# *Chapter 5*

## Tawney's Century, 1540–1640: The Roots of Modern Capitalist Entrepreneurship

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### The Weber-Tawney Thesis on Protestantism and Capitalism: The Role of Protestant Dissenters in the Scientific and Industrial Revolutions (1660–1820)

One of the very most remarkable features of the Industrial Revolution era is that Non-Conformists or Dissenters—those Protestants who refused to conform to the officially established Church of England[1]—accounted for a remarkably high proportion, perhaps one half, of the scientists and inventors listed in the Royal Society (founded 1660) and the related Lunar Society of Birmingham (founded 1764).[2] Even more important for the history of entrepreneurship is the fact that they also accounted for at least half of the known entrepreneurs (and other business leaders) of the Industrial Revolution era itself, up to circa 1820. Yet Dissenters were then a very small minority: consisting of about 1,250 congregations in later eighteenth-century England, comprising about 5 percent and certainly under 10 percent of the population.[3]

There is no agreed upon explanation for this extraordinary phenomenon. Some various hypotheses will be offered in the subsequent discussion of the role of religion in the early-modern English and Scottish economies, in the context of the very well known, and still hotly debated Weber-Tawney thesis. For a variety of reasons that will soon become apparent, the focus of this discussion is on Richard Tawney (1880–1962), unquestionably one of the very most important economic historians that England has ever produced: in particular, on his role in seeking to explain the emergence of modern capitalist entrepreneurship in what is now commonly called "Tawney's century," 1540–1640.[4] The central thesis of this current study, however, is that all of the events and turning points leading to the rise or dramatically significant expansion of modern forms of capitalism, per se, of a truly modern capitalist ethos, and thus of entrepreneurship, took place, not in Tawney's century, but rather in the following century, 1640–1740, the one preceding the modern Industrial Revolution era. Indeed, this thesis is indicated by the very statement that begins this study.

With deeply held Christian and Fabian socialist views, Tawney had become fascinated with the relationship between Protestantism and the emergence and development of modern capitalism, and implicitly of modern capitalist entrepreneurship.

That led, in 1926, to the publication of his most famous book: *Religion and the Rise of Capitalism*. While highly esteemed for the vast amount of new information that it supplied on both religion and society in sixteenth- and seventeenth-century England, the book's chief importance lies in explaining, elaborating on, and propagating the much earlier thesis on this issue, initially published (in 1904–5) in German: Max Weber, *The Protestant Ethic and the Spirit of Capitalism*.[5]

Neither author, it must be stressed, ever proposed that Protestantism was responsible in any way for the actual birth of European capitalism, for they were well aware that its origins were purely medieval. Furthermore, they were far from being the first scholars to make a link between Protestantism and modern capitalism, a linkage involving a wide variety of theories. Their goal was instead to provide an analytical framework, in the context of historical sociology, to explain how one particular form of Protestantism—Calvinism—ultimately influenced the development of the "ethos" or "spirit" or *mentalité* of modern European capitalism, in ways that distinguished it from earlier forms of capitalism.[6] Weber and Tawney both agreed that Calvinism (ultimately) played such a role by the socio-psychological consequences of its three essential doctrines or components.

The first is the doctrine of predestination, which in essence stipulates that God, being omnipotent, determines (has determined, will determine) who are the very few to be the so-called Elect: those who shall enjoy eternal salvation with God. All the rest of mankind, because of original sin and free will, have and will have condemned themselves to eternal perdition in hell, and thus they are completely incapable of gaining salvation on their own.[7] Even for the most devout of faithful Calvinists, such a bleak doctrine must have seemed unpalatable, indeed horrifying. But Calvin scorned those who sought to find positive signs of their Election, replying that to do so was inherently sinful. A century or so later, however, that strict Calvinist view could and did no longer prevail: perhaps because of pressure of public opinion in predominantly Calvinist lands (see Pettegree, Duke, and Lewis 1994; Riemersma 1967; Little 1969), and perhaps because of the evolving impact of the other two doctrines of this Calvinist triad: in Weber's terminology, the "calling" and "worldly asceticism."

The doctrine of the calling was also based on the principle of God's omnipotence, so that obviously the world existed according to his will, as he had ordained it; and thus it was the duty of every man and women to serve God by fulfilling his or her calling—in whatever honorable (nonsinful) occupation one had gained—to exercise his or her utmost ability, in order to achieve the greatest possible degree of success in doing so.[8] Calvin himself had been trained as a lawyer, and deemed that to be an honorable calling, as were not only those of other professional persons (e.g., doctors, professors, theologians), but also businessmen, and thus entrepreneurs. Indeed that list implicitly includes merchants, financiers, industrialists, retailers, storekeepers, and also industrial craftsmen or artisans, all so necessary for the maintenance and prosperity of a well-ordered civil society.

For many businessmen, what better, more tangible sign of success in one's calling could be found than profit? That meant profit maximization, which surely is the very essence of modern microeconomics. As so many came to believe, such proof of success in one's calling should also mean a positive, indeed certain, sign of one's Election. In turn, to the extent that so many in Calvinist societies came to equate such success in their calling with Election, that society in turn came to view such success,

and success in profitable business enterprises in particular, with far greater approval, as a socially desirable goal, than ever before, in medieval society.

Nevertheless, by the seventeenth and eighteenth centuries, an individual entrepreneur or businessman's success in his calling, when measured by profits (or "the bottom line," as many would say today), was strictly conditional on how that person utilized those profits, in terms of the Weber-Tawney concept of "worldly asceticism." If profits were spent largely on "conspicuous consumption," such an individual risked incurring social opprobrium: that is, for worshipping Mammon,[9] and not God. If consuming profits in this fashion was sinful, then the obvious and most laudable alternative—both socially and theologically—was to reinvest those profits in the business enterprise: that is, to increase the capital stock and scale of the enterprise, better enabling the entrepreneur to innovate and to increase subsequent profits, and thus better able to be dedicated to one's calling, for the greater glorification of God.

The Weber-Tawney thesis has, of course, engendered an enormous amount of debate from the 1920s, continuing to the present day; and a reexamination of that debate would serve no useful purpose in this study.[10] In my own view, whether or not the Weber-Tawney thesis has any real significance for the history of entrepreneurship in England, and for the evolution of a more truly "capitalist" economy, the relevance will be found not in "Tawney's century" itself—when so many Calvinists seemed to be hostile to capitalism (and usury)—but rather in the succeeding century, 1640–1740.[11]

First, during the era of the English Civil War, Commonwealth, and Cromwell's Protectorate (1642–59), Calvinists—both Puritans and Scottish Presbyterians—played a very major role in winning that war against the Crown and the Cavalier or royalist factions; and furthermore, in then governing England during the Commonwealth-Protectorate era and in altering the nature of the established Church of England.[12] In 1659, the year after Cromwell's death, the army terminated the Protectorate of his son Richard, and then forced the dissolution of the Long Parliament. The new parliamentary Convention that replaced it in April 1660 then invited Charles II (1660–85) to resume his throne.The ensuing Restoration Parliaments enacted two statutes to rid England of any Calvinist, and therefore Republican, influences within the English church and governments (national and local): the Corporation Act of 1661 and the Test Act of 1673.[13]

Together these statutes required anyone seeking to hold any church or government-related position (including the army, local justices, education, etc.) to swear oaths to conform to the Thirty-nine Articles of the Church of England and to take communion annually within the established church. As noted earlier, those Protestants who refused to do so were thus known as Non-Conformists or Dissenters. Along with Calvinists and Presbyterians, this group included such other Protestant sects as Baptists, Quakers, Unitarians, and later the Methodists.[14] When, however, the Catholic King James II (1685–88) was deposed in the Glorious Revolution, his successors, his daughter Mary II (1689–94) and her husband the Dutch prince William III of Orange (1689–1702), insisted that Parliament protect the religious rights of his Calvinist coreligionists, in the Toleration Act of 1689 (not including Catholics or Unitarians).[15] That act did not, however, annul the provisions of the Corporation and Test Acts, so that Dissenters remained barred from all the aforementioned government, and government-related and church-related, positions and schools.

Do these sociopolitical events and circumstances themselves explain why Dissenters came to play such a vital and clearly disproportionate role in the ensuing age of the Scientific Revolution (from 1660) and then in the Industrial Revolution era itself? Or should the answer be sought in the socio-psychological evolution of Calvinist Protestantism, as indicated in the Weber-Tawney thesis? Or are there yet other, alternative if complementary explanations?

Certainly one obvious explanation for that disproportionate role, to be sought in the first hypothesis, is the Dissenters' minority status: yet one without the burden of true oppression, in enjoying that "halfway" house of full religious but only partial social toleration. Thus their obvious challenge. Finding themselves excluded from the normal avenues of wealth, power, and social prestige, now available only to members of the established Church of England, the Dissenters instead sought to succeed and prosper in alternative avenues that did remain open to them: namely, in the worlds of business enterprise, commerce, finance, and industry (but also commercial agriculture). Perhaps they also experienced a deep psychological compulsion and social drive to prove themselves, both in their own eyes and in the eyes of society: so that such minority status did not mean inferior social status.

Another explanation, one that T. S. Ashton has offered, is "the fact that, broadly speaking, the Nonconformists constituted the better educated section of the middle classes," which was chiefly due to the role of the so-called Dissenting Academies (1948, 19). They were the educational institutions that the Dissenters had been forced to establish, after having been barred from the traditional church- and state-sponsored schools and universities. Many of these academies were modeled after Scottish Presbyterian schools, which, in Ashton's view (endorsed by many others), were "in advance of that of any other European country at this time," as were Scottish universities.[16] Such schools focused upon or emphasized mathematics, the physical and biological sciences, and modern languages (English, French, and German especially). Also included in the curriculum were such practical subjects as accounting, surveying, and engineering. Necessarily eschewed—if only on grounds of opportunity cost—were the traditional subjects long favored by Church of England schools, "public" (i.e., private), and state grammar schools: Greek and Latin language and literature, philosophy, theology, and history. Even if history and Latin were also taught in the Dissenting academies, they were not taught within the same framework (theological) and emphasis; for indeed many Dissenters viewed Latin with some suspicion as still the fundamental language of the Catholic Church.

In Ashton's view, and certainly in the view of many other historians, the education offered by the Scottish schools and the English Dissenting academies was one more in tune with the objectives of the post-1660 Scientific Revolution and then of the British Industrial Revolution, and one more likely to inspire profitable innovations and entrepreneurship in both. Nevertheless, this Ashton thesis does not really tell us why these schools were so different from and better than the traditional schools: why in particular they were so much oriented to the worlds of science and business. One answer may be that those designing the curriculum in the Scottish schools and Dissenting academies were not encumbered by centuries of tradition and church-sanctioned and aristocratic social requirements. Another may be market demand: most of the students came from predominantly middle-class families that were then involved in the world of business, commerce, finance, and engineering.

Even to the extent that both explanatory models are valid, they do not permit us to discard the essence of the Weber-Tawney thesis, in particular the *subsequent* ways in which English society, in the later seventeenth, eighteenth, and early nineteenth centuries, came to interpret the Calvinist doctrines discussed above. For a better historical perspective, let us recall that in France, in 1685—just four years before William III's Toleration Act—King Louis XIV had revoked the Edict of Nantes, which Henry IV (a Calvinist forced to convert to Catholicism to gain the throne), had promulgated in April 1598, in order to grant full religious rights and full civil liberties to France's Protestant Huguenots, thereby ending the country's horribly divisive and destructive Wars of Religion (1562–98). The revocation of the Edict of Nantes soon led to the expulsion or emigration of a high proportion of the nation's Huguenots, many of whom were, like the Dissenters, disproportionately active in trade, commerce, and banking.[17] While many refugee Huguenots fled to Protestant Holland and Protestant German states, some also came to England, where they made valuable contributions to the growth of the English business community, in trade and banking in particular (see Crouzet 1991).

Stanley Chapman, in his impressive monograph *Merchant Enterprise in Britain* (1992), provides much additional supporting evidence for the unusual economic and social role of the Dissenters in the Industrial Revolution era, stressing in particular the importance of their international mercantile connections with coreligionists abroad (especially in the American colonies), indeed the vital importance of both their family and religious ties for providing the necessary trust involved in "the transmission of credit and trading reports." For all economic transactions involving principal-agent relationships—perhaps accounting for the majority of economic transactions in European economic history—have vitally depended on trust and confidence between all participants, in order to obviate the high transaction costs of enforcing agreements and monitoring a multitude of activities. Certainly, most economists would quickly recognize the importance of principal-agent relationships that were based on both knowledge of and trust in those with common religious, social, and business activities, and a common need of coreligionists and family members to unite for protection against hostile forces. Or as David Landes has so cogently and pithily observed: "In banking [and trade], connections count."[18] Finally, Chapman contends that economic ideology played almost as important a role in the striking mercantile success of the Quakers and Unitarians in the eighteenth and nineteenth centuries (1992, 43–47).

There are, of course, many other possible or hypothetical relationships between Protestantism and the development of modern forms of capitalism and of capitalist entrepreneurship in particular that have concerned a wide variety of historians and sociologists, but cannot be considered in this study.[19] That question of relationships includes a deeper sociological analysis of the Protestant "work ethic," which pertains as much to artisans, tradesmen, and professionals, as to entrepreneurs. One other possible relationship, and a major difference between Protestantism and Catholicism, that has not been so well studied is the question of confession and guilt. Well known, of course, is the power and prevalence of the Catholic confessional, in which the penitent, in confessing his or her sins by the sacrament of penance, to a hidden priest, receives absolution or formal remission of sin: that is, forgiveness and thus the (temporary) removal of guilt. Protestants had and have no such confession-

als, and no such absolution and thus no such removal of the stain of guilt. To what extent were Protestants, and not just Calvinists and other Dissenters, motivated to achieve success in order to absolve themselves of guilt—not so much guilt for actual sins committed but guilt for not living up to their ingrained ideals, including those of the Protestant "work ethic"?[20]

## Protestants in England's Glorious Revolution and the Ensuing Financial Revolution

Finally, any analysis of the relationship between Protestantism and capitalism, and the role of the Dissenters, in the century from the end of the Civil War and Cromwell era to the beginnings of the Industrial Revolution, must also be seen in the context of major constitutional and institutional changes. Those were principally the product of the aforementioned Glorious Revolution: the overthrow of King James II (1685–88), and his replacement by Mary II and her Dutch *stadhouder* husband William III of Orange. Well known is the 1989 article of Douglass North and Barry Weingast on the consequences of this Glorious Revolution. Those consequences included not just the quasi-religious freedom offered by the Toleration Act of 1689, but more so the final establishment of the supremacy of Parliament—of the House of Commons over finances. That in turn also brought about the establishment of judicial independence and the rule of law and property rights, as much in the market economy—greatly reducing transaction costs (as defined by North)—as in the political sphere and civil conduct. The most specific and immediate example was the 1689 Bill of Rights, establishing the rule of law over royal supremacy.[21]

Perhaps of equal importance, especially for this study on entrepreneurship, is what the British still call the Financial Revolution, whose chief institutional features were clearly imported from William's Dutch Republic (The United Provinces).[22] That led to the establishment of a permanent funded national debt—the responsibility of Parliament, not of the Crown—based on the government's sale of fully negotiable perpetual annuities (Dutch *renten*), traded on the London and Amsterdam stock exchanges, and financed by the levy of excise (consumption) taxes authorized by Parliament.[23]

Any such seemingly radical reinterpretation of economic history, on critical "turning points," has naturally and recently provoked a considerable reaction in the periodical literature (see Sussman and Yafeh 2006; Stasavage 2003, 2007). Though I do not believe that the critics have succeeded in negating the North-Weingast thesis, the nature of this study on British entrepreneurship, along with lack of space, precludes any further analysis of this debate, except to note one relevant point: the relationship between a major religious issue, for Protestants as well as Catholics—the usury doctrine, and the origins and nature of the Financial Revolution.

As I have contended elsewhere, those origins lie in the vigorous resuscitation of the antiusury campaign in the early thirteenth century, following the Church Council Lateran IV, in 1215, and the contemporary establishment of the two mendicant preaching orders—the Franciscans and Dominicans—preaching hellfire and damnation for those guilty of the mortal sin of usury: both for those who exacted and those who paid any interest on a loan. There is considerable evidence that, from the 1220s, in many towns in northern France and Flanders, more and more merchants

and financiers, fearing such damnation, preferred to accept much lower returns on annuities (*rentes, renten*) purchased from urban governments than the far higher interest rates that they would have earned on loans or debentures. As the papacy soon determined, as early as 1251 (Innocent IV), the *rente* or annuity was not a loan, and hence not subject to the usury doctrine, because the purchaser had surrendered his capital in perpetuity to the seller, and thus had no right to redeem or reclaim his investment, while the seller could later choose to redeem the annuity at par. By the sixteenth century, the sale of annuities (*rentes*) was displacing loans as the predominant form of public borrowing in western Europe: thus, providing the precedents for England's own Financial Revolution (Munro 2003a, 2008c; Tracy 1985, 1995, 2003).

The relevance for seventeenth-century England is simply the fact that most Protestants had continued to be as hostile to usury as most Roman Catholics had been, and probably even more so. We have been led to believe, however, that after Elizabeth I's Parliament of 1571 had amended the usury laws to permit interest up to 10 percent—so that henceforth usury came to mean any interest charges above that limit—public hostility to "normal" interest waned. But such a view is far from the truth. Even Elizabeth's statute used hostile language in stating (in an almost contradictory fashion) in its preamble that "all Usurie" was "forbydden by the lawe of God."[24] In fact, Elizabeth had merely restored her father's statute of 1545 (Henry VIII), which had then been repealed under the even more Protestant regime of Edward VI, in 1552: "Usurie is by the worde of God utterly prohibited, as a vyce moste odyous and detestable."[25]

Furthermore, John Calvin (1509–64) and Martin Luther (1483–1546), the two major initiators and leaders of the Protestant Reformation, did not really have the more liberal views commonly attributed to them on the usury issue. Only grudgingly did these religious leaders accept interest payments: but only on investment loans and only to a maximum of 5 percent.[26] Calvin himself clearly voiced his disapproval in stating that "it is a very rare thing for a man to be honest and at the same time a usurer."[27] He had also contended that all habitual usurers should be expelled from the church (Noonan 1957, 365–67); and indeed in Holland, the Calvinist synod of 1581 had decreed that no banker should ever be admitted to communion service (Parker 1974, 538). Subsequently, in the seventeenth century, an English Puritan minister observed that "Calvin deals with usurie as the apothecarie doth with poyson";[28] and early in that century the renowned Sir Francis Bacon (1561–1626) had contended that "Usury is the certainest Meanes of Gaine, though one of the worst."[29] According to Richard Tawney, the English Puritan clergy continued to preach against the "soul-corrupting taint of usury" to the very eve of the English Civil War (Wilson 1925, 106–34, esp. 117; Tawney 1926, 91–115, 132–39, 178–89).

It is thus important, in the early-modern history of usury laws and the origins of England's own Financial Revolution, to note that, although Elizabeth I had set the maximum interest rate at 10 percent (1571), subsequent Parliaments lowered that legal maximum, evidently in accordance with the long-term decline in real interest rates: to 8 percent in 1623, to 6 percent in 1660, and finally to 5 percent in 1713, the rate that continued to prevail until Parliament finally abolished the usury laws in 1854.[30] Hence another point of significance about England's Financial Revolution, in establishing its own permanent funded national debt: it was entirely based on annuities, and not on loan instruments (bonds and debentures), and thus it was

also fully exempt from these usury laws, with such a low legal maximum.[31] One indication of the success of the Financial Revolution was the fall in the interest rate on government borrowing from the 14 percent return on the Million Pound Loan of 1693 (in fact a lifetime annuity, marking the inception of the Financial Revolution) to the 3 percent return on consols in 1757, with the completion of Pelham's Conversion.[32]

That reduced considerably the extent to which government borrowing, principally to finance warfare, "crowded out" capital investments for private enterprise; and the fully negotiable consols themselves provided British entrepreneurs with an exceptionally valuable form of collateral in borrowing capital, both working and fixed capital.[33] Few entrepreneurs were and are able to survive without borrowing at some time in the development of their business enterprises.

