Department of Economics
and
Institute for Policy Analysis
University of Toronto
150 St. George Street
Toronto, Ontario M5S 3G7
Canada

Monday, 9 October 2006

Revised: Monday, 16 October 2006

WORKING PAPER No. 30

Entrepreneurship in Early-Modern Europe (1450 - 1750): An Exploration of Some Unfashionable Themes in Economic History

Repec Handle: tecipa-257

by

John Munro

Author's e-mail: munro5@chass.utoronto.ca
http://www.economics.utoronto.ca/munro5

On-line version: http://repec.economics.utoronto.ca/files/tecipa-257-1.pdf

JEL Classifications: E31; E40; F10; G20; G21; J10; J30; L10; L71; L72; N13; N23; N33; N83; 031.

Abstract for: Entrepreneurship in Early-Modern Europe (1450 - 1750): **An Exploration of Some Unfashionable Themes in Economic History**

Entrepreneurship, by its very essence, concerns the theory of the firm – the individual enterprise – which in turn is the essential core of micro-economics. A major theme of this study, however, is to demonstrate the interaction of micro- and macro-economic phenomena: to show how such firms or enterprises, and entrepreneurship itself, were often shaped by, and often helped shape, such macro-economic forces as demographic changes, monetary changes, price changes – in terms of both deflation and inflation – long distance trade, overseas exploration and expansion (colonialism), and indeed related changes in social institutions and socio-cultural values that were also influenced by such macro-economic changes.

One generalization about macro-economic changes involving inflations and deflations has both general and considerable importance in the history of European business enterprises and entrepreneurship itself: for long-term inflations (when moderate) tend to cheapen or reduce the relative factor costs of labour (wages), land (rent contracts), and capital (fixed interest rates in loan contracts). Similarly, long term deflations tend, in reverse fashion, to increase the real or relative factor costs of labour, land, and capital, especially with pronounced wage-stickiness, and related 'stickiness' in leasehold rent contracts (and more so with customary tenures), and with loan contracts -- even if the long-term trends in real interest rates was falling over this long period. At the same time, both inflations and deflations are accompanied by changes in the relative prices of key industrial inputs. The key question to be posed is this: how did entrepreneurs respond to such changes in their factor costs, both short term and long term?

This study commences by demonstrating how deflation in mid-15th century Europe, in increasing the purchasing power of silver, provided the stimulus for two major technological innovations in silver-mining and smelting that led to the South German silver-copper mining boom of 1460-1540, which also meant major changes in commercial-industrial entrepreneurship and in industrial scales. That mining boom in turn laid the foundations for the 130 year inflation of the Price Revolution (1520-1650) – an inflation further fostered by a financial revolution in credit and banking institutions (from the 1520s), and then further fuelled by the influx of Spanish-American silver. The heart of this study is on the role of inflation, and associated macro-economic changes, in producing the roots of modern capitalist entrepreneurship, during what is often called Tawney's Century (1540-1640). We begin, however, with two famous related theses: Hamilton's thesis of 'Profit Inflation' (in which wages lag behind consumer prices), a wrongly-constructed thesis that endures only because Keynes endorsed it; and Nef's thesis of the 'Tudor Stuart industrial revolution' – a much ridiculed response to Hamilton – whose merit lies in revealing the capitalist entrepreneurship, major technological changes, and changes in industrial scale that resulted from the substitution of coal – the heart of modern industrialization – for every more costly wood charcoal. Tawney's three theses themselves concern the origins of modern agrarian capitalism, the related 'Rise of the Gentry' debate (on the role of inflation in shifting land ownership from the aristocracy to the more 'capitalist-minded' gentry landowners), and the Weber-Tawney thesis on Religion (Protestantism) and the Rise of Capitalism, which, I endeavour to show has its real relevance only from the late 17th century. Associated with the Price Revolution era is the Age of Overseas Expansion (involving one of the most momentous technological and entrepreneurial change of the early modern era: the development of the Full Rigged Atlantic ship, with heavy artillery). England joined that overseas commercial-colonial race rather late, in the 1550s, but in doing so developed the institutional foundations of modern capitalism by creating the joint stock company. Certainly technological and institutional innovations are the real hallmark of entrepreneurship. This three-century study ends with the following era of monetary scarcity and deflation (1650-1740) that provided another macro-economic challenge whose response was revolutionary changes in banking and financial institutions – i.e., in financial-commercial entrepreneurship. It also fostered the growth and spread of rent-seeking Mercantilist philosophies that also influenced the character of early-modern capitalist entrepreneurship.

JEL Classifications: E31; E40; F10; G20; G21; J10; J30; L10; L71; L72; N13; N23; N33; N83; 031.

Entrepreneurship in Early-Modern Europe (1450 - 1750): **An Exploration of Some Unfashionable Themes in Economic History**

by John H. Munro (University of Toronto)

****

Introduction: the medieval background to early modern entrepreneurship

Entrepreneurship, by its very essence, concerns the theory of the firm – the individual enterprise – which in turn is the essential core of micro-economics. A major theme of this study, however, is to demonstrate the interaction of micro- and macro-economic phenomena: to show how such firms or enterprises, and entrepreneurship itself, were often shaped by, and often helped shape, such macro-economic forces as demographic changes, monetary changes, price changes – in terms of both deflation and inflation – long distance trade, overseas exploration and expansion (colonialism), and indeed related changes in social institutions and socio-cultural values that were also influenced by such macro-economic changes.

One generalization about macro-economic changes involving inflations and deflations has both general and considerable importance in the history of European business enterprises and entrepreneurship itself: for long-term inflations (when moderate) tend to cheapen or reduce the relative factor costs of labour (wages), land (leasehold rent contracts, but more especially customary tenures), and capital (fixed interest rates in loan contracts). Similarly, long term deflations tend, in reverse fashion, to increase the real or relative factor costs of labour, land, and capital, especially with pronounced wage-stickiness, and related 'stickiness' in leasehold rent contracts (and more so with customary tenures), and with loan contracts -- even if the long-term trend in real interest rates was falling over this long period.[1] At the same time, both inflations and deflations are accompanied by changes in the relative prices of key industrial inputs – particularly for fuels and building materials, as well for foodstuffs (as a factor in determining labour costs) – that are explained by both real and monetary factors (or changes in income distributions with fixed household budgets). A key question to be posed is this: how did entrepreneurs respond to such changes in their factor costs, both short term and long term?

If such observations may be considered relevant to any epoch in European history, they are the most important – in my view (as one trained essentially as a medievalist) – in the early modern era, an era that brought forth the full flowering and development of modern industrial capitalism, modern financial institutions, in both the private and public sectors, and modern business organization. Capitalism itself, of course, was fundamentally created in the earlier medieval era, especially in the era known to historians as the Commercial Revolution era (ca. 1000 - 1320). But that was essentially commercial and financial capitalism – or rather, mercantile capitalism of which financial capitalism was its offshoot and subsidiary. Of the four major sectors of the European economy – agriculture (always the largest in terms of population and 'gross national product'), commerce, finance, and industry – manufacturing industry was certainly the smallest in scope, scale, and aggregate value of output.[2]

---

[1] See John H. Munro, 'Wage Stickiness, Monetary Changes, and Real Incomes in Late-Medieval England and the Low Countries, 1300 - 1500: Did Money Matter?' *Research in Economic History*, 21 (2003), 185 - 29; Sidney Homer and Richard Sylla, *A History of Interest Rates*, 3rd rev. edn (New Brunswick, 1991), pp. 89-143, especially Table 11 (pp. 137-38), and Chart 2 (p. 140).

[2] See John H. Munro, 'Manufacturing and Industry', in William Chester Jordan, ed., *Dictionary of the Middle Ages: Supplement 1* (New York: Charles Scribner's Sons, 2004), pp. 345-55.

Medieval industries: **Textiles and the 'putting-out' or domestic system**

To be sure, one should qualify that generalization by noting that some extractive industries – mining, forestry, fishing, in particular – had a claim to greater relative importance, and certainly greater industrial scale, in the medieval era. Shipbuilding comes to mind as one example of substantial industrial capitalism in that era; but we should alway remember that the most famous example of that medieval industry, the Venetian Arsenal, was in fact a state-dominated enterprise.

The single most important form of manufacturing industry in the medieval and indeed in the early modern era itself was textiles: in the form of woollen, worsted (and hybrid stuffs or serges), linens, fustians (mixed linen-cotton fabrics), and silks.[3] In the later-medieval era, the overwhelmingly dominant branch of this industry, in terms of the numbers employed and the aggregate values of output, most especially of that entering into regional and long distance trade, was woollen textile manufacturing. By no stretch of the imagination (despite valiant attempts to do so) was the medieval and early modern woollen cloth industry 'capitalistic'. By its organic nature, it was fundamentally an enterprise and trade that encompassed a marriage of mercantile capitalism with petty artisan handicraft production, whether the actual manufacture was essentially urban or rural based. In many cases of medieval and early modern cloth production such manufacturing involved a rural-urban symbiosis, in which wool preparation, combing, carding, and spinning took place in the countryside, while weaving and fulling took place in either urban or rural locations. Cloth finishing, on the other hand, was almost always an urban occupation, really more commercial than purely industrial; and these processes were usually commissioned by merchants rather than by industrialists.

Such a system of textile manufacturing is generally known as the 'domestic' or 'putting out' system of production (*Verlag*, in German). The term 'putting-out' simply meant that an industrial contractor, often a master weaver, received – on credit – the raw materials, of which the wool was the most important, and other basic inputs from the clothier or draper, who was a mercantile and financial capitalist, who otherwise took no direct role in the actual processes of production. The master weaver (sometimes known as a 'weaver draper') then 'put-out' the wools to the various artisans involved in the chain of production. First, the basic raw wools were given to the combers and carders, who prepared them for the spinners: the former, to prepare the wools for spinning the warps; the latter, for the weft. These wools, when so prepared, were then delivered to the weaver-draper, who then 'put-out' these prepared wools to the warp- and weft-spinners, accordingly; and they similarly delivered the spun yarns to the weaver-draper, who then delivered them to the warp- and weft-winders in his employ, who prepared them for the looms, operated by journeymen weavers, also in his employ. The woven cloth, when taken down from the loom, was then delivered to master-fullers, also in the employ of the weaver-draper. After the woollen cloth had been thoroughly fulled – whether by foot-fullers, or mechanical fullers - and tentered, the weaver-draper then arranged for the cloth to be sold to cloth-merchants, who then hired dyers and shearers to finish the cloths, according to current fashions and market demand.

This system is also known as the 'domestic' system, simply because virtually all of the processes of production took place in the actual homes of the artisans concerned – both rural and urban habitations; and these artisans generally owned their own tools of production. The two possible exceptions were weaving

---

[3] For the following, see John H. Munro, 'Medieval Woollens: Textiles, Textile Technology, and Industrial Organisation, c. 800 - 1500', in David Jenkins, ed., *The Cambridge History of Western Textiles*, 2 vols. (Cambridge and New York: Cambridge University Press, 2003), Vol. I, chapter 4, pp. 181-227.

looms, which were often owned by the weaver-draper (as a 'petty capitalist' artisan); and mechanical, water-driven fulling mills – which may have been owned, and whose used was leased, by a local landlord, or even by a town government. Nevertheless, the general overall structure was one in which artisans owned their productive capital (the home, as 'factory' and tools), and thus earned a return on both the sale of their labour power and the use of their capital. These artisans, being unsupervised in their own homes, earned wages that were based on piece-work, rather than time rates; and dyers and shearers earned professional fees, determined by their guilds and town governments.

The master-weaver or weaver-draper differed from all the others in that his return was profit: the difference between his costs of production and the revenue he received from the sale of the fully-manufactured but, as yet, unfinished woollen cloth. By far the greatest capital investments and the returns in this textile industry were those made by and earned by the wool merchants, the clothiers (or commercial drapers), the dyers, and the cloth merchants. That situation is best understood when we realize that in late-medieval luxury cloth production the wools themselves accounted for between 65 - 75 percent of the pre-finishing costs of production, while dyeing could add a value ranging from 15 to 50 percent to those costs, in determining the final price.[4] That further explains why, in this industry, mercantile-financial capitalism reigned supreme.

Medieval and early-modern iron manufacturing: the blast furnace with hydraulic machinery

One may argue that medieval metallurgy (as opposed to the mining processes) had a distinctly greater flavour of industrial capitalism than did textile manufacturing.[5] That, however, is not really clear from the traditional methods of iron manufacturing. Again, the most typical process involved the same type of 'petty capitalist' artisan handicraft production, by artisans often at the financial mercy of those who sold them the basic raw materials (the iron ore, the charcoal fuels, etc.) and those who marketed the finished iron goods. The iron-making artisan was one who also worked chiefly in his own home, or on his own property, and owned his own iron forge (also known as a Catalan hearth). We now call his method of iron manufacturing as the 'direct process': in which the iron ore – ferric oxide (Fe_2,O_3), to be more specific -- is cleansed and the purified iron 'won', by separating the iron itself from the oxygen in this compound by exposure to the intense heat of a charcoal fuel, while the iron-maker pounds that iron ore with a heavy steel hammer. The object was to cause a chemical reaction in which the oxygen combined with the carbon in the fuel, to form carbon dioxide gas, thus liberating the iron itself; but then the iron had to be decarburised by further heating

---

[4] For the medieval evidence, see John Munro, 'Industrial Protectionism in Medieval Flanders: Urban or National?' in Harry Miskimin, David Herlihy, and A. L. Udovitch, eds., *The Medieval City* (New Haven and London: Yale University Press, 1977), pp. 229-68; and John Munro, 'The Medieval Scarlet and the Economics of Sartorial Splendour', in Negley B. Harte and Kenneth G. Ponting, eds., *Cloth and Clothing in Medieval Europe: Essays in Memory of Professor E. M. Carus-Wilson*, Pasold Studies in Textile History No. 2 (London: The Pasold Research Fund and Heinemann Educational Books, 1983), pp. 13-70; both reprinted in John Munro, *Textiles, Towns, and Trade: Essays in the Economic History of Late-Medieval England and the Low Countries*, Variorum Collected Studies series CS 442 (Aldershot, Hampshire; and Brookfield, Vermont: Ashgate Publishing Ltd., 1994).

[5] For the following, see John Munro, 'Industrial Energy from Water-Mills in the European Economy, 5th to 18th Centuries: the Limitations of Power', in Simonetta Cavaciocchi, ed., *Economia ed energia, seccoli XIII - XVIII*, Atti delle 'Settimane di Studi' e altrie Convegni, Istituto Internazionale di Storia Economica, 'Francesco Datini da Prato', vol. 34 (Florence, Le Monnier: 2003), pp. 223-69.

and pounding, until the result was purified iron (purified from any remaining carbon, sulphur, and silicon).[6]

The great revolution in iron-manufacturing, one that would result in a genuinely capitalist form of industry, with a vast increase in industrial scale, came at the dawn of the modern era – perhaps in the fifteenth (or very late fourteenth century), and possibly first in the Rhineland or eastern Low Countries. The technological changes in that revolution were two-fold. The first was the introduction of the blast furnace, which thus necessitated a two-stage or so-called 'indirect' process of iron manufacturing. The blast furnace, sometimes called a smelter, was an enormous brick-kiln furnace, about 10 or metres high, whose fuel was again, and necessarily so, wood-charcoal. The objective was to smelt the iron ore – again by having the carbon from the fuel combine with the oxygen in ferric oxide – into a heavily carburised product which had two names: 'pig iron', when it was to be refined into pure or malleable or 'wrought' iron; and 'cast' iron if it was poured molten into pre-fashioned moulds, or casts, to become a usable metal in itself, for pans, pipes, machinery parts – and most especially, artillery.

The second aspect was the application of water power, both in the smelting and refining processes. In order to achieve the far higher level of combustion required, about 1000 ° Celsius, the furnace employed water-powered air-bellows, to inject air (oxygen) into the flames of the furnace. And in the 'finery forges', which were now designed to decarburize and purify the pig iron into wrought iron, water-power was also employed to operate tilt-hammers, vastly more powerful and efficient than the traditional application of human labour, in wielding the heavy hammers.

One can readily appreciate therefore, that these two sets of technological innovations required and/or led to a vast increase in the scale of production and a vast increase in capital investments, well beyond the financial capabilities of the traditional artisans. Those who were now employed in this distinctly new form of industrial capitalism no longer worked in their own homes, or properties, and no longer owned their tools of production. They worked in large establishments and in effect sold only one commodity: their labour power, for wages, to their employer, the industrial capitalist..

We do not fully understand the roots or causes of this fundamental industrial transformation, but it seems to be linked to the demand of later-medieval, and certainly fifteenth-century warfare, in what was also a military revolution: namely the far wider spread use of artillery (which finally brought to a decisive end the Hundred Years War, in 1453). Though gunpowder and primitive guns and artillery are undoubtedly Asian (Chinese) in origin, Europeans, from the mid-fourteenth century made far more effective use of this radically new and far more powerful use of military weaponry. At the same time, the development of European artillery owed much to the power of religion: namely, to the methods of manufacturing cathedral bells, by using similar types of smelters or furnaces to produce cast bronze bells, whose shape could obviously be readily altered to produce bronze cannon barrels. Thus one of the very first objectives in building blast furnaces to smelt iron was indeed to produce cast iron that could be used to fashion artillery, i.e., cannon barrels. Initially, however, cast iron artillery was inferior in quality and reliability to bronze artillery, but it was also much cheaper than bronze artillery. Not until Darby's process of coke-smelting would cast iron artillery finally supersede brass and bronze artillery in quality and popularity. But that subject is well beyond the scope of this study, for which we must now return to another striking set of technological changes in both mining and metallurgy, that took place again in the fifteenth century.

