere around 2.4, though the standard deviation is quite high

(about 0.7). At the same time, the data show that the pivotal people in the Industrial Revolution (industrialists and architects/engineers) were doing somewhat worse than merchants and financiers.

Table 1: wealth at death, by occupation

Occupation- part a (only those reporting one occupation)	Average value of W	s.d.	n
Merchant	2.48	0.71	105
Industrialist	2.33	0.76	266
Banker/Financier	2.65	0.64	69
Engineer/Architect	2.28	0.79	180
Physician/Chemist	2.50	0.65	14
Total	2.38	0.75	634
Occupation - part b (those reporting multiple occupations included in all)			
Merchant	2.44	0.75	144
Industrialist	2.32	0.77	311
Banker/Financier	2.55	0.71	110
Engineer/Architect	2.27	0.79	194
Physician/Chemist	2.55	0.67	22
Total	2.37	0.76	781 ^a

a - total affected by double-counting those declaring multiple occupations, actual number of observations equals 706..

Table 2: Wealth at Death by subperiod and occupation: mean, (s.d.); n

	Before 1800	1800-1825	1825-1850	1850+
Merchant	2.35 (0.81); 34	2.24 (0.79); 33	2.41 (0.78); 29	2.67 (0.59); 49
Industrialist	2.16 (0.78); 64	2.22 (0.72); 59	2.20 (0.83); 66	2.52 (0.73); 124
Banker/Financier	2.38 (0.81); 16	2.50 (0.75); 28	2.50 (0.71); 26	2.70 (0.65); 40
Engineer/Architect	2.08 (0.78); 24	2.32 (0.77); 28	2.18 (0.80); 38	2.33 (0.79); 104
Physician/Chemist	3.00 (—); 2	2.83 (0.41); 6	2.00 (0.82); 4	2.50 (0.71); 10
Total	2.23(0.78); 123^a	2.30 (0.75); 135^a	2.27 (0.80); 149^a	2.51 (0.72); 302^a

a- individual components add up to more than total because multiple occupations have been counted in both categories.

Table 3: Average Specific Financial Bequests, by subperiod and occupation (in £)
(s.d.'s and cell size in parentheses)

	Before 1800	1800-1825	1825-1850	1850+	Total
Merchant	182,405 (292,322, 16)	176,214 (360,326, 17)	193,801 (221,761, 20)	378,339 (856,345, 43)	271,445 (625,283, 96)
Industrialist	121,726 (236,193, 26)	141,587 (313,672, 27)	93,311 (336,339, 44)	148,346 (336,671, 109)	132,445 (321,269, 206)
Banker/Financier	4,000 (65,803, 5)	174,952 (246,674, 18)	267,998 (551,537, 19)	511,508 (972,354, 38)	344,138 (740,763, 80)
Engineer/Architect	21,275 (48,913, 13)	25,067 (36,354, 19)	41,879 (70,484, 23)	60,019 (131,081, 90)	49,088 (109,417, 145)
Physician/Chemist	25,000 (na, 1)	98,643 (131,537, 3)	na	22,369 (23,190, 10)	38,902 (63,897, 14)
Total	89,966 (194,065, 49)	105,785 (236,883, 68)	126,865 (357,693, 96)	197,319 (551,926, 256)	157,275 (444,826, 491)

Tables 1-3 summarize the data on British entrepreneurship in the eighteenth century. Beside the overall high level of W for the entire sample, a weaker version of the Nye hypothesis is

corroborated by the fact that industrialists left significantly ($t = 1.79$) *less* wealth than merchants for the period as a whole (table 1a) and mildly significant ($t=1.62$) for the sample in table 1b. The difference between engineers and bankers/financiers is larger and significant in both tables ($t = 3.82$ and 3.24 respectively). Thus, it seems that the more industrial occupations yielded lower average rates of return and, to judge from the standard deviations, higher risks. This seems consistent with the intuitively appealing hypothesis that entrepreneurs in the modern sector suffered a higher failure rate, but when they struck it big, they did so on a larger scale. It is also consistent with Rubinstein's view that "the wealthy in Britain have disproportionately earned their fortunes in commerce and finance ... rather than in manufacturing and industry" (1981, p. 61). Note, however, that this difference declines over time and becomes small after 1850. It is also striking that there is little improvement in the wealth at death either in table 2 or table 3 over time, with the notable exception of those who lived beyond 1850. Again, this is consistent with Rubinstein's findings, although his approach to the data is quite different (*ibid.*, pp. 35-37). This must in part reflect the fact that the real payoff to the efforts made during the Industrial Revolution came to the people living in the second half of the nineteenth century, though part of it also reflects the fact that some of these people ended up living to an older age.