## Tawney's Thesis on "Agrarian Capitalism" and the "Rise of the Gentry" Debate

Tawney had first achieved academic fame, not with *Religion and the Rise of Capitalism,* but much earlier, in 1912, with his study on the enclosure movements and the evolution of "agrarian capitalism" in Tudor-Stuart England: *The Agrarian Problem in the Sixteenth Century*. Subsequently, almost three decades later, in 1941, he achieved even greater fame, but then trenchant opposition, opprobrium, and misfortune, with his famous article on "The Rise of the Gentry." His goal was to explore both the social and economic origins of the English Civil War, and also of modern capitalism. In his view, the English gentry were or largely became agrarian "capitalists," who were imbued with an entrepreneurial spirit and profit-maximizing motivations, far more so than typical members of the traditional, military-oriented, aristocracy—or, more properly speaking, the peerage: that is, dukes, archbishops, marquesses, earls (= European counts), viscounts, and barons.

The term *gentry* has to be understood as a unique English social institution, in its relation to the genuine aristocracy.[34] For the English aristocracy differed in many important respects from continental forms. In the first place, only the eldest son, by the law of primogeniture, inherited the noble or aristocratic title, along with the attached estates, and thus the right to sit as a peer in the House of Lords. All other offspring were commoners under law (even if having a lifetime courtesy title of Lord), while on the continent they would have been considered members of the aristocracy. Therefore, many members of the English gentry were the younger sons and relatives of these peers; and consequently—as Tawney was really loathe to admit—they were generally indistinguishable economically, socially, and politically from the peers. Certainly they were not a separate social class. Furthermore, while all knights (cavalry horse soldiers) were considered to be aristocrats on the continent (*noblesse d'épée*), they were all legally commoners in England; and they were also the major component of the House of Commons in medieval and early-modern England. The English gentry also consisted of those second-generation gentlemen farmers whose fathers—often of bourgeois or even yeomen origins—had purchased manorial estates and who then bred their children to emulate the lifestyles of a lesser landed nobility, though without (in Tawney's view) losing their bourgeois acquisitive and entrepreneurial instincts.[35]

Tawney's thesis begins again with the question of Protestantism: namely, Henry VIII's break with Rome to establish an independent Church of England, in 1534 (Act of Supremacy), a break that was solidified with the dissolution of the monasteries in the years 1536–41. Initially, most of the monastic lands, accounting for perhaps 20 percent of the developed arable lands of England, were either given as rewards or sold to Henry's aristocratic supporters—to ensure that they would support him against Rome. But during the following century—from 1536 to the outbreak of Civil War in 1642—about 90 percent of those monastic lands (according to most estimates) passed into the hands of the gentry.[36]

In Tawney's view, the economic mechanism that lay behind this vast transfer of land to the gentry was the Price Revolution: in particular the variety of responses to this long sustained inflation, commencing just before 1520 and lasting until the mid-1650s.[37] Tawney contended that the traditional feudal aristocracy were suffering from three related problems during the Price Revolution era. First, most aristocrats' estates were in the form of hundreds or more manors scattered across not just England, but across the British Isles. That scattering made estate management very difficult to undertake, all the more so since much of their estate income was in the form of fixed feudal dues and relatively fixed (nominal) rents for both freehold and copyhold peasant tenures. Consequently, their estate incomes did not rise with inflation.

The second problem was that many of the aristocracy were still imbued with a feudal mentality that scorned any thought of commercial estate improvements and profit-maximization—certainly not any form of "agrarian capitalism," as Tawney envisaged it—and also any thought of seriously disrupting the lives of their tenants, many so loyal to their lords over many generations. The third and related problem was that their political, military, and social statuses, so necessary to maintain their aristocratic rank, were becoming increasingly expensive to maintain, especially when many such costs—chiefly military and court services—were rising faster than the consumer price index, or the overall price level.[38]

Whether all or most of these factors were really true of the Elizabethan aristocracy, clearly many did opt for the line of least resistance in coping with inflation: namely, to live off their capital by selling lands, especially recently acquired lands that were not governed by aristocratic estate entails. That meant chiefly their lands of monastic origin, though many aristocrats were also finally forced to sell patrimonial estate lands as well. The Tudor and early Stuart monarchs were similarly forced to sell off crown lands, for the very same reasons.[39]

Many of the gentry, on the other hand—again, in Tawney's view—did not face such enormous demands on their time and energies. Furthermore, in having far smaller estates, often with only a few manors, they had a commensurately greater ability to engage in rational estate management, and indeed to engage in the enclosures that became so prominent in Tudor-Stuart and Hanoverian England, so that by the early eighteenth century about 70 percent of the cultivated arable land of England had been enclosed.[40] Such enclosures eliminated communal peasant tenancy rights and permitted the engrossing or amalgamations of the scattered plow strips constituting the former peasant tenancies into compact farms under single unified management, whether undertaken by the landlord himself or by his tenants, who leased lands at market rentals. That allowed both gentry landlords and their major tenants, now freed from peasant property rights and their communal constraints, to

engage in the New Husbandry, most of which was imported from the Low Countries. Thus much of the gentry, whether they managed their own estates, as capital farms, or let their enclosed lands to tenant farmers, on relatively short-term leases, were able to capture much more of the economic rent (Ricardian rent) that accrued with the steady rise in the real values of most agricultural commodities—economic rents that would otherwise have been captured by those freehold and copyhold tenants enjoying fixed, nominal money rents.

What is the current evidence for the extent of such land transfer? According to statistics from various sources (unavailable to Tawney), presented in table 5.1, the gentry's share of English arable lands rose from about 25 percent in 1436—thus indicating that the gentry had already "risen" long before 1536—to 45 percent in 1690, and to 50 percent by 1790.

Those gentry gains, up to 1690, appear to have come chiefly from the Church and the Crown, whose share fell from 35 percent in 1436 to just 10 percent in 1690, while the shares for the peerage (aristocracy) fell only from 20 percent in 1436 to 18 percent in 1690. But these figures are highly misleading, in not revealing that a considerable proportion of aristocratic land holdings in 1690 consisted of estates that were held by many former gentry who had acquired peerages after 1660 (when the ranks of aristocrats had been seriously depleted, for various reasons). As this table indicates, and as H. J. Habakkuk had contended, they undoubtedly provided a major reason why this rejuvenated aristocracy, so vastly different from that of the Elizabethan era, was able to regain its share of land holdings to about 25 percent, a century later, in 1790. Note, from this table, that the gains in both aristocratic and gentry landholdings, from 1690 to 1790, came chiefly at the expense of yeomen freeholders.

We should not assume that these new peers had shed their former gentry customs, culture, and socio-economic and especially entrepreneurial outlooks. Indeed, many of them—such as Norfolk's Second Viscount Charles Townsend of Rainham (1675–1738), known as Turnip Townsend—were major proponents and practitioners of the New Husbandry.[41] Of course one can find many variations, with some gentry who failed as capitalist farmers, or those who simply failed to engage in rational estate management, and contrary examples of some aristocratic landowners who did cope with inflation and prospered—though most such examples are really found among the aristocracy of gentry origins, in the post-Restoration era.

In general, the Tawney thesis on the "rise of the gentry"—even if the gentry had risen long before Tawney's century—deserves more support and credit than most

**TABLE 5.1**
Percentage of Land Held by Various Social Groups in England, 1436, 1690, and 1790

| | 1436 | 1690 | 1790 |
|---|---|---|---|
| Church and Crown | 35% | 10% | 10% |
| Peerage (aristocracy) | 20% | 18% | 25% |
| Gentry | 25% | 45% | 50% |
| Yeomen freeholders | 20% | 27% | 15% |

*Sources*: Mingay 1976, table 3.1, p. 59, based on Cooper 1967; Thompson 1966, table 3.1.
*Note*: Figures adjusted, to add up to 100 percent.

historians seem willing to grant it. For unquestionably, Tudor-Stuart England did experience the transfer of a vast amount of productive lands into the hands of those more likely, more able, more willing, and certainly more predisposed to engage in rational estate management, and other commercial enterprises, indeed to engage in entrepreneurial profit-maximization.[42] Furthermore, as Tawney and many others have noted, a high proportion of these gentry, especially in the seventeenth century, were Puritans—the most renowned example being Oliver Cromwell himself (see Cliffe 1984, 1988).

The extent to which at least a significant number of the English gentry and their major leasehold tenants did become or act as genuine "agrarian capitalists," employing significant innovations in market-oriented mixed husbandry (i.e., combining the cultivation of grain and other arable crops with livestock raising, both sheep and cattle), with the aim of maximizing profits, has yet to be fully explored. But consider, for example, the ingenuity and entrepreneurship of the Herefordshire gentleman farmer Roland Vaughan, who, in 1589, invented and then popularized the "floating meadow" (or water meadow). This capital-intensive innovation involved the use of sluice gates, dykes, and canals to divert water from streams or rivers to flood the meadows or parts of the arable in November, and then to drain them in March. That provided a thermal blanket, under the ice, to protect the underlying soil from freezing and to promote far earlier and more intense germination, yielding as much as an eightfold increase in hay production.[43]

Certainly the very character of English agriculture did change dramatically from this period, especially with the far more widespread diffusion of convertible husbandry, which led to major increases in agricultural productivity. In essence, convertible husbandry meant the alternation in the use of agricultural land between arable and pasture (as opposed to the previous regime of permanent arable and permanent pastures) over a cycle of five or more years, the cultivation of a wider variety of crops, including far more powerful nitrogen-fixing legumes (clover, alfalfa-lucerne, sainfoin), other fodder crops, and industrial crops, thereby eliminating the need for fallowing parts of the arable. It also provided far more efficient pastures and thus a far more productive form of livestock raising. That in turn vastly improved livestock feeding (with more fodder crops from the arable) and the size of cattle and sheep herds. Equally important, enclosures and convertible husbandry also permitted selective breeding of livestock, which had been virtually impossible with the previous communal grazing system of open field peasant agriculture. Convertible husbandry became the very heart of the later so-called Agricultural Revolution, in providing the most efficient and productive form of agriculture before the advent of modern chemical fertilizers.[44]

The greatest and most widespread diffusion of convertible husbandry, especially with the cultivation of the new legumes, came during the period of an agrarian recession, from the 1660s to the 1740s, when the behavior of relative prices promoted a shift from grain growing to fodder and industrial crops, and especially a much greater shift to livestock products. At the same time, a fall in grain prices, while wages and other farm costs were rising, created a price-cost squeeze, which in turn provided a strong incentive for farmers to increase efficiencies per unit of labor and per acre of land. Convertible husbandry, along with the introduction of floating meadows, required very large infusions of capital, which were generally obtained by mortgaging enclosed lands; and mortgaging was also virtually impossible to

undertake with communal peasant open field farming. Those landowners and tenants-in-chief who did engage in mortgage financing, and those who succeeded in vastly increasing rents and profit margins, certainly were entrepreneurs, in any sense of the word, and well deserve to be called agrarian capitalists.[45]

One may cavil, however, that while many such gentry did become, in Tawney's terminology, genuine agrarian capitalists and were responsible for promoting important innovations in agricultural productivity, such developments are not really relevant to a study on entrepreneurship—even if they did promote English economic development. The proper response is that the Tawney thesis on agrarian capitalism is highly relevant, in two respects, if we may now draw on the wisdom of Joseph Schumpeter (1883–1950).

## Schumpeter on Entrepreneurship

First, many of us who have written on this theme have been inspired by the work of Schumpeter: especially his classic essay on this subject, but also his many other publications.[46] His views on the historical development of entrepreneurship do not seem to be confined merely to the worlds of industry, commerce, and finance. In my view, he would have implicitly accepted Tawney's "agrarian capitalism" (if he accepted the thesis itself) as an integral part of the evolution of modern entrepreneurship. Indeed, his definition of entrepreneurship is exceptionally broad: that which succeeds in "transforming or combining factors into products [and services]." Schumpeter comments further: "If there is not necessarily any sharp dividing line between entrepreneurial activity and ordinary management," nevertheless, "the distinction between adaptative and creative response to given conditions may or may not be felicitous, but it conveys . . . an essential difference." For Schumpeter, an apt synonym for an entrepreneur is a business innovator—someone who proves successful in introducing and maintaining productive and profitable economic changes in his or her enterprise. Especially important for this study is Schumpeter's view that "the entrepreneurial function need not be embodied in a physical person or, and in particular, in a single physical person" (Schumpeter 1949, 254–55).

Certainly in this study one basic objective is an investigation of the economic, social, and cultural forces that induce profitable innovations as the key to economic growth. A related objective is to demonstrate that innovations, especially technological innovations, have been fundamentally the products of capitalist entrepreneurship, in all four key sectors of the economy, including agriculture. Above all, we must always be clear in distinguishing between mere inventions—many of which were never successfully applied in their day (e.g., Hero of Alexandria's steam pump, of circa 60 CE)—and entrepreneurial innovation: the successful, productivity-increasing, and profit-maximizing application of new techniques and new technologies in some business enterprise, including agricultural enterprises.

Another justification for examining the role of the early-modern English gentry in such entrepreneurial innovations is simply the long-accepted fact that many gentry landowners did not draw even the greater share of their incomes from leasehold rentals. Nor did they confine their enterprises to agriculture. For they also invested in mining, metallurgy, and textiles. We must remember that many capitalistic industrial enterprises—in mining and metallurgy especially—were necessarily found on

gentry estates; and much of the capital investment in these enterprises came from gentry landowners, for clearly they had a disproportionate amount of the nation's wealth to make such investments (see in particular Simpson 1961). The extent to which they financed and promoted or engaged in English industrial development in the early-modern era is yet another avenue of research that needs to be more fully explored, despite several important recent studies.[47] Even more important would be a fully-researched historical analysis of those gentry, and especially the well-educated and the socially, economically, and politically well-connected sons of gentry who became successful, profit-maximizing entrepreneurs in business itself, as usually the term is understood: in industry, commerce, and finance.

## The Hamilton-Keynes Thesis on Profit Inflation and the Rise of Industrial Capitalism during the Price Revolution Era, and the Gould Alternative

Pre–World War II scholarship on economic issues in Tawney's century (1540–1640), especially those involving the Price Revolution, includes two other scholarly names, once renowned, if not so much today, for clearly neither had Tawney's intellectual caliber. Yet both remain important for raising very important issues for any scholar analyzing the origins of early-modern industrial capitalism and related issues of capitalist entrepreneurship. We simply cannot dismiss them for supposed defects in their scholarship, if they did succeed, in this fashion—that is, by investigating such critical issues—in promoting our understanding of the evolution of early-modern English entrepreneurship, and industrial capitalism.

The first was Earl Hamilton (1899–1989), professor of economics at Chicago (1949–69), and President of the Economic History Association in 1951–52. His chief claim to fame in economic history is in providing some statistical foundations for an explanation of the inflation of the European Price Revolution era based on a quantity theory of money, in many publications, from 1928 (Hamilton 1928, 1929a, 1929b, 1934, 1936, 1942, 1947, 1952). Since the time of the French philosopher Jean Bodin (1566) a majority of scholars had in fact assumed that the primary cause of the Price Revolution was the influx of silver from the Americas (Bodin 1946; Wiebe 1895). That inflation had in fact begun much earlier—in Spain, England, the Low Countries, Italy: from at least the 1520s, long before any significant amounts of Spanish-American silver had arrived in Europe. Some economic historians, on discovering this fact, unfortunately leapt to the false conclusion that the true, fundamental cause of this inflation was instead population growth. In fact the initial causes were monetary, but in the form of the south German–central European silver mining boom (ca. 1460–ca. 1550) and a financial revolution in the 1520s, issues that need not detain us here, except to note that Hamilton himself had also perceived the importance of these two issues, and did not (contrary to popular opinion) contend that the influx of American silver provided either the initial cause of the Price Revolution or the predominant cause of Spanish inflation during its final phase, in the first half of the seventeenth century.[48]

Hamilton's second claim to fame, and the one far more relevant to the theme of this study on entrepreneurship, was his 1929 thesis that the inflation of the Price Revolution was fundamentally responsible for the birth of modern industrial capitalism through the mechanism of "profit inflation." In truth, Hamilton really owed

his fame to the fact that the eminent economist John Maynard Keynes (1883–1946) had so strongly and publicly endorsed Hamilton's thesis; and indeed it was Keynes himself who actually coined the term *profit inflation* (in 1930).[49]

In essence, Hamilton and Keynes argued that in this era industrial wages lagged behind prices, particularly in England (but not so much in Spain), thereby producing growing profits, the bulk of which English entrepreneurs chose to invest in larger-scale, more capital-intensive forms of manufacturing industries and other industrial or commercial enterprises, for example, overseas joint-stock trading companies (see below).

To be sure, in England, as in many other European countries, nominal or money wages generally did lag behind consumer prices; and such a phenomenon can be found in many other eras as well (including the twentieth century). Unfortunately for Hamilton, however, he used wheat prices to measure the price level. From the 1950s, most economic historians have instead preferred to measure changes in the price level by following the model of Henry Phelps Brown and Sheila Hopkins: by constructing a weighted "basket of consumables" consumer price index. In their index, about 80 percent of the commodity weights consist of foodstuffs: wheat, rye, peas, barley, malt (for beer), butter, cheese, meat, and fish. The remaining 20 percent is in common industrial products: chiefly textiles and fuels.[50] In all price indexes for this era, grain prices rose the most, by a very substantial degree, followed by those for wood fuels, and livestock. Prices for industrial manufactures did rise, as well, but by a far lesser degree. It is far from clear that in various individual industries prices of manufactures rose more than did the wages for those who produced them.

Under such circumstances, one may ask why English industrial entrepreneurs would have necessarily, by the Hamilton model, invested their supposed extra profits, if any, in larger-scale, more capital-intensive forms of industry, when labor had become relatively so cheap, and, in real terms, had become even cheaper. Furthermore, if the real wages of industrial labor had declined, from a rise in their cost of living, industrialists in general would have achieved market gains only if the real incomes of those engaged in other economic sectors—agriculture, commerce, and finance—experienced a more than compensatory rise. That was an important issue that neither Hamilton nor Keynes (nor indeed most other historians) ever really considered.

With the now better-observed long-term behavior of relative prices and wages in early-modern Europe, we may confidently assert that Hamilton and Keynes were not justified in contending that industrialists enjoyed any verifiable profit inflation. Indeed, no economic historian can make such a contention without measuring, industry by industry, the long-term relationships between industrial wages and the wholesale prices for the manufactures that wage-earning employees produced. For the later sixteenth- and seventeenth-century southern Low Countries, arguably then one of the most advanced industrial regions in Europe, I myself have found evidence for the very opposite of profit inflation: a rise in industrial wages (for building craftsmen) that was, overall, greater than the rise in the industrial price index. And yet that did not seem to impair the profits and fortunes of most industrialists and entrepreneurs in the seventeenth-century southern Low Countries (Munro 2002).

Whether or not, in this and other eras, inflation reduced the factor cost of labor in this and other sectors of the economy may seem to be an interesting if moot question. Yet this question raises two very important and more major issues: (1) what has been the historical impact of inflations and deflations upon all factor costs of

production; and (2) how have industrial entrepreneurs reacted to such changes in their real factor costs: that is, have such changes proved to be yet another spur to entrepreneurial innovation?

One of the very few economic historians to explore this vital issue was John D. Gould, though regrettably without much success in affecting historical interpretations. In a now all but forgotten article, published in 1964, Gould contended that inflation generally reduced an arguably even more important factor cost: namely, the cost of capital. Thus, insofar as early-modern entrepreneurs had borrowed funds for capital investment by contracts that specified the payment of annual interest and finally the repayment of the principal, in current money-of-account terms, the inflation of the Price Revolution era had cheapened the costs of previously borrowed capital. Any contrary contention that lenders of this era—when annual rates of inflation were still low by modern standards—had responded by raising their interest rates is fully negated by abundant evidence that nominal interest rates were continuously falling in the sixteenth century (in Flanders, from 20.5 percent in 1511–15 to 11.0 percent in 1566–70), so that in fact, with inflation, real interest rates fell even further.[51]

Finally, we may observe that insofar as the Price Revolution did cheapen capital costs, it did so in ways that more directly promoted larger-scale, more capital-intensive forms of manufacturing industries. One may also argue that it similarly promoted larger-scale capital-intensive agricultural and commercial enterprises.