Late-medieval deflation: the spur for innovation in silver-copper mining and smelting:

---

[6] The chemical formula for this process is: $3C + 2Fe_20_3 \rightarrow 4Fe + 3CO_2$

This time, those changes involved two other metals: one precious, silver; the other base, copper. This time we can also be far more confident about the causation, which certainly involved very major macro-economic changes: a severe monetary scarcity (sometimes called the 'bullion famine') and its consequences, in the form of deflation.[7] Here is not the place to engage in the still ongoing debate about this 'bullion famine' during the so-called 'Great Depression of the Middle Ages'. In my view, there certainly was a scarcity of coined money, relative to the transactions demand for money, the proof of which was indeed the stark deflations of the late fourteenth and the mid fifteenth century (interrupted only by inflationary, war-induced coinage debasements). The two most important causes were: (1) a reduction in the income velocity of money ('hoarding'), which was fundamentally the consequence of the widespread warfare of the Hundred Years' War era (1337-1453), and of the closely related, proto-mercantilist bullionist and fiscal polices that most governments then pursued; and (2) an overall reduction in the mined output of precious metals, both gold and silver, which was the consequence of technological stagnation, rising marginal costs – and indeed rising flood waters in so many mine shafts situated in mountainous regions. Other historians cite an increased outflow of precious metals to the Levant and Asia; but I find no evidence of any relative increase in net bullion exports to the East. [8]

If deflation was the monetary consequence of at least the first two problems, it provided its own solution: in that deflation, ipso facto, increased the purchasing power of silver, in terms of silver-based moneys of account, ounce per ounce, gram per gram. That increased 'real' value in turn provided the necessary profit motive and thus incentive for technological changes. Two revolutionary sets of innovations were adopted, about the same time, in the early to mid-fifteenth century, in the mountainous silver-mining zones of South Germany and Central Europe.[9] The first was in mechanical engineering: the application of

---

[7] See the studies in John H. Munro, *Bullion Flows and Monetary Policies in England and the Low Countries, 1350 - 1500*, Variorum Collected Studies series CS 355 (Aldershot, Hampshire; and Brookfield, Vermont: Ashgate Publishing Ltd., 1992); Munro, 'Wage Stickiness, Monetary Changes, and Real Incomes', John Day, 'The Great Bullion Famine of the Fifteenth Century', *Past and Present*, no. 79 (May 1978): 1-54; reprinted with other relevant studies in John Day, *The Medieval Market Economy* (Oxford, 1987), 1-54; Peter Spufford, *Money and Its Use in Medieval Europe* (Cambridge, 1988).

[8] See publications of Spufford and Day in the previous note; and also Harry Miskimin, *The Economy of Early Renaissance Europe, 1300-1460* (1969; reissued Cambridge, 1976; see also John Munro, '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 Simonetta Cavaciocchi, ed., *Relazione economiche tra Europa e mondo islamico, seccoli XIII - XVIII*, Atti delle "Settimana di Studi" e altri convegni, no. 38, Istituto Internazionale di Storia Economica "Francesco Datini" (Florence: Le Monnier, 2007), forthcoming.

[9] For the following, see John Munro, 'The Central European Mining Boom, Mint Outputs, and Prices in the Low Countries and England, 1450 - 1550', in Eddy H.G. Van Cauwenberghe, ed., *Money, Coins, and Commerce: Essays in the Monetary History of Asia and Europe (From Antiquity to Modern Times)*, Studies in Social and Economic History (Leuven: Leuven University Press, 1991), pp. 119 - 83; John Munro, 'The Monetary Origins of the "Price Revolution:" South German Silver Mining, Merchant-Banking, and Venetian Commerce, 1470-1540', in Dennis Flynn, Arturo Giráldez, and Richard von Glahn, eds., *Global Connections and Monetary History, 1470 - 1800* (Aldershot and Brookfield, Vt: Ashgate Publishing, 2003), pp. 1-34; John Nef, 'Silver Production in Central Europe, 1450-1618', *Journal of Political Economy*, 49 (1941), 575-91; John Nef, 'Mining and Metallurgy in Medieval Civilisation', in *The Cambridge Economic History of Europe*, 2: *Trade and Industry in the Middle Ages*, 2nd rev. edn., ed. M. M. Postan and E. E. Rich

water-power to piston-drainage pumps, creating suction and a vacuum so that air pressure forced the water out of mining shafts, and thus permitting much deeper shafts to be constructed to reach hitherto untouched ore bodies. The second and even more important innovation was in chemical engineering: the *Saigerhütten* Process, to separate the two metals in argentiferous cupric ores. Indeed, the largest silver-bearing ore bodies in Europe were those containing copper; but until this latter innovation, metallurgical engineers had not found any practical and low cost method of extracting the silver.[10] In this process, which used a water-powered blast furnace similar to the one just discussed for iron (i.e., with hydraulic machinery to operate the bellows), lead was added to the ore; and while it was being smelted, the lead combined with the silver, leaving the copper as a precipitate. Since lead has a lower melting point, it was simple enough to remove that metal in reheating the silver-lead amalgam.

This momentous German silver-copper mining boom, which began in the 1460s and lasted until the 1550s, had three important consequences for European economic history and for the history of business organization and entrepreneurship. First, and most obviously, by vastly increasing the scale of both mining and metallurgy, it thereby increased the scope and extent of industrial capitalism, for the same reasons just outlined for iron production. Second, it provided a major force for the revival of long-distance, overland trading routes from Italy to north-west Europe, now following (from the 1420s) a relatively peaceful and secure trajectory running from Venice and Lombardy across the Alps through South Germany and then down the Rhine to the Low Countries: in particular the newly developing Brabant Fairs of Antwerp and Bergen-op-Zoom. Rapidly expanding commerce along this new overland route, connecting with a myriad number of other fair-based overland networks, servicing hundreds of more towns and a vastly large area than those affected by the Atlantic maritime routes, along with the Central European mining boom, was arguably the most important factor in the revival of the European economy from the late-medieval slump, and one that promoted as well demographic recovery. At the same time, such trade also provided the essential foundations and the propelling forces that made the Brabant Fairs, but essentially Antwerp, the predominant commercial, financial, and industrial centre of the early-modern economy, from the 1460s to the 1560s (i.e., to the

---

(Cambridge, 1987), 691-761 (1st edn. published in 1952); Philippe Braunstein, 'Innovations in Mining and Metal Production in Europe in the Late Middle Ages', *The Journal of European Economic History*, 12 (1983): 573-91; Ćirković, S., 'The Production of Gold, Silver, and Copper in the Central Parts of the Balkans from the 13th to the 16th Century', in Hermann Kellenbenz, ed., *Precious Metals in the Age of Expansion* (Stuttgart, 1981), 41-69; Ekkehard Westermann, 'Die Bedeutung des Thüringer Saigerhandels für den mitteleuropäischen Handel an der Wende vom 15. zum 16. Jahrhundert', *Jahrbuch für die Geschichte Mittel- und Ostdeutschlands*, 21 (1972): 68-92. [Ed. by Wilhelm Berges, Hans Herzfeld, and Henryk Skrzypczak]; Ekkehard Westermann, 'Die Unternehmungsform der Saigerhandelsgesellschaft und ihre Bedeutung für den oberdeutschen Frühkapitalismus: Forschungs-stand und - aufgeben', in Simonetta Cavaciocchi, ed., *L'impresa industria, commercio, banca seccoli XIII - XVIII*, Istituto internazionale di storia economica 'F. Datini' Prato, series II, Atti delle 'Settimane di Studi' e altri Convegni vol. 22 (Prato, 1991), 577-86.

[10] See also Ian Blanchard, 'Technological Diffusion in the International Mining and Metallurgical Industries: Introduction', in Ian Blanchard, Anthony Goodman, and Jennifer Newman, eds., *Industry and Finance in Early Modern History: Essays Presented to George Hammersley on the Occasion of his 74th Birthday*, Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte, Beheift series no. 98 (Franz Steiner Verlag: Stuttgart, 1992), pp. 143-60; Ian Blanchard, *International Lead Production and Trade in the 'Age of the Saigerprozess', 1460 - 1560*, Zeitschrift für Unternehmensgeschichte-Beheifte, Band 85 (Franz Steiner Verlag: Stuttgart, 1995).

outbreak of the Revolt of the Netherlands against Spanish rule, from 1568 to 1609).[11]

South German silver mining and the origins of the 'Price Revolution'

Third, this South German - Central European silver-copper mining boom also provided the initial and fundamental causes of the Price Revolution, a unique era of inflation in European economic history, commencing about 1515-20 and enduring until the 1640s. Using a common base of 1501-10 = 100, we find that the Composite Price Indexes rose, by the end of the Price Revolution era, in 1646-50, as follows: in Spain, to 343.36 (but 457.09, using copper-vellon based prices); in Brabant, to 845.07; and in southern England, to 611.435 (the differences are largely accounted for by the relative degrees of coinage debasements).[12] In explaining the causes of this inflation, the monetary significance of this German mining boom, in full flower by the beginning of the sixteenth century, can be seen in the very conservative estimate that it had quintupled Europe's mined output of silver by its peak, in the 1530s, when it was producing far more silver than would be imported from the Spanish Americas before the 1570s.[13] Because this influx of Spanish American silver, once thought to be the primary monetary cause of the Price Revolution, came well after inflation had commenced, many – perhaps most – economic historians have advanced an alternative theory of causation: namely, population growth. But population growth can explain only an increase in the *relative* prices of agricultural and other land-based commodities (e.g, wood, charcoal), and not an increase in the overall price level (i.e., the Consumer Price Index). In any event, the populations of both England and the southern Low Countries were still at their late-medieval nadirs – no more than half of their medieval peaks (ca. 1300) – when the inflation of the Price Revolution era began, ca. 1515-20.[14]

---

[11] Herman Van der Wee, *Growth of the Antwerp Market and the European Economy, 14th to 16th Centuries*, 3 Vols. (The Hague, 1963); Herman Van der Wee, 'Structural Changes in European Long-Distance Trade, and Particularly in the Re-export Trade from South to North, 1350 - 1750', in James D. Tracy, ed., *The Rise of Merchant Empires: Long-Distance Trade in the Early Modern World, 1350 - 1750* (Cambridge and New York: Cambridge University Press, 1990), pp. 14 - 33; John Munro, The "New Institutional Economics" and the Changing Fortunes of Fairs in Medieval and Early Modern Europe: the Textile Trades, Warfare, and Transaction Costs', *Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte*, 88:1 (2001), 1 - 47.

[12] See Table 1 and the sources cited there. The Phelps Brown and Van der Wee 'basket of consumables' consumer price indexes both employ the base 1451-75=100. With that base, the index numbers for quinnquennial mean prices at the peak of the Price Revolution in 1646-50 are as follows: for England, 646.404; and for Brabant, 1015.138. Note that I have recalculated the Phelps Brown and Hopkins index numbers, for their 'basket of consumables' price index; their published numbers produce a much higher quinquennial mean of 733.200.

[13] See sources cited n. 7 above.

[14] In England, the population was only about 2.25 million in the early 1520s, about half of the most conservative estimate of the population level in 1300: i.e., 4.5 million. A majority of historians, however, believe that England's population was then about 6.0 to perhaps even 7.0 million. See Bruce M. S. Campbell, 'The Population of Early Tudor England: A Re-evaluation of the 1522 Muster Returns and the 1524 and 1525 Lay Subsidies', *Journal of Historical Geography*, 7 (1981), 145-54; Bruce M.S. Campbell, James A. Galloway, Derek Keene, and Margaret Murphy, *A Medieval Capital and Its Grain Supply: Agrarian Production and Distribution in the London Region c. 1300*, Institute of British Geographers, Historical Geography Research Series no. 30 (London, 1993); Pamela Nightingale, 'The Growth of London in the

The Origins of the Price Revolution: Innovations in financial institutions and the usury problem

The South-German mining boom was not, however, the only monetary cause of inflation in the earliest phases of the Price Revolution, which also experienced a veritable financial revolution, in the development and transmission of negotiable credit instruments. The significant role that credit and financial institutions had earlier commanded, in the medieval economy, has led some historians to deny the existence of (relative) monetary scarcity, on the grounds that any shortages of precious metals were probably offset by a supposed increased resort to credit instruments.

That misguided view overlooks, however, three major problems – apart from the previous observation that the prolonged later-medieval deflations provide proof of that relative monetary scarcity. In the first place, all of the major medieval financial innovations and institutions – in particular the bill-of-exchange, the related bill obligatory, and deposit-and-transfer banking (with a fractional reserve system) – had been well established long before the onset of monetary scarcity, in the later fourteenth century; and they did not undergo any important changes during the so-called 'bullion famines'(with one minor exception to be noted shortly). Second, although various forms of credit, including especially sales credit, were widely used by merchants, those credit instrument were tied to the availability of coined money, and thus they were really a function of the supply of precious metals. As Peter Spufford (and many others have also noted), in so far as monetary scarcity was due to hoarding, which in turn was related to widespread insecurity and uncertainty, that scarcity also served restricted the supply of credit: [15]

> Fear of disorder made men conceal their coin. Fear of not being able to replace coin made men the keener to keep their assets liquid. With scarcity of coin went a reluctance to spend or invest what one had in hand, so that there was a sluggish circulation, which in itself was equivalent to a further reduction in the available quantity of coin. . ... Finally fear of the failure to repay cut back on credit. This too was partially a consequence of the shortage of money and was also a cause of yet further shortage.

Conversely, as Frank Spooner has demonstrated, the increasing influxes of Spanish American silver from the mid-sixteenth century, and the ready availability of increased silver coinage supplies, increased both the willingness to lend and thus the supply of credit.[16] The second problem is that even in the major commercial and financial centres, most people did not have access to banking institutions. Spufford estimates that only about ten percent of the late-medieval adult population maintained deposit accounts even in Venice, Florence, or Bruges.

Medieval English Economy', in Richard Britnell and John Hatcher, eds., *Progress and Problems in Medieval England* (Cambridge and New York: Cambridge University Press, 1996), pp. 89-106.

[15] Spufford, *Money and Its Use*, pp. 345-47. For similar views, see Pamela Nightingale, 'Monetary Contraction and Mercantile Credit in Later Medieval England', *Economic History Review*, 2nd ser. 43 (November 1990), 560 - 75; Reinhold Mueller, ' "Chome l'ucciello di passegio": la demande saisonnière des espèces et le marché des changes à Venise au moyen âge' , in John Day, ed., *Études d'histoire monétaire, XIIe-XIXe siècles* (Université de Paris VII, Lille, 1984), pp. 195-220.

[16] Frank Spooner, *The International Economy and Monetary Movements in France, 1493-1725* (Paris, 1956; Harvard, 1972, for the English edn), also cited by Spufford, *Money and Its Use*, p. 347.

The third and perhaps most important problem was that bills of exchange, bills obligatory, promissory notes, bank transfers (cheques), and related credit instruments were not negotiable: i.e., they were not normally payable to bearer; and they normally could not be sold – for either cash, goods, or services – to a third party (someone other than the designated payee), before the stipulated date of maturity. Thus, in the medieval economy, they did not serve to increase the money supply, but only to increase, and really only marginally so, the income velocity of money. The reasons for such limitations are three-fold. First, in most medieval jurisdictions (Florence being the major exception), these credit instruments were all holograph documents (written by the merchants themselves, without recourse to a notary public or a local court); and as such, they had no legal standing in official, state-run courts. The second, and related problem, is that medieval legal institutions did not provide any legally enforceable and practical means to protect the financial interests of those third parties who purchased or acquired such bills: i.e., no means of ensuring that they could collect the full stipulated payment from the issuing debtor on the date of maturity.

Thirdly, negotiability, by its very essence, would have contravened the universally respected and widely enforced usury doctrine: i.e., the prohibition against demanding and accepting any form of interest, anything beyond the principal of the loan. Consider, for example, the situation of a creditor who holds a bill of exchange or bill obligatory (with interest disguised in the exchange rate) whose redemption value on maturity, in six months time, was £120 sterling. If that creditor needed funds before that date and sought to sell his note, nobody would buy it at the stipulated redemption value. That creditor would have had to sell the bill at some discount – and the difference between the discounted value and the redemption value would therefore be forbidden interest, which no court would sanction. For many, the risks of imperiling their immortal souls – even if not punished on this earth – was too high a price to pay.