Conclusions.

Three important conclusions emerge. One is that the topic of entrepreneurship needs to be studied as part of the modern approach to the phenomenon of economic growth by looking at cultural and institutional factors that made more sophisticated economies possible. This approach will shed light on the question "why Britain led" perhaps more than "why did an Industrial Revolution happen

at all.” The environment that made British entrepreneurship so effective during the Industrial Revolution consisted of institutions that created the right incentives, and the complementarities created by human capital, natural resources, and a more effective polity (Mokyr, 2007). Cast in those terms, it may well be time for entrepreneurs to resume their rightful place as agents of economic progress right next to inventors, scientists, and enlightened politicians.

Secondly, I have shown that contrary to what is sometimes believed, entrepreneurs in the Industrial Revolution on the whole probably were not “lucky fools” but committed individuals who had a fair chance of doing well, even if they did not all strike gold. In a competitive environment this is perhaps to be expected. But many more acquired the respect of their peers, some measure of economic security, and enjoyed what they did. In other words, the British entrepreneur could expect to be rewarded for his contribution. That contribution, it turns out, depended not only on the classic characteristics of entrepreneurs, but also on their ability to cooperate with others and establish relations based on trust without depending on third-party enforcement.

Third, the British institutional environment was an important element in British early leadership in the Industrial Revolution (Mokyr, 2007). In the eighteenth century, rent-seeking and other leaky-bucket policies slowly fell out of favor, in part because the new industrial classes objected to them on purely selfish grounds. Thus, the struggle over restrictions on the adoption of new technology was unequivocally decided in favor of the entrepreneurs and the innovators. But in part rent-seeking fell out of favor also because a new enlightenment ideology was being absorbed by the landed and commercial elites. This ideology persuaded them that the economic game was not zero-sum and that a free-market environment of open access, competition, and unrestrained innovation was the patriotic and virtuous thing to do. As it turns out, it was also the profitable thing to do.