Perhaps, however, the real significance of the ill-formulated Hamilton thesis is that it provoked his colleague John Nef into producing an alternative thesis to explain the early-modern origins of genuine industrial capitalism in Tudor-Stuart England, and one that certainly involved rational if risk-taking innovative entrepreneurship.

## The Nef Thesis Revisited (with Wrigley and Hatcher): The Tudor-Stuart Energy Crisis and an Early Industrial Revolution

John Nef's counterthesis on this same theme was that England experienced a veritable "energy crisis" in Tawney's century, 1540–1640, and one that entrepreneurs largely resolved (in Nef's view) in the form of an "early industrial revolution." This "revolution" involved very significant industrial innovations, specifically important technological innovations in fuel consumption, and also necessarily in the form of far larger-scale and genuinely capitalist forms of enterprise.[52]

The traditional medieval and early-modern industrial economies had been fundamentally wood-based—for both fuels and construction. In Nef's view, the energy crisis took the form of soaring wood and wood charcoal prices, rising as much as or even more than grain prices, and certainly to a far greater extent than industrial prices. The implicit culprit was population growth. Indeed, as we now know (and better than Nef), the population of England and Wales well more than doubled in this era: rising from about 2.250 million in the 1520s to reach a peak of 5.773 million in the mid-1650s.[53] That demographic expansion, combined with a disproportionate growth in urbanization, and a rapid growth in shipbuilding for overseas trade, led to a far more extensive deforestation than was experienced in any other region in northern Europe.

Furthermore, as Nef contended, England enjoyed a singular advantage over any other European region afflicted by a similar fuel crisis: in enjoying an abundant

supply of readily accessible, relatively cheap coal, easily transportable by water (river or seaborne) in much of England. Thus a continuing divergence between wood charcoal and coal prices provided industrial entrepreneurs with a strong cost-price and profit incentive to shift from wood fuels, or wood charcoal, to coal. This contention subsequently, from the mid-1950s, aroused considerable, and generally very hostile, criticism from a wide variety of scholars.[54]

In this respect, two very important defects in Nef's analyses of fuel prices must be noted, though they were not defects that his opponents fully, clearly, and convincingly dealt with. First, as many opponents indeed noted, he made the absurd claim that England had suffered a "national" energy crisis during this century, when there were no national markets for wood, wood charcoal, or coal and when available evidence for some regional markets indicates often significant disparities in fuel prices. Nor could there have been any national market with such serious deficiencies in overland transportation and commercial facilities. Charcoal, it should be noted, was not a commodity that could then have been easily transported, chiefly because of its friable nature: that is, its physical instability, such that any agitation or disturbance causes the charcoal to crumble into unusable dust. Instead, in Tudor Stuart England, there were purely regional, local markets: in some such markets, wood remained abundant—and there charcoal was typically created at the forest site. In other regions, it soon became scarce and expensive, especially in relation to coal.

The other defect was to state, on the basis of insufficient data samples, that a serious divergence in charcoal and coal prices had already occurred by the later sixteenth century. My detailed comparative analysis of various sets of wood, charcoal, and coal prices in the same regional markets (see figure 5.1) indicates that, for a wide variety of such regional markets, the most marked divergence in relative prices did indeed take place—contrary to the assertions of some critics—but generally not until after the 1640s, when coal prices starting falling while charcoal prices (nominal and real) generally continued to rise.[55] Nevertheless, for some specific local markets, such as Cambridge and Westminster, the price of a ton of coal was well under half the price of a ton of charcoal—when both had about the same calorific (heating) utility—indeed before the 1640s.[56]

If an industrial shift from charcoal to coal, purely on the basis of relative prices, were the only story to be told, it would not be worth serious consideration in a history of early-modern English entrepreneurship. The real interest lies in the entrepreneurial responses in the form of technological innovations, and consequent increase in industrial scales, that such a change in the choice of fuels necessitated: made necessary in the sense that without such innovations many industrial entrepreneurs would have faced failure and bankruptcies. The basic technological problem involved in choosing coal over wood charcoal lies in the fact that coal is a very dirty fuel that contaminates most products with which it comes into contact. Charcoal, conversely, is a form of pure carbon, and the purest of all available fuels, explaining its worldwide use over many millennia.

There were two possible solutions to the fuel contamination problem. For this early-modern era, the first and indeed only technological solution was the construction of a reverberatory furnace to separate the coal fuel, and its noxious fumes, from the manufactured product. The second solution, which came much later, only with the advent of the Industrial Revolution era, was the distillation and purification of coal, transforming it into coke. That process in turn proved successful only after long, arduous, and costly experimentations, which themselves reveal a true entrepre-

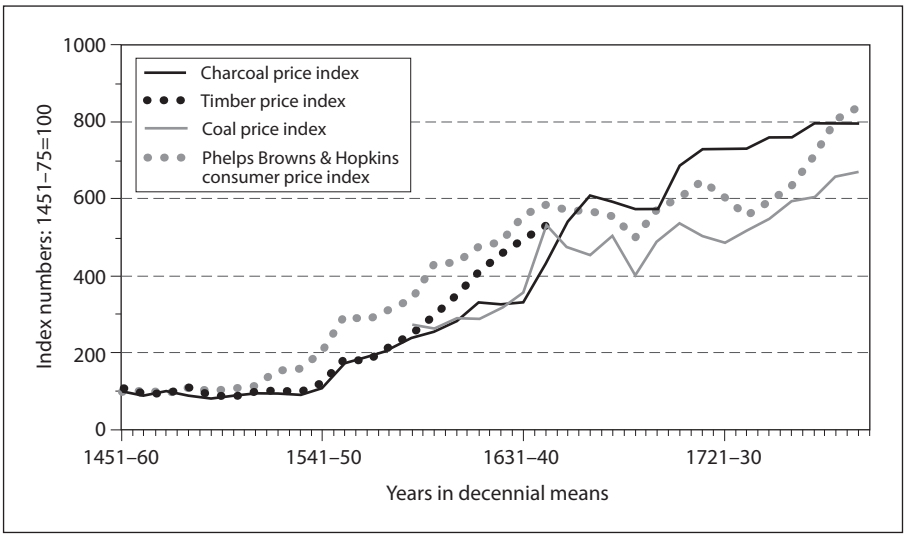


Figure 5.1. Price Relatives for Fuels (Wood, Charcoal, and Coal) and the Phelps Brown and Hopkins "Basket of Consumables" (Revised Version), 1451–60 to 1781–90, in decennial means. Base 1451–75 = 100 for all indexes.

neurial spirit among many industrialists, in the course of the later seventeenth and early eighteenth centuries.[57]

The first solution, the reverberatory furnace, is first described in Vanoccio Birunguccio's *De la pirotechnica*, about 1540, though we do not know who were the original inventors or entrepreneurs, those who first succeeded in achieving this vital technological advance. It was a very large-scale and complex brick kiln furnace that transmitted heat by convection and reflection ("reverberation")—reflecting heat from the roof of the furnace onto the product being manufactured, while isolating the coal fuel itself and the fumes by eliminating the chimneys and using underground pipes to exhaust the fumes and to draw in fresh air.[58] This new furnace also required hydraulic machinery, with large water-powered leather bellows, in order to inject air into the burning coal fuels to achieve the required high levels of combustion. Such technologically complex furnaces obviously required a quantum leap in the scale of capital investment. That in turn meant a dramatic change from simple artisanal production to true industrial capitalism, employing not traditional artisans (owning their own capital), but wage-earning laborers, indeed factory workers.

Would this far more costly furnace technology have threatened the profit margins of the new industrial capitalists? Whatever their initial fears and expectations, the answer is no. For Nef's so-called industrial revolution in fuel technologies in fact entailed three separate sets of cost reductions. First, this new and very capital-costly fuel technology required a commensurately large increase in industrial scale, which in turn ultimately meant a sharp fall in the marginal costs of production. Those changes in scale economies, however, had to be based upon and justified by a very large increase in market sales, from both a general population growth and disproportionate urbanization (discussed below) and an expansion of the market economy itself with the requisite commercial-financial institutions (also discussed below). In other words, the success of this industrial innovation depended upon a large enough

increase in production and sales to distribute the initially high fixed costs over the production run, so that unit costs fell. Second, industrial capitalists achieved gains in transaction, organizational, and labor costs by concentrating production in one centralized, factory-like unit. Third, of course, they benefited by substituting relatively cheaper coal for ever more costly charcoal, at least generally so from the 1640s. Nef's chief point, therefore, is that industrial entrepreneurs, facing this "energy crisis"—even if Nef misdated the real era of crisis—could have survived to prosper only by engaging in a technological change that in turn demanded radical changes in industrial and commercial organization, to achieve much larger economies of scale.

What examples of the new "industrial capitalism," specifically for early-modern (later Stuart-Hanoverian) England, did Nef and other historians of the British coal industry, such as John Hatcher, provide? The chief examples are the following innovative industries: glass (perhaps the first such industry, ca. 1610),[59] beer (brewing with hops), bricks, clay tiles, pottery making, lime-burning (construction and agriculture), soap, paper, gunpowder, brass wares, salt (seawater evaporation), alum and dyestuffs, sugar refining (post-1660). In the field of metallurgy, the new coal-burning industries included those of calcining ores (burning out impurities before smelting); copper-based industries, especially those making brass and bronze alloys; metallic processes in separating silver from lead; the final finishing of many metals, for example, in drawing wire or making nails. None of these was truly new, of course, in terms of the product, but rather in terms of industrial technology; and many did become important as import-substitution industries.

To reiterate the other key point: such industries could have been successful in achieving the necessary scale economies only if they had found sufficient mass markets to consume these products. Such was not the case for export markets, for none of these "new" industries was responsible for any significant exports (except a few industrial products exported to West African and American markets). They were far more successful in the domestic market: thanks to the aforementioned population growth. Although, as noted earlier, the population of England and Wales had reached a seventeenth-century peak of 5.773 million in 1656, and although that population thereafter did experience some decline and stagnation, it rose again from the 1720s to reach a level of 6.757 million in 1761, on the eve of the modern Industrial Revolution era. But far more dramatic and certainly far more important was the growth of London itself. Having been relatively insignificant in 1500, with a population of only about 50,000, it had grown to 200,000 by 1600, to 350,000 in 1650—when it had become indisputably the largest city in Europe—and to 550,000 in 1750. That provided a concentrated mass-market with much lower transaction costs from the very density of sales.[60]

Equally important was the fact that such products as glass, bricks, soaps, dyestuffs, beer, brass- and bronze-wares enjoyed significant price elasticities of demand, so that cost and then competitive price reductions ensured a more than proportional increase in the quantity demanded and consumed. The same effect was achieved, in this era of steadily rising real-wage incomes, from the 1650s, for those products that similarly enjoyed a high income elasticity of demand.[61]

Other major manufacturing industries of this era did not, however, enjoy any such changes and benefit from this new furnace technology. Woolen textiles, which collectively remained by far England's most important manufacturing industry, producing by far its overwhelmingly dominant exports until the eighteenth century (92.5 percent by value, to the 1640s), did not undergo any truly significant tech-

nological changes, not even with the rise of the so-called New Draperies, until the true Industrial Revolution of the later eighteenth century, that is, from the 1760s.[62] Indeed productivity in the eighteenth-century woolen industry remained about the same as that documented for the fifteenth century (Munro 2003b, 1988).

Furthermore, England's other major and growing industry, iron manufacturing, proved to be unable to use the new furnace technology. Until the early eighteenth century, it remained fully dependent on charcoal (and also on water power). The technological reason for that is very simple: smelting iron ore requires the direct contact of the ore, as ferric oxide ($Fe_2O_3$), with the fuel, so that the carbon in the charcoal unites with the oxygen in ferric oxide to liberate the iron (Fe) while producing carbon dioxide: $CO_2$. The initial solution to that problem, and at the same time, the previously indicated second solution to the overall "coal problem," came in 1709–10 with Abraham Darby's development of coke fuels. That fuel was the successful result of distilling coal into coke in an airless furnace, as a virtually purified form of carbon.[63] It did not, however, then produce an "industrial revolution," because initially coke fuels were more expensive than charcoal fuels, and coke-smelting also required extra refining costs, to eliminate the silicon (which, however, improved the quality of cast iron). Coke-smelting became fully cost-effective and thus successful, indeed "revolutionary," only with application of John Smeaton's piston air pumps (replacing bellows, ca. 1760) and then James Watt's steam engine to power them, in 1776. It should be noted that most of the trenchant opposition to the Nef thesis concerns his views—and those of T. S. Ashton—on the supposed "tyranny of wood and water," in curbing the growth of early-modern iron industry. This is a story beyond the scope of this chapter, belonging to the study of the eighteenth-century Industrial Revolution.[64]

In summary, and in all these respects, it is fair to criticize the Nef thesis by contending that no industrial revolution took place in Tudor-Stuart (or even early Hanoverian) England: there was no significant growth of the industrial sector, whether in terms of outputs, exports, or employment. Furthermore, no significant transfers of labor and resources from the agrarian to the industrial, commercial, financial, and service sectors took place in either Tawney's century or the following century: none to compare with those of the later eighteenth and nineteenth centuries.

Nevertheless, we must not overlook the important fact that coal was assuming an ever greater role in the British industrial economy from the sixteenth to eighteenth century, well before the onset of the Industrial Revolution. John Hatcher has contended that "in the latter half of the seventeenth century, sweeping changes occurred in the pattern of industrial coal consumption," so that "by 1700 coal was the preferred fuel of almost all fuel consuming industries, and access to coal supplies had already begun to exert a determining influence over industrial location" (1993, 450, 458). Even if the aforementioned textile industries did not, as noted earlier, undergo any significant technological changes in this era, certainly none involving power, nevertheless they also experienced a major growth in coal consumption for many of their industrial processes: from combing to dyeing to finishing; and in the production of dyestuffs and mordants (Tann 1973; Wrigley 1988, 78; Hatcher 1993, 442–44). Hatcher estimates that British coal output (England, Scotland, Wales) had expanded almost twelvefold: from about 227,000 tonnes in 1560 to about 2,640,000 tonnes in 1700, when it was supplying about half of England's fuel needs (1993, table 4.1, p. 68). Anthony Wrigley has furthermore observed that British coal output was then at least five times greater than the combined output in the rest of the world. By 1800,

British coal output had expanded at least fivefold, to about 15 millions tonnes a year, which was at least five times greater than the aggregate coal output in continental Europe.[65] By 1830, according to Michael Flinn's estimates, Great Britain was producing 30.861 million tonnes (34.024 million tons), almost twelve times as much as Britain had produced in 1700.[66]

The aforementioned rapid and dramatic growth in London's population itself had a major impact on the English coal-mining industry and trade, for that growth could have occurred only with and because of massive imports of coal, especially for domestic heating, chiefly by sea from Newcastle, into London. Certainly London could not have imported enough wood to supply the city's need for both domestic and industrial fuels. As Wrigley has pointed out, a ton of coal produces "about twice as much heat as the same weight of dry wood." Furthermore, noting that an acre of woodland then produced only about two tons of dry wood a year, he contends that the heat produced by one million tons of coal (mined and seaborne) would have required one million acres of forested land.[67]

Coal, as so many historians have contended, became the essential core of European industrialization in the eighteenth and nineteenth centuries, both promoting and permitting very major technological changes, which, by their very nature, were also entrepreneurial changes.[68] Indeed, Wrigley has put forward the seminal thesis that English economic growth and the Industrial Revolution both depended upon a shift from an "organic" (wood) to a "mineral"-based economy (coal).[69] Coal, distilled into coke, replaced charcoal almost everywhere in metallurgy (amalgamating smelting and refining, with vastly increased scales of production); coal-fired steam engines ultimately replaced water-mills, while later coal-fired steam turbines produced a new and very cheap form of power in electricity. And finally, coal also subsequently, and much later, became the fundamental base for a new set of very innovative chemical industries that also constituted part of the so-called Second Industrial Revolution, especially from the 1870s.

In sum, and in retrospect, Nef had supplied the essence of a good case for explaining why England was the birthplace of the modern Industrial Revolution: its entrepreneurial, technological, and industrial primacy in using coal, as the essential ingredient for modern industrialization. But he seriously compromised his case by using poor data, and by exaggerating his claims of growing industrial output in Tudor Stuart England. Perhaps his most serious fault was one of chronology. To reiterate the primary thesis in this historical analysis of English entrepreneurship: the Nef thesis, and Tawney's theses as well, have a much greater validity for the century following Tawney's century—the century preceding the Industrial Revolution. Those innovative entrepreneurial developments in that century indeed do help us better to understand the nature of the forms of the ensuing Industrial Revolution, from the 1760s, especially, and thus obviate concerns about a temporal gap between Tawney's century and the Industrial Revolution.

## Overseas Expansion and Changes in Commercial-Financial Structures

### *The Atlantic Ship*

There remains, however, one further set of English economic and entrepreneurial developments in Tawney's century—actually beginning in the previous century, but in

the Iberian peninsula—that demands our attention in this study: the age of overseas maritime exploration, colonization, and trade. That in turn ultimately brought about economic "globalization." The combination of technological innovation and entrepreneurial ingenuity that physically and economically made this possible—indeed in a very major form of industrial capitalism for this early-modern era—was the development of the so-called Atlantic ship or full-rigged ship.[70] Portuguese shipyards, responding to demands from those oceangoing mariners who had been unable to cope with the Atlantic trade winds off the African coast, had initiated this industrial and commercial transformation by copying and adapting the triangular lateen-sail rigging of the Arabic coastal ship, in fact, a very small boat, known as the *dhow*; but the result was a much larger ship (40 to 200 tonnes) known as the *caravel*, with correspondingly much larger masts. It was that lateen-rigging that provided the caravel with the maneuverability to cope with these Atlantic trade winds, and allowed Portuguese mariners, from 1434, to advance south of Cape Bojador (26° N), and thus to commence their commercial and colonial acquisitions along the West African coast, and ultimately to Asia (India and the East Indies) in a highly successful search for both gold and spices, with the aid of a much improved oceangoing ship.

Subsequently, some unknown Iberian shipyards made the next advance in ship rigging, perhaps in the mid-fifteenth century, by combining the large square canvas sails of the northern Hanseatic *cogge*—providing power and speed—with the caravel's lateen sails: a small lateen spritsail on the bow, the square sails in the middle, and a large lateen sail on the rear or mizzenmast. These full-rigged or Atlantic ships, better known as *carracks* and *galleons*, were much larger than the Portuguese caravels, expanding in size to 600 tonnes in the early sixteenth century and then to 1,500 tonnes by the 1590s. A major factor in that increased scale was the addition of naval artillery: up to fifty or sixty cannons, placed both on deck and below deck. It was this large, full-rigged, heavily armed ship that allowed Europeans to dominate the world's oceanic trade routes up to the nineteenth century. Indeed, it may be considered, along with Gutenberg's printing press (ca. 1450), as the most important technological innovation of the fifteenth century—certainly a marvel of European entrepreneurship.

Another major aspect of this new age of overseas expansion was, of course, the vast influx of Spanish American treasure, silver, especially, which did so much to fuel and promote the ongoing inflation of the Price Revolution era (see Munro 2003c). But surely the more important economic function and consequence of that vast influx was in providing Europeans with essential means of expanding their trade with Asia: all the more so, since silver generally commanded a higher value in relation to both gold and goods in Asia than in Europe. That in turn was the prime consideration in western Europe's subsequent achievement of economic globalization.

### *The Crises in English Trade with the Antwerp Market in the 1550s*

If we date the beginnings of this new era of overseas expansion with Portugal's capture of the Moroccan port of Ceuta in 1415, and then with the Portuguese and Spanish acquisitions in Africa, Asia, the Atlantic islands, and the Americas, to, say, the 1520s, the English appear to have been remarkably slow to seek out these new overseas business opportunities. One reason may have been that English exports, once predominantly in the form of raw wool, were by the 1520s almost entirely in the form of woolen cloth—accounting (as indicated earlier) for at least 90 percent

of the total value of all exports. Almost all of this export trade was directed to the cross-Channel port and market of Antwerp.