The first small but very important legal step that ultimately led to the full-fledged legally protected institutions of negotiability of all credit instruments took place in the London Mayor's court, an officially designated law-merchant court, in November 1436.[17] At issue, was a dishonoured bill of exchange, drawn in Bruges on a London merchant named Elias Davy, and made payable to 'John Burton or the bearer of this letter of payment', for the sum of £30 sterling in London, on 14 March 1436. Although Elias Davy had 'accepted' the bill, he refused to make payment to one John Walden, who presented the bill for redemption as the 'bearer'. The court ruled, on the basis of substantial precedent in the international law merchant, that John Walden, as the bearer, had a claim to payment, as equally valid as the designated payee, John Burton (whose testified in favour of Walden, as the legitimate bearer of the bill). In terms of both legal and institutional history, the significance of this decision has to be understood in the light of a statute (Statute of the Staples) that Edward III's Parliament had enacted almost a century earlier (1353): it granted the international 'law merchant' superior standing over English Common Law courts, for civil suits in mercantile law, when adjudicated in urban 'mayor's' courts, designated as law merchant courts, which were given the power to seize the goods and chattels of defaulting debtors.[18]

---

[17] For the following see, John Munro, 'English "Backwardness" and Financial Innovations in Commerce with the Low Countries, 14th to 16th centuries', in Peter Stabel, Bruno Blondé, and Anke Greve, eds., *International Trade in the Low Countries (14th - 16th Centuries): Merchants, Organisation, Infrastructure*, Studies in Urban, Social, Economic, and Political History of the Medieval and Early Modern Low Countries (Marc Boone, general editor), no. 10 (Leuven-Apeldoorn: Garant, 2000), pp. 105-67; John Munro, 'The Medieval Origins of the Financial Revolution: Usury, *Rentes*, and Negotiablity', *The International History Review*, 25:3 (September 2003), 505-62.

[18] 27 Edwardi III stat. 2, in *Statutes of the Realm* , vol. I, 332-43.

The chief of importance of the legal decision was to serve as the likely precedent for subsequent law-merchant court verdicts, first in the Hanseatic League's de facto capital of Lübeck (1499, reaffirmed 1502), and then, in 1507, in Antwerp, both of which ports were important participants in the English cloth-export trade. According to Herman Van der Wee's interpretation of the Antwerp court's *turba*, concerning two disputed English letters obligatory, it 'granted the bearer of writings obligatory the same rights as the original creditor [payee] with regard to the prosecution of an insolvent debtor'.[19] Subsequently, in 1527, Bruges' civic mercantile court issued a virtually identical legal decision; and then so did several other town courts in the Habsburg Netherlands.[20] Finally, in March 1537 and October 1541, the Estates General of the Netherlands enacted a series of ordinances that completed the true legal foundations for modern negotiability. Together, they entitled the bearer to sue any and all prior assignors of the note for the full payment, for full damages, and established these principles of financial assignment, with full legal guarantees and protection for the bearer, on a fully national basis.[21]

Usury, the legalization of interest, and discounting

In the latter year, 1541, the Estates General also enacted another revolutionary ordinance: to permit the legal payment of interest up to 12 percent per annum, so that henceforth 'usury' came to mean interest in excess of that legal limit. So far as can be ascertained, this is the first instance in which a national legislature negated the fundamental provisions of both canon and secular law on usury (in so far as Christians were concerned). While the Habsburg Netherlands still remained officially Catholic, Calvinism had certainly already made considered inroads into this region; but it should also be remembered that Calvin himself only grudgingly tolerated interest payments, and only up to 5 percent. Four years later, in 1545, in now Protestant England, Henry VIII's Parliament enacted similar legislation on 'usury', though with a 10 percent ceiling;

---

[19] Herman Van der Wee, 'Anvers et les innovations de la technique financière aux XVIe et XVIIe siècles', *Annales: E.S.C.*, 22 (1967), 1067-89, republished as 'Antwerp and the New Financial Methods of the 16th and 17th Centuries', in Herman Van der Wee, *The Low Countries in the Early Modern World* , trans. by Lizabeth Fackelman, Variorum Series (Cambridge: Cambridge University Press, 1993), pp. 145-66; Herman Van der Wee, 'Monetary, Credit, and Banking Systems', in E.E. Rich and Charles Wilson, eds., *The Cambridge Economic History of Europe*, V: *The Economic Organization of Early Modern Europe* (Cambridge, 1977), p. 325. This court consisted of aldermanic magistrates from the civic *schepenbank*. See also Van der Wee, 'Anvers et les innovations de la technique financière', pp. 1067-89.

[20] Abbott Payson Usher, *The Early History of Deposit Banking in Mediterranean Europe*, vol. I: *The Structure and Functions of the Early Credit System: Banking in Catalonia: 1240-1723*, Harvard Economic Studies, vol. 75 (Cambridge, Mass., 1943; reissued New York, 1967), pp. 98-9, citing a document in Louis Gilliodts-Van Severen, ed., *Coutume de la ville de Bruges*, Commission Royale d'Histoire (Brussels, 1875), II, no. 127, p. 318. See also Raymond de Roover, *Gresham on Foreign Exchange: An Essay on Early English Mercantilism* (Cambridge, Mass. 1949), pp. 117-52, citing the text of the ordinance of the 1537 Estates General discussed below.

[21] Van der Wee, 'Credit and Banking Systems', p. 326: For the text of the March 1537 ordinance, concerning bills of obligatory only, see C. Laurent, M. J. Lameere, and H. Simont, eds., *Recueil des ordonnances des Pays Bas, deuxième série, 1506 - 1700*, Commission Royale d'Histoire (Brussels, 1907), Vol. 4, pp. 15-17, and 34-5. For the text of the 31 October 1541 decree (including bills of exchange), see Herman Van der Wee, *Growth of the Antwerp Market and the European Economy, 14th to 16th Centuries*, 3 vols. (The Hague, 1963), II, p. 344. See also Usher, *Deposit Banking*, pp. 98-9; and De Roover, *Gresham*, pp. 117-52.

but in 1552, Edward VI's Parliament repealed that act, which was restored only much later, in 1571, by Elizabeth I's Parliament.[22] Elsewhere in Europe, Catholic countries maintained their traditional anti-usury laws, up to the French Revolution of 1789.

The significance of the Netherlander and English laws permitting some interest thus eliminated the final barrier to full negotiability by permitting open, visible discounting in all financial bills. Nevertheless, Herman Van der Wee has contended that discounting did not become widespread in the Low Countries until much later in the sixteenth century, with the diffusion and widespread acceptance of endorsement: by the use of personal signatures, on the back of the bill, by which each successive assignor not only surrendered his financial claim to the bill but also acknowledged through his signature his full liability for reimbursement in the event of default.[23] In England and the Protestant Dutch Republic (Republic of the United Provinces), endorsement and discounting did not really become commonplace until the seventeenth century, when we return to this story to consider major innovations in banking institutions, later in that century.

A financial revolution in public finance: *rentes* (annuities)

Meanwhile, from the early sixteenth century, a financial revolution was also achieved in the realm of public finance, with the much wider spread diffusion of the *rente* contract, with provisions related to both full-fledged negotiability and the usury doctrine. The *rente* (Flemish *renten*) was first used as an instrument of urban finances, throughout northern France and the Low Countries, in the early to mid-thirteenth century, as a reaction to the intensification of the anti-usury campaigns then being conducted by the new mendicant preaching orders – the Dominicans and Franciscans. Thus these towns, rather than borrowing funds through loans and bonds (even with disguised interest payments), began selling *rentes*, which were, in effect annuities. A merchant or other investor thus purchased either a lifetime stream of annual income (*lijfrenten*) or a perpetual stream (*erfelijk renten*), which could be passed on to his descendants or to others, by sale of the contract. Though many theologians, Dominicans, in particular, condemned these new *rentes* as an evasion of the usury doctrine, Pope Innocent IV, as early as 1250, ruled that the *rente* was not usurious, so long as two conditions were met: that the purchaser of the contract could never reclaim his funds (though governments were permitted to redeem them at par, whenever they chose); and that the annual annuity payments were based on 'real properties' – just as rent payments were derived from the 'fruits' of the property. Although the theological debate continued until the mid-fifteenth century, the Church came to agree that excise taxes on the consumption of the products of the land – food and drink in particular, but also textiles — met this test of 'real properties'.[24]

---

[22] For England, see: statutes 37 Henrici VIII, c. 9 of 1545, permitting interest up to 10%; repealed by 5-6 Edwardi VI, c. 20 in 1552, which was in turn repealed in 1571 by 13 Elizabeth I, c. 8, which thus restored 37 Hen. VIII, c. 9, in *SR*, III, 996; and IV.i, 155, 542, respectively. It is worth noting that the usury ceiling was progressively lowered, with the gradual fall in the real rate of interest: from 10% to 8% in 1623, to 6% in 1660, and finally to 5% in 1713. Not until 1854 (17-18 Victoria c. 90), however, were the usury laws finally abolished. See R.D. Richards, *The Early History of Banking in England* (London, 1929; reissued 1958), pp. 19-20.

[23] See above n. 17.

[24] All remaining moral, legal, and ecclesiastical doubts were fully resolved by the three papal bulls, which were evidently influenced by the debates at the Council of Constance: those of Martin V (*Regiminis*, 1425), Nicholas V (*Solicitude pastorales,* 1452), and Calixtus III (*Regiminis*, 1455); Bernard Schnapper, *Les rentes au XVI siècle: histoire d'un instrument de crédit*, S.E.V.P.E.N , École Pratique des Hautes Études: Centre de

For good or ill, insofar as *rentes* came to displace loans and to dominate public finance in so much of western Europe, in the early modern era – in the Netherlands, France, the Empire (in Germany, but not Italy), and Spain, this financial revolution thus developed an institutional structure that transferred income from the lower classes – for excise taxes on food and drink were highly regressive – to the rich. It should be noted that England did not adopt excise taxes until as late as 1643: by an act of the Long Parliament (John Pym), just after the outbreak of the Civil War; and that the establishment of a permanent funded national debt, with similar annuities, did not take place until after the Glorious Revolution of 1688 – when England imported not only a Dutch king (William III) but also, in essence the Dutch *renten*-based, financial system.

The financial success of this form of public finance obviously depended upon full-fledged negotiability in well organized secondary financial markets. For most of those who purchased *rentes* or annuities, knowing full well that they could never reclaim their funds from the government (and unwilling to wait for periodic redemptions), would not have made such an investment without the opportunity to sell their *rentes* to a third party, who in turn would not have agreed to buy them without full assurance that the state would transfer those payments to him, as the buyer. That right and certainty does not seem to have been fully established in all the countries mentioned until the mid-fifteenth century. The first well-organized financial market dealing in *rentes* and related government financial instruments was established almost a century later, in 1531: as the Antwerp *Beurs* (*Bourse*), undoubtedly influenced in its operations by the South German merchant-banking firms (Fuggers, Welsers, Hochstetters, Imhofs, etc.), which had become predominant in the Antwerp market.

They were also heavily engaged in marketing Spanish *rentes*, which, in the form of perpetual annuities, were known as *juros*. The scale and dazzling growth of this form of public finance can best be appreciated from the government statistics: from their inception (or the first records) in 1504 to 1598, with the death of Philip II, the issues of *juros* rose from 2.996 million ducats (*escudos* of 375 maravedís*)* to 80.040 million ducats, when Genoese bankers had displaced the South Germans.[25] Part of this enormous expansion involved the obligatory conversion of high-interest, short-term loans called *asientos* into five-percent perpetual but redeemable *juros al quittar*. As Van der Wee has commented, this sixteenth-century 'age of the Fuggers and [then] of the Genoese was one of spectacular growth in public finances'.[26] Early in the next

---

recherches historiques: Affaires et gens d'affaires, vol. 12 (Paris, 1957), pp. 59-65; Bernard Schnapper, 'Les rentes chez les théologiens et les canonistes du XIIIe au XVIe siècles', in Georges Vedel (Centre National de la Recherche Scientifique), ed., *Études d'histoire du droit canonique dédiées à Gabriel le Bras*, 2 vols. (Paris, 1965), vol. I, pp. pp. 977-87; Van der Wee, 'Monetary, Credit, and Banking Systems', pp. 304-05.

[25] Van der Wee, 'Monetary, Credit, and Banking Systems', pp. 373-76, Table 28: based on Felipe Ruiz-Martin, 'Credito y banca: comercio y transportes en la Etapa del capitalismo mercantil', *Jornados de metodologia aplicada de las Ceincias Historicas 24-27 April 1973, Santiago de Compostella* (Santiago de Compostella, 1973), p. 14. See also Usher, *Early History of Deposit Banking*, Table 7, p. 169, which shows a rise in the Spanish funded debt from 4.320 million ducats in 1515 to one of 76.540 million ducats in 1598; and Alavaro Castillo, 'Dette flottante et dette consolidée en Espagne de 1557 à 1600', *Annales: Économies, sociétés, civilisations*, 18:4 (July-August 1963), 745-59 (especially graph II, p. 757), which provides a third set of figures: from 5 million ducats in 1515 to 83 million ducats in 1600.

[26] Van der Wee, 'Monetary, Credit, and Banking Systems', pp. 375-76; see also Herman Van der Wee, 'European Banking in the Middle Ages and Early Modern Period (476-1789)', in Herman Van der Wee and G. Kurgan-Van Hentenryk, eds., *A History of European Banking*, 2nd edn. (Antwerp, 2000), pp. 152-80; Fernand Braudel, *La Méditerranée et le monde méditerranéen à l'époque de Philippe II*, 2nd rev edn. (Paris,

century, in 1608, another *Beurs* for an international commerce in both commodities and securities was established in Amsterdam, the capital of the young Dutch Republic of the United Provinces (and thus the year before the 1609 Truce with Spain).[27]

In sum, therefore, the monetary origins of the European Price Revolution lay in both the South German silver-copper mining boom – and in related German commercial and financial activities – and in this dual financial revolution, in both private and public finance, both involving fully negotiable credit instruments, which acted both to increase the actual supply of money and the income velocity of money. The subsequent role of the vast influxes of silver from the Spanish Americas, from the 1570s, should not be disparaged, however, for clearly that influx provided a considerable amount of extra fuel to augment and sustain the Price Revolution, until the late 1640s.

The Price Revolution era, especially for the century 1540 - 1640 – sometimes known as Tawney's century – provides a very important analytical framework in the history of early modern entrepreneurship, in particular for the development of industrial capitalism. Richard Tawney's role in this debate will be considered later, after a discussion of the contribution of two other pre-World War II economic historians, both Americans, both at the University of Chicago: Earl Hamilton and (his opponent) John Nef.

Hamilton on the origins of modern industrial capitalism: the Price Revolution and 'profit inflation'

Hamilton is, of course, most famous for reviving and providing statistical support for the Bodin thesis, enunciated in 1568, which (along with more obscure writings of Spanish economists of the Salamanca School, in 1556) had provided the earliest explanation for the origins of the Price Revolution. In their collective view, of course, the long-sustained inflation was due entirely to the vast influxes of Spanish American 'treasure', above all the silver from Potosi and Zacatecas.[28] We now realize, of course, that both Bodin and Hamilton were in error, in so far they sought to ascribe both the initial origins and the entire inflationary phenomena to the Spanish silver influxes. But Hamilton is also famous, thanks to John Maynard Keynes, for his related thesis of 'profit inflation', which both saw as the fundamental instrument in the birth

---

1966; original edn. 1949); republished as *The Mediterranean and the Mediterranean World in the Age of Philip II*, translated by Sian Reynolds, 2 vols. (London and New York, 1972-73), Vol. 1, pp. 500-15, 528-32; and John H. Elliott, *Imperial Spain, 1469 - 1716* (New York, 1964), pp. 198-9, noting that Spanish holders of *juros* vigorously opposed their redemption during the 1552 crisis because 'they saw no safe alternative for their investments except in the purchase of land, the price of which would rise sharply if the *juros* were redeemed'. See also pp. 280-81.

[27] See n. 000 below.

[28] See George A. Moore, ed., *The Response of Jean Bodin to the Paradoxes of Malestroit and The Paradoxes, translated from the French Second Edition, Paris 1578* (Washington, D.C.: Country Dollar Press, 1946). The first edition was published in 1568, in a debate with Malestroit, who espoused the argument that coinage debasements remained the chief cause of inflation. Some, however, give the credit for the first enunciation of the Quantity Theory to the Spanish cleric Azpilcueta Navarra, of the Salamanca School, with a treatise dated 1556. See Marjorie Grice-Hutchison, *The School of Salamanca: Readings in Spanish Monetary Theory, 1544 - 1605* (Oxford, 1952), Appendix III.95.

of modern industrial capitalism.[29] By this term, both meant a widening gap between prices and industrial wages. Hamilton himself first introduced this concept in a seminal article, published in 1929, on 'American Treasure and the Rise of Capitalism'.[30] The very next year, in his famed *Treatise on Money,* John Maynard Keynes bestowed his blessing on this concept of 'profit inflation' and on its role as a positive stimulus promoting industrial and general economic growth. If Hamilton had not explicitly used this term, Keynes certainly did.[31]

Any fair discussion of Hamilton's thesis should first examine the exact words he used in introducing this concept in his the aforementioned article. After comparing a set of graphs and tables on prices and wages in England, France, and Andalusia, for the sixteenth and seventeenth centuries, he then stated the following:[32]

> Let us assume that of every 100,000 pounds' worth of goods produced by a capitalist in England or France at the beginning of the sixteenth century 60,000 went to wages, 20,000 to rent, and 20,000 to profits..... [It is not] unreasonable to suppose that at the close of the sixteenth century the same product would have been sold for about 250,000 pounds; that wages would not have amounted to more than 75,000; and, making the unreasonable assumption that rents did not lag behind prices, not more than 50,000 pounds would have

---

[29] The fundamental publications by Earl J. Hamilton are: 'American Treasure and Andalusian Prices, 1503-1660: A Study in the Spanish Price Revolution', *Journal of Economic and Business History*, 1 (February 1928), 1-35, reprinted in P.H. Ramsey, ed., *The Price Revolution in Sixteenth-Century England* (London, 1971), pp. 147-81; 'American Treasure and the Rise of Capitalism, 1500-1700', *Economica*, 27 (Nov. 1929), 338-57; 'Imports of American Gold and Silver into Spain, 1503-1660', *Quarterly Journal of Economics*, 43 (1929), 436-72; *American Treasure and the Price Revolution in Spain, 1501-1650* (Cambridge, Mass., 1934; reissued 1965); *Money, Prices, and Wages in Valencia, Aragon, and Navarre, 1351 - 1500* (Cambridge, Mass., 1936); 'The Decline of Spain', *Economic History Review*, 1st ser., 8:2 (1937-38), reprinted in E.M. Carus-Wilson, ed., *Essays in Economic History*, 3 vols (1954-62), vol. I, pp. 215-26; 'Profit Inflation and the Industrial Revolution, 1751-1800', *Quarterly Journal of Economics*, 56:2 (February 1942), 256-73; reprinted in F.C. Lane and J.C. Riemersma, eds., *Enterprise and Secular Change: Readings in Economic History* (London, 1953), pp. 322-49; and 'Prices as a Factor in Business Growth: Prices and Progress', *Journal of Economic History*, 12:4 (Autumn 1952), 325-49. This was his Presidential Address to the 12th Annual Meeting of the Economic History Association.