REFERENCES

- Acemoglu, Daron, Johnson, Simon and Robinson, James. 2005. "Institutions as a Fundamental Cause of Long-Run Growth." In Philippe Aghion and Steven N. Durlauf, eds., *Handbook of Economic Growth*, Vol. 1A, pp. 385-472. Amsterdam: Elsevier.
- Baumol, William J. 1993. *Entrepreneurship, Management, and the Structure of Payoffs*. Cambridge, Mass.: MIT Press.
- Baumol, William J. 2002. *The Free-Market Innovation Machine: Analyzing the Growth Miracle of Capitalism*. Princeton, NJ: Princeton University Press.
- Baumol, William J. 2005. "The Return of the Invisible Men: the Microeconomic Value of Inventors and Entrepreneurs". Presented at the AEA meetings, Boston 2005.
- Blackstone, William. 1765-69. *Commentaries on the Laws of England* First Edition Oxford : Printed at the Clarendon Press. <http://www.yale.edu/lawweb/avalon/blackstone/blacksto.htm>.
- Brewer, John. 1982. "Commercialization and Politics." In Neil McKendrick et al., eds, *The Birth of a Consumer Society: The Commercialization of Eighteenth century England*. Bloomington, Indiana University Press, pp. 197-262.
- Briggs, Asa. 1959. *The Age of Improvement*. London: Longman.
- Brooks, C.W. 1989. "Interpersonal Conflict and Social Tension: Civil Litigation in England, 1640-1830." In A.L. Beier et al. eds., *The First Modern Society: Essays in English History in Honor of Lawrence Stone*. Cambridge: Cambridge University Press.
- Cain, Peter and Hopkins, Anthony G. 1993. *British Imperialism: Innovation and Expansion*. Harlow, Essex: Longman.
- Calcott, Wellins. 1759. *Thoughts moral and divine; collected and intended for the better instruction and conduct of life*. third edition. Coventry: printed by T. Luckman.
- Crouzet, François. 1985. *The First Industrialists: The Problems of Origins*. Cambridge: Cambridge University Press.
- Dam, Kenneth W. 2005. *The Law-Growth Nexus: the Rule of Law and Economic development*. Washington: Brookings Institution Press.
- Daunton, Martin J. 1989. "Gentlemanly Capitalism and British Industry 1820-1914 *Past and Present*, No. 122 (Feb.), pp. 119-158.
- Davenant, Charles. 1699. *Essay upon the probably methods of making a people gainers in the balance of trade . . . By the author of the Essay on ways and means*. London: printed for J. Knapton. Repr. in Davenant, Charles, *The political and commercial works of that celebrated writer Charles D'avenant, LL.D.*, Collected and revised by Sir Charles Whitworth, London, 1771. Vol. 2, pp. 168-382.
- Defoe, Daniel. 1703. *A collection of the writings of the author of The true-born English-man*. London. (no publisher listed).
- . 1710. *An Essay upon Publick Credit*. London: Printed and Sold by the Booksellers.
- . 1738. *The Complete English Tradesman*. Fourth edition. 2 Vols. London: C. Rivington.
- Dormois, Jean-Pierre and Dinterfass, Michael. 1999. *The British Industrial Decline*. London and New York: Routledge.
- Dupin, Charles. 1825. *The Commercial Power of Great Britain : exhibiting a complete view of the public works of this country*. London: Printed for C. Knight, 2 vols.
- Ellickson, Robert C. 1991. *Order without Law: How Neighbors settle Disputes*. Cambridge, MA: Harvard University Press.
- Floud, Roderick and Johnson, Paul, eds. 2004. *The Cambridge Economic History of Modern Britain, Vol. I: Industrialization, 1700-1860*. Cambridge: Cambridge University Press.
- Glaeser, E.L., La Porta, R., Lopez-de-Silanes, F., Shleifer, A. 2004. "Do institutions cause growth?" *Journal of Economic Growth* Vol. 9, 271–303.
- Godley, Andrew. 2001. *Jewish Immigrant Entrepreneurship in New York and London, 1880-1914*. Houndsmills, Basingstoke, Palgrave.
- Greif, Avner. 1994. "Cultural beliefs and the organization of society: a historical and theoretical reflection on collectivist and individualist societies." *Journal of Political Economy* Vol. 102, no. 5 (1994), pp. 912-941.
- Greif, Avner. 2005. *Institutions and the Path to the Modern Economy: Lessons from Medieval Trade*. Cambridge: Cambridge University Press.
- Grosley, Pierre Jean. 1772. *A Tour to London; or, New observations on England, and its Inhabitants*. Translated from the French by Thomas Nugent, London: printed for Lockyer Davis.
- Guiso, Luigi, Sapienza, Paola, and Zingales, Luigi. 2006. "Does Culture Affect Economic Outcomes?" *Journal of*