Indeed, the original "tripod" or three-legged foundation upon which Antwerp had gained its role as the preeminent commercial, financial, and industrial center at the dawn of the modern era, from circa 1460 to circa 1560, had consisted of first, English woolen cloths; then, south German metals (silver, copper), fustians, and banking; and finally, from 1501, the Portuguese royal staple for the spice trade from the East Indies. English cloth merchants, having been excluded from Flanders, the Baltic, and the Mediterranean, had found only this one available outlet, in the Antwerp market (the Brabant fairs), where German merchants avidly sought their woolens, and had them finished in the Antwerp region, as their chief return cargo, just as the Portuguese later sought south German silver, copper, and banking to conduct their new African and Asian trades (see Munro 1994, 1999).

The English cloth trade boom, from circa 1460 to 1552—almost entirely coinciding with the Tudor enclosure movement (then chiefly for sheep pastures)—reached its culmination, followed by disaster, in the Great Debasement of 1542–52, which Henry VIII and his successors had undertaken to finance their wars. Then, in mid-1552, Northumberland's Protectorate government abruptly revalued the English coinage by 253 percent (a 3.5-fold increase in silver contents). The obvious consequence of this drastic revaluation was a sharp rise in the foreign exchange value of the pound sterling, and hence a sharp increase (if not fully proportional) in the overseas cost of buying English woolens, whose sales soon plummeted on the Antwerp market.[71]

Since the previous debasements had provided such a stimulus to cloth exports, the Antwerp market may have already experienced a glut, so that exports might have fallen even without the revaluation (though probably not as much). From 1546–50 to 1551–55, London's quinquennial mean cloth exports had fallen by 10.4 percent: from 123,780 broadcloths to 110,888 broadcloths; and in 1560s London's mean exports fell to just 85,952 broadcloths (an overall decline of 30.5 percent).[72] By the end of that decade, the outbreak of the Revolt of the Netherlands (1568–1609) made Antwerp quite inhospitable to English trade. But long before those events, the English had already undertaken their new search for alternative trading ports, and that involved a radical change and transformation in business organization in the form of the joint-stock company.

## *The New Joint-Stock Companies of the Later Sixteenth and Seventeenth Centuries*

The very first such overseas joint-stock trading company, the Muscovy or Russia Company, was established in May 1553, in the direct aftermath of the Antwerp crisis.[73] It is also the first (historically verifiable) joint-stock company, a revolutionary new form of business organization.[74] The founders of this new venture subscribed a capital sum of £6,000 through the sale of stock, that is, shares of ownership, with a par value of £25 (i.e., 240 shares). This capital was then invested, with additional expenditures of £4,000, in the purchase of three ships and trading goods. Two ships were lost in the ice of the White Sea en route to Russia (which then had no Baltic port); but the third, under Richard Chanceller, the expedition's leader, did reach Archangel. He successfully negotiated a trade treaty with Czar Ivan IV ("The Ter-

rible"). On his return, Chancellor obtained a royal charter that incorporated the new company "as one bodie and perpetuall fellowship and communaltie," with a monopoly on all trade with Russia and adjacent regions in Asia. By 1563, the capital stock had been increased to £33,600, with permission to call upon a further £60 from each of the 240 shareholders (i.e., an additional £14,400 to bring the total capital to £48,000).[75]

The revolutionary nature of this new form of business organization can best be understood by comparing it with that of the famous Merchants Adventurers Company, first established in 1407, for the English cloth export trade, but given a royal charter for that trade in 1505.[76] This earlier enterprise was a "regulated company" in the sense that it possessed such a charter and certain monopoly rights, whose enforcement required a governing council with an appointed governor and his assistants and a court in its overseas headquarters at Antwerp. But the actual commerce, the cloth-export trade, was conducted by a large number of private firms—family firms and simple partnerships—that operated on their own account under the protective umbrella of the Merchants Adventurers. They raised their capital by pooling funds of family members or those of the partners, generally limited to six members. Other capital was raised by borrowing, often by mortgaging properties. Because of the nature of their trade—the very short cross-Channel trade between London and Antwerp—their capital requirements, both in terms of fixed and working capital, were small. Rarely did such merchants own and operate their own ships; and generally they bought their woolens, on credit, at Blackwell Hall, and simply leased space on small ships for this cross-Channel journey. With a succession of cloth sales at Antwerp, and with the investment of the proceeds in the purchase of various goods from the Brabant fairs, for importation into England (on behalf of the Mercers Company of London), these Merchants Adventurer enjoyed very quick turnovers of cargoes and business transactions—a matter of a few weeks at most, permitting them either to reinvest profits in this bilateral trade or to invest them by purchasing a bill of exchange from other merchants about to embark on their own Antwerp-based trade.

The Russia (Muscovy) Company, in sharp contrast, was established to conduct very long-distance, truly overseas trading ventures, each of which required a year or more to be conducted and return a profit. That was indeed true of all the new overseas trading companies. Such a very large-scale, long-term enterprise, requiring large initial fixed-capital investments, could hardly have been financed by the traditional methods of pooling funds from family members and a few partners. Instead the necessary capitals for such firms could have been raised only by the sales of stock (shares), often to hundreds of investors.

The origins of this form of business organization remain obscure. They may have been Italian, in that medieval *commenda* contracts were often divided into shares, or *loca*; but *commenda* contracts were undertaken for only one maritime venture.[77] For this early-modern English business organization, the term *joint stock* meant that the capital stock was held collectively by all of the stock- or shareholders, as joint owners of the company. It was a collective business venture with a common capital, invested in the company, and not in the individual participants. Each shareholder had the right to vote for the directors of the company, based on the number of shares that each investor held. Shareholders received a share of the profits, in the form of dividends declared per share. Equally important, they had the right to sell

their shares to other investors, and thus potentially to reap substantial capital gains as well.

The sale of shares or the death of shareholders in no way affected the life and operations of the company, as was the case with a partnership. A partnership existed only so long as all of the partners continued to own the firm. Thus the withdrawal or death of a partner necessitated the legal cessation of the firm, which could continue only with a new partnership contract. In contrast, a joint-stock company continued to exist as the same business venture, until such time as the shareholders voted to wind up the affairs of the company, and to distribute the invested capital among the existing shareholders.

The other two major joint-stock companies in overseas trade, established in the later sixteenth century, were the Levant Company, originally created in 1581 as the Turkey Company, and then reorganized in 1591, under its new name; and the East India Company, created in 1600, with a royal charter and a monopoly on trade with South Asia (that is, with those parts of Asia not included in the Russia Company's monopoly charter).[78]

Certainly by far the most important of the new overseas joint-stock trading companies, for the later sixteenth and early seventeenth centuries, was the Levant Company. It represents England's very first and remarkably successful entry into the still far more lucrative Mediterranean trade.[79] The circumstances that led to this English success, and the establishment of the Levant Company, were somewhat fortuitous: the Ottoman Turks' seizure of Cyprus in 1570–71, thereby gaining control of the Aegean Sea from Venice; and then, in October 1571, the crushing victory of the Venetian-led coalition of European fleets over the Turks at the Battle of Lepanto. That ended forever the European fear of Ottoman naval supremacy in the Mediterranean and enabled the English to exploit European differences in dealing with the Turks. Note that the Levant Company was founded just ten years after the Battle of Lepanto.

What the Turks wanted was a new European ally—one more reliable than the French had been. They also wanted a secure supply of guns, munitions, and above all other European textiles, but most especially fine English woolen broadcloths, to reduce their recent dependence on Venetian woolens, especially since the Turks were so often at war with Venice. What the English wanted was not just a general entry into Mediterranean trade, but more specifically a new and more profitable market for their own woolens, in view of the serious difficulties still afflicting Antwerp and other potential northern markets. English merchants also wanted a guaranteed access to the even more lucrative import trade in raw silk (Turkish and Persian) and Asian spices.

The brilliant entrepreneurial success of the Levant Company was due principally to two factors. The first was skilful diplomacy, especially in negotiating better commercial relations and commercial services, in supplying better-quality textiles than those offered by its European and especially Venetian competitors.[80] The second was much superior naval technology and naval tactics. By the mid-seventeenth century, the English were building far larger, far stronger oak-based carracks and galleons, which were also more heavily gunned than were those of any of their rivals in the Mediterranean basin. They proved to be largely invincible to both pirates and Muslim corsairs—which had for so long menaced the Mediterranean shipping lanes. While their freight rates were perhaps 10 percent higher than those of their com-

petitors, their insurance rates were far lower—and above all the Levant Company's galleons offered the virtual certainty of delivering their cargoes.[81]

In 1600, some leading entrepreneurs in the Levant Company were also instrumental in the establishment of what ultimately became an even more important overseas joint-stock trading company: the East India Company. Its objective was to compete with the Dutch, in a desperate race to establish a direct sea link, via South Africa (the Cape route), with the Indian Ocean and East Indies spice trade, at a time when warfare was disrupting the spice trades of the then two principal participants: Venice and Portugal.

In the early seventeenth century, however, the English seemed destined to lose this competition, especially after the Dutch, in 1623, had forcibly evicted the English from Amboyna (modern-day Ambon), one of the key East Indies spice islands, in the Moluccas, thereby allowing the Dutch to gain virtual control of this region's trade. The Dutch victory was due to superior capitalization and superior organization in its own joint-stock company, the Vereinige Oost-Indisch Compagnie (United East India Co.: VOC), and to its superior military power, with a government support that was largely unavailable to the English East India Company. The English East India Company directors then decided to "suboptimize" by focusing their commercial, political, and then military activities on gaining control of the Indian subcontinent. But they were certainly not successful in doing so, nor in expanding their Asian commerce, until at least the 1660s. But if the export of silver, the chief export of both companies to Asia, is a measure of relative success, the English exports had exceeded those of the Dutch by 1720.[82] Certainly by that time, both East India companies had proved successful in terminating forever the role of both the Venetians and the Portuguese in the Asian spice trades.[83]

Growing hostility in late Elizabethan and Stuart England to monopolies, in both domestic industry and overseas trade (since most demanded and enjoyed royal monopoly rights)—and a growing mercantilist hostility as well to exports of "treasure" (gold and silver)—hindered the creation of new joint-stock companies. Thus not until after the Civil War and Commonwealth-Protectorate era, and with the Restoration under Charles II in 1660, were new and important joint-stock companies created, in particular (1) the Royal African Company in 1662, reorganized with a new charter in 1672; (2) the Hudson's Bay Company in 1670; (3) the Bank of England in 1694; (4) the New East India Company in 1698 , which was established by a large loan to the government, as rival to the original East India Co.; but in 1709 it was absorbed by and merged into the original company; and finally, (5) the South Sea Company in 1711 (Scott 1912, 1:263–421, 2:228–40; Cawston and Keene 1968, 154–243).

Only from the 1660s did the joint-stock overseas trading companies prove truly successful in both altering the structure of English foreign trade and in establishing economically viable commercial-colonial empires for Great Britain. They did so, fundamentally, by shifting their trade from spices, precious metals, and luxury silks into a new reexport trade in more mass-consumption-oriented colonial products, which themselves came to be mass-produced: above all sugar, Asian cotton textiles (calicoes and muslins), tobacco, tea, coffee, codfish, lumber. That colonial reexport trade rose from just 4 percent of total export values in 1640 to 31 percent in 1700, thereby reducing the dependence on woolen cloth exports from 92 percent in 1640 to 48 percent in 1700.[84] Throughout the eighteenth century, the colonial reexport trades consistently accounted for about a third of total export values.[85] Ralph Davis

called that transformation a Commercial Revolution, while Eric Hobsbawm called it New Colonialism, demonstrating that it was vastly more profitable and more conducive to economic growth than was the so-called Old Colonialism (based, in his view, on the seemingly profitable lure of spices and precious metals).[86] It is also, of course, known as the Age of Mercantilism, whose significance for this topic may lie in the ways that state-supported economic nationalism, with the twin goal of increasing national wealth and national power, fostered and fortified the rent-seeking goals of many English entrepreneurs, especially in commerce and finance (Viner 1948; Wilson 1949, 1958).

### *Limitations of the Early-Modern Joint-Stock Companies*

The joint-stock company was not, however, destined to become the predominant form of business enterprise, and certainly not the major vehicle for capital formation in mining and manufacturing in the Industrial Revolution itself. Its inherent weakness, at least for those joint-stock companies operating within the local domestic economy, was its legal status. For English law regarded joint-stock companies as nothing more than large partnerships. Under long-standing commercial law throughout western Europe, from Roman times, a simple partnership (*societas*, *compagnia*) was subject to unlimited liability for all its partners—and thus for all shareholders in unchartered joint-stock companies. Typically, and usually, partners bore liability for losses in proportion to their capital investments in the firm; but in fact, under customary and common law, all were collectively and severally responsible for all of the debts, losses, and other liabilities of the firm. This sword of Damocles, this prospect of unlimited debt, undoubtedly discouraged those who did not enjoy asymmetric information, with an intimate knowledge of the company's business, from buying shares in such companies (see, in general, Scott 1912, 1:1–14, 150–65, 439–72).

The joint-stock companies discussed previously, those in foreign trade and those that were the most important in the early-modern English economy, enjoyed a major benefit and advantage over most others: possession of a charter of incorporation. Such charters were derived from the constitutions of medieval English guilds and civic corporations, which made them, as a *corpus*, a separate body and legal entity that could sue and be sued in their own corporate name, without financially or otherwise legally obligating or involving in any way the individual status or the fortunes of its members. For a joint-stock corporation, that meant in particular limited liability: that is, the liability of each individual shareholder was limited to the amount that he or she had agreed to pay in buying the shares, usually on margin.

Curiously enough, the English never availed themselves of a compromise form of business organization that the French government (and then other European governments) had sanctioned from about 1670: the *société en commandite*. It provided limited liability to all those shareholders (or silent partners) who took no active role in the operations of the company, reserving complete, unlimited liability only for those shareholders who did take an active entrepreneurial role. Of course, the whole issue of limited liability is really one of risk allocation and moral hazard: to the extent that shareholders, that is, those with equity in the firm, are protected by limited liability, the firm's creditors (lenders, bond or debenture holders), are thus subject to increased risk of loss in the event of the firm's failure. In compensation

for such increased risks, these creditors may have demanded higher interest rates (Heywood 1992; Price 1981).

The other significant limitation, and one that applied to virtually all joint-stock companies from the mid-sixteenth to very late seventeenth century, was the absence of an organized and effective stock market; that is, a secondary market in securities. For obviously most investors would have been reluctant to buy shares in a joint-stock company without the opportunity to recover their capital investment by the resale of the shares to other parties. Indeed, one strong incentive to buy such shares was to realize a capital gain through their subsequent sale, even if, of course, purchasers also bore a risk of capital losses. While the wealthier, more prominent, and influential businessmen did have some prospect of finding individual brokers to handle such secondary stock sales (and purchases, for those who wished to acquire new or more shares), most potential investors did not.

In 1695, however, England did gain its own London Stock Exchange (or Royal Exchange): beginning with the regularly scheduled meetings of stockbrokers or "jobbers" in London coffeehouses in or near Lombard Street, near the location of the new Bank of England, so recently established, in 1694. By that time, England already possessed 137 joint-stock companies, for domestic and foreign enterprises; and the creation of the London Stock Exchange soon encouraged the formation of many more new, and generally unchartered and unincorporated, joint-stock companies (Scott 1912, 1:326–87; Michie 1999). That in turn eventually spawned a speculative boom, especially in the years from 1711, from the formation of the South Sea Company (with a royal charter) to the infamous South Sea Bubble of 1720–21—a speculative era much akin to that of the 1920s.[87]

That story is far too complex to discuss here. Suffice it to say that the South Sea Company was formed ostensibly to acquire a monopoly on British trade in the Pacific, a dubious proposition, since that trade was firmly controlled by Spain—a nation then very hostile to Great Britain. But its real purpose was to acquire most of the outstanding national debt, which had ballooned during the costly War of the Spanish Succession, from 1701 to 1714: that is, the national debt not then held by the Bank of England and the East India companies. This amounted to £31,490,800 sterling, or 63.2 percent of the total permanent national debt. In essence, the company proposed to buy up or exchange that debt, much of it short term, for perpetual South Sea stock, paying 5 percent, and readily marketable on the London Stock Exchange.

In the final stage of this remarkable enterprise, in 1720, when the company had to raise new capital—that is, by selling new stock issues—its directors unwisely sought to curb the competition from other joint-stock companies in the capital market by having Parliament enact statute 6 George I cap. 18—thereafter known as the Bubble Act. It forbade the sale of any shares on the stock exchange issued by any joint-stock company that did not already possess a charter of incorporation, or one that possessed a charter issued for some other purpose. In August, the South Sea Company sought to enforce the act by securing writs of *scire facias* against some unchartered companies and companies with dubious charters. At the same time, the company directors were engaged in illegal activities—as later revealed—to inflate the prices of South Sea Company stock in order to exchange fewer shares for outstanding government debt issues, thus feeding the now expanding "bubble."

They failed miserably to anticipate the consequences. As the stock market prices of the affected companies fell sharply, and as prices of other stocks fell in the ensuing panic, those who had bought stocks "on margin," usually with a 10 percent down payment, with "call loans" for the balance, received a demand from their creditors to pay the full amount owing immediately. The same was true for many merchants who had used stock as collateral for other loans. That meant the forced sale of not only the affected stocks, but also of perfectly good stocks, in order to raise sufficient funds to pay creditors. It was the stock market equivalent of Gresham's Law.

The obvious political consequence of the ensuing horrendous stock market crash was a Parliamentary inquiry, begun in December 1720. Among the major discoveries was indisputable evidence that South Sea Company officials had bribed government ministers, other members of Parliament, and royal officials; and also, as indicated earlier, evidence of illegalities in inflating share prices.[88] According to many historians, so traumatic were both the financial losses from the Bubble and the stench of corruption that henceforth the government and Parliament interpreted the Bubble Act in highly restrictive terms. In particular, Parliament made incorporation extremely difficult: it now required, in all instances, a costly private act of Parliament, which in turn generally required that all or most of the subscribed capital be placed on deposit with the Bank of England until that incorporation act was formally approved. Very few if any small companies, especially those just starting operations, could have then afforded to pay for such acts and acquire the required charters of incorporation.

In the 105 years of the Bubble era that followed, until its repeal in 1825, the only notable exceptions, that is, the only joint-stock corporations that did acquire such charters, were the canal companies in the 1780s and 1790s. Why they were exceptions is obvious: they needed large capital investments and clearly served the general public good, for such transportation improvements were desperately needed for the expanding market of the Industrial Revolution. Obviously canal companies could not have raised the required capitals except by joint-stock financing. In any event, the authorization for the creation of a canal company, with monopoly rights and with necessary public expropriations (eminent domain), also required private acts of Parliament.

The chief response to the view that the Bubble Act impeded capital formation in British industry, and thus implicitly impeded industrialization itself, is the obvious fact that the Industrial Revolution nevertheless did take place during this very era of the Bubble restriction. Phyllis Deane and others have argued in particular that neither the technological needs of the Industrial Revolution nor the scale of enterprise, in turn a function of commercial scales, required large initial amounts of capital, citing in particular the growth of the cotton industry (Deane 1965, 203–6; see also Ashton 1955, 118–21). But when one considers the vastly larger scale required for the new coke-fueled and steam-powered iron industry—in mining, smelting, and refining—one may contend that had chartered and incorporated joint-stock financing been available, without the legal and financial encumbrances just outlined, the British Industrial Revolution might have progressed faster and earlier, with better-financed and larger-scale industrial enterprises. At the same time, we should also consider, in terms of the previously discussed Weber-Tawney thesis, that the virtual absence of joint-stock financing made entrepreneurial profit reinvestment (or profit retention) all the more important for industrial capital formation during that early, pre-1825 phase, of the Industrial Revolution.