[30] See n. 5 above.

[31] John Maynard Keynes, *A Treatise on Money*, two vols. (London, 1930), vol. II, pp. 152–63, esp. pp. 154-5: 'But it is the teaching of this Treatise that the wealth of nations is enriched, not during Income Inflations during Profit Inflations – at times, that is to say, when prices are running away from costs. We must, therefore, turn to the course of wages (as the only available indication of the movement of costs.)' He also stated, however, that Hamilton's presentation of wage data, if 'convincing' for Spain, 'must surely overstate the case' for England and France. Nevertheless, he states on pp. 158-59 that 'we may say that Profit Inflation in Spain lasted from 1520 to 1590, in England from 1550 to 1650, and in France from 1539 to 1700 (with a serious depression intervening from 1600 to 1625)'; and on p. 163: 'It is unthinkable that the difference between the amount of wealth in France and England in 1700 and the amount in 1500 could ever have been built up by Thrift alone. The intervening Profit Inflation which created the modern world was surely worth while if we take a long view.'

[32] Hamilton, 'American Treasure', pp. 356-57.

> gone to rent. Profits amounted to 125,000 pounds, or 100 per cent on the turnover. The lag of wages behind prices has quadrupled profits. The windfalls thus received, along with gains from the East India trade, furnished the means to build up capital equipment, and the stupendous profits obtainable supplied an incentive for the feverish pursuit of capitalistic enterprise.

Unfortunately Hamilton, obviously engaging in pure conjecture, and hyperbole, failed to provide any statistical evidence, in any country, to validate this fanciful scenario. If he had been able to demonstrate, for a wide range of specific 'capitalistic' manufacturing industries, that the prices for the products sold — say, for bar iron, other metalwares, glass, bricks, dyestuffs, soaps, gunpowder, artillery, etc. – rose so much faster than did the wages of their own employees who produced those goods; and further, that other manufacturing costs did not rise in proportion, and that profits actually did increase in the manner described, then his thesis might merit further consideration. But his graphs and other statistical evidence on prices concerned movements only of the general price level, or what might be called the Consumer Price Index, and one that is very heavily weighted with foodstuffs and other agricultural products.

Some historians have fallaciously contended that, if monetary forces were chiefly responsible for inflation – as this study certainly contends , those forces should have acted equally on all prices – and possibly Hamilton implicitly thought in this erroneous fashion (though, of course, a wage is a price). But any examination of the several available price indices for the European economy, from medieval to modern times, will reveal that the prices of its component, individual commodities virtually never moved together in unison.[33] During the Price Revolution era, real factors interacted with each other and monetary factors to produce differences in the movement of particular, relative prices.

The most important real factor was certainly population growth, acting upon limited supplies of land whose exploitation was certainly subject to diminishing returns, in the absence of major technological changes in agriculture and many extractive industries (except mining), and thus rising costs. We should thus not be surprised to learn that in all well-documented regions of western Europe (England and the Low Countries especially) the prices that rose the most, and the most swiftly, were those of cereals, lumber, and charcoal; those that experienced the next most dramatic if not quite comparable rise in prices were those for other agricultural commodities, livestock products in particular. The prices for most, if not all, manufactured commodities also rose, but certainly they rose the least, lagging well behind agricultural prices. So did the price of labour, of course.

Thus Hamilton was correct in contending that, in general, money wages fail to keep pace with prices — but in this context, 'prices' has to mean the overall Consumer Price Index -- even if money wages, which are really documented only for building craftsmen throughout western Europe – did not manifest the same degree of nomianl 'wage stickiness' that is so often encountered in most deflationary eras. Certainly in this early-modern Price Revolution era demographic factors also played a major if not sole role in that widening gap: i.e., in providing a relatively more abundant supply of readily available labour and an adverse change in the land:labour ratio, presumably leading to a fall in the marginal productivity of labour, and thus (supposedly) in the real wage.

---

[33] For example, see J.D. Gould, 'The Price Revolution Reconsidered', *Economic History Review*, 2nd ser., 17 (1964-5), 253 (91-116l; reprinted in Ramsey, *Price-Revolution in Sixteenth-Century England,* pp. 95 (91-116). In reviewing a book on monetary history in *The Journal of European Economic Histor*y, 3: 1 (Spring 1974), 253, Anna Jacobson Schwartz commented that: 'the author subscribes to a familiar fallacy, namely that a monetary explanation to be valid requires that all prices move in unison'.

But the fall in real wages was also a related function of the structure of craftsmen's wages and the structure of household expenditures for most of these craftsmen and other urban artisans. Thus, if and when money wages, especially those based on time payments (daily or weekly), and not on piece-work, failed to keep pace with the Consumer Price Index, the craftsmen's restricted household budgets (if unable to borrow, or draw down savings) would have forced most of them to spend a higher proportion of that budget on food, clothing, and fuel, and thus proportionally less on other, more luxury-oriented goods; and in terms of food itself, they would have spent proportionally more on cereals (including barley malt for beer), and less on meat, butter, cheese, fruits and vegetables. That shift in expenditure patterns would thus have induced the already observed rise in the relative prices of cereals and wood products, and a relative decline in prices of manufactured goods, especially in labour-intensive manufacturing industries.

Hamilton's own analyses of price and wage data for Spain, France, and England during the entire Price Revolution era led him to conclude the following: that Spain had enjoyed virtually no 'profit inflation', since wages had generally kept pace with prices; and that early-modern England had experienced the greatest degree of such 'profit inflation'. Such a contrast in their national economic experiences helps to explain, in his view, why Spain subsequently 'declined', while England became the homeland of the modern Industrial Revolution. But to observe and assert that 'real wages' did fall so sharply in Tudor-Stuart England (i.e., ca 1520-1650), that money wages in general lagged so far behind the Consumer Price Index, hardly permits anyone to conclude that the result was 'profit inflation', not when rising prices of manufactured goods also lagged so far behind that overall Consumer Price Index. Indeed, what benefit would an 'industrial capitalist' have derived from a fall in the real wages of his employees, when that fall was chiefly cause by the rise in relative prices of foodstuff and fuels? How could industrial 'capitalists' have benefited, if the consequence of that fall in real wages was to diminish demand from wage-earners for manufactured industrial commodities?

Unfortunately we simply lack the statistical evidence to test the 'profit inflation' thesis, because we have so few products for manufactured goods, especially those produced by 'industrial capitalists', and also because our only usable money-wage series is for building craftsmen, chiefly those employed by religious, medical, and educational institutions, and town governments. We might, however, cite an opportunity cost argument to validate that wage series: i.e., on the grounds that employers had to pay going market rates to ensure that their craftsmen did not seek alternative, and more remunerative employment in other urban industries. Just the same, without being able to compare the wages, say, for employees in glass or brick factories with the wholesale prices of their products, and without being able to measure actual profits (taking account of other costs), we are on very shaky grounds. In my own research, I have found no convincing evidence of any 'profit inflation' in Tudor-Stuart England; but, in the southern Low Countries, indisputably more advanced industrially than England in the sixteenth and seventeenth centuries, I have found the contrary: 'profit disinflation', in the sense that industrial wages (again for building craftsmen), faring so much better than in England, rose faster than did the prices of a wide range of industrial products.

There is a final objection to the Hamilton-Keynes 'profit inflation' thesis. If industrial capitalists did derive increased profits from this lag in wages, this fall in 'real wages', what incentive did they have to invest those profits by increasing their stock of fixed industrial capital (plant and machinery, etc.), thereby displacing the factor of production that had become relatively cheaper: namely, labour?

One contributor to this debate, J.D. Gould, has argued, however, in a now forgotten article, that the inflation of the Price Revolution era did in fact cheapen the real cost of that other important factor of production in this debate: namely, capital. For, *ceteris paribus*, nominal interest rates rarely adjust for inflation, which certainly, at the very least, cheapens the cost of *previously borrowed* capital, if such funds

were borrowed by contracts stipulating fixed interest payments and repayment of principal in terms of the current money-of-account (e.g., the pound sterling) .[34] Furthermore, Van der Wee's data for the Low Countries indicate that even *nominal* rates of interest, for short term public loans, were falling during the sixteenth century: in Flanders, from 20.5 percent in 1511-15 to 11.0 percent in 1566-70; and on the Antwerp market, again from 20 percent in 1511 to 10 percent in 1550 (but 14 percent in 1555).[35]

The Nef thesis on the Tudor-Stuart 'early industrial revolution': the impact of an energy crisis

Hamilton's chief opponent, his fellow Chicago economist colleague John U. Nef, argued that the true well-spring for the rise of early-modern industrial capitalism lay in the disproportionate rise of a very important set of industrial costs: wood, wood fuels, and especially charcoal[36]. That 'energy crisis' provided the spur to technological changes that brought forth a veritable 'early industrial revolution' in Tudor-Stuart England, in the form of much larger scale capitalist enterprise utilizing an entirely different fuel technology.

The ways in which population growth in Tudor-Stuart England (up to the 1650s, at least) led to a sharp rise in the relative prices of most agricultural and forest-based commodities has already been discussed (and could be further elaborated in terms of inelasticities of both supply and demand). But Nef also pointed out that Tudor-Stuart England experienced a far greater rate of deforestation than did any other northern European country, if not necessarily as much as did early-modern Italy, Spain, and other parts of Mediterranean Europe. In all these countries, the demand for timber for shipbuilding, in this new age of overseas exploration, colonization, and global commerce, was a major factor explaining this deforestation; but so was a disproportionate increase in urbanization, which in turn required more agricultural land to feed these growing cities, lands provided by further clearances and thus more deforestation; and increased urbanization also required of course, large increase in the supplies of wood for both construction and fuels, both domestic and industrial. When such deforestation took place, a major factor in the rise in timber and wood-fuel prices was the relative increase in transport costs from more distant forests to cities or other places of direct consumption. Because of the very fragile or 'friable' nature or charcoal, so that it crumbles to dust when experiencing any shocks in transport, and because of England's poor quality transport (bad roads, etc.), charcoal was generally not transported but generally created by burning timber at the forest sites. Much less

---

[34] Gould, 'The Price Revolution Reconsidered', 249-66..

[35] Van der Wee, *Growth of the Antwerp Market*, vol. I: *Statistics*, Appendix 45/2, pp. 525-27. No usable data after 1555 because the government was obtaining short-term funds from other sources; and the Spanish bankruptcy of 1557 disturbed relations with traditional lenders.

[36] See the following: John Nef, *The Rise of the British Coal Industry*, 2 vols. (London, 1923; reprinted 1966). In particular, Vol. I, Part ii, 'Coal and Industrialism', pp. 133-264. Chapter 2 of this section is entitled: 'An Early Industrial Revolution.' (pp. 165-89); John U. Nef, 'The Progress of Technology and the Growth of Large Scale Industry in Great Britain, 1540-1640', *Economic History Review*, 1st ser. 5 (1934), reprinted in John Nef, *Conquest of the Material World* (Chicago, 1964), pp. 121-43; John Nef, 'A Comparison of Industrial Growth in France and England, 1540-1640', *Journal of Political Economy*, 44 (1936), reprinted in Nef, *Conquest of the Material World* (1964), pp. 144-212; John Nef, 'Prices and Industrial Capitalism in France and England, 1540-1640', *Economic History Review*, 1st. 7 (1937), reprinted in F.C. Lane and J.C. Riemersma, eds., *Enterprise and Secular Change: Readings in Economic History* (London, 1953), 292-321; John Nef, *War and Human Progress: An Essay on the Rise of Industrial Civilization* (New York, 1950; reprinted 1963). See Part I (1494-1640), Chapter 4, 'Progress of Capitalist Industry', pp. 65-88.

frequently charcoal was produced from wood transported from the forests to another, better situated location.[37]

But, as Nef pointed out, England possessed one advantage that none of these other countries enjoyed: a relatively much cheaper industrial fuel in the form of coal. What statistical evidence supports the core of the Nef thesis, which, over the years has been subjected to severe criticisms, sometimes verging on vicious assaults?[38] We now possess far more and far better price data for England, and for fuel prices in particular, than was available to Hamilton, Nef, or to any of their critics. The evidence may be found in the accompanying Table 2, whose references to the Phelps Brown and Hopkins (PBH) 'basket of consumables' commodity price index will be familiar to many historians.[39] All of the data in this table, however, are

---

[37] Charcoal is 'obtained by partial burning or carbonisation (destructive distillation) of organic material. It is largely pure carbon. The entry of air during the carbonisation process is controlled so that the organic material does not turn to ash, as in a conventional fire, but decomposes to form charcoal. The most common variety of charcoal, wood charcoal, was formerly prepared by piling wood into stacks, covering it with earth or turf, and setting it on fire. In this process volatile compounds in the wood (e.g., water) pass off as vapors into the air, some of the carbon is consumed as fuel, and the rest of the carbon is converted into charcoal .... Air is not really needed in the carbonisation process, and advanced methods of charcoal production do not allow air to enter the kiln. This results in a higher yield, since no wood is burned with the air, and quality is improved. Charcoal yields a larger amount of heat in proportion to its volume than is obtained from a corresponding quantity of wood and has the further advantage of being smokeless'. From *The Columbia Encyclopedia*.

[38] Donald C. Coleman, 'Industrial Growth and Industrial Revolutions', *Economica*, new ser. 23 (1956), reprinted in: E.M. Carus-Wilson, ed., *Essays in Economic History*, Vol. III (London, 1962), pp. 334-52; D.C. Coleman, *Industry in Tudor and Stuart England* (London, 1975), pp. 35-49; Donald C. Coleman, *The Economy of England, 1450-1750* (London, 1977), Chapter 5, 'Occupations and Industries, 1450 - 1650', pp. 69 - 90; chapter 9, 'Industrial Change, 1650 - 1750', pp. 151 - 72; George Hammersley, 'The Crown Woods and their Exploitation in the Sixteenth and Seventeenth Centuries', *Bulletin of the Institute of Historical Research, University of London*, 30 (1957), 154-59; George Hammersley, 'The Charcoal Iron Industry and its Fuel, 1540-1750', *Economic History Review*, 2nd ser. 26 (1973), 593-613; George Hammersley, 'The State and the English Iron Industry in the Sixteenth and Seventeenth Centuries', in Donald Coleman and A. H. John, eds., *Trade, Government, and Economy in Pre-Industrial England: Essays Presented to F. J. Fisher* (London, 1976), pp. 166 - 86; Michael Flinn, 'The Growth of the English Iron Industry, 1660-1760', *Economic History Review*, 2nd ser. 11 (1958), 144-53; Michael Flinn, 'Timber and the Advance of Technology: A Reconsideration', *Annals of Science*, 15 (1959), 109-20; Sybil Jack, *Trade and Industry in Tudor and Stuart England* (London, 1977), especially chapter 2, pp. 66-121; Oliver Rackham, *Trees and Woodland in the British Landscape* (London, 1976); Oliver Rackham, *Ancient Woodlands: Its History, Vegetation and Uses in England* (London, 1980). For an overview, see John Hatcher, *The History of the British Coal Industry*, vol. I: *Before 1700: Towards the Age of Coal* (Oxford: Clarendon Press 1993), pp. 31-55, in effect, while acknowledging the many faults in Nef's research and analyses, lending support to the Nef thesis, as does Brinley Thomas, 'Was There an Energy Crisis in Great Britain in the 17th Century?' *Explorations in Economic History*, 23 (April 1986), 124 - 52.