- Economic Perspectives* Vol. 20, No. 2 (Spring), pp. 23-48.
- Hamilton, Barton H. 2000. "Does Entrepreneurship Pay? An Empirical Analysis of the Returns to Self Employment." *Journal of Political Economy* Vol. 108 No. 3 (June), pp. 604-631.
- Honeyman, Katrina. 1983. *Origins of Enterprise: Business Leadership in the Industrial Revolution*. New York: St. Martin's Press.
- Jones, Eric L. 2006. *Cultures Merging: A Historical and Economic Critique of Culture*. Princeton: Princeton University Press.
- Kamien, Morton I. 2005. "Entrepreneurship by the Books." Unpublished, Kellogg Graduate School of Management.
- Laird, Pamela Walker. 2006. *Pull: Networking and Success since Benjamin Franklin*. Cambridge, MA: Harvard University Press.
- Langford, Paul. 1989. *A Polite and Commercial People: England 1727-1783*. Oxford and New York: Oxford University Press.
- . 2002. "The Uses of Eighteenth-Century Politeness." *Transactions of the Royal Historical Society*, Vol. 12, pp. 311-31.
- Maitland, Frederic. 1911. *The Constitutional History of England*. Cambridge: at the University Press.
- Malthus, Thomas R. 1820. *Principles of Political Economy*. London: J. Murray.
- McCloskey, D.N., ed. 1971. *Essays on a Mature Economy: Britain after 1840*. London: Methuen.
- . 1998. "Bourgeois Virtues and the History of P & S". *Journal of Economic History* Vol. 58, No. 2 (June), pp. 297-317.
- . 2006. *The Bourgeois Virtues: Ethics for an Age of Commerce*. Chicago: University of Chicago Press.
- Merimée, Prosper (1930). "Études Anglo-Américaines," in *Oeuvres Complètes*, Pierre Trahard and Édouard Champion, eds., Vol. 8. Paris: Librairie Ancienne Honoré Champion.
- Mingay, G.E. 1963. *English Landed Society in the Eighteenth century*. London: Routledge-Kegan-Paul.
- Michie, Ranald. 2001. *The London Stock Exchange: a History*. Oxford: Oxford University Press.
- Mokyr, Joel. 1998. "Editor's Introduction: The New Economic history and the Industrial Revolution." In Joel Mokyr, ed., *The British Industrial Revolution: An Economic Perspective*. Boulder: Westview Press, pp. 1-127.
- . 2002. *The Gifts of Athena: Historical Origins of the Knowledge Economy*. Princeton: Princeton University Press.
- . 2006a. "The Great Synergy: the European Enlightenment as a factor in Modern Economic Growth", in Wilfred Dolfsma and Luc Soete (eds), *Understanding the Dynamics of a Knowledge Economy*. Cheltenham: Edward Elgar, pp. 7-41.
- . 2006b. "Mercantilism, the Enlightenment, and the Industrial Revolution," Presented to the Conference in Honor of Eli F. Heckscher, Stockholm, May 2003. In Ronald Findlay, Rolf Henriksson, Håkan Lindgren and Mats Lundahl (eds), *Eli F. Heckscher (1879-1952): A Celebratory Symposium*. Cambridge, MA: MIT Press, 2006, pp. 269-303.
- . 2007. "The Institutional Origins of the Industrial Revolution." Unpublished, Northwestern University, May.
- Muldrew, Craig. 1998. *The Economy of Obligation*. New York: St. Martin's Press.
- Murphy, Kevin, Shleifer, Andrei, and Vishny Robert. 1991. "The Allocation of Talent: Implications for Growth," *The Quarterly Journal of Economics*, vol. 106, no.2, May.
- Musson, A. E., and Eric Robinson. 1969. *Science and Technology in the Industrial Revolution*. Manchester: Manchester University Press.
- Norris, J.M. 1958. "Samuel Garbett and the Early Development of Industrial Lobbying in Great Britain." *Economic History Review* Vol. 10, No. 3, pp. 450-460.
- North, Douglass C. 1990. *Institutions, Institutional Change, and Economic Performance*. Cambridge: Cambridge University Press.
- North, Douglass C. 2006. *Understanding the Process of Economic Change*. Princeton: Princeton University Press.
- Nye, John Vincent. 1991. "Lucky Fools and Cautious Businessmen: on Entrepreneurship and the Measurement of Entrepreneurial Failure." In Joel Mokyr, ed., *The Vital One: Essays in Honor of Jonathan R.T. Hughes. Research in Economic History* Vol. 6., pp. 131-52.
- O'Brien, Patrick K. 1994. "Central Government and the Economy" In Roderick Floud and D. N. McCloskey, eds., *The Economic History of Britain Since 1700*, Cambridge: Cambridge University Press. 2nd ed., Vol. I, pp. 203-241.
- . 2002. "Fiscal Exceptionalism: Great Britain and its European rivals from Civil War to triumph at Trafalgar and Waterloo." In Donald Winch and Patrick O'Brien, eds., *The Political Economy of the British Historical*