## Some Conclusions on Entrepreneurship in Early Modern England

As was stressed in the introduction to this current study, Richard Tawney's lifelong pursuit of the origins of a distinctly new and "modern" form of capitalism—so different from its medieval forms—implicitly involved seeking out the origins of modern capitalist entrepreneurship, and thus the origins of the modern Industrial Revolution, that is, from the second half of the eighteenth century. The thesis of this study is that those origins are to be found, not in Tawney's century (1540–1640), but rather in the ensuing century, 1640–1740, that is, from the Civil War era, and the era of Puritan ascendancy, to the eve of the Industrial Revolution. The corollary and ancillary thesis is that such new forms of entrepreneurship, if not entirely explaining how the modern Industrial Revolution came about, certainly constituted the most vital force in producing it—and in its true homeland of Great Britain (England, Scotland, Wales). While some economic historians dispute the reality of the Industrial Revolution, pointing out the continued low levels of economic growth until, say, the 1830s or 1840s,[89] the very idea that there had been no Industrial Revolution is hardly worthy of serious debate. For the ensuing and completely unprecedented rates of sustained aggregate economic growth, demographic growth, and growth in per capita incomes, from the 1840s until World War I, could not have taken place without a prior industrial revolution: that is, without a truly revolutionary transformation of virtually all sectors of the economy, with backward and forward linkages to industry. How could England and Wales have more than tripled their populations in the century from 1811 to 1911—from 10.563 million to 36.136 million—while not only fully feeding that far higher population (from imports) but also experiencing a 2.76-fold rise in the real wage index (for building craftsmen, from 49 to 135), and a 43.4 percent decline in mortality rates (from 25.6/1,000 in 1811 to 14.5/1,000 in 1911)? That truly marks a fundamental watershed in human history, for never before had all such forms of economic growth ever been so combined and sustained (providing a virtual escape from the Malthusian Trap).[90]

If, surely, it is impossible to refute or otherwise negate the significant roles that entrepreneurs did play, not only in creating and fashioning that Industrial Revolution, but also in laying its foundations in that crucial century of 1640–1740, then we must conclude that early-modern England (then Great Britain) was blessed with a very substantial number of practically innovative, highly productive and successful, profit-maximizing entrepreneurs, arguably more so than any other region—except possibly Holland and the northern American colonies (which were then virtually an extension of England). As documented in some detail in this study, the very considerable number of both institutional and technological innovations that did take place in this crucial century—not just in industry, but also in agriculture, overseas trade, and finance—illustrate how successful British entrepreneurs were in implementing and ensuring their success. Who would doubt their vital importance for the ensuing Industrial Revolution, and for Britain's economic growth, up to World War I?

Of course, we must always be careful—as stressed earlier—to distinguish between inventions, which may or may not have any real impact on economic growth, and innovations that so often do have such an impact. We must also recognize that many entrepreneurs, in a market economy, proved to be failures, in that sense—and one thinks of those involved in trying but failing to create and use coke fuels, before Abraham Darby (e.g., Dud Dudley). Most economic historians are instinctively inclined to study successes rather than failures; and also to do so without having

the relevant data to measure those successes, except for some general indications of long-term results. We do not, therefore, usually possess any mechanism to measure the actual financial rewards that accrued to the individual entrepreneurs who initiated the productive and profitable innovations. Furthermore, in view of the prior discussion of both the Protestant Ethic and of institutional restrictions (the Bubble Act) their financial rewards may have been chiefly in the growth of their enterprises (including amalgamations, as the winners took over the assets of the losers).

We should also qualify the term *profit-maximizing*. It should be used only in the context of the ethos of so many of these entrepreneurs, for reasons examined in that initial and core section of this study: on the relationship between religion (Dissenters), social and political institutions, and entrepreneurship in the crucial century 1640–1760. In particular, this study has focused on those political and institutional changes that flowed from, or at least ensued from, the Glorious Revolution of 1688, including in particular, the Financial Revolution, culminating with Pelham's Conversion of 1749–57. That also included the remarkable success of so many new joint-stock companies in this era, though we must also note that for many their successes dated from the earlier, post-Restoration period (i.e., from 1660). As argued earlier in that section of this study, those political, social, and institutional changes were a very major factor in promoting and ensuring the economic success of so many entrepreneurs.

That brings us to the important issue of the social status of entrepreneurs in early-modern, or post-1640, England. This study has, quite obviously, solidly endorsed the Weber-Tawney thesis, in particular the view that, if entrepreneurial success came to be viewed—certainly by the mid-seventeenth century (and just as certainly not in the mid-sixteenth century)—as a positive sign of Election, that is, to enjoy Paradise with God in the hereafter, then that change in both religious and social *mentalité* itself proved to be a socioeconomic revolution in making highly individualistic and intensely competitive capitalist entrepreneurship, successful entrepreneurship, not just socially acceptable, but socially meritorious.

That was in stark contrast to prevalent views of medieval society that had stressed the overall primacy of the entire community—especially urban communities—over the individual, and that so often viewed business success as a threat to social harmony, while also reflecting common religious views that scorned not just usury but profit-seeking avarice.[91] A very common belief in medieval society (indeed to the early seventeenth century) was the oft-quoted biblical statement of Jesus (Matthew 19:24): that "it is easier for a camel to go through the eye of a needle than for a rich man to enter into the kingdom of God." So many in medieval society had assumed that those who did become rich had done so only at the direct expense of the rest of society—and not from a creative, innovative, productive entrepreneurship that brought about economic growth, and rising real incomes, to the benefit of most of society. To be sure, as stressed earlier, Calvinism (or Protestantism in general) in its first century, to the 1640s, was as hostile to usury, and perhaps to capitalism in general, as the Catholics were and had been. But from the Civil War era such hostilities virtually vanished (in Holland as well as in England), to permit and promote a revolutionary change in general social attitudes about competitive capitalist entrepreneurship and to business enterprises in general.

At the same time, the peculiar success of so many (but not all, obviously) English Dissenters and Scottish Presbyterians in the conjoined worlds of science and busi-

ness during the later seventeenth and eighteenth centuries also reflected the impact of the post-Restoration religious, political, and social restrictions imposed on them by Parliament's Corporation and Test Acts. For those restrictions were only partially removed by the 1689 Toleration Act, following the Glorious Revolution. As argued earlier, however, the ensuing state of quasi-toleration, ensuring a distinctive minority status for Dissenters, may, if only in part, help to explain their entrepreneurial successes. A specifically important attribute of that legislated minority status were the Academies, which the Dissenters were thus forced to establish, since they had been denied entry into traditional educational institutions. For certainly these new academies had fostered in a very material sense those entrepreneurial successes. In other words, some institutional limitations that appear to have been harmful may in fact prove to have been the key spurs to successful entrepreneurial innovations and, in more general terms, to economic growth itself, in early-modern England.

There remains, finally, one presumed institutional impediment to business organization, and thus possibly to entrepreneurial success to be considered: the Bubble Act, enduring from 1720 to 1825; or more correctly the ways in which Parliament interpreted that act to prevent the formation of joint-stock companies during this era. Whether or not business enterprises and their leading entrepreneurs would have enjoyed a very different and perhaps more profitable existence during the ensuing Industrial Revolution without the Bubble Act, is an exercise in counterfactual economic history that does not now seem worthwhile exploring.

## Notes

[1] These were chiefly Calvinist-oriented Protestants who had refused to swear an oath to accept the Thirty-nine Articles of the established Church of England. As correctly stated in the online Answers.com: "The Thirty-Nine Articles of Religion were established in 1563 . . . and are those finally agreed by the convocations of the Church of England in 1571. They comprise a set of doctrinal statements which were intended to define the position of the reformed Church of England. Printed as an appendix to the 1662 Book of Common Prayer, their declared purpose is 'for the avoiding of diversities of opinions and for the establishing of consent touching true religion.' They steer a careful—and sometimes ambiguous—path between Catholic and reformed doctrines. Subscription to them is still required of the clergy, but since 1865 only a general affirmation is required."

[2] The most important study is Merton 1970, especially chap. 4: "Puritanism and Cultural Values," 55–79; and chap. 6: "Puritanism, Pietism, and Science," 112–36. See also Merton 1938, 1957; Thorner 1952; Mason 1953; Hill 1964a, 1964b, 1964c, 1965a; Kearney 1964, 1965; Rabb 1965; Hill 1965b, providing comments on both Kearney and Rabb; Rabb 1966, a note in reply to Hill; Musson and Robinson 1960, 1969; Musson 1972, his collected essays; Calder 1953. On this point see also Landes 1998, 176–77.

[3] See Davis 1973a, 310: "Dissent was strongest in northern and Midland England, where industry was growing most rapidly, and an extraordinarily high proportion of known inventors, innovators, and successful entrepreneurs of the later eighteenth century have been shown to be Dissenters." See also Ashton 1948, 17–21. He also observes that "the growth of industry was connected historically with the rise of groups which dissented from the Church."

[4] Richard Tawney taught at the London School of Economics from 1917 to 1949 (serving as professor of economic history from 1931). See Fisher 1961, 1-14; Wright 1987; Terrill 1974.

[5] See also Weber 1961, part 4, "The Origins of Modern Capitalism," 207–70 (and especially chapter 20: "The Evolution of the Capitalist Spirit," pp. 258–70). See also the following note.

[6] John Calvin (1509–1564) published his seminal *Institutes of the Christian Religion* in 1536 (Calvin 1960, 1961 1960). See, inter alia, Harkness 1958; Bainton 1952; Biéler 1959.

[7] For the following, see sources cited in nn. 5 and 6 above, and n. 10 below.

[8] See the sources in nn. 5–7 above, and n. 11 below.

[9] From Answers.com: "Riches, avarice, and worldly gain personified as a false god in the New Testament. Middle English, from Late Latin *mammon*, from Greek *mamōnās*, from Aramaic *māmonā*, riches, probably from Mishnaic Hebrew *māmôn*."
[10] For an important overview, very favorable to the Weber-Tawney thesis, see Landes 2003; and even more so, Landes 1998, 174–81, and 516 (see n. 2 above). Needless to say, I fully endorse his views, even though, as Landes notes (177), "most historians today would look upon the Weber thesis as implausible and unacceptable." For other views, see in particular Lehmann and Roth 1985; Turner 2000: in particular Elster 2000, Hamilton 2000, Engerman 2000; Besnard 1970; Munro 1973, a review article based on Besnard; Mitzman 1970; Schumpeter 1991; Fischoff 1944; Hill 1961; Luthy 1963, 1964; Eisenstadt 1968; Van Stuivenberg 1975; Burrell 1964; Kitch 1967. For the chief critics, see also Robertson 1933; Fanfani 1935; and especially Samuelsson 1961.
[11] For some of the literature on the relationship between Protestantism and a new "capitalism" in Tawney's century, to 1640, in both England and Scotland, see the sources in n. 10, and also Jones 1997; George and George 1958; Burrell 1960; Hill 1964b; Ashton 1965, a critique of Christopher Hill's writings on this theme; Trevor Roper 1967; Little 1969; Marshall 1980; Durston and Eales 1996. But, for another valuable perspective, see O'Connell 1976. For the usury question, see nn. 24–29 and accompanying text.
[12] See, inter alia: Heal and O'Day 1977; O'Day 1986; Cliffe 1984, 1988; Durston and Eales 1996; Wedgwood 1966, 1970a, 1970b.
[13.] The Corporation Act, 1661: statute 13 Car. II c. 1 was the initial stage of the Earl of Clarendon's program to reassert Anglican supremacy after the Restoration: it required anyone holding municipal office to qualify by taking communion with the Church of England. The Test Act, 1673: 25 Car. II c. 2 required all officeholders under the Crown, including members of Parliament, to receive communion according to the rites of the Church of England (Thirty-nine Articles) at least once a year, and to make a declaration against the Catholic doctrine of transubstantiation. Neither was repealed until 1828, which repeal was followed by the Catholic Emancipation Act of 1829.
[14] The Unitarians, who denied the divinity of Christ, owed their origins to the sixteenth-century Italian theologian Lelio Sozzini (1525–62), whose followers, principally in Poland (to which Sozzini had fled), were called Socinians. The Methodists were founded by John and Charles Wesley, at Oxford's Holy Club, in 1729 (nicknamed "Methodists" by critics).
[15] More, formally, the Act of Toleration, enacted on May 24, 1689, as statute 1 William & Mary, c. 18, was entitled: "An Act for Exempting their Majestyes Protestant Subjects dissenting from the Church of England from the Penalties of certaine Lawes." It included all non-Conformists except Unitarians. See also Mijers 2007; Troost 2005; Claydon 2002. William III's rule and the victory of the Glorious Revolution was not ensured, however, until his victory over James II and his Irish armies, at the Battle of the Boyne, in 1690. See the intriguing essay by Goldstone (2002).
[16] Ashton 1948, 19, noting that "this view is supported by a consideration of the part played . . . by the stream of energy that poured into England from Presbyterian Scotland after (though not immediately after) the Union of 1707." See Herman 2001, especially chap. 12: "Scots in Science and Industry," 320–44. See also West 1975, especially chap. 6, "Scottish Elementary Education," 59–73; and also O'Day 1982.
[17] Cardinal Richelieu, responding to the Catholic clergy's bitter hatred of the Edict of Nantes, had in fact annulled the political clauses in 1629; but the far greater damage was done by Louis XIV in 1685. See also the comments of Ralph Davis, in referring again to the English Dissenters: "Their peculiar social position had no French counterpart, and France was economically the worse for this" (1973a, 310), and, "Although the need for innovation was as strong in France as in England, French society offered a less congenial climate to innovation than did English society" (1973a, 313).
[18] Landes 2006, 8: "That means family, continuity, good marriages, dynastic succession." As he also comments (10): "Within this [English] business world, banking held top rank, and international and large-scale commerce generally enjoyed greater respect than industrial endeavours." Similar arguments for the international importance of family connections, in foreign "diasporas," have been advanced for both French Huguenot and Jewish banking and commercial firms, in the eighteenth and nineteenth centuries.
[19] See in particular: Jonassen 1947; McClelland 1953, 1975; McClelland, Winter, and Winter 1969. See also n. 10 above.
[20] See Thompson 1967. For a corresponding French view on this confessional difference between Catholics and Protestants, see Camus 1981; and McBride 1992.
[21] North and Weingast 1989. See also North 1984, 1985.
[22] See Tracy 1985; Hart, Jonker, and van Zanden 1997; Hart 1991; Fritschy 2003.

[23] See in particular: Dickson 1967; and also Roseveare 1991; and O'Brien 1988, 2002; O'Brien and Hunt 1993; Brewer 1990.
[24] 13 Elizabeth I, c. 8 (1571): in Great Britain, Record Commission, *Statutes of the Realm*, ed. T. E. Tomlins, J. Raithby, et al., 6 vols. (London, 1810–22), 4:1, 542.
[25] Statute 37 Henrici VIII, c. 9 (1545) and Statute 5–6 Edwardi VI c. 20, in *Statutes of the Realm*, 3:996; 4:1, 155.
[26] See Bainton 1952, 247–50, noting few differences between Luther and Calvin on this issue. See n. 6 above.
[27] Harkness 1958, 201–10. See n. 6 above.
[28] Cited in Tawney 1926, 94; see also pp. 61–115.
[29] Coquillette 1993, 94–99, citing also a similar statement from John Blaxton, *The English Usurer* (1634).
[30] Richards 1929, 19–20; and statute 17–18 Victoria c. 90 (1854).
[31] See n. 23 above, and Dickson 1967, table 7, p. 80. Note that in 1711 and 1712, the English Exchequer had sold redeemable debentures with an interest rate of 6.0 percent. But thereafter all annuities were issued at 5.0 percent or less.
[32] See n. 23. Sir Henry Pelham, both chancellor of the exchequer and prime minister (1743–d. 1754), undertook the conversion of the national debt from 1749 to 1752: first, into 3.5 percent consols (Consolidated Stock of the Nation: perpetual redeemable and negotiable annuities); and then from 1757 (by his successor), into 3.0 percent consols, which endured unchanged until 1888, when Chancellor of the Exchequer George Goschen converted them into 2.75 percent annuities, with the provision that they be converted into 2.5 percent annuities in 1903, the rate that prevails to this day for consols sold on the London Stock Exchange. On June 9, 2009, the market price of 2.5 percent consols on the London Stock Exchange was £53.04, to provide a yield of 4.71 percent (i.e., 2.5/53.04). See Dickson 1967, 486–520; Harley 1967, 101–6.
[33] For several different perspectives, but more for the subsequent era, see Williamson 1984; Crafts and Harley 1992; Heim and Mirowski 1987; Mokyr 1987; Black and Gilmore 1990; Heim and Mirowski 1991; Clark 2001, 403–36.
[34] On the English gentry, and its relationships with the peerage or titled aristocracy, the most important study is Mingay 1976. See also for the literature of the debate on the Tawney thesis: Stone 1948; Trevor-Roper 1951, a vigorous (indeed heartless) attack on Stone; Stone 1952; Trevor-Roper 1953; Stone 1956; Kerridge 1969, more concerned with the question of enclosure than with the gentry debate per se; Simpson 1961; Cornwall 1965, 1988; Batho 1967; Aston and Philpin 1987, which reprints Brenner 1982 and Cooper 1978; Cooper 1956; Coss 1995, 2003.
[35] For a contemporary definition of the Tudor gentry, see Smith 1906, chap. 20, pp. 39–40: "Whosoever studieth the lawes of the realme, who studieth in the universities, who professeth liberal sciences, and to be shorte, who can live idly and without manuall labour, and will beare the port, charge and countenance of a gentleman,… he shall be taken for a gentleman."
[36] Habakkuk 1958. The proximate cause of Henry's break with Rome was Pope Clement VII's refusal (1529) to grant Henry's divorce from Catherine of Aragon, who had produced only a daughter (Mary, in 1516), when Henry was desperate to have a male heir to ensure the survival of his Tudor dynasty.
[37] For the literature on the Price Revolution, and my own views on inflation, see Munro 2003c, 2004, 2008b. These publications also discuss the now enormous literature on this subject. Tawney did not, in fact, have a good understanding of the Price Revolution, or of inflation in general.
[38] See Phelps Brown and Hopkins 1981, with price indexes for subgroups not in the original publication (1956). Their basket of consumables price index, as calculated in quinquennial means, with a base of 1451–75 = 100, rises from 108.60 in 1511–15 to a peak of 733.20 in 1646–50. My recalculation (unpublished) of their price index, from their own working papers in the Archives of the British Library of Political and Economic Science, and using a different methodology (based on actual prices) rises from a quinquennial mean of 106.04 in 1511–15 to one of 646.40 in 1646–50 (peaking in the same quinquennium).
[39] For both the evidence and analysis, see Tawney 1941 and nn. 34 above and 40 below.
[40] For Tudor-Stuart era enclosures the literature is again vast. See in particular: Thirsk 1967a, esp. Thirsk 1967b; Thirsk 1984, 1985a; Overton 1996a; McCloskey 1975a, 1975b; Yelling 1977; Kussmaul 1990; Allen 1992; Mingay 1968; Brewer 1972; Wordie 1983.
[41] See in particular Habakkuk 1940. See also the sources cited in n. 40 above and n. 44 below.
[42] See the literature on this debate in n. 34 above. The most trenchant (and often unfair) critics of the Tawney thesis were Eric Kerridge, Hugh Trevor-Roper (Lord Dacre), and J. P. Cooper.