[39] Phelps Brown, E.H., and Sheila V. Hopkins, 'Seven Centuries of Building Wages', *Economica*, 22:87 (August 1955), 195-206; reprinted in E.M. Carus-Wilson, ed., *Essays in Economic History*, 3 vols. (London, 1954-62), vol. II, 168-78, and in E.H. Phelps Brown and Sheila V. Hopkins, *A Perspective of Wages and Prices* (London, 1981), pp. 1-12; E.H. Phelps Brown and Sheila V. Hopkins, 'Seven Centuries of the Prices

different from the published versions of this index, and indeed these data have not previously been published. With the exception of the timber prices (not included in the PBH index), they have all been extracted from the worksheets for the PBH index, which are now part of the Phelps Brown Papers Collection, in the Archives of the British Library of Economic and Political Science (at the London School of Economics); and I have recalculated all of their data, linking commodity prices to their index numbers, using methods very different from those used by the PBH team of statisticians (too complicated to explain fully here).[40]

With the same index base employed by the PBH statisticians, 1451-75 = 100, this table presents relative prices in index numbers, in decennial means, from 1451-60 to 1781-90: for charcoal, coal, timber, and also for the composite PBH 'basket of consumables' price index. 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; the timber prices are from Cambridge alone.[41] Also shown are the price indexes for the seven components of the PBH index: grains (wheat, rye, barley, peas); meat (pigs, mutton, beef); fish (herring and cod); dairy products (butter and cheese); drink (barley malt and hops); fuel and light (charcoal, coal, candles, oil); and textiles (woollens, linens, canvas). Not surprisingly charcoal prices and those for 'timber' (wood fuels) rise in tandem; but somewhat surprisingly neither achieved a sustained rise above the 1451-75=100 base until the 1540s, suggesting again that population growth, urbanization, and deforestation were hardly important economic problems before the mid sixteenth century (or even later). By the peak decade of the Price Revolution, 1641-50 (when the timber price series ends as well), the decennial mean charcoal price index stood at 433.40, the timber price-index stood substantially higher, at 528.3, but even that did not match the current level of the composite PBH price index, which stood at 585.24. When we realize that foodstuffs account for an 80-percent share of this composite price index, and thus only 20 percent for industrial products, and find that the cereal grain index for 1641-50 was an astounding 829.53, we can understand better why the PBH composite price index was then so high.[42] At the same time, it should be noted that the price-indexes for England's

---

of Consumables, Compared with Builders' Wage Rates', *Economica*, 23:92 (November 1956), 296-314; reprinted in E.M. Carus-Wilson, ed., *Essays in Economic History*, 3 vols. (London, 1954-62), vol. II, pp. 179-96, and in E.H. Phelps Brown and Sheila V. Hopkins, *A Perspective of Wages and Prices* (London, 1981), pp. 13-59, containing additional statistical appendices not provided in the original publication, or in earlier reprints. But there are no separate price-indexes for individual fuels.

[40] The working papers are found in Box Ia:324 and Box J. III.2a, both in the Phelps Brown Papers Collection, Archives of the British Library of Economic and Political Science. Since I played a role in the acquisition of these papers, I was the first to use them – and I am unaware of their use by any other scholars. The chief differences lie in (1) my correction of many errors in the original worksheets, and (2) a different method of dealing with missing data, using statistical interpolations and regression analyses. For the overall index, the original PBH index was based on fixed component shares (e.g., 20 percent for grains), while my component shares depend upon changes in relative prices.

[41] Taken from Peter Bowden, 'Agricultural Prices, Farm Profits, and Rents', in Joan Thirsk, ed., *The Agrarian History of England and Wales*, Vol. IV: *1500 - 1640* (Cambridge: Cambridge University Press, 1967), Table VI, pp. 846-850. I have converted his original base, 1450-99= 100 (7.99s for 100 faggots) to the PBH base of 1451-75, and also to a base of 1581-90, for reasons explained in the text.

[42] See nn. 21-22 above. The published version of the PBH index has the following fixed component weights: 20.0 percent for cereal grains, 22.5 percent for 'drink' crops, 21.0 percent for meat, 4.0 percent for fish, 12.5 percent for dairy products – totalling 80 percent – and 7.5 percent for fuel and light, and finally,

most important manufactured products and most important exports – textiles – experienced the most modest rise in prices of all commodities in this table (except for fish), reaching a price index of only 343.29 in 1641-50. That is to be expected, since in general, in similar periods of inflation, manufacturing prices, especially in labour-intensive industries, rise much less than do grain or any other agricultural prices.

The much more important issue, however, is the comparison of the trends in charcoal and coal prices. Unfortunately, we 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).[43] The reader, therefore, may be astonished to find that , in this Table 2, a coal-price index number of 274.61 has been computed and assigned to the initial decade of recorded coal prices, 1581-80. The explanation is that the Phelps Brown and Hopkins statisticians created the index numbers for that, and succeeding decades, by splicing the Cambridge and Westminster charcoal prices with the coal prices for these two places, over the period 1586 to 1635 (and the initial value, for 1584, was 230.63).[44] With the same base of 1451-75=100 used for both charcoal and coal prices, Table 2 indicates that by the final decade of the Price Revolution era, 1641-50, this coal-price index had risen to 530.69, while the charcoal price-index – for exactly the same regions – had risen to only 433.398. Since the artificially computed coal price index for the initial decade of 1581-90 was already higher for coal (274.61) than for charcoal (239.30), we may ask if the results would be different if we measured both sets of prices from the initial decade of coal prices, by creating a new index base of 1581-90 = 100. But again, we find that the coal price index is still higher than is the charcoal price index in 1641-50: 193.26 vs. 181.108. That is certainly not a comparison that one would use to support the Nef thesis.

This comparison of trends in relative prices, however, does not take account of two major considerations. The first is the enormous regional variations in fuel supplies, so that in some place wood and charcoal had remained relatively cheap, while becoming very expensive in others. 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).[45] 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 (1.400 long 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.[46]

However, we may now note that the comparison radically changes from the decade 1641-50, which, by the way, was the era of the English Civil War, in which economic disruptions, supply shocks, and military demands for fuels may have affected the behaviour of relative prices. Thereafter, with a few exceptions, the

---

12.5 percent for textiles.

[43] Hatcher, *British Coal Industry*, Table B.4, pp. 577-78.

[44] See nn. 21-22 above. the Cambridge multiplier is 20.15607 and the Westminister multiplier is 17.3897.

[45] Hatcher, *British Coal Industry*, vol. I, p. 39;

[46] James E. Thorold Rogers, *History of Agriculture and Prices in England*, 7 vols. (Oxford, 1866-1902) IV, 385-7; V, 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 1630-9, while the coal price index had risen 126.9. For calorific values, see Hatcher, *Coal Industry*, p. 39.

coal price index falls, while the charcoal price continues to rise. The coal price index, with the base of 1581-90 = 100, falls from a decennial mean of 193.26 in 1641-50 to a low of 145.70 in 1681-90, and then recovers, but only to 177.30 in 1721-30; but the charcoal index rises from a decennial mean of 181.11 (1581-00 base) to 304.20 in 1721-30 – i.e., it rises by 68.0 percent. Note as well that only from the mid seventeenth century does the nominal charcoal price index rise, and rises steadily, above the PBH price index: in terms of the original base of 1451-75, from a decennial mean of 433.40 in 1641-50 to one of 729.75 in 1731-40, while the composite PBH index in fact falls from the decennial mean peak of 585.24 in 1641-50 to one of 557.411 in the same decade, 1731-40.

Therefore, as the latter set of index numbers reveal, England (and also the southern Low Countries) experienced general deflation in the second half of the seventeenth and in the early eighteenth centuries. The most severe period of deflation was from 1650 to 1690, with a significant decline of 14.30 percent in the PBH composite price index (i.e. , to 501.54 in 1681-90). Thereafter, despite supply shocks during the ensuing war years, from 1689 to 1715, and renewed influxes of precious metals from the Spanish Americas (both gold and silver), the PBH index does not indicate that England again experienced sustained, continuous inflation until and from the 1740s. That general deflation between the mid-seventeenth and mid-eighteenth century thus meant that the real rise of charcoal prices was even greater than the extent revealed by the index numbers, which, of course, are based on nominal prices. Even so, the central issue is, of course, the growing disparity in the trends of rising charcoal and falling coal prices, to at least the 1730s.

The reasons why the relative price of coal had fallen in this manner are not difficult to find. Coal mining benefited from the same technological changes, and from the consequent growth in industrial scale economies, as had the mining of precious metals. But it also benefited from another major technological innovation at the beginning of the eighteenth century, from about 1710, and one that was truly fundamental for the subsequent industrial revolution: the development of Newcomen's atmospheric 'steam-engine' (i.e., the precursor of the Watt steam engines), which was chiefly applied to coal mining.

If the Nef thesis on the 'early industrial revolution' cannot be fully supported by the statistical evidence for 'Tawney's century' itself, i.e., from c.1540 to c.1640, and thus up to the Civil War, this new evidence on comparative fuel prices does lend the thesis some credibility for the next century, even if that takes us from the Stuart to the Hanoverian eras (from 1714). But if the story involved only these changing trends in fuel prices, the Nef thesis would not merit any consideration in the history of modern entrepreneurship, industrial capitalism – and the origins of the true Industrial Revolution. The crucial issue is that those industrial entrepreneurs who found an incentive in the behaviour of relative prices to switch from wood or wood-charcoal fuels to coal fuels encountered a very serious technological problem. For while charcoal burns without smoke – without any contaminants or impurities, explaining why it has been the world's most popular fuel for many millennia -- coal is a smoke-producing and very dirty fuel, with many contaminants, such as sulphur, that will corrupt or even destroy the product being manufactured, if placed in direct contact with the fuel (e.g., glass, soap, beer, alum).

There were two possible technological solutions to this problem. The first and most obvious, the one utilized in this Stuart-Hanoverian era, was to separate the coal fuel, and all elements of its combustion, from the manufactured product by the construction of a reverberatory furnace: a very large-scale and complex brick kiln furnace that transmitted heat by convection and reflection ('reverberation'), while isolating the fumes completely with specially designed tall chimneys. Again, hydraulic machinery was also required, as in similar-scale blast furnaces (smelters), in order to fan the burning coal fuels with air (oxygen) to achieve the required levels of combustion. Such complex hydraulic reverberatory furnaces obviously required a quantum leap in the scale of capital investment; and for the reasons already outlined that meant a dramatic

change from simple artisanal production to true industrial capitalism, employing not traditional artisans (with their own capital) by wage-earning labourers, 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 fact involved three separate sets of cost reductions. First, the great increase in industrial scale that this new fuel technology required ultimately meant a sharp fall in the marginal costs of production, provided that a commensurately large volume of production – and thus sales – had been achieved (i.e., large enough 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 labour 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 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 survive and prosper only by engaging in a technological change that in turn demanded a change in industrial organization, i.e., to achieve sufficient economies of scale.

What examples of the new 'industrial capitalism' provide, specifically for early-modern (later Stuart-Hanoverian) England did Nef and other historians, such as John Hatcher, provide? The chief examples are the following so-called 'new industries' that used this hydraulic reverberatory furnace technology to produce the following products: beer (brewing with hops), bricks, clay tiles, pottery making, lime-burning (construction and husbandry), glass, soap, paper, gunpowder, brass wares, salt (sea-water evaporation), alum and dyestuffs, sugar refining. Glass-making was a 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 – and to coal fields (or water-borne coal supplies).[47] In the field of metallurgy, such 'new industries' also included those that engaged in the following processes: 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, i.e., in drawing wire, making nails. None of these was truly 'new', of course, in terms of the product, but rather in terms of industrial technology; and many became important as import-substitution industries. In sum, as Hatcher contends, (1) 'In the latter half of the seventeenth century, sweeping changes occurred in the pattern of industrial coal consumption; and (2) 'by 1700 coal was the preferred fuel of almost all fuel consuming industries [except for iron manufacturing, for reasons to be explored in the next section], and access to coal supplies had already begun to exert a determining influence over industrial location'.[48]

Obviously such industries could have been successful in achieving the necessary scale economies only if they found mass markets to consume these products. Such was not the case in terms of export markets, for none of these 'new' industries was responsible for any significant exports (except a few to the West African and American markets). They were far more successful in the domestic markets: thanks to population growth. England's population had risen from about 2.25 million in the 1520s to 2.83 million in 1541, to 4.162 million in 1601, and then to a seventeenth-century peak of 5.391 million in 1656, thus about doubling in just over a century. While England's population thereafter experienced some decline and

---

[47] See D.W. Crossley, 'The Performance of the Glass Industry in Sixteenth-Century England', *Economic History Review*, 2nd ser. 25 (1972), 421-33. See also Hatcher, *British Coal Industry*, pp. 422-58, who does not, however, discuss the reverberatory furnace. See n. 56 below.

[48] Hatcher, *British Coal Industry*, pp. 450, 458, respectively.

stagnation, it rose again from the 1720s to reach a level of 6.310 million in 1761, on the eve or at the beginning of the modern Industrial Revolution era.

More dramatic and certainly more important was the growth of London itself. Having been relatively insignificant in 1500, in a European context, with a population of only about 50,000 (possibly 80,000) 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 truly a highly efficient, concentrated, mass-market with very significant reductions in transaction costs from the very density of sales.[49] Such a growth could have occurred, it must be stressed, only with and because of massive imports of coal, chiefly by sea from Newcastle, into London; and London certainly could not have imported a comparable quantity of wood to supply the city's need for both (and most especially) 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'; and, further 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 would have required one million acres of forested land.[50]

Equally important, to the extent that such products as glass, bricks, soaps, dyestuffs, beer, brass- and bronze-wares and many other metallic products for household consumption enjoyed significant price elasticities of demand, the effect of technologically induced reductions in costs and then, through market competition, price reductions meant that falling prices ensured a more than proportionate 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.

Two other major manufacturing industries of this era did not, however, enjoy any such changes and benefit from this new furnace technology. Textiles, already noted as by far England's most important manufacturing industry, did not undergo any truly significant technological changes until the actual, and true Industrial Revolutions of the later eighteenth century, i.e., from the 1760s, though certainly it also required significant increases in coal consumption for many of its industrial processes (from combing to dyeing to finishing).[51] The only minor exceptions to be noted for the early-modern era are the stocking frame (of William Lee), swivel loom (introduced from Holland), neither of which employed mechanical power, and a more widespread diffusion of water-powered gig mills (for finishing woollens, usually linked to fulling mills). The only and truly marginal benefits derived from the new furnace technology lay in improved and lower cost methods of producing dyestuffs and related alum mordants. But none of these had a significant impact on either the organization or volume of production; and indeed productivity in the eighteenth-century

---

[49] See E. A. Wrigley, R.S. Davies, J.E. Oeppen, and R. S. Schofield, *English Population History from Family Reconstitution*, Cambridge Studies in Population, Economy and Society in Past Time no. 32 (Cambridge and New York: Cambridge University Press, 1997).

[50] E. Anthony Wrigley, *Continuity, Chance and Change: The Character of the Industrial Revolution in England* (Cambridge University Press, 1988), pp. 54-55, also stating (no. 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, *British Coal Industry*, p. 39.

[51] Jennifer Tann, 'Fuel Saving in the Process Industries during the Industrial Revolution: a Study in Technological Diffusion', *Business History*, 15 (1973), 149-59; Wrigley, *Continuity, Chance, and Change*, p. 78; Hatcher, *British Coal Industry*, pp. 442-44.

woollen industry remained about the same as that documented for the fifteenth century.[52]

Nevertheless, we must not overlook the central fact that coal was assuming an ever greater role in the British industrial economy from the sixteenth to eighteenth centuries, well before the onset of the 'Industrial Revolution', and thus long before any comparable industrial changes on (or in most of) the continent.[53] According to the most recent research, undertaken by John Hatcher, British coal output (England, Scotland, Wales) had expanded almost 12-fold from about 227,000 tons in 1560 to about 2,640,000 tons in 1700, when it was supplying about half of England's fuel needs.[54] As Anthony Wrigley has 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 five-fold, to about 15 millions tons a year, which was at least five times greater than the aggregate coal output in continental Europe.[55]

Furthermore, for a study on early-modern entrepreneurship, we must marvel at the risk-taking, ingenuity, and foresight of those who did make such a radical shift in their modes of production in adopting the new coal-burning technology in so many manufacturing industries. . Obviously, to repeat a key point, a mere change in relative prices would not have induced most of them to do so – in view of the dramatic increases in capital costs in doing so. How many would have had the wisdom, foresight (certainly without a training in economics), and courage to do so; and how many therefore would have anticipated the economic gains, and presumably increased profits, from the changes in industrial scale, in sales prices (from cost reductions), and in market volumes? Also unsung are those entrepreneurs and their technical craftsmen

---

[52] A weaver-draper could have produced no more 20-25 woollen broadcloths (measuring 24 yds by 1.75 yds) a year. See Munro, 'Medieval Woollens: Textiles, Technology and Organisation', pp. 196-97; Walter Endrei, 'The Productivity of Weaving in Late Medieval Flanders,' in Negley B. Harte, and K. G. Ponting, eds., *Cloth and Clothing in Medieval Europe: Essays in Memory of Professor E. M. Carus-Wilson*, Pasold Studies in Textile History no. 2 (London, 1983), pp. 108-19; Walter Endrei, 'Manufacturing a Piece of Woollen Cloth in Medieval Flanders: How Many Work Hours,' in Erik Aerts and John Munro, eds., *Textiles of the Low Countries in European Economic History*, Proceedings of the Tenth International Economic History Congress, Studies in Social and Economic History, Vol. 19 (Leuven, 1990), pp. 14-23.