- Experience, 1688-1914*. Oxford: Oxford University Press, pp. 245-265.
- . 2006. "The Hanoverian State and the Defeat of the Continental System: a Conversation with Eli Heckscher." In Ronald Findlay et al., eds., *Eli Heckscher, International Trade, and Economic History*. Cambridge, MA: MIT Press, pp. 373-405.
- Owen, Robert. [1815] 1927. "Observations on the Effects of the Manufacturing System." In G. D. H. Cole, ed., *A New View of Society and Other Writings*. London: Everyman's Library.
- Payne, Peter. 1978. "Industrial Entrepreneurship and Management in Great Britain." In Peter Mathias and M.M. Postan, eds., *The Cambridge Economic History of Europe*. Cambridge: Cambridge University Press.
- Pearson, Robin. 1991. "Collective Diversification: Manchester Cotton Merchants and the Insurance Business in the Early Nineteenth century." *Business History Review* Vol. 65, No. 2 (Summer), pp. 379-414.
- Pearson, Robin and Richardson, David. 2001. "Business Networking in the Industrial Revolution." *Economic History Review* Vol. 54, No. 4, pp. 657-79.
- Perkin, Harold J. 1969. *The Origins of Modern English Society, 1780-1880*. London: Routledge and Kegan Paul.
- Pollard, Sidney. 1968. *The Genesis of Modern Management*. London: Penguin.
- Porter, Roy. 1990. *English Society in the 18th Century*. Revised edition. London: Penguin.
- Posner, Eric. 2000. *Law and Social Norms*. Cambridge, MA: Harvard University Press.
- Robb, George. 1992. *White Collar Crime in Modern England: Financial Frauds and Business Morality, 1845-1929*. Cambridge: Cambridge University Press.
- Rodrik, Dani, Subramanian, Arvind and Trebbi, Francesco, 2004. "Institutions Rule: The Primacy of Institutions Over Geography and Integration in Economic Development," *Journal of Economic Growth*, vol. 9, pp. 131-165
- Rubinstein, William D. 1981. *Men of Property: the Very Wealthy in Britain Since the Industrial Revolution*. London: Croom Helm.
- Schumpeter, Joseph A. 1934, *The Theory of Economic Development*. Oxford: Oxford University Press.
- Shapin, Steven. 1994. *A Social History of Truth*. Chicago: University of Chicago Press.
- Smiles, Samuel. 1863. *Self-Help: with Illustration of Character and Conduct*. Boston: Ticknor and Fields.
- Smiles, Samuel. 1884. *Men of invention and industry*. London: J. Murray.
- Smith, Adam. 1759. *The Theory of Moral Sentiments*. London: A. Millar.
- Smith, Adam. [1976] 1776. *The Wealth of Nations*, Edwin Cannan, ed., Chicago: University of Chicago Press.
- Spagnolo, Giancarlo. 1999. "Social Relations and Cooperations in Organizations." *Journal of Economic Behavior and Organizations* Vol. 38, pp. 1-25.
- Tabellini, Guido. 2006. "Culture and Institutions: Economic development in the Regions of Europe." Bocconi university, unpub. ms.
- Taine, Hippolyte [1872], 1958. *Notes on England*. Translated with an introduction by Edward Hyams. Fair Lawn, NJ, Essential Books.
- Urdank, Albion. 1990. *Religion and Society in a Cotswold Vale*. Berkeley: University of California Press.
- Wedgwood, Josiah, 1973. *Letters of Josiah Wedgwood*, edited by Katherine Euphemia, Lady Farrer]. Manchester : E. J. Morten [for] the Trustees of the Wedgwood Museum.
- Wiener, Martin J. 1981. *English Culture and the Decline of the Industrial Spirit, 1850-1980*. Cambridge: Cambridge University Press.
- Wilson, Charles. 1955 [1963]. "The Entrepreneur in the Industrial Revolution in Britain." Repr. in Barry Supple, ed., *The Experience of Economic Growth*. New York: Random House, pp. 171-178.