[43] Bettey 2003; Delorme 1989; Bowie 1987; Martins and Williamson 1994; Kerridge 1973, chap. 4, "The Great Inventions," 103–29; Kerridge 1967; Overton 1996a, esp. chap. 3, "Agricultural Output and Productivity, 1500–1800," 63–132.
[44] See the sources cited in nn. 40, 43 above; and also the following: Thirsk 1967c, 1985b; Jones 1967; Mingay 1977; Broad 1980; Overton 1984; Outhwaite 1986; Clay 1984, vol. 1, chap. 3, "Rural Society," 53–101, and chap. 4, "The Progress of Agriculture," 102–41; Campbell and Overton 1991, especially the studies by Overton, Allen, Shiel, and Clark; Campbell and Overton 1993; Overton 1996b; Allen 1999; Wrigley 2006. The most recent study is Allen 2008.
[45] On the importance of mortgaging enclosed lands to furnish capital, see Hudson 2004.
[46] Schumpeter 1949. See also Schumpeter 1961, 1987, 1989, 1997; Backhaus 2003.
[47] See sources cited in nn. 40, 43–44.
[48] See Hamilton 1928, 1929a, 1929b, 1934, 1936, 1942, 1947, 1952; and Munro 2007a.
[49] Keynes 1930, 2:152–63, esp. 154–55: "It is the teaching of this Treatise that the wealth of nations is enriched, not during Income Inflations, but during Profit Inflations—at times, that is to say, when prices are running away from costs"; and on p. 163: "The intervening Profit Inflation which created the modern world was surely worth while if we take a long view."
[50] See the Phelps Brown "basket of consumables" composite price index, in n. 38 above.
[51] Van der Wee 1963, vol. 1, appendix 45/2, pp. 525–27. The outbreak of the Revolt of the Low Countries in 1568 renders subsequent data, when available, useless, in this context. The real interest rate is the nominal rate less (minus) the rate of inflation.
[52] See the following: Nef 1923, in particular, vol. 1, part 2, "Coal and Industrialism," 133–264 (chap. 2 of this section is entitled "An Early Industrial Revolution," 165–89); Nef 1934, 1936, 1937; Nef 1950, part 1 (1494–1640), chap. 4, "Progress of Capitalist Industry," 65–88.
[53] See Wrigley et al. 1997, appendix 9, pp. 613–16. See also Wrigley and Schofield 1980, 528–29.
[54] See in particular: Coleman 1956; 1975b, 35–49; 1975a, chap. 5, "Occupations and Industries, 1450–1650," 69–90, chap. 9, "Industrial Change, 1650–1750," 151–72; Rackham 1976, 1980; Zell 1993. For an overview, see Hatcher 1993, 31–55. In effect, while acknowledging the many faults in Nef's research and analyses, he lends support to the Nef thesis, as does Brinley Thomas in two articles (1985, 1986). See also nn. 55, 64 below.
[55] See figure 5.1. The charcoal prices are taken from college and institutional accounts in Cambridge, Eton (Berkshire, near Windsor), and Westminster (London); the coal prices are similarly from these three same sources, plus (later) Greenwich, which I took from the Phelps Brown and Beveridge price data in the Archives of the British Library of Political and Economic Science (at the London School of Economics). The timber prices are from Cambridge alone, taken from Bowden 1967, table 6, pp. 846–50. I have converted his original base, 1450–99 = 100 (7.99s for 100 faggots) to the PBH base of 1451–75. Unfortunately, we do not possess any usable coal price series that may be compared with charcoal prices, until 1584—with the exception of coal prices alone at Hull (1471–1700): Hatcher 1993, table B.4, pp. 577–78. The statistical table on which this figure has been based has been published in Munro 2008a, table 8, p. 57.
[56] Hatcher has correctly observed that, at Westminster, "by the close of the 1630s charcoal was virtually twice as expensive as coal [in terms of heat produced)" (1993, 39). An even greater difference can be found at Cambridge, if we also take account of a second factor: that a ton of charcoal and a ton of coal have almost identical calorific values, a comparison disguised in measuring charcoal prices in loads (about one ton) and coal prices in chaldrons (36 heaped bushels = 28 cwt. = 3,135 lb. or 1.568 tons). In the 1630s, a ton of charcoal at Cambridge cost (on average) 27.38 shillings, but a ton of coal cost only 10.70 shillings (Rogers 1866–1902, 4:385–87, 5:398–402). But in terms of just relative prices, with a base 1580–89 = 100, the charcoal price index had risen to 140.3 in 1630–39, while the coal price index had risen to 126.9. For calorific values, see Hatcher 1993, 39.
[57] From Answers.com. The best example is Dud Dudley (1599–1684). The illegitimate son of Edward Sutton, the Ninth Baron of Dudley, he was given the task of managing the family's ironworks in Staffordshire. He was the first to experiment with smelting iron ore in a coal-fired furnace. Dudley patented his innovation in 1621, but the poor quality of his metal limited its sale. Dudley's work culminated in Abraham Darby's coke-fired furnace in 1709. See n. 64 below.
[58] Mokyr 1990. See also see the sources cited in nn. 53, 55, above.
[59] Glassmaking is good example of an industry that had to adopt the new furnace technology, because it obviously could not have transported its delicate products from forest sites along bad roads to urban

markets; and indeed it had to locate as closely as possible to those markets. See Crossley 1972; Hatcher 1993, 422–58; Mokyr 1990, 62 (also for the date).

[60] See n. 53 above.

[61] For the evidence on rising real incomes in this era, at least in the English building trades, see Phelps Brown and Hopkins 1956; Allen 2001; and Munro 2002.

[62] In 1640, when textiles still accounted for almost all of English exports, 92.3 percent by value, the woolens of the Old Draperies still exceeded the value of the products of the New Draperies (bays, says, serges, perpetuanas, etc.), but not by much: 48.9 percent for the former vs. 43.3 percent, for the latter (Clay 1984, vol. 2, table 13, p. 144; see also Van der Wee 2003).

[63] *Columbia Encyclopedia:* "Coke is a solid carbonaceous residue derived from low-ash, low-sulfur bituminous coal. The volatile constituents of the coal (including water, coal-gas and coal-tar) are driven off by baking [the coal] in an *airless* oven at temperatures as high as 1,000 degrees Celsius, so that the fixed carbon and residual ash are fused together. Since the smoke-producing constituents are driven off during the coking of the coal, coke forms a desirable fuel."

[64] See the sources cited in n. 54 above; and also Ashton 1924, 1–23; Ashton and Sykes 1964; Schubert 1957; Hammersley 1957, 1973, 1976; Flinn 1958, 1959, 1978, 1984, esp. 23–35, 286–328; Jack 1977, esp. chap. 2, pp. 66–121; Riden 1977; Hyde 1973, 1977, esp. chap. 1, pp. 7–22, also chap. 3, pp. 42–52; Pollard 1980; Harris 1988. See also Mokyr 1990, 93, 160, who cites Flinn (1958, 1978) to dispute the "scarcity of wood" thesis, stating that Flinn's "evidence on prices does not confirm this view." But Flinn provides no statistics on prices in these publications; and the evidence on wood, charcoal, and coal prices in my figure 5.1 contradicts Flinn's views, though, as noted above, only from the 1640s. No comparative prices are provided in Flinn 1984; but see table 9.4, pp. 303–4, for an index of coal prices, 1700–1830. The quinquennial mean index (base 1770–79 = 100) falls from 90.94 in 1701–5 to 80.22 in 1726–30, and thereafter rises slowly into the early era of the Industrial Revolution, reaching 95.60 in 1771–75; over the same period, the Phelps Brown–Hopkins composite price index (adjusted to this same base) rises from 70.85 in 1701–5 to 103.45 in 1771–75: i.e., rising more than the coal price index.

[65] Wrigley 1988, 54. See also Wrigley 2000; Hatcher 1993, 555–56 (also citing a figure of 15 millions tonnes for 1800), stating that "the major turning point for the British coal industry occurred in the second half of the eighteenth century"); Pollard 1980.

[66] Flinn 1984, table 1.2, p. 26, providing an estimate aggregate coal production of 3.033 million tonnes. Hatcher's subsequently published coal statistics differ for 1700, as noted: 2.640 million tonnes. See Hatcher 1993 and n. 64 above. 1 metric tonne = 1000 kilograms = 2,205 lb. = 1.1025 short ton.

[67] Wrigley 1988, 54–55, also stating (n. 52) that "the heat output of combustion of bone-dry wood is 4,200 kcal/kg compared with 8,000 kcal/kg for bituminous coal." For a very similar estimate, see Hatcher 1993, 39.

[68] A recent, iconoclastic dissenting view can be found in Clark and Jacks 2007. I must note that their data set is very different from and—in my view—less complete than what I have produced in figure 5.1 (see n. 55, above) ; and their comparisons of fuel prices are very different as well.

[69] See nn. 65–67 above.

[70] See Unger 1980, 1981, 1987; Cipolla 1965; Boxer 1969; Elbl 1985, 1994; Lewis and Runyan 1985.

[71] Gould 1970; Challis 1967, 1971, 1978; Van der Wee 2003. See n. 62 above.

[72] After 1552, cloth export statistics are available only for London, which, however, then accounted for over 90 percent of total exports, and virtually all of its exports were sent to the Antwerp market. Statistics extracted from Carus-Wilson and Coleman 1963; Bridbury 1982, appendix F, pp. 118–22; Gould 1970, 136; and Fisher 1940. A standard and fully finished broadcloth measured 24 yards in length and 1.75 yds in width.

[73] Its original title was the "Mysterie and Companie of the Marchants Adventurers for the discoverie of regions, dominions, islands and place unknown." In 1556, by an act of Parliament, its name was shortened to the Fellowship of English Merchants for discovery of New Trades. See the following note.

[74] The classic study is and remains Scott 1912. Similar joint-stock companies were set up in the Dutch Republic, or Republic of the United Provinces (fundamentally established by the Union of Utrecht, in January 1579); and they may have existed earlier in the former county of Holland—known as *rederij* in maritime shipping and commerce.

[75] Scott 1912, 1:18–21, 2:36–69, carrying the history of the company to its effective end in 1699, when it lost its monopoly in the Russian-Persian trade. The company was not dissolved, however, until as late as 1917. See also Willan 1956, 1968, 1973.

[76] Scott 1912, 1:8–12. See also Carus-Wilson 1933; Van Houtte 1940, 1961; Van der Wee 1963, vol. 2, part 1, chaps. 2–5; Davis 1976.
[77] See Scott 1912, 1:18. He speculates that the Russia Company's first governor, Sebastian Cabot (ca. 1476–1557), son of the ill-fated John Cabot (whose last naval expedition disappeared at sea, in 1498, without a trace), may have learned about joint-stock organization from his native Italy.
[78] One major new trading enterprise not mentioned here, because it was not undertaken by a joint-stock company, was the Eastland Company, established in 1579, by members of its parent organization, the Merchants Adventurers, with the objective of marketing English woolens in Prussia and Livonia, in the eastern Baltic. Marking England's first reentry into the Baltic trades in more than a century, the Eastland Company faced an overwhelming Dutch supremacy in these trades, and was thus doomed to failure, especially with inadequate capitalization. On Dutch trade and Baltic commerce, see in particular Israel 1989; De Vries and Van der Woude 1995; Unger 1997.
[79] Technically, the first successful English maritime venture was the arrival of the *Swallow* in the harbor of Livorno (Leghorn) on June 23, 1573; and Livorno would continue to be very important for English trade in the Mediterranean. See Pagano de Divitiis 1997, 5. See also Scott 1912, 2:83–88; Cawston and Keane 1968, 67–85.
[80] See Munro 2007b. As Ralph Davis has commented, "When the cold gales of autumn blew from the uplands of Asia Minor and the Balkans, the prosperous Turk or Persian counted himself lucky to be wrapped in the thickest and heaviest of English woollens" (1961, 122–23).
[81] See Davis 1961, 126–37; 1962, 1–57, 228–56; 1973b, 20–31; Pagano di Divitiis 1997, 41–55, especially table 2.1, p. 43.
[82] In the decade 1710–20, the decennial mean fine silver exports of the English East India Company were 41,133.6 kilograms, compared to 37,108.1 kilograms by the Dutch Company. Gaastra 1983; Chaudhuri 1968, table 1, pp. 497–98.
[83] For the English East India Company, see Scott 1912, 2:89–206; Cawston and Keane 1968, 86–153; Chaudhuri 1965, 1968, 1978; Bowen, Lincoln, and Rigby 2002; Bowen 2006.
[84] Sources: Fisher 1950; Davis 1954, 1973a, tables 1–5, pp. 52–57; Clay 1984, 2:103–202, esp. tables 10, p. 125; 11–15, pp. 142–46; 16–20, pp. 155–60; 21, p. 180.
[85] Statistics extracted or calculated from Mitchell and Deane 1962, 274–337; and Mathias 1983, 87–88.
[86] Davis 1973b, 250–87; 1973a, 26–40; Hobsbawm 1954. See also Parker and Smith 1978; Rabb 1976, 3–34; De Vries 1976, 1–29.
[87] For the following, and also for the complex, most detailed story, see Scott 1912, 1:387–438, 3:287–360. See also Dickson 1967; and Neal 1990.
[88] See sources cited in the preceding note.
[89] See n. 33 above.
[90] Scotland is not included because of inadequate data to make these comparisons. See Phelps Brown and Hopkins 1956, 30–31; and Wrigley et al. 1997, 613–16. See also Komlos 2000; Thomas 1985. For a different perspective, see Clark 2007.
[91] See Tawney 1926 and other studies discussed in nn. 2–29 above and accompanying text.

## References

Allen, Robert C. 1992. *Enclosure and the Yeoman: The Agricultural Development of the South Midlands, 1450–1850.* Oxford: Clarendon Press.

———. 1999. "Tracking the Agricultural Revolution in England." *Economic History Review*, 2nd ser., 52:209–35.

———. 2001. "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War." *Explorations in Economic History* 38(4): 411–47.

———. 2008. "The Nitrogen Hypothesis and the English Agricultural Revolution: A Biological Analysis." *The Journal of Economic History* 68(1): 182–210

Ashton, Robert. 1965. "Puritanism and Progress. " *Economic History Review*, 2nd ser., 17:579–87.

Ashton, T. S. 1924. *Iron and Steel in the Industrial Revolution.* Manchester: Manchester University Press, reprinted 1951.

———. 1948. *The Industrial Revolution, 1760–1830*. New York: Oxford University Press.
———. 1955. *An Economic History of England: The 18th Century*. London: Methuen
Ashton, T. S., and Joseph Sykes. 1964. *The Coal Industry of the Eighteenth Century.* 2nd ed. Manchester: Manchester University Press.
Aston, T. H., and C.H.E. Philpin, eds. 1987. *The Brenner Debate: Agrarian Class Structure and Economic Development in Pre-industrial Europe*. Cambridge: Cambridge University Press.
Backhaus, Jürgen. 2003. *Joseph Alois Schumpeter: Entrepreneurship, Style, and Vision*. New York: Kluwer Academic Publishers.
Bainton, Roland. 1952. *The Reformation of the Sixteenth Century.* Boston: Beacon Press.
Batho, Gordon. 1967. "Noblemen, Gentlemen, and Yeomen." In *The Agrarian History of England and Wales,* vol. 4, *1500–1640,* ed. Joan Thirsk, 276–306. Cambridge: Cambridge University Press.
Besnard, Philippe, ed. 1970. *Protestantisme et capitalisme: La controverse post-Weberienne*. Paris: A. Colin.
Bettey, Joseph. 2003. "The Development of Water Meadows on the Salisbury Avon, 1665–1690." *Agricultural History Review* 51:163–72.
Biéler, André. 1959. *La pensée économique et sociale de Calvin*. Geneva: Librairie de l'université.
Black, Robert, and Claire Gilmore. 1990. "Crowding Out during Britain's Industrial Revolution." *Journal of Economic History* 50, no. 1: 109–31.
Bodin, Jean. 1946. *The Response of Jean Bodin to the Paradoxes of Malestroit and The Paradoxes, translated from the French Second Edition, Paris 1578*. Trans. George A. Moore. Washington, DC: Country Dollar Press.
Bowden, Peter. 1967. "Agricultural Prices, Farm Profits, and Rents." In *The Agrarian History of England and Wales*, vol. 4, *1500–1640*, ed. Joan Thirsk. Cambridge: Cambridge University Press.
Bowen, H. V. 2006. *The Business of Empire: The East India Company and Imperial Britain, 1756–1833*. Cambridge: Cambridge University Press.
Bowen, H. V., Margarette Lincoln, and Nigel Rigby, eds. 2002. *The Worlds of the East India Company*. Woodbridge, Suffolk: Boydell Press.
Bowie, G. G. 1987. "Watermeadows in Wessex: A Re-evaluation for the Period 1640–1850." *Agricultural History Review* 35:151–58.
Boxer, C. R. 1969. *The Portuguese Seaborne Empire, 1415–1825*. London: Hutchinson.
Brenner, Robert. 1982. "The Agrarian Roots of European Capitalism." *Past and Present* 97:16–113.
Brewer, J. G. 1972. *Enclosures and the Open Fields: A Bibliography*. London: British Agricultural History Society.
Brewer, John. 1990. *The Sinews of Powers: War, Money, and the English State, 1688–1783*. Cambridge: Harvard University Press.
Bridbury, A. R. 1982. *Medieval English Clothmaking: An Economic Survey*. London: Heinemann Educational, Pasold Research Fund.
Broad, John. 1980. "Alternate Husbandry and Permanent Pasture in the Midlands, 1650–1800." *Agricultural History Review* 28:77–89.
Burrell, Sidney A. 1960. "Calvinism, Capitalism, and the Middle Classes: Some Afterthoughts on an Old Problem." *Journal of Modern History* 32:129–41.
———, ed. 1964. *The Role of Religion in Modern European History*. New York: Macmillan.
Calder, Ritchie. 1953. *Profile of Science*. London: Allen and Unwin
Calvin, Jean, 1960. *Calvin: Institutes of the Christian Religion*. 2 vols. London: Westminster Press.
———. 1961. *Institution de la religion chrestienne*. 4 vols. Paris: Société d'Édition "Les Belles Lettres."

Campbell, Bruce M. S., and Mark Overton, eds. 1991. *Land, Labour, and Livestock: Historical Studies in European Agricultural Productivity*. Manchester: Manchester University Press.
———. 1993. "A New Perspective on Medieval and Early Modern Agriculture: Six Centuries of Norfolk Farming, c.1250–c.1850." *Past and Present* 141:38–105.
Camus, Albert. 1981. *Correspondance, 1932–1960*. Paris: Gallimard.
Carus-Wilson, Eleanora M. 1933. "The Origins and Early Development of the Merchant Adventurers' Organization in London as Shown in Their Own Medieval Records." *Economic History Review*, 1st ser., 4:147–76. Reprinted in Eleanora M. Carus-Wilson, *Medieval Merchant Venturers: Collected Studies* (London: Methuen, 1954), 143–82.
Carus-Wilson, Eleanora M., and Olive Coleman. 1963. *England's Export Trade, 1275–1547*. Oxford: Oxford University Press.
Cawston, George, and A. H. Keane. 1968. *The Early Chartered Companies, A.D. 1296–1858*. 1896; New York: B. Franklin.
Challis, Christopher E. 1967. "The Debasement of the Coinage, 1542–1551." *Economic History Review*, 2nd ser., 20:441–66.
———. 1971. "The Circulating Medium and the Movement of Prices in Mid-Tudor England." In *The Price Revolution in Sixteenth-Century England*, ed. Peter Ramsey, 117–46. London: Methuen.
———. 1978. *The Tudor Coinage*. Manchester: Manchester University Press; New York: Barnes and Noble.
Chapman, Stanley. 1992. *Merchant Enterprise in Britain from the Industrial Revolution to World War I*. Cambridge: Cambridge University Press.
Chaudhuri, K. N. 1965. *The English East India Company: The Study of an Early Joint Stock Company, 1600–1640*. London: F. Cass.
———. 1968. "Treasure and Trade Balances: The East India Company's Export Trade, 1660–1720." *Economic History Review*, 2nd ser., 21:480–502.
———. 1978. *The Trading World of Asia and the English East India Company, 1669–1760*. Cambridge: Cambridge University Press.
Cipolla, Carlo. 1965. *Guns, Sails, and Empires: Technological Innovation and the Early Phases of European Expansion 1400–1700*. New York: Pantheon.
Clark, Gregory. 2001. "Debts, Deficits, and Crowding Out: England, 1727–1840." *European Review of Economic History* 5:403–36.
———. 2007. *A Farewell to Alms: A Brief Economic History of the World*. Princeton: Princeton University Press.
Clark, Gregory, and David Jacks. 2007. "Coal and the Industrial Revolution, 1700–1869." *European Review of Economic History* 11:39–72.
Clay, Christopher. 1984. *Economic Expansion and Social Change: England, 1500–1700*. 2 vols. Cambridge: Cambridge University Press.
Claydon, Tony. 2002. *William III*. London: Longman.
Cliffe, J. T. 1984. *The Puritan Gentry: The Great Puritan Families of Early Stuart England*. London: Routledge.
———. 1988. *Puritans in Conflict: The Puritan Gentry during and after the Civil Wars*. London: Routledge.
Coleman, Donald C. 1956. "Industrial Growth and Industrial Revolutions." *Economica* n.s. 23:1–22. Reprinted in *Essays in Economic History*, ed. Eleanora M. Carus-Wilson (London: E. Arnold, 1962), 3:334–52.
———. 1975a. *The Economy of England, 1450–1750*. London: Oxford University Press.
———. 1975b. *Industry in Tudor and Stuart England*. London: Macmillan.
Cooper, J. P. 1956. "The Counting of Manors." *Economic History Review*, 2nd ser., 8:377–86.
———. 1967. "The Social Distribution of Land and Men in England, 1436–1700." *Economic History Review*, 2nd ser., 20:419–40.
———. August 1978. "In Search of Agrarian Capitalism." *Past and Present* 80:20–65.