[53] Except perhaps in the Dutch Republic. On the uses of the various sources of power utilized there, see J.W. de Zeeuw, 'Peat and the Dutch Golden Age: the Historical Meaning of Energy Attainability', *Afdeling Agrarische Geschiedenis (AAG) Bijdragen*, 21 (1978), 3-31; Richard W. Unger, 'Energy Sources for the Dutch Golden Age: Peat, Wind and Coal', *Research in Economic History*, 9 (1984), 221-53; Richard W. Unger, 'The Dutch Coal Trade in the Seventeenth and Eighteenth Centuries', *Mededelingen van de Nederlandse Vereinging voor Zeegeschiedenis*, 43 (1981), 6-14; republished in Richard W. Unger, *Ships and Shipping in the North Sea and Atlantic, 1400 - 1800*, Variorum Collected Series CS 601 (Aldershot and Brookfield, Vt., Ashgate, 1997); Joel Mokyr, *Industrialization in the Low Countries, 1795 - 1850*, Yale Studies in Economic History (New Haven and London, 1976), pp. 204-06.

[54] Hatcher, *British Coal Industry*, vol. I, Table 4.1, p. 68.

[55] Wrigley, *Continuity, Chance, and Change*, p. 54; See also E. Anthony Wrigley, 'The Divergence of England: the Growth of the English Economy in the Seventeenth and Eighteenth Centuries', *Transactions of the Royal Society*, 6th ser., 10 (2000), 117-41; Hatcher, *British Coal Industry*, pp. 555-56 (also citing a figure of 15 millions tons for 1800), stating that 'the major turning point for the British coal industry occurred in the second half of the eighteenth century'); Sidney Pollard, 'A New Estimate of British Coal Production, 1750-1850', *Economic History Review*, 2nd ser. 33 (1980), 212-35.

employees who undertook significant alterations for coal-burning furnaces or stoves and heat distribution systems for domestic heating in London and many other towns.[56]

Growth and stagnation in the early-modern English iron manufacturing industry

The other major industry in Tudor-Stuart England, iron manufacturing, did undergo a significant change, if not one that involved any new technology. For this period witnessed the importation, from either the eastern Low Countries or from Rhineland Germany, of the blast furnace and thus of the two-stage process of iron manufacturing (i.e., separate processes of smelting and refining) whose later-medieval technological changes and metamorphosis into genuine industrial capitalism have already been analysed. The 'new' iron manufacturing industry first developed from the early sixteenth century in the still well-forested Weald district of south-east England, close to the Home Counties and London, where it found its principal markets, especially for munitions (cast-iron cannons). But the maximum number of furnaces sites in the Weald, fifty-four, was reached in the 1580s; and as the number there diminished, more furnace sites were established elsewhere, evidently reflecting the search for more ample supplies of charcoal and water power. Even so the maximum number of furnace sites in all of England, eighty-nine, was reached in the decade 1600-10. At the same time, however, aggregate output had risen swiftly: from an annual average of 1,200 tons of pig iron in the 1530s to a seventeenth-century maximum of 23,000 tons per year in the 1650s. That difference was achieved by an increase in furnace scales, from an average output of 200 tons per year in the 1530s to 270 tons in the 1650s, and then to as much as 375 tons a year almost a century later, in the 1740s, when aggregate output, having fallen in the later seventeenth century, achieved a modest increase from the early eighteenth century, reaching 28,000 tons in the 1720s, but falling again to 26,500 tons in the 1740s.[57]

---

[56] See in particular, for both industrial and domestic fuels (the latter, by far consuming the greater share), see Hatcher, *Coal Industry*, pp, 410-58. But there is surprisingly almost no discussion of the new reverberatory furnaces of other technological changes in furnaces and fuel-consumption, except for one brief mention (without technical or economic analysis) on p. 456.

[57] For these data, and the following analyses, see: T. S. Ashton, *Iron and Steel in the Industrial Revolution* (Manchester, 1924; reprinted 1951), chapter 1, pp. 1-23; T. S. Ashton and J. Sykes, *The Coal Industry of the Eighteenth Century* (Manchester, 1929; reprinted 1964); Coleman, 'Industrial Growth and Industrial Revolutions', pp. 334-52; H. R. Schubert, *The History of the British Iron and Steel Industry from ca. 450 B.C. to A.D. 1775* (London, 1957); Michael Flinn, 'The Growth of the English Iron Industry, 1660-1760', *Economic History Review*, 2nd ser. 11 (1958), 144-53; Michael Flinn, 'Timber and the Advance of Technology: A Reconsideration', *Annals of Science*, 15 (1959), 109-20; George Hammersley, 'The Charcoal Iron Industry and its Fuel, 1540-1750', *Economic History Review*, 2nd ser. 26 (1973), 593-613; D.C. Coleman, *Industry in Tudor and Stuart England* (London, 1975), pp. 35-49; George Hammersley, 'The State and the English Iron Industry in the Sixteenth and Seventeenth Centuries', in Donald Coleman and A. H. John, eds., *Trade, Government, and Economy in Pre-Industrial England: Essays Presented to F. J. Fisher* (London, 1976), pp. 166 - 86; Philip Riden, 'The Output of the British Iron Industry Before 1870', *Economic History Review*, 2nd ser. 30 (1977), 442-59; Charles K. Hyde, *Technological Change and the British Iron Industry, 1700-1870* (Princeton, 1977), especially chapter 1, pp. 7-22; also chapter 3, pp. 42-52; Pollard, 'A New Estimate of British Coal Production, 1750-1850', pp. 212-35; Brinley Thomas, 'Escaping from Constraints: The Industrial Revolution in a Malthusian Context', *The Journal of Interdisciplinary History*, 15 (Spring 1985), 729 - 54; Brinley Thomas, 'Was There an Energy Crisis in Great Britain in the 17th Century?' *Explorations in Economic History*, 23 (April 1986), 124 - 52; J. R. Harris, *The British Iron Industry*, Studies in Economic and Social History series (London: Macmillan, 1988); John Hatcher, *The History of the British Coal Industry*, Vol. 1: *Before 1700* (Oxford: Oxford University Press, 1993); Michael

According to John Nef, Thomas Ashton, Brinley Thomas, and others, this imported iron industry failed to resolve major technological problems, those collectively known as 'the tyranny of wood and water': the continued dependence on wood-charcoal fuels and of hydraulic machinery for both the furnace and forge bellows and for the forge tilt-hammers. The 'tyranny of water' cannot detain us here, other than to note, first, the seasonal limitation on the use of water power (i.e, with winter freezing and summer droughts), and second, the locational and opportunity-costs involved in finding and claiming unused, unrented water sites.

As for the 'tyranny of wood' (charcoal), it should be obvious why the new coal-burning reverberatory furnace technology was totally inapplicable to iron manufacturing. In the first place the blast furnace required the direct contact of the fuel – the smokeless and pure wood charcoal – in order to achieve the iron-winning process of separating the iron and oxygen atoms in ferric oxide (iron ore), to produce carbon dioxide and iron itself, though an iron heavily contaminated with carbon, which thus had to be refined (decarburized) in the forges. Though that did not require the same direct contact with the fuel it did require a level of combustion (heat) that was not possible with the existing 'reverberatory' (reflecting) furnaces.

The nature of the ongoing 'energy crisis' in terms of wood-base fuels is indicated by the evidence from a wide number and widely diffused furnace sites that from the 1530s to the early 1700's the nominal price of a load of charcoal had risen from about eleven-fold, from 3.00s to 37.17s a load, a rise that was about 2.75 time greater than the overall rise in the PBH price index. An even fuller grasp of the problem can be realized when furnace accounts for the early eighteenth century reveal that charcoal alone accounted for 71.0 percent of total manufacturing costs in producing a ton of pig iron, while the iron ore itself accounted for only 15.2 percent and furnace labour for only 3.0 percent of those total accounts. Another dismal picture of the English iron industry, in the 1740s, can be found in a comparison of domestic bar (refined) iron production with importations of Baltic iron (chiefly from Sweden and Russia) for that decade: only 18,650 domestic tons vs. 22,500 imported tons, so that imports accounted for 54.7 percent of total English iron consumption.[58]

The alternative solution: distilling coal into coke

As indicated earlier, there were two possible solutions for finding the optimum fuel for the crucial initial stage of iron production, in smelting. That second solution lay in the purification of coal into virtually pure carbon in the form of coke. In some respects, it remains puzzling why the solution to the distillation problem took so long to be discovered, since the process of converting coal into coke is similar to the one of converting timber into charcoal. According to the estimable *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 for stoves and furnaces in which conditions are not suitable for the complete burning of bituminous coal itself. Coke may be burned with little or no smoke under combustion conditions which

---

Zell, *Industry in the Countryside: Wealden Society in the Sixteenth Century* (Cambridge: Cambridge University Press, 1993).

[58] Hyde, *Technological Change and the British Iron Industry;* Riden, 'Output of the British Iron Industry', pp. 443, 448. For somewhat different data, but leading to the same conclusions, see Brinley, 'Was There an Energy Crisis', pp. 124-52.

would result in a large amount of smoke if bituminous coal were the fuel.

From the later seventeenth century adventuresome entrepreneurs and engineers (e.g., the aptly named Dud Dudley) did seek practical and profitable methods for distilling coal; but the first to be successful in using a purified form of coal as coke in a blast furnace to convert iron ore into pig or cast iron was Abraham Darby, in 1709-10, at his ironworks in Coalbrookdale, in Shropshire. But his process, while making a radical difference in the production of cast iron, did not resolve the key technological problems to initiate a true industrial revolution in iron manufacturing, i.e., for the desired end product, in the form of bar iron.

The essential deficiency in his process was that the smelting process in his coke blast furnace achieved so rapid a combustion that the ore was reduced to pig iron before the silicon could be eliminated. Thus the cost of refining coke-smelted pigs into refined bar iron was increased by the extra cost of eliminating ('burning off') the silicon; and for several decades that extra cost discouraged entrepreneurs from building coke-fired blast furnaces, all the more so when initially costs of producing pig iron were in fact still higher with coke than with charcoal.[59] The solution to this problem in lay in reducing the fuel costs for those furnaces, because effective coke-smelting required a much higher air pressure for the 'blast' than did charcoal. The first major break through occurred in (or about) 1760, when the Scottish engineer John Smeaton, at Edinburgh's famed Carron Ironworks, replaced the very old-fashioned bellows with piston air pumps, though these still used water power. And thus the true breakthrough, initiating a veritable industrial revolution in iron, was the application of James Watt's steam engine to power the piston air-pumps in Joseph Wilkinson's coke blast furnace in his iron works in Shropshire – thereby cutting the fuel costs by over one-third. At the same time, Watt also applied to his new steam engine in coal mining – together in the truly revolutionary year of 1776 (also marking the publication of Adam Smith's *The Wealth of Nations*). But that lies beyond this story of entrepreneurship in early-modern, pre-Industrial Revolution Europe.

We must now return to Abraham Darby, in order to learn that his coke-smelting process, despite the major technological difficulties it posed for the total process of iron-making, was nevertheless a major entrepreneurial triumph. For, surprisingly enough, the silicon residues in the smelted iron vastly improved the quality of cast iron – i.e., the same chemical and physical product as pig iron, but one designed or destined to be a consumer product. The silicon had the effect of sealing all of the fissures, bubbles, and cracks that appeared or later developed in the heavily carburized iron; and Darby truly prospered by justifiably advertising the superior quality of his castings. That was especially important in the production of cast iron artillery, for the silicon process virtually eliminated the historic problem that with, continuous winter freezing and summer heating, the fissures and cracks in the iron worsened so much that too highly charged artillery shells would cause these cannons to explode into thousand of razor sharp shards of metal.[60]

The Nef Thesis in retrospect: England's primacy in adopting a coal-based technology

In view of this history, into the eighteenth century, up to the true Industrial Revolution, what can be said about the Nef thesis on the Tudor-Stuart 'early industrial revolution'? In essence, Nef overstated and

---

[59] When Darby began his process, his costs for smelting a ton of pig iron were about £7 a ton, while some charcoal smelters were producing pig-iron at around £5 - £6 per ton; but by the 1730s, Darby's coke-smelting production costs had fallen below that level of £5 a ton. See Hyde, *Technological Change*, pp.

[60] Such an event supposedly occurred when Dutch engineers, in demonstrating their cast iron cannon to French army officers, killed many of their gunners, in this same fashion; the human capital loss was much more important than that of the physical capital.

thereby ruined what was in fact a good case (or thesis).[61] There was in fact no industrial revolution in this Tudor-Stuart era – and the Nef thesis more properly lies, as indicated, in the later Stuart and early Hanoverian eras. England's most important industry remained textile manufacturing; and, as stressed earlier, it did not then undergo any major changes in technology and industrial organization. Textiles fundamentally remained an industry that married mercantile capitalism with artisan craft production; and iron-manufacturing, while it was indeed a genuine form of industrial capitalism, was one that had already been imported with that capitalist organization, and, other than some modest increases in industrial scale (designed to deal with rising fuel costs), did not undergo any further changes before the true Industrial Revolution of the later eighteenth century, when cotton textiles then also underwent major technological changes and thus a true metamorphosis into genuine industrial capitalism.

Indeed the most important industrial transformation in Tudor-Stuart England , involving the wool-based textile industries, was the slow but inexorable shift, from the 1560s, from the so-called Old Draperies, producing heavy-weight, luxury quality and thus expensive woollen broadcloths, to the so-called New Draperies, producing far cheaper, much lighter weight, mixed woollen-worsted 'stuffs' (and far less durable than the traditional broadcloths). Despite the nomenclature of 'New', this was in fact a revival of an old medieval industry (also centred in East Anglia) , using the same medieval technology, simpler and much cheaper than that found in the Old Draperies.[62] While the New Draperies did indeed have, on the other hand, a very major impact on English foreign trade in the seventeenth and eighteenth centuries, as will be seen below, none of Nef's 'new industries', had any such importance; and most especially they did nothing to alter the structure of the English economy – as the later Industrial Revolution most certainly did.

What, therefore, remains to be said about the Nef thesis: a lot more, in my view, than most critics are willing to admit. If the Nef thesis cannot be vindicated in truly statistically verifiable, quantitative changes, certainly it can be in terms of qualitative changes in the economy. For the essence of modern industrialization lay in the use of coal throughout the economy, leading some historical geographers to comment than an industrial map of Europe in the nineteenth century was essentially a map of its coal fields. Coal, distilled into coke, replaced charcoal almost everywhere as the chief industrial power; coal-fired steam engines ultimately replaced water-mills, while much later in the nineteenth century, coal-fired steam turbines produced a radically new and very cheap form of power in electricity. And finally, coal, from the later nineteenth century, also became the fundamental base for a radically new set of chemical industries that would also – in this so-called 'Second Industrial Revolution' – transform the new industrial world, veritably across the globe.

For the iron manufacturing industry itself, a major topic of this study, technological changes in the

---

[61] For chief critics of the Nef thesis, see n. 37 above. For a more nuanced and more sympathetic view, see L.A. Clarkson, *The Pre-Industrial Economy in England, 1500-1750* (London, 1971), Chapter 4: 'Industry', pp. 75-116; Christopher G. A. Clay, *Economic Expansion and Social Change: England, 1500 - 1700,* Vol. II: *Industry, Trade, and Government* (Cambridge, 1984), chapter 8, 'The Diversification of Economic Activity', pp. 1 - 102.

[62] John Munro, 'Medieval Woollens: The Western European Woollen Industries and their Struggles for International Markets, c.1000 - 1500', in David Jenkins, ed., *The Cambridge History of Western Textiles*, 2 vols. (Cambridge and New York: Cambridge University Press, 2003), Vol. I, chapter 5, pp. 228-324, 378-86 (bibliography); and Herman Van der Wee (in collaboration with John Munro), 'The Western European Woollen Industries, 1500 - 1750', in David Jenkins, ed., *The Cambridge History of Western Textiles*, 2 vols. (Cambridge and New York: Cambridge University Press, 2003), Vol. I, chapter eight, pp. 397- 472; and See Munro, 'Medieval Woollens: Textiles, Textile Technology, and Industrial Organisation', pp. 181-227.

use of coal and coke fuels ended forever the 'tyranny of wood and water', converting England from a veritable backwater to the very forefront in the world output of iron. After resolving the breakthrough in coke smelting, with steam power, other engineers and entrepreneurs (beginning with Cort and Onions) combined the use of steam engines with coke fired reverberatory furnaces to resolve the problem of refining, so that English production of iron rose from 37,000 tons in the 1760s to 3,106,000 tons in the 1850s. [63]

We must therefore credit John Nef for his insights into England's primacy in the industrial use of coal, with highly significant entrepreneurial and not merely technological innovations – a primacy that meant almost a two-century head start in such a use of coal, when we seek to explain the origins of the true Industrial Revolution and also to explain why it found its initial homeland in England (or Great Britain, since we must also include Wales and Scotland).

If most historians have remained hostile to the Nef thesis, one of Britain's very most distinguished economic historians, Anthony Wrigley, has at least implicitly acknowledged its importance in advancing this own thesis that English economic growth had depended on a shift from an 'advanced organic economy' to a more modern 'mineral-based energy economy', i.e., one based on coal (but also the mineral iron). For the reasons cited earlier from Wrigley's publications, he estimates that, without the use of coal, the English economy in the reign of George III (1760-1800) would have required an additional 15 million acres of woodland compared to its energy needs in the reign of Elizabeth I (1558-1603). He thus concludes that 'the transition to a partial dependence upon inorganic *stocks* of energy rather than upon organic energy *flows* played an important role in allowing the English economy to expand without debilitating pressure on the land in the early modern period', so that 'constraints upon growth were eased'.[64]

Of course, as most historians would also be quick to assert, those origins of both modern industrial capitalism and the Industrial Revolution involve a great deal more than just these innovations in coal-burning technology. There are indeed far too many considerations involved, far more than can be discussed in this study. Yet we cannot stop here, without considering, first, two other major socio-economic changes that took place in 'Tawney's century, 1540-1640', the first of which is also related to the macro-economic changes of the Price Revolution era.

Tawney' Century, 1540 - 1640: I: Agrarian capitalism and 'the rise of the gentry' debate

Richard Tawney (1880 - 1962) first achieved academic fame with his renowned study on the evolution of 'agrarian capitalism' in Tudor-Stuart England: *The Agrarian Problem in the Sixteenth Century* (London, 1912).[65] Subsequently, in 1940, Tawney achieved even greater fame, but then trenchant opposition,

---

[63] See sources cited above, in n.

[64] Wrigley, *Continuity, Chance, and Change*, pp. 54-55. See also E. Anthony Wrigley, 'The Divergence of England: the Growth of the English Economy in the Seventeenth and Eighteenth Centuries', *Transactions of the Royal Society*, 6th ser., 10 (2000), 117-41; E. Anthony Wrigley, 'The Supply of Raw Materials in the Industrial Revolution', *Economic History Review*, 2nd ser., 15 (1962), 1-16. See also Thomas, 'Was There an Energy Crisis in Great Britain', pp. 124 - 52.

[65] Richard H. Tawney, *The Agrarian Problem in the Sixteenth Century* (London, 1912) Re-issued with an introduction by Lawrence Stone, 1967. For a trenchant attack on this and other publications by Tawney, see Eric Kerridge, *Agrarian Problems in the Sixteenth Century and After*, Historical Problems: Studies and Documents no. 6 (London: George Alan and Unwin; New York: Barnes and Noble, 1969).

opprobrium, and misfortune with his famous article on 'The Rise of the Gentry', in which he sought to explore the social and economic origins of the English Civil War; i.e., for him and other socialists, 'the transition from feudalism to capitalism', at least in early-modern England.[66] 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. Thus the 'rise of the gentry' was even more important in understanding the subsequent development of the English economy, certainly from the early to mid seventeenth century.

To understand the nature of the 'gentry', and why it was a social institution unique to England, one must first understand that medieval England had not possessed a genuine feudal aristocracy, not of the type generally found on the continent. From its Carolingian origins, the continental feudal aristocracy consisted of those of who served as a cavalry horse-soldiers — knights, *chevaliers* – and who, in exercising this costly profession, were necessarily servant-vassals of superior lords, receiving from them, in reward for their military service, fiefs in the form of manors, or other forms to landed estates, thereby making them an economic and political as well as a military aristocracy. Subsequently to become an aristocrat one had to be borne with this status, as a descendent of cavalry horse-soldier. Thus all knights, at the base of this feudal pyramid (with king or emperor at the peak), were by definition feudal aristocrats, as were all members of their families, and their subsequent offspring.

In England, however, all knights were legally commoners; and indeed the medieval House of Commons consisted of the few burgesses of the towns and the many knights of the shires. Even baronets (a title that James I created in 1611) sat in the Commons. Those peers sitting in the House of Lords were (from the top down): dukes, archbishops, marquesses, earls (= European counts), viscounts, and barons. They were all addressed as 'Lord'. Furthermore, by the firmly practised custom of primogeniture, only the eldest son of a peer inherited the aristocratic title and the estate, kept intact by the laws of entail. 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 political from the peers – and certainly not a separate social class. The second obvious components of the 'gentry' were the even larger number of knights, addressed as 'Sir'.

A third, far larger, and far more amorphous group were those known or classed as 'gentlemen'. They were often merchants, lawyers, financiers, professional men, royal officials, etc., who had gained royal or public offices and attached lands; or those who had purchased or otherwise acquired manorial estates and proceeded to live like country squires or country gentlemen, including some wealthy yeomen farmers. In general, therefore, those who acquired the landed wealth, education, and social trappings of a lesser nobility would be considered 'gentry': if not the first generation, then the second generation, most of whom were bred into that way of rural life. As contemporary English commentator Thomas Smith stated in his *De Republica Anglorum* (ca. 1600): 'to be shorte, [he] who can live idly and without manuall labour, and will bear the port, charge and countenance of a gentleman, he shall be taken for a gentleman'; and according to

---

[66] R.H. Tawney, 'The Rise of the Gentry, 1558-1640', *Economic History Review*, 1st ser. 11 (1941). Reprinted with a postscript (1954) in E.M. Carus-Wilson, ed., *Essays in Economic History*, Vol. I (London, 1954), pp. 173-214.

Smith, this group also included university professors.[67]

The so-called Tawny thesis was actually best expressed by his contemporary H. J. Habakkuk, who published an equally important, if less well known article on 'English Land Ownership, 1680-1740', also in the *Economic History Review*, but in the year before Tawney's article appeared. [68] Habakkuk began by reminding his readers that:

> Harrington, writing at the end of the Commonwealth period [i.e., the Cromwell interregnum period, in the 1650s, before the restoration of the monarchy in 1660] found the key to the Civil War in the shift of property from the Church, the Crown, and above all from the great semi-feudal landowners to the squires [i.e., to the gentry]. This notion of the rise of the squirearchy [gentry] has become the organising conception of English social history between the Dissolution of the Monasteries [in 1536] and 1640 [i.e., to the outbreak of the English Civil War] ...

The following Table 3, presenting data supplied by George Mingay, lends some considerable support to this view, and thus to the Tawney thesis:[69]

Table 3. Percentage of Total Lands Held by Leading Social Classes in 1436 and 1690

---

[67] Sir Thomas Smith, *De Republica Anglorum* [1600], ed. L. Alston (London, 1906).

[68] H.J. Habakkuk, 'English Land Ownership, 1680-1740', *Economic History Review*, 1st ser. , 10 (1940), 2-17.

[69] George E. Mingay, *The Gentry: The Rise and Fall of a Ruling Class* (London, 1976), especially chapters 1 - 3, pp. 1-79. On the English gentry and the Tawney debate, see also Hugh R. Trevor-Roper (Lord Dacre), *The Gentry, 1540-1640: Economic History Review Supplement*, no. 1 (Cambridge University Press, 1953), pp. 1 - 55; Lawrence Stone, ed., *Social Change and Revolution in England, 1540-1640, Problems & Perspectives* Series (London, 1965); Jack Hexter, 'Storm Over the Gentry', *Encounter*, 10 (1958); reprinted in J.H. Hexter, *Reappraisals in History* (London, 1961); Lawrence Stone, *The Crisis of the Aristocracy, 1558-1641* (Oxford, 1956); J.P. Cooper, 'The Counting of Manors', *Economic History Review*, 2nd ser., 8 (1956), 377 - 86; J. P. Cooper, 'In Search of Agrarian Capitalism', *Past and Present*, No. 80 (August 1978), 20-65; Alan Simpson, *The Wealth of the Gentry, 1540-1660* (Chicago, 1961); Julian Cornwall, 'The Early Tudor Gentry', *Economic History Review*, 2nd ser., 17 (1965), 456 - 71; Gordon Batho, 'Noblemen, Gentlemen, and Yeomen', in Joan Thirsk, ed., *The Agrarian History of England and Wales*, Vol. IV: *1500-1640* (Cambridge, 1967), pp. 276-305; Robert Brenner, 'Agrarian Class Structure and Economic Development in Pre-Industrial Europe', *Past and Present*, no. 70 (Feb. 1976), 30-75; republished in T. H. Aston and C.H.E. Philipin, eds., *The Brenner Debate: Agrarian Class Structure and Economic Development in Pre-Industrial Europe* (Cambridge, 1987); Robert Brenner, 'The Agrarian Roots of European Capitalism', *Past and Present*, No. 97 (Nov. 1982), 16-113.; Christopher Clay, *Economic Expansion and Social Change: England 1500-1700*, Vol. I: *People, Land, and Towns* (Cambridge, 1985), chapter 5, 'The Landlords', pp. 142 - 64; J. T. Cliffe, *Puritans in Conflict: The Puritan Gentry during and after the Civil Wars* (London: Routledge, 1988).

CLASS OF LANDHOLDERS	1436	1690
Church and Crown	35%	10%
Peerage (aristocracy)	20%	18%
Gentry	25%	45%
Yeoman Freeholders	20%	27%
TOTALS	**100%**	**100%**

Source: George E. Mingay, *The Gentry: The Rise and Fall of a Ruling Class* (London, 1976), Table 3.1, p. 59, based on J.P. Cooper, 'The Social Distribution of Land and Men in England, 1436 - 1700', *Economic History Review*, 2nd ser., 20:3 (December 1967), 419-40; F.M.L. Thompson, 'The Social Distribution of Landed Property in England Since the Sixteenth Century', *Economic History Review*, 2nd ser., 19:3 (December 1966), 505-17.

But obviously, if that amorphous social grouping called the 'gentry' had already held a quarter of the land in 1436, they had already 'risen' at least a full century before the Dissolution of the Monasteries. Nevertheless, this indication that the gentry's collective landownership had risen from 25 percent to 45 percent, almost half, by 1690 represents an economic and social transformation that cannot be ignored. At first glance, it would appear that almost all of the gentry acquisitions came at the expense of the church and the crown, and not the aristocracy. But this would be highly misleading, for, as Habbakuk sought to demonstrate, and F. M. L Thompson confirmed, the 'rejuvenated' aristocracy of the later seventeenth and eighteenth centuries was vastly different from the medieval or even the Elizabethan aristocracy, for it now contained a much larger number of recently former gentry who had won, purchased, or otherwise acquired titles of peerage – and thus we may not assume that these 'new' peers had shed their former gentry customs, culture, and socio-economic and especially entrepreneurial outlooks.[70]

Tawney's actual economic thesis is a fairly simple one, again calling on the role of inflation during the Price Revolution era (for him, 1540 - 1640). But the key role was certainly played by Henry VIII's Dissolution of the Monasteries, which he undertook in 1536 for three reasons: first, to consolidate and fortify the foundations of his recently imposed Protestant Reformation by fatally undermining the economic power of the Catholic Church; second, in view of those still shaky foundations, and those of his monarchy as well, to reward or bribe the leading peers of the realm; and also, given the parlous state of royal finances, to increase his royal income. According to Tawney (but also Mingay), about 90 percent of these monastic lands, which had accounted for as much as 20 percent of English arable lands passed from the crown and aristocracy into the hands of the gentry by the eve of the Civil War.[71] In essence, so many members of the aristocracy,

---

[70] F.M.L. Thompson, 'The Social Distribution of Landed Property in England Since the Sixteenth Century', *Economic History Review*, 2nd ser., 19:3 (December 1966), 505-17. See also Mingay, *The Gentry*, chapters 3-4; George Mingay, *English Landed Society in the Eighteenth Century* (London, 1963).

[71] See also Joyce Youings, 'The Church', in in Joan Thirsk, ed., *The Agrarian History of England and Wales*, Vol. IV: *1500 - 1640* (Cambridge: Cambridge University Press, 1967), pp. 306-56.

unable to cope with inflation, and in particular unable to cope their own rising costs in maintaining their estates, their military power, their position at court, and their various social and political obligations, found that their easiest solution was to sell off land – 'to live off their capital', in particular recently acquired lands that were not part of their (often entailed) aristocratic estates; i.e., the monastic lands. But many of them, along with the crown, were finally also forced to sell their own patrimonial lands as well.

The essential economic problem for much of the aristocracy, in Tawney's view, was that most of their feudal dues and rental incomes were fixed in money-of-account terms, or very difficult to adjust, so that their annual incomes diminished in real values with the persistent 130-year long inflation of the Price Revolution era. their estates. Worse, many of their estates were in the form of hundreds of manors scattered across England, Wales, and often Scotland and Ireland as well: holdings that were far too dispersed to be managed efficiently. Furthermore, few of the aristocracy had the time, interest, and will to engage in rational estate management, especially in view of manifold other claims, social, feudal, military, and political, on their time. Hence, a periodic recourse to land sales, piecemeal, to be sure, was the most rational response.

Many of the gentry, on the other hand – again, in Tawney's view – did not face such enormous demands on their time and energies; and 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 enclosure 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.[72] Such enclosures eliminated communal peasant tenancy rights and permitted amalgamations of the scattered plough strips constituting the former peasant tenancies into compact ('engrossed') farms under single unified management, whether undertaken by the landlord himself or by his leasehold tenants. 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.[73] And 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.

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 amongst the 'rejuvenated' aristocracy (again, often of gentry origin), in the post Restoration era. But in very general terms, the Tawney thesis deserves more support and credit than most historians seem willing to accord: namely, the economic and social significance of the transfer of a vast amount of productive lands into the hands of those more likely, more able, and more willing to engage in rational estate management, to engage in profit-maximisation, and to capture the steadily rising economic rents (otherwise accruing to peasant copyhold tenants, to a maximum of 'three lives', or to freehold tenants with inalienable rights of inheritance) on land, at least until the mid seventeenth century. We must remember that many capitalistic industrial enterprises – in mining and metallurgy especially – were found on gentry estates; and much of the capital investments came from gentry landowners.

---

[72] See J.R. Wordie, 'The Chronology of English Enclosure, 1500-1914', *Economic History Review*, 2nd ser. 36:4 (November 1983), 483-505.

[73] See for example W. W. Skeat, ed., *The Book of Husbandry by Master Fitzherbert* [*The Boke of Husbandry*, 1534] (London, 1882); Sir Richard Weston, *A Discourse of Husbandrie Used in Brabant and Flanders* (London, 2nd ed., 1652).

The extent to which the English gentry and/or their major leasehold tenants did become or act as genuine 'agrarian capitalists', re-orienting agricultural production in mixed husbandry (i.e., combining grain growing and the production of other arable crops with livestock raising, both sheep and cattle) towards the market, with the aim of maximizing profits, has yet to be fully explored, though there are several important studies on these questions.[74] 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).[75] It involved the use of sluice-gates, dykes, and water-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, as much as an eight-fold increase in hay production.

Certainly the very character of English agriculture does change dramatically in this period, especially with the far more widespread diffusion of 'convertible husbandry', which produced radical increases in agricultural productivity, becoming indeed the very heart of the so-called 'Agricultural Revolution', and providing the most efficient and productive form of agriculture before the advent of modern chemical fertilizers. It meant, in essence, the alternation in the use of agricultural land between arable and pasture (as opposed to the previous regime of permanent arable and pastures) over a five or more year cycle, the cultivation of a far 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 fallowon the arable. It also provided far more efficient efficient pastures and thus a far more productive form of livestock raising, not only in vastly improving livestock feeding (with more fodder crops from the arable) and the size of cattle and sheep herds, but in permitting selective breeding of livestock.

The period of the greatest, 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 behaviour of relative prices promoted a shift from grain growing to fodder and industrial crops; and especially a more marked shift to livestock products. At the same, the more general fall in agricultural prices, while wages and other farm costs were rising, thus creating a 'price-cost' also provided a strong incentive for entrepreneurial farms to increase efficiencies per unit of labour.[76] Convertible husbandry, along with the introduction of 'floating meadows', required very large infusions of capital, which were generally obtained

---

[74] See in particular Alan Simpson, *The Wealth of the Gentry, 1540-1660* (Chicago, 1961); Gordon Batho, 'Noblemen, Gentlemen, and Yeomen', in Joan Thirsk, ed., *The Agrarian History of England and Wales*, Vol. IV: *1500-1640* (Cambridge, 1967), pp. 276-305, especially pp. 285-90 ('The Profits of Office, Profession, and Trade'); and also sources in nn. 72-74 below.

[75] It had become widespread in this region by the 1650s. See Eric Kerridge, *The Agricultural Revolution* (London, 1967); Eric Kerridge, *The Farmers of Old England* (London: George Allen and Unwin, 1973), pp. 110-15; G. G. Bowie, 'Watermeadows in Wessex: A Re-evaluation for the Period 1640 - 1850', *Agricultural History Review*, 35 (1987), 151-58; Susanna Wade Martins and Tom Williamson, 'Floated Water-Meadows in Norfolk: A Misplaced Innovation', *Agricultural History Review*, 42:I (1994), 20 - 37, demonstrating that only certain areas of England could utilize this very costly innovation.