Coquillette, Daniel. 1993. "The Mystery of the New Fashioned Goldsmiths: From Usury to the Bank of England (1622–1694)." In *The Growth of the Bank as Institution and the Development of Money-Business Law*, ed. Vito Piergiovanni, 94–99. Berlin: Duncker & Humblot.

Cornwall, Julian. 1965. "The Early Tudor Gentry." *Economic History Review*, 2nd ser., 17:456–71.

———. 1988. *Wealth and Society in Early Sixteenth-Century England*. London: Routledge and Kegan Paul.

Coss, Peter R. 1995. "The Formation of the English Gentry." *Past and Present* 147:38–64.

———. 2003. *The Origins of the English Gentry*. Cambridge: Cambridge University Press.

Crafts, N.F.R., and C. K. Harley. 1992. "Output Growth and the British Industrial Revolution: A Restatement of the Crafts-Harley View." *Economic History Review*, 2nd ser., 45:703–30.

Crossley, D. W. 1972. "The Performance of the Glass Industry in Sixteenth-Century England." *Economic History Review*, 2nd ser., 25:421–33.

Crouzet, François. 1991. "The Huguenots and the English Financial Revolution." In *Favorites of Fortune: Technology, Growth, and Economic Development since the Industrial Revolution*, ed. Patrice Higonnet, David Landes, and Henry Rosovsky, 221–66. Cambridge: Harvard University Press.

Davis, Ralph. 1954. "English Foreign Trade, 1660–1700." *Economic History Review*, 2nd ser., 7:150–66.

———. 1961. "England and the Mediterranean, 1570–1670." In *Essays in the Economic and Social History of Tudor and Stuart England, in Honour of R. H. Tawney*, ed. F. J. Fisher, 117–26. Cambridge: Cambridge University Press.

———. 1962. *The Rise of the English Shipping Industry in the Seventeenth and Eighteenth Centuries*. London: Macmillan.

———. 1973a. *English Overseas Trade, 1500–1700*. London: Macmillan.

———. 1973b. *Rise of the Atlantic Economies*. Ithaca, NY: Cornell University Press.

———. 1976. "The Rise of Antwerp and Its English Connection." In *Trade, Government, and Economy in Pre-industrial England: Essays Presented to F. J. Fisher*, ed. Donald C. Coleman and A. H. John, 2–20. London: Weidenfeld and Nicholson.

De Vries, Jan. 1976. *The Economy of Europe in an Age of Crisis, 1600–1750*. Cambridge: Cambridge University Press.

De Vries, Jan, and Ad Van der Woude. 1995. *Nederland 1500–1815: De eerste ronde van moderne economische groei*. Amsterdam: Balans. Translated as *The First Modern Economy: Success, Failure, and Perseverance of the Dutch Economy, 1500–1815* (Cambridge: Cambridge University Press, 1997).

Deane, Phyllis. 1965. *The First Industrial Revolution*. Cambridge: Cambridge University Press.

Delorme, Mary. 1989. "A Watery Paradise: Roland Vaughan and Hereford's 'Golden Vale.'" *History Today* 39:38–43.

Dickson, Peter G. M. 1967. *The Financial Revolution in England: A Study in the Development of Public Credit, 1688–1756*. London: Macmillan; New York: St. Martin's Press.

Durston, Christopher, and Jacqueline Eales, eds. 1996. *The Culture of English Puritanism, 1560–1700*. London: Macmillan.

Eisenstadt, S. N., ed. 1968. *The Protestant Ethic and Modernization: A Comparative View*. New York: Basic Books.

Elbl, Martin. 1985. "The Portuguese Caravel and European Shipbuilding: Phases of Development and Diversity." *Revista da Universidade de Coimbra* 33:543–72.

———. 1994. "The Caravel and the Galleon." In *Cogs, Caravels, and Galleons: The Sailing Ship, 1000–1650*, ed. Robert Gardiner, 91–98. London: Conway Maritime Press.

Elster, Jon. 2000. "Rationality, Economy, and Society." In *The Cambridge Companion to Weber*, ed. Stephen P. Turner, 21–41. Cambridge: Cambridge University Press.

Engerman, Stanley. 2000. "Max Weber as Economist and Economic Historian." In *The Cambridge Companion to Weber*, ed. Stephen P. Turner, 256–71. Cambridge: Cambridge University Press.

Fanfani, Amintore. 1935. *Catholicism, Protestantism, and Capitalism.* London: Sheed & Ward.

Fischoff, Ephraim. 1944. "The Protestant Ethic and the Spirit of Capitalism: The History of a Controversy." *Social Research* 11:61–77.

Fisher, F. J. 1940. "Commercial Trends and Policy in Sixteenth-Century England." *Economic History Review*, 1st ser., 10:95–117.

———. 1950. "London's Export Trade in the Early Seventeenth Century." *Economic History Review*, 2nd ser., 3:151–61.

———. 1961. "Tawney's Century." In *Essays in the Economic and Social History of Tudor and Stuart England, in Honour of R. H. Tawney,* ed. F. J. Fisher, 1–14. Cambridge: Cambridge University Press.

Flinn, Michael. 1958. "Revisions in Economic History: XVII: The Growth of the English Iron Industry, 1660–1760." *Economic History Review*, 2nd ser., 11:144–53.

———. 1959. "Timber and the Advance of Technology: A Reconsideration." *Annals of Science* 15:109–20.

———. 1978. "Technical Change as an Escape from Resource Scarcity: England in the Seventeenth and Eighteenth Centuries. In *Natural Resources in European History: A Conference Report*, ed. Antoni Mączak and William N. Parker, 139–59. Washington, DC: Resources for the Future.

———. 1984. *The History of the British Coal Industry*. Vol. 2, *1700–1830: The Industrial Revolution.* Oxford: Clarendon Press.

Fritschy, Wantje. 2003. "A 'Financial Revolution' Revisited: Public Finance in Holland During the Dutch Revolt, 1568–1648." *Economic History Review*, 2nd ser., 56:57–89.

Gaastra, F. S. 1983. "The Exports of Precious Metal from Europe to Asia by the Dutch East India Company, 1602–1795 A.D." In *Precious Metals in the Medieval and Early Modern Worlds*, ed. John F. Richards, 447–76. Durham, NC: Carolina Academic Press.

George, C., and K. George. 1958. "Protestantism and Capitalism in Pre-Revolutionary England." *Church History* 27:351–71.

Goldstone, Jack A. 2002. "Europe's Peculiar Path: Would the World Be 'Modern' if William III's Invasion of England in 1688 Had Failed?" In *Unmaking the West; What-If Scenarios That Rewrite World History*, ed. Philip E. Tetlock, Ned Lebow, and Geoffrey Parker, 168–196. Ann Arbor: University of Michigan Press.

Gould, John D. 1964. "The Price Revolution Reconsidered." *Economic History Review*, 2nd ser., 17:249–66. Reprinted in *The Price Revolution in Sixteenth-Century England,* ed. Peter H. Ramsey (London: Methuen, 1971), 91–116.

———. 1970. *The Great Debasement: Currency and the Economy in Mid-Tudor England*. Oxford: Oxford University Press.

Habakkuk, H. J. 1940. "English Land Ownership, 1680–1740." *Economic History Review*, 1st ser., 10:2–17.

———. 1958. "The Market for Monastic Property, 1539–1603." *Economic History Review*, 2nd ser., 10:362–80.

Hamilton, Alastair. 2000. "Max Weber's *Protestant Ethic and the Spirit of Capitalism*." In *The Cambridge Companion to Weber*, ed. Stephen P. Turner, 151–71. Cambridge: Cambridge University Press.

Hamilton, Earl J. 1928. "American Treasure and Andalusian Prices, 1503–1660: A Study in the Spanish Price Revolution." *Journal of Economic and Business History* 1:1–35. Reprinted in *The Price Revolution in Sixteenth-Century England,* ed. Peter H. Ramsey (London: Methuen, 1971), 147–81.

———. 1929a. "American Treasure and the Rise of Capitalism, 1500–1700." *Economica* 27:38–57.
———. 1929b. "Imports of American Gold and Silver into Spain, 1503–1660." *Quarterly Journal of Economics* 43:436–72.
———. 1934. *American Treasure and the Price Revolution in Spain, 1501–1650*. Cambridge: Harvard University Press.
———. 1936. *Money, Prices, and Wages in Valencia, Aragon, and Navarre, 1351–1500*. Cambridge: Harvard University Press.
———. 1942. "Profit Inflation and the Industrial Revolution, 1751–1800." *Quarterly Journal of Economics* 56:256–73. Reprinted in *Enterprise and Secular Change: Readings in Economic History*, ed. Frederic C. Lane and Jelle C. Riemersma (London: George Allen and Unwin, 1953), 322–49.
———. 1947. *War and Prices in Spain, 1651–1800*. Cambridge: Harvard University Press.
———. 1952. "Prices as a Factor in Business Growth: Prices and Progress." *Journal of Economic History* 12:325–49.
Hammersley, George. 1957. "The Crown Woods and Their Exploitation in the Sixteenth and Seventeenth Centuries." *Bulletin of the Institute of Historical Research, University of London* 30:154–59.
———. 1973. "The Charcoal Iron Industry and Its Fuel, 1540–1750." *Economic History Review*, 2nd ser., 26:593–613.
———. 1976. "The State and the English Iron Industry in the Sixteenth and Seventeenth Centuries." In *Trade, Government, and Economy in Pre-Industrial England: Essays Presented to F. J. Fisher*, ed. Donald Coleman and A. H. John, 166–86. London: Weidenfeld and Nicholson.
Harkness, Georgia. 1958. *John Calvin: The Man and His Ethics*. New York: H. Holt.
Harley, C. Knick. 1967. "Goschen's Conversion of the National Debt and the Yield on Consols." *Economic History Review*, 2nd ser., 29:101–6.
Harris, John R. 1988. *The British Iron Industry, 1700–1850*. London: Macmillan.
Hart, Marjolein 't. 1991. " 'The Devil or the Dutch': Holland's Impact on the Financial Revolution in England, 1643–1694." *Parliaments, Estates and Representatives* 11, no. 1: 39–52.
Hart, Marjolein 't, Joost Jonker, and Jan Luiten van Zanden, eds. 1997. *Financial History of the Netherlands*. Cambridge: Cambridge University Press.
Hatcher, John. 1993. *The History of the British Coal Industry*. Vol. 1, *Before 1700: Towards the Age of Coal*. Oxford: Clarendon Press.
Heal, Felicity, and Felicity O'Day, eds. 1977. *Church and Society in England: Henry VIII to James I*. London: Macmillan.
Heim, Carol E., and Philip Mirowski. 1987. "Interest Rates and Crowding-Out during Britain's Industrial Revolution." *Journal of Economic History* 47:117–39.
———. 1991. "Crowding Out: A Response to Black and Gilmore." *Journal of Economic History* 51:701–6.
Herman, Arthur. 2001. *How the Scots Invented the Modern World*. New York: Three Rivers Press.
Heywood, Colin. 1992. *The Development of the French Economy, 1750–1914*. Basingstoke: Macmillan.
Hill, Christopher. 1961. "Protestantism and the Rise of Capitalism." In *Essays in the Economic and Social History of Tudor and Stuart England, in Honour of R. H. Tawney*, ed. F. J. Fisher, 15–39. Cambridge: Cambridge University Press.
———. 1964a. "Puritanism, Capitalism, and the Scientific Revolution." *Past and Present* 29:88–97.
———. 1964b. *Society and Puritanism in Pre-Revolutionary England*. London: Secker & Warburg.

———. April 1964c. "William Harvey and the Idea of Monarchy." *Past and Present* 27: 54–57.
———. 1965a. *The Intellectual Origins of the English Revolution*. Oxford: Oxford University Press.
———. 1965b. "Science, Religion and Society in the Sixteenth and Seventeenth Centuries." *Past and Present* 32:110–12.
Hobsbawm, Eric. 1954. "The Crisis of the Seventeenth Century." *Past and Present* 5:33–53 and 6:44–65. Reprinted in *Crisis in Europe, 1560–1660: Essays from Past and Present*, ed. Trevor Aston (London: Routledge and Kegan Paul, 1965), 5–58, 97–112.
Hudson, Patricia. 2004. "Land Markets, Credit and Proto-Industrialization in Britain and Europe." In *Il mercato della terra, seccoli XIII–XVIII*, ed. Simonetta Cavaciocchi, 721–42. Florence: Le Monnier.
Hyde, Charles K. 1973. "The Adoption of Coke-Smelting by the British Iron Industry, 1709–1790." *Explorations in Economic History* 10:397–418.
———. 1977. *Technological Change and the British Iron Industry, 1700–1870*. Princeton: Princeton University Press.
Israel, Jonathan I. 1989. *Dutch Primacy in World Trade, 1585–1740*. Oxford: Clarendon Press.
Jack, Sybil. 1977. *Trade and Industry in Tudor and Stuart England*. London: Allen and Unwin.
Jonassen, Christen T. 1947. "The Protestant Ethic and the Spirit of Capitalism in Norway." *American Sociological Review* 12:676–86.
Jones, E. L., ed. 1967. *Agriculture and Economic Growth in England, 1650–1815*. London: Methuen; New York: Barnes and Noble.
———. 1997. "Capitalism: One Origin or Two?" *Journal of Early Modern History: Contacts, Comparisons, Contrasts* 1, no. 1: 71–76.
Kearney, H. F. 1964. "Puritanism, Capitalism, and the Scientific Revolution." *Past and Present* 28:81–101.
———. 1965. "Puritanism and Science: Problems of Definition." *Past and Present* 31: 104–10.
Kerridge, Eric. 1967. *The Agricultural Revolution*. London: Allen and Unwin.
———. 1969. *Agrarian Problems in the Sixteenth Century and After*. London: Allen and Unwin; New York: Barnes and Noble.
———. 1973. *The Farmers of Old England*. London: Allen and Unwin.
Keynes, John Maynard. 1930. *A Treatise on Money*. 2 vols. London: Macmillan.
Kitch, M. J., ed. 1967. *Capitalism and the Reformation*. London: Longmans.
Komlos, John. 2000. "The Industrial Revolution as the Escape from the Malthusian Trap." *Journal of European Economic History* 29:307–31.
Kussmaul, Ann. 1990. *A General View of the Rural Economy of England, 1538–1840*. Cambridge: Cambridge University Press.
Landes, David. 1998. *The Wealth and Poverty of Nations: Why Some Are So Rich and Some So Poor*. New York: Norton
———. 2003. *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present*. 2nd ed. Cambridge: Cambridge University Press.
———. 2006. *Dynasties: Fortunes and Misfortunes of the World's Great Family Businesses*. New York: Viking.
Lehmann, Hartmut, and Guenther Roth, eds. 1985. *Weber's Protestant Ethic: Origins, Evidence, Contexts*. Cambridge: Cambridge University Press.
Lewis, Archibald, and Timothy Runyan. 1985. *European Naval and Maritime History, 300–1500*. Bloomington: Indiana University Press.

Little, David. 1969. *Religion, Order, and Law: A Study in Pre-Revolutionary England*. New York: Harper and Row.
Luthy, Hubert. 1963. "Calvinisme et capitalisme: Après soixante ans de débat." *Cahiers Vilfredo Pareto* 2:5–35. Republished in Hubert Luthy, *Le passé present: Combats d'idées de Calvin à Rousseau* (Monaco: Éditions du Rocher, 1965).
———. 1964. "Once Again: Calvinism and Capitalism." *Encounter* 22, no. 1: 26–38.
Marshall, Gordon. 1980. *Presbyteries and Profits: Calvinism and the Development of Capitalism in Scotland, 1560–1707*. Oxford: Clarendon Press.
Martins, Susanna Wade, and Tom Williamson. 1994. "Floated Water-Meadows in Norfolk: A Misplaced Innovation." *Agricultural History Review* 421:20–37.
Mason, S. F. 1953. "Science and Religion in Seventeenth-Century England." *Past and Present* 3:28–44.
Mathias, Peter. 1983. *The First Industrial Nation: An Economic History of Britain, 1700–1914*. 2nd ed. London: Methuen.
McBride, Joseph. 1992. *Albert Camus: Philosopher and Littérateur.* London: St. Martin's Press.
McClelland, David C. 1953. *The Achievement Motive*. New York: Appleton-Century-Crofts.
———. 1975. *The Achieving Society: With a New Introduction.* New York: Irvington, distributed by Halstead Press.
McClelland, David C., David G. Winter, and Sara K. Winter. 1969. *Motivating Economic Achievement*. New York: Free Press.
McCloskey, Donald N. 1975a. "The Economics of Enclosure: A Market Analysis." In *European Peasants and Their Markets: Essays in Agrarian Economic History*, ed. W. N. Parker and E. L. Jones, 123–60. Princeton: Princeton University Press.
———. 1975b. "The Persistence of English Common Fields." In *European Peasants and Their Markets: Essays in Agrarian Economic History*, ed. W. N. Parker and E. L. Jones, 92–120. Princeton: Princeton University Press.
Merton, Robert K. 1938. "Science, Technology, and Society in Seventeenth-Century England." *Osiris* 4:360–78.
———. 1957. "Puritanism, Pietism, and Science." In *Social Theory and Social Structure*, 575–606. Rev. ed. Glencoe, IL, Free Press.
———. 1970. *Science, Technology, and Society in Seventeenth-Century England*. New York: H. Fertig.
Michie, Ranald. 1999. *The London Stock Exchange: A History.* Oxford: Oxford University Press.
Mijers, Esther. 2007. *Redefining William III: The Impact of the King-Stadholder in International Context*. Aldershot: Ashgate.
Mingay, George E. 1968. *Enclosure and the Small Farmer in the Age of the Industrial Revolution*, Studies in Economic History series. London: Macmillan.
———. 1976. *The Gentry: The Rise and Fall of a Ruling Class*. London.
———, ed. 1977. *The Agricultural Revolution: Changes in Agriculture, 1650–1880*. London: Longman.
Mitchell, B. R., and Phyllis Deane. 1962. *Abstract of British Historical Statistics*. Cambridge: Cambridge University Press.
Mitzman, A. 1970. *The Iron Cage: An Historical Interpretation of Max Weber.* New York.
Mokyr, Joel, 1987. "Has the Industrial Revolution Been Crowded Out? Some Reflections on Crafts and Williamson." *Explorations in Economic History*, 24(3): 293–319.
———. 1990. *The Lever of Riches: Technological Creativity and Economic Progress* p. 62. Oxford and New York: Oxford University Press, 1990.
Munro, John. 1973. "The Weber Thesis Revisited—and Revindicated?" *Revue belge de philologie et d'histoire* 51:381–91.

———. 1988. "Textile Technology." in Joseph R. Strayer, et al., eds., *Dictionary of the Middle Ages*, 13 vols. (New York: Charles Scribner's Sons/MacMillan, 1982–88), Vol. 11, pp. 693–711.

———. 1994. "Patterns of Trade, Money, and Credit." In *Handbook of European History in the Later Middle Ages, Renaissance, and Reformation, 1400–1600*, ed. James Tracy, Thomas Brady Jr., and Heiko Oberman, vol. 1, *Structures and Assertions*, 147–95. Leiden: E. J. Brill.

———. 1999. "The Symbiosis of Towns and Textiles: Urban Institutions and the Changing Fortunes of Cloth Manufacturing in the Low Countries and England, 1270–1570." *Journal of Early Modern History: Contacts, Comparisons, Contrasts* 3, no. 1: 1–74.

———. 2002. "Prices, Wages, and Prospects for 'Profit Inflation' in England, Brabant, and Spain, 1501–1670: A Comparative Analysis." Working paper, Department of Economics, University of Toronto.
http://www.economics.utoronto.ca/index.php/index/research/workingPaperDetails/141.

———. 2003a. "The Medieval Origins of the Financial Revolution: Usury, *Rentes*, and Negotiablity." *International History Review* 25:505–62.

———. 2003b. "Medieval Woollens: Textiles, Textile Technology, and Industrial Organisation, c. 800–1500." In *The Cambridge History of Western Textiles*, ed. David Jenkins, 1:181–227. Cambridge: Cambridge University Press.