[76] Note that Tawney, *The Agrarian Problem in the Sixteenth Century*, does not discuss convertible husbandry. For the considerable literature on this topic, see n. 75 below.

by mortgaging enclosed lands, virtually impossible to do with common field farming).[77] Those landowners and tenants in chief who did so, and those who succeeded in vastly increasing rents and profit margins, certainly were entrepreneurs, in any sense of the word, who deserve to be called 'agrarian capitalists'.[78] Certainly many gentry landowners did not draw even the greater share of their incomes from leasehold rentals; nor did they confine their enterprises to farming, but also invested in mining, metallurgy, and textiles. 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.[79]

Tawney's Century, 1540 - 1640: II: Protestantism and the capitalist 'ethos'

Tawney's other claim to academic fame lies, of course, with his promotion and advocacy, and indeed clear explanation, of the Weber thesis: on *the Protestant Ethic and the Spirit of Capitalism*.[80] Tawney's own

---

[77] See Patricia Hudson, 'Land Markets, Credit and Proto-Industrialization in Britain and Europe', in Simonetta Cavaciocchi, ed., *Il mercato della terra, seccoli XIII - XVIII*, XXXV Settimana di Studio, Istituto Internazionali di Storia Economica 'Francesco Datini', vol. 35 (Florence: 2003), pp. 721-42. The contention that open-field farmers also engaged in convertible husbandry has been advance in the now widely known publication: Michael A. Havinden, 'Agricultural Progress in Open-Field Oxfordshire', *Agricultural History Review*, 9 (1961), 73-83; reprinted in W.E. Minchinton, ed., *Essays in Agricultural History* (London, 1968), Vol. I, pp. 147-60; E.L. Jones, ed., *Agriculture and Economic Growth in England, 1650-1815* (London, 1967), pp. 66-79. Havinden does not demonstrate, however, the genuine convertible husbandry was practised to the extent of converting formerly permanent arable lands into pasture – thereby destroying the layout of tenancies (in the form of scattered plough strips) in the various Open Fields – and the conversion of formerly pasture lands into arable. Hence the synonym: up and down husbandry, ploughing up the pastures and putting the arable down to grass.

[78] For the major agrarian and economic changes of this era, see Joan Thirsk, ed., *The Agrarian History of England and Wales*, Vol. IV: *1500-1640* (Cambridge, 1967); Eric Kerridge, *The Agricultural Revolution* (London, 1967); Eric Kerridge, *The Farmers of Old England* (London: George Allen and Unwin, 1973); Christopher Clay, *Economic Expansion and Social Change: England, 1500-1700*, 2 vols. (Cambridge, 1984), Vol. I: *People, Land, and Towns*, chapter 3, 'Rural Society', pp. 53-101; and chapter 4, 'The Progress of Agriculture', pp. 102-41; Ann Kussmaul, *A General View of the Rural Economy of England, 1538 - 1840* (Cambridge University Press, 1990); Mark Overton, 'The Diffusion of Agricultural Innovations in Early-Modern England: Turnips and Clover in Norfolk and Suffolk, 1580 - 1740', *Transactions of the Institute of British Geographers*, new series, 10 (1985), 205-21; Mark Overton, *Agricultural Revolution in England: The Transformation of the Agrarian Economy, 1500 - 1800*, Cambridge Studies in Historical Geography (Cambridge and New York: Cambridge University Press, 1996); Bruce M. S. Campbell and Mark Overton, 'A New Perspective on Medieval and Early Modern Agriculture: Six Centuries of Norfolk Farming, c.1250 - c.1850', *Past & Present*, no. 141 (November 1993), 38 - 105; Robert Allen, 'Tracking the Agricultural Revolution in England', *The Economic History Review*, 2nd ser., 52:2 (May 1999): 209-35.

[79] See Bowden, 'Agricultural Prices, Farm Profits, Rents', pp. 694-95: 'Rent was not the landlord's only source of estate revenue, and proceeds from direct farming – not to mention timber sales and other receipts – were sometimes of much greater importance'; see also

[80] Max Weber, *Die Protestantische Ethik und der Geist des Kapitalismus* (Berlin, 1904-05); reissued in English translation as *The Protestant Ethic and the Spirit of Capitalism*, by Talcott Parsons (New York, 1930). Forward by Tawney and Preface by Weber (pp. 1-31).

monumental monograph appeared in 1926 as *Religion and the Rise of Capitalism.*[81] This Weber-Tawney thesis has probably engendered more hostile debate than has Tawney's 'Rise of the Gentry' thesis or the Nef and Hamilton theses combined. Few historians today seem sympathetic to the view that the Protestant Reformations, and most especially Calvinism, promoted and disseminated a new and fundamentally different 'spirit of capitalism', with the notable exceptions of David Landes and Stanley Engerman.[82] Let us be clear that neither Weber nor Tawney (or other supporters of their thesis) ever claimed that Protestantism brought about the birth of capitalism, for they were fully and astutely aware of the various forms of medieval capitalism, most especially mercantile-financial capitalism. None doubted, for example, that the late-

---

[81] Richard H. Tawney, *Religion and the Rise of Capitalism*: *A Historical Study* (London: 1926). For the major contributions to the debate, see Christopher Hill, 'Protestantism and the Rise of Capitalism', in F. J. Fisher, ed., *Essays in the Economic and Social History of Tudor and Stuart England* (London: 1961), pp. 15-39; Christopher Hill, 'Puritanism, Capitalism, and the Scientific Revolution: A Debate', *Past and Present*, no. 29 (1964), pp. 88-97; Alastair Hamilton, 'Max Weber's *Protestant Ethic and the Spirit of Capitalism*', and Stanley Engerman, 'Max Weber as Economist and Economic Historian', in Stephen P. Turner, ed., *Cambridge Companion to Weber* (Cambridge, 2000), pp. 151-71, 256-71; Malcolm MacKinnon, 'The Longevity of the Thesis: A Critique of the Critics', in Hartmut Lehmann and Guenther Roth, eds., *Weber's Protestant Ethic: Origins, Evidence, Contexts*,(Cambridge and New York, 1993), pp. 211-43; John Munro, 'The Weber Thesis Revisited -- and Revindicated?' *Revue belge de philologie et d'histoire*, 51 (1973), 381-91; J. H. Van Stuivenberg, 'The Weber Thesis: Attempt at Reinterpretation', *Acta Historiae Neerlandica*, 8 (1975), 50-66; E.L. Jones, 'Capitalism: One Origin or Two?', *Journal of Early Modern History: Contacts, Comparisons, Contrasts*, 1:1 (February 1997), 71-6; Ephraim Fischoff, 'The Protestant Ethic and the Spirit of Capitalism: The History of a Controversy', *Social Research*, 11 (1944), 61-77; Andrew Pettegree, Alastair Duke, and Gillian Lewis, eds., *Calvinism in Europe, 1540 - 1620* (Cambridge and New York: Cambridge University Press, 1994); Christopher Durston and Jacqueline Eales, ed., *The Culture of English Puritanism, 1560 - 1700* (London and Basingstoke: MacMillan, 1996); Hartmut Lehmann and Guenther Roth, eds., *Weber's Protestant Ethic: Origins, Evidence, Contexts*, Publications of the German Historical Institute (Cambridge and New York: Cambridge University Press, 1985); David C. McClelland, *The Achieving Society* (New York, 1961).

[82] David Landes, *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present*, 2nd edn. (Cambridge and New York: Cambridge University Press, 2003), pp. 22-32; Stanley Engerman, 'Max Weber as Economist and Economic Historian', in Stephen P. Turner, ed., *Cambridge Companion to Weber* (Cambridge, 2000), pp. 256-71; and Stanley Engerman's Review of Max Weber, *Protestant Ethic and the Spirit of Capitalism:* in 'EH.Net Review' <ehreview@eh.net>, 21 March 2000. As Engerman comments, 'Many of the disagreements about Weber's linking of Protestantism and capitalism contain a distinct moral flavor. To those who find capitalism and the modern world morally distasteful, linking capitalism's rise to religious beliefs places an unfortunate and unfair burden upon the religion, which can lead to a denial of any relationship between the two'. In a statement that David Landes would surely endorse, Engerman states that 'The principal characteristics of modern capitalism that Weber points to are the centrality of rationality and those measures that help to implement rational behavior. The emergence of a rationally organized formally free labor market to replace the various forms of labor institutions that had characterized earlier forms of capitalism, the development of rational law and administration in large firms and governments, the evolution of forms of rational bookkeeping and capital accounting, and the growth of bureaucracies in the public and private sectors to order the behavior of the larger-scale units in economic society - all these represent those factors developed out of Protestantism which permit continued capitalist accounting procedures to separate business and household capital in the interests of determining growth'.

fifteenth-century South German merchant-banker Jacob Fugger was a genuine 'capitalist'. Their emphasis, however, was on changes in the social ethic and social acceptability of modern capitalism, and the *mentalité* and *esprit* of that capitalism.

The various Protestant Reformations of the sixteenth century were, collectively, important in forever breaking the religious, cultural, and social monopoly or hegemony of the Catholic Church, but really in fact ultimately eroding the role of religion in Western society, thereby promoting a more secular society. That is not, however, the main issue in this debate. Nor, for that matter, contrary to popular opinion, is the question of usury really that imporant in the debate. To be sure, the evolution of the Catholic doctrine on usury, so that lending money at interest became a mortal sin, against Natural Law, did present several costly barriers to the development of a true market economy and of capitalism;[83] and to be sure, the earlier analysis of this question demonstrated how fundamental was the official and fully legal acceptance of interest in the development of full-fledged negotiability in credit instruments.[84] Nevertheless, usury does not really enter into the Weber-Tawney thesis itself, for many sixteenth-century Protestants were even more hostile to usury than were traditional Catholics. Even though John Calvin himself had grudgingly permitted interest payments -- but only for investment loans – and only up to five percent, he stated that 'it is a very rare thing for a man to be honest and at the same time a usurer'. [85] Subsequently, in the seventeenth century, an English Puritan divine commented that 'Calvin deals with usurie as the apothecarie doth with poyson'.[86]

Calvinism in the Weber-Tawney thesis

The central issues in the Weber-Tawney thesis debate concern instead Calvinism, and the following triad of doctrines: Predestination and Election; the Calling; and (to use Weber's term) 'Worldly Asceticism. Predestination, though implicit in all forms of Christianity, certainly from the time of St. Augustine of Hippo (354-430), came to the very forefront of Christian theology only with John Calvin (1509-1564). In essence the doctrine stipulates that God, being omnipotent – so that all men are unable to gain salvation on their own – determines (has determined) who are the very few to be the so-called Elect: those who will 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.

Even for the most devout of the faithful such a bleak doctrine must have seemed unpalatable, indeed horrifying, especially in view of the common Catholic view (if not a doctrine) that one could gain Salvation through 'good works' (along with 'faith', to be sure). Who indeed could continue to live comfortably with the doctrine that none of us could ever alter a personal fate that seemed likely to end in eternal damnation and

---

[83] See Munro, 'The Medieval Origins of the Financial Revolution: Usury, *Rentes*, and Negotiablity', *The International History Review*, 25:3 (September 2003), 505-62.

[84] See above, pp.

[85] Georgia Harkness, *John Calvin: The Man and His Ethics* (New York, 1958), pp. 201-10. Martin Luther's views were approximately the same. Roland Bainton, *The Reformation of the Sixteenth Century* (Boston, 1952), pp. 247-50.

[86] Cited in Tawney, *Religion and the Rise of Capitalism,* p. 94; see also pp. 61-115; Noonan, *Scholastic Analysis of Usury*, pp. 365-67, noting Calvin's dictum that all habitual usurers be expelled from the church. Roland Bainton, *The Reformation of the Sixteenth Century* (Boston, 1952), pp. 247-50, noting few differences between Luther and Calvin.

Hell Fire. 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, perhaps because of the evolving impact of the other two doctrines of this Calvinist triad.

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 therefore, since man was destined to serve God, all occupations that were not prohibited by scriptures and the law were thus honourable and designed to serve that role. That is, it was the duty of every adult man and women to serve God by fulfilling his or her Calling to his/her utmost ability, to achieve the greatest possible degree of success in doing so. Calvin himself had been trained as a lawyer, and deemed that to be an honourable Calling, as were not only those of other professional persons (e.g., doctors, professors, theologians), and craftsmen, but also business men: merchants, financiers, industrialists, or common storekeepers and retailers, and industrial artisans, obviously 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 their Calling could they find than profit? And that meant profit maximization. And surely, as so many came to believe, such proof of success in their Calling, proof of having fulfilled their duty in glorifying God, should also mean a positive 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 before. Certainly in later-medieval society, in western Europe, the more prevailing view was that individual profit accumulation took place at the expense of the community, and that the cohesive organization, stability, and general well being of the community always took precedence over the individual's own self interest.

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 utilised those profits. If they were spent largely on 'conspicuous consumption', such an individual risked incurring social opprobrium: i.e., for worshipping Mammon, and not God; indeed, for offending God by placing Him last.[87] 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: i.e., to increase the capital stock and scale of the enterprise, better enabling the entrepreneur to increase subsequent profits. That is what both Weber and Tawney meant by the colourful (or provocative) term 'Worldly Ascetism': business enterprises undertaken with the goal of profit maximization and continued capital accumulation, eschewing any conspicuous consumption: all for the greater glorification of God, dedicated to one's Calling.

Does this, and its closely related concept of profit maximization, have any relevance for the creation of the modern capitalist, industrial world? First, most economic historians of the Industrial Revolution era would indeed argue that profit reinvestment (profit retention within the business) was one of the chief and most effective forms of capital accumulation and thus for achieving an increased and more efficient scale of enterprise. To be sure, that role of profit reinvestment was enhanced because of many defects and limitations

---

[87] As Jesus is recorded as saying in the Sermon on the Mount (Matthew 6:24, *Holy Bible: Revised Standard Version: New Testament*, 1952, p. 7): 'No one can serve two masters ....You cannot serve God and mammon'. *Mammon* is derived from the Aramaic word *ma-mona* -– in the language that Jesus spoke (one related to Hebrew) – meaning 'riches, avarice, and worldly gain, which was personified as a false god in the New Testament'. Catholicism and Protestantism (Calvinism) shared a mutual hatred of avarice.

in evolving capital markets, especially with the history of join-stock companies, to be explored in the very next topic. Nevertheless some economic historians have expressed or implied a degree of wonderment that so many businessmen would have so willingly postponed consumption and the personal satisfaction of their successful enterprise, in short, to live so frugally, while building up their enterprises. Furthermore, not only did that truly successful achievement depend on profit maximization, but profit maximization itself becomes the essential core of modern Classical economic theory, as expounded (or intimated) in Adam Smith's *Wealth of Nations* (1776), and by his followers of the Classical School.

The so-called Protestant Ethic and 'Wordly Asceticism', however, concerns not just profit maximization and reinvestment on the part of entrepreneurs and other businessmen, but – for artisans and labourers alike – the view that Everyman's duty, in worshipping and glorifying God in whatever Calling was to work as hard and as efficiently as possible, even when wages or fixed fees, rather than profits were involved. Surely that is equally related to Worldly Asceticism; for the alternative to doing so, working as hard as possible, was to enjoy leisure, with the implied sin of Sloth (slothfulness, laziness). That, however, was certainly not a concept that originated with Calvin or any other Protestants. Sloth was, in the medieval catechism, one of the seven deadly sins that led to eternal damnation (along with pride, covetousness or greed, lust, anger, gluttony, and envy). But certainly Calvinism and the more general Protestant Work Ethic made the inverse relationship between the evils of Sloth and the true virtues of incessant hard and productive work all the more socially evident and socially laudable in early modern Europe.

The Protestant Dissenters (Non-Conformists): their role in the Scientific and Industrial Revolutions

It would hardly be fruitful to participate here in the voluminous, ongoing debate about the Weber-Tawney thesis, except to point out some very certain and salient social and economic facts of the later seventeenth-century English economy and society, and more particularly of the Industrial Revolution era. That is all the more important so since so many twenty-first century students and many academics have difficulty in grasping how significant religion -- irrelevant today for so many -- was in that earlier society, indeed in the society of even our own forefathers. What is so important about religion in the English economy of that era was the role of Dissenters, a term that requires some brief explanation.

The original Dissenters were those Calvinists or Puritans within the established Church of England (Protestant) who had sought both to reform and indeed to dominate this Church during the early to mid seventeenth century. They played a very major role in the English Civil War, between King Charles I (1625-49) and Parliament. After the king's execution in 1649, and during the subsequent dictatorship of Oliver Cromwell (1649-58) and his son Richard (1658-60) — known as the Commonwealth, these Calvinists or Puritans dominated both the state government and the Church. They also found strong support in neighbouring Scotland's established church, which in fact did consist predominantly of Calvinists, known as Presbyterians. That religious situation remained true, however, only so long as Cromwell lived. On his death, in 1658, his indolent and weak son Richard was unable to exercise power. In 1660, his many opponents overthrew his Republican regime, and invited Charles' son to return from exile to become King Charles II (1660-1685). With this Restoration of the Monarchy, the Puritans and other Calvinists were evicted from all government, military, ecclesiastical, and all other royal institutional posts, all the more so since most were suspected of harbouring Republican sympathies. The first step to achieve this goal was the Corportion Act of December 1661, aimed specifically at Presbyterians, who had remained a powerful force in local government. It stipulated that no one could be elected or appointed to any office of a corporation or city government who had not taken the sacrament of communion with the Church of England during the

previous year.[88] In 1673, Parliament went even further in enacting the Test Act, now aimed at all Disseners and Roman Catholics. It stipulated that all those who sought to hold any form of public office (including the military, the Church, the schools and universities, etc.), had to 'conform' to the Church of England: by swearing formal oaths to subscribe to the 39 articles of the Church, and by annually taking communion