———. 2003c. "The Monetary Origins of the 'Price Revolution': South German Silver Mining, Merchant-Banking, and Venetian Commerce, 1470–1540." In *Global Connections and Monetary History, 1470–1800,* ed. Dennis Flynn, Arturo Giráldez, and Richard von Glahn, 1–34. Aldershot: Ashgate.

———. 2004. "Inflation." In *Europe, 1450–1789: Encyclopedia of the Early Modern World*, ed. Jonathan Dewald et al., 3:262–65. New York: Charles Scribner's Sons, Gale Group.

———. 2007a. "Classic Reviews in Economic History:" Earl Hamilton, *American Treasure and the Price Revolution in Spain, 1501–1650*. EH.NET Book Review, January 15. http://eh.net/bookreviews/library/munro.

———. 2007b. "South German Silver, European Textiles, and Venetian Trade with the Levant and Ottoman Empire, c. 1370 to c. 1720: A Non-mercantilist Approach to the Balance of Payments Problem." In *Relazione economiche tra Europa e mondo islamico, seccoli XIII–XVIII*, ed. Simonetta Cavaciocchi, 907–62. Florence: Le Monnier.

———. 2008a. "Money, Prices, Wages, and 'Profit Inflation' in Spain, the Southern Netherlands, and England during the Price Revolution Era: ca. 1520–ca. 1650." *História e Economia: Revista Interdisciplinar* 4:13–71.

———. 2008b. "The Price Revolution." In *The New Palgrave Dictionary of Economics*, ed. Steven N. Durlauf and Lawrence E. Blume, no. 1339. 2nd ed. 6 vols., London: Palgrave Macmillan.

———. 2008c. "The Usury Doctrine and Urban Public Finances in Late-Medieval Flanders (1220–1550): Rentes (Annuities), Excise Taxes, and Income Transfers from the Poor to the Rich." In *La fiscalità nell'economia Europea, secc. XIII–XVIII / Fiscal Systems in the European Economy from the 13th to the 18th Centuries*, ed. Simonetta Cavaciocchi, 973–1026. Florence: Firenze University Press.

Musson, Albert E. 1972. *Science, Technology, and Economic Growth in the Eighteenth Century*. London: Methuen.

Musson, Albert E., and Eric Robinson. 1960. "Science and Industry in the Late Eighteenth Century." *Economic History Review*, 2nd ser., 13:222–45.

———. 1969. *Science and Technology in the Industrial Revolution*. Toronto: University of Toronto Press.

Neal, Larry. 1990. *The Rise of Financial Capitalism: International Capital Markets in the Age of Reason.* Cambridge: Cambridge University Press.

Nef, John U. 1923. *The Rise of the British Coal Industry*. 2 vols. London: G. Routledge. Reprinted London: F. Cass, 1966.

———. 1934. "The Progress of Technology and the Growth of Large Scale Industry in Great Britain, 1540–1640." *Economic History Review*, 1st ser., 5:3–24. Reprinted in John U. Nef, *Conquest of the Material World* (Chicago: University of Chicago Press, 1964), 121–43.

———. 1936. "A Comparison of Industrial Growth in France and England, 1540–1640." *Journal of Political Economy* 44:643-66. Reprinted in John U. Nef, *Conquest of the Material World* (Chicago: University of Chicago Press, 1964), 144–212.

———. 1937. "Prices and Industrial Capitalism in France and England, 1540–1640." *Economic History Review*, 1st. ser., 7:155–85. Reprinted in *Enterprise and Secular Change: Readings in Economic History*, ed. Frederic C. Lane and Jelle C. Riemersma (London: George Allen and Unwin, 1953), 292–321.

———. 1950. *War and Human Progress: An Essay on the Rise of Industrial Civilization.* Cambridge: Harvard University Press. Reprinted New York: Russell & Russell, 1968.

Noonan, John T. 1957. *The Scholastic Analysis of Usury.* Cambridge: Harvard University Press

North, Douglass. 1984. "Government and the Cost of Exchange in History." *Journal of Economic History* 44:255–64.

North, Douglass. 1985. "Transaction Costs in History." *Journal of European Economic History* 14:557–76.

North, Douglass, and Barry Weingast. 1989. "Constitutions and Commitment: The Evolution of Institutions Governing Public Choice in Seventeenth-Century Britain." *Journal of Economic History* 49:803–32.

O'Brien, Patrick. 1988. "The Political Economy of British Taxation." *Economic History Review* 2nd ser., 41:1–32.

———. 2002. "Fiscal Exceptionalism: Great Britain and Its European Rivals—from Civil War to Triumph at Trafalgar and Waterloo." In *The Political Economy of British Historical Experience, 1688–1914,* ed. Patrick O'Brien and Donald Winch, 245–65. Oxford: Oxford University Press.

O'Brien, Patrick, and P. Hunt. 1993. "The Rise of a Fiscal State in England, 1485–1815." *Historical Research* 66:129–76.

O'Connell, Laura. 1976. "Anti-entrepreneurial Attitudes in Elizabethan Sermons and Popular Literature." *Journal of British Studies* 15:1–20.

O'Day, Rosemary. 1982. *Education and Society, 1500–1800: The Social Foundations of Education in Early Modern Britain.* London: Longman.

———. 1986. *The Debate on the English Reformation*. London: Methuen.

Outhwaite, R. B. 1986. "Progress and Backwardness in English Agriculture, 1500–1650." *Economic History Review*, 2nd ser., 39:1–18.

Overton, Mark. 1984. "Agricultural Revolution? Development of the Agrarian Economy in Early-Modern England." In *Explorations in Historical Geography: Interpretative Essays*, ed. A.R.H. Baker and D. J. Gregory, 118–39. Cambridge: Cambridge University Press.

———. 1996a. *Agricultural Revolution in England: The Transformation of the Agrarian Economy, 1500–1800*. Cambridge: Cambridge University Press.

———. 1996b. "Re-establishing the English Agricultural Revolution." *Agricultural History Review* 44:1–20.

Pagano de Divitiis, Giglioa. 1997. *English Merchants in Seventeenth-Century Italy*. Trans. Stephen Parkin. Cambridge: Cambridge University Press. Originally published as *Mercanti inglesi nell'Italia del Seicento: Navi, traffici, egemonie* (Venice: Marsilio Editore, 1990).

Parker, Geoffrey. 1974. "The Emergence of Modern Finance in Europe, 1500–1750." In *The Fontana Economic History of Europe*, vol. 2, *Sixteenth and Seventeenth Centuries*, ed. Carlo Cipolla, 527–94. Glasgow: Collins/Fontana.

Parker, Geoffrey, and L. M. Smith, eds. 1978. *The General Crisis of the Seventeenth Century*. London: Routledge and Kegan Paul.
Pettegree, Andrew, Alastair Duke, and Gillian Lewis, eds. 1994. *Calvinism in Europe, 1540–1620*. Cambridge: Cambridge University Press.
Phelps Brown, E. H., and Sheila V. Hopkins. 1956. "Seven Centuries of the Prices of Consumables, Compared with Builders' Wage Rates." *Economica* 23:296–314. Reprinted in E. H. Phelps Brown and Sheila V. Hopkins, *A Perspective of Wages and Prices* (London: Methuen, 1981), 13–39.
Pollard, Sidney. 1980. "A New Estimate of British Coal Production, 1750–1850." *Economic History Review*, 2nd ser., 33:212–35.
Price, Roger. 1981. *An Economic History of Modern France, 1730–1914*. Rev. ed. London: Macmillan.
Rabb, Theodore K. July 1965. "Religion and the Rise of Modern Science." *Past and Present* 31:111–26.
———. 1966. "Science, Religion and Society in the Sixteenth and Seventeenth Centuries." *Past and Present* 33:148.
———. 1976. *The Struggle for Stability in Early Modern Europe*. Oxford: Oxford University Press.
Rackham, Oliver. 1976. *Trees and Woodland in the British Landscape*. London: J. M. Dent.
———. 1980. *Ancient Woodland: Its History, Vegetation, and Uses in England*. London: Edward Arnold.
Richards, R. D. 1929. *The Early History of Banking in England*. London: P. S. King & Son.
Riden, Philip. 1977. "The Output of the British Iron Industry before 1870." *Economic History Review*, 2nd ser., 30:442–59.
Riemersma, Jelle C. 1967. *Religious Factors in Early Dutch Capitalism, 1550–1650*. The Hague: Mouton,
Robertson, H. M. 1933. *Aspects of the Rise of Economic Individualism: A Criticism of Max Weber and His School*. Cambridge: Cambridge University Press.
Rogers, James E. Thorold. 1866–1902. *History of Agriculture and Prices in England*. 7 vols. Oxford: Clarendon Press.
Roseveare, Henry. 1991. *The Financial Revolution, 1660–1760*. London: Longman.
Samuelsson, Kurt. 1961. *Religion and Economic Action*. London: Heinemann.
Schubert, H. R. 1957. *The History of the British Iron and Steel Industry from ca. 450 B.C. to A.D. 1775*. London: Routledge and Kegan Paul.
Schumpeter, Joseph A. 1949. "Economic Theory and Entrepreneurial History." In *Change and the Entrepreneur: Postulates and Patterns for Entrepreneurial History*, ed. Research Center in Entrepreneurial History, Harvard University, 63–84. Cambridge: Harvard University Press. Republished in *Essays of J. A. Schumpeter*, ed. Richard Clemence (Cambridge, Addison-Wesley, 1951), 248–66.
———. 1961. *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*. Trans. Redvers Opie. 1934; New York: Oxford University Press.
———. 1987. *Capitalism, Socialism, and Democracy*. London. Unwin Paperbacks.
———. 1989. *Business Cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process*. 1964; New York: Porcupine Press.
———. 1991. "Max Weber's Work." In *The Economics and Sociology of Capitalism*. Ed. Richard Swedberg. Princeton: Princeton University Press.
———. 1997. *Essays: On Entrepreneurs, Innovations, Business Cycles, and the Evolution of Capitalism*. New York: Transaction.
Scott, William Robert. 1912. *The Constitution and Finance of English, Scottish, and Irish Joint-Stock Companies to 1720*. 3 vols. Cambridge: Cambridge University Press.
Simpson, Alan. 1961. *The Wealth of the Gentry, 1540–1660*. Chicago: University of Chicago Press.

Smith, Sir Thomas. 1906. *De Republica Anglorum: A Discourse on the Commonwealth of England*. 1583. Ed. L. Alston. Cambridge: Cambridge University Press.
Stasavage, David. 2003. *Public Debt and the Birth of the Democratic State: France and Great Britain, 1688–1789*. Cambridge: Cambridge University Press
———. 2007. "Partisan Politics and Public Debt: The Importance of the 'Whig Supremacy' for Britain's Financial Revolution." *European Review of Economic History* 11:123–53.
Stone, Lawrence. 1948. "The Anatomy of the Elizabethan Aristocracy." *Economic History Review*, 1st ser., 18:1–53.
———. 1952. "The Elizabethan Aristocracy: A Restatement." *Economic History Review*, 2nd ser., 4:302–21.
———. 1956. *The Crisis of the Aristocracy, 1558–1641*. Oxford: Oxford University Press.
Sussman, Nathan, and Yafeh, Yishay. 2006. "Institutional Reforms, Financial Development and Sovereign Debt: Britain, 1690–1790." *Journal of Economic History* 66:882–905.
Tann, Jennifer. 1973. "Fuel Saving in the Process Industries during the Industrial Revolution: A Study in Technological Diffusion." *Business History* 15:149–59.
Tawney, Richard H. 1912. *The Agrarian Problem in the Sixteenth Century*. London: Longmans, Green. Reissued with an introduction by Lawrence Stone (London: Harper and Row, 1967).
———. 1926. *Religion and the Rise of Capitalism*: *A Historical Study*. London: J. Murrary. Reissued London: Penguin, 1990.
———. 1941. "The Rise of the Gentry, 1558–1640." *Economic History Review*, 1st ser., 11:1–38. Reprinted with a postscript in *Essays in Economic History*, ed. Eleanora M. Carus-Wilson (London: E. Arnold, 1954), 1:173–214.
Terrill, Ross. 1974. *R.H. Tawney and His Times: Socialism as Fellowship*. London: Deutsch.
Thirsk, Joan, ed. 1967a. *The Agrarian History of England and Wales*. Vol. 4, *1500–1640*. Cambridge: Cambridge University Press.
———. 1967b. "Engrossing and Enclosing." In *The Agrarian History of England and Wales*, ed. Joan Thirsk, vol. 4, *1500–1640*, 200–256. Cambridge: Cambridge University Press.
———. 1967c. "Farming Techniques." In *The Agrarian History of England and Wales*, ed. Joan Thirsk, vol. 4, *1500–1640*, 161–99. Cambridge: Cambridge University Press
———. 1984. *The Agrarian History of England and Wales*. Vol. 5, *1640–1750*. Part 1, *Regional Farming Systems*. Cambridge: Cambridge University Press.
———. 1985a. *The Agrarian History of England and Wales*. Vol. 5, *1640–1750*. Part 2, *Agrarian Change*. Cambridge: Cambridge University Press.
———. 1985b. "Agricultural Innovations and their Diffusion." In *Agrarian History of England*, vol. 5, ed. Joan Thirsk, part 2, *Agrarian Change*, 533–89. Cambridge: Cambridge University Press.
Thomas, Brinley. 1985. "Escaping from Constraints: The Industrial Revolution in a Malthusian Context." *Journal of Interdisciplinary History* 15:729–54.
———. 1986. "Was There an Energy Crisis in Great Britain in the 17th Century?" *Explorations in Economic History* 23:124–52.
Thompson, E. P. 1967. "Time, Work-Discipline, and Industrial Capitalism." *Past and Present* 38:56–97.
Thompson, F.M.L. 1966. "The Social Distribution of Landed Property in England since the Sixteenth Century." *Economic History Review*, 2nd ser., 19:505–17.
Thorner, Isidor. 1952. "Ascetic Protestantism and the Development of Science and Technology." *American Journal of Sociology* 58:25–33.
Tracy, James D. 1985. *A Financial Revolution in the Habsburg Netherlands: Renten and Renteniers in the County of Holland, 1515–1565*. Berkeley and Los Angeles: University of California Press.
———. 1995. "Taxation and State Debt." In *Handbook of European History, 1500–1600: Late Middle Ages, Renaissance, and Reformation*, ed. Thomas Brady, Heiko Oberman, and James Tracy, vol. 1, *Structures and Assertions*, 563–88. Leiden, E. J. Brill.

———. 2003. "On the Dual Origins of Long-Term Urban Debt in Medieval Europe." In *Urban Public Debts: Urban Government and the Market for Annuities in Western Europe, 14th–18th Centuries,* ed. Karel Davids, Marc Boone, and V. Janssens, 13–26. Turnout: Brepols

Trevor-Roper, Hugh R. 1951. "The Elizabethan Aristocracy: An Anatomy Anatomized." *Economic History Review*, 2nd ser., 3:279–98.

———. 1953. *The Gentry, 1540–1640. Economic History Review*, supplement no. 1. Cambridge: Cambridge University Press

———. 1963. *Religion, the Reformation, and Social Change*. London: Bowes & Bowes.

Troost, Wouter. 2005. *William III the Stadholder-King: A Political Biography*. Aldershot: Ashgate

Turner, Stephen P., ed. 2000. *The Cambridge Companion to Weber*. Cambridge: Cambridge University Press.

Unger, Richard W. 1980. *The Ship in the Medieval Economy, 600–1600*. London: Croom Helm.

———. 1981. "Warships and Cargo Ships in Medieval Europe." *Technology and Culture* 22:233–52.

———. 1987. "Portuguese Shipbuilding and the Early Voyages to the Guinea Coast." In *Vice-Almirante Avelino Teixeira da Mota, In Memoriam*, ed. Academia Portuguesa da História, 1:229–49. Lisbon: Academia de Marinha / Instituto de Investigacao Cientifica Tropical.

———. 1997. *Ships and Shipping in the North Sea and Atlantic, 1400–1800*. Aldershot: Ashgate.

Van der Wee, Herman. 1963. *The Growth of the Antwerp Market and the European Economy, 14th–16th Centuries*. 3 vols. The Hague: Martinus Nijhoff.

Van der Wee, Herman (in collaboration with John Munro). 2003. "The Western European Woollen Industries, 1500–1750." In *The Cambridge History of Western Textiles*, ed. David Jenkins, 2:397–472. Cambridge: Cambridge University Press.

Van Houtte, Jan A. 1940. "La genèse du grande marché international d'Anvers à la fin du moyen âge." *Revue belge de philologie et d'histoire* 19:87–126.

———. 1961. "Anvers aux XVe et XVIe siècle." *Annales: Economies, Sociétés, Civilisations* 16:248–78.

Van Stuivenberg, J. H. 1975. "The Weber Thesis: Attempt at Interpretation." *Acta Historiae Neerlandicae* 8:50–66.

Viner, Jacob. 1948. "Power vs. Plenty as Objectives of Foreign Policy in the Seventeenth and Eighteenth Centuries." *World Politics* 1:1–29. Republished in *Revisions in Mercantilism*, ed. Donald C. Coleman (London: Methuen, 1969), 61–91.

Weber, Max. 1904–5. *Die Protestantische Ethik und der Geist des Kapitalismus*. Berlin. Trans. Talcott Parsons as *The Protestant Ethic and the Spirit of Capitalism* (New York: Charles Scribner's Sons, 1930).

———. 1961. *General Economic History*. Trans. Frank H. Knight. New York: Collier Books

Wedgwood, Cicely V. 1966. *The King's War, 1641–1647*. London: Collins.

———. 1970a. *The King's Peace, 1637–1641: The Great Rebellion*. London: Collins Fontana.

———. 1970b. *Oliver Cromwell and the Elizabethan Inheritance*. London: J. Cape

West, E. G. 1975. *Education and the Industrial Revolution*. London: B. T. Batsford.

Wiebe, Georg, 1895. *Zur Geschichte der Preisrevolution des XVI. und XVII. Jahrhunderts*. Leipzig: Duncker & Humblot.

Williamson, Jeffrey. 1984. "Why Was British Growth So Slow during the Industrial Revolution?" *Journal of Economic History* 44:687–712.

Willan, Thomas S. 1956. *The Early History of the Russia Company, 1553–1603*. Manchester: Manchester University Press.

———. 1973. *The Muscovy Merchants of 1555*. New York: A. M. Kelly.
———. 1968. *Studies in Elizabethan Foreign Trade*. New York: A. M. Kelly.
Wilson, Charles. 1949. "Treasure and Trade Balances: The Mercantilist Problem." *Economic History Review*, 2nd ser., 2:152–61.
———. 1958. *Mercantilism*. Historical Association Pamphlet No. 37. London: Historical Association.
Wilson, Thomas. 1925. *A Discourse Upon Usury By Way of Dialogue and Orations*. With a historical introduction by R. H. Tawney. London: G. Bell.
Wordie, S. R. 1983. "The Chronology of English Enclosure, 1500–1914." *Economic History Review*, 2nd ser., 36:483–505.
Wright, Anthony. 1987. *R. H. Tawney*. Manchester: Manchester University Press.
Wrigley, E. Anthony. 1988. *Continuity, Chance, and Change: The Character of the Industrial Revolution in England*. Cambridge: Cambridge University Press.
———. 2000. "The Divergence of England: The Growth of the English Economy in the Seventeenth and Eighteenth Centuries." *Transactions of the Royal Society*, 6th ser., 10:117–41.
———. 2006. "The Transition to an Advanced Organic Economy: Half a Millennium of English Agriculture." *Economic History Review*, 2nd ser., 59:425–80.
Wrigley, E. Anthony, R. S. Davies, J. E. Oeppen, and R. S. Schofield. 1997. *English Population History from Family Reconstitution, 1580–1837*. Cambridge: Cambridge University Press.
Wrigley, E. Anthony, and, R. S. Schofield. 1980. *The Population History of England, 1541–1871: A Reconstruction*. Cambridge: Cambridge University Press.
Yelling, J. A. 1977. *Common Field and Enclosure in England, 1450–1850*. London: Macmillan.
Zell, Michael. 1993. *Industry in the Countryside: Wealden Society in the Sixteenth Century*. Cambridge: Cambridge University Press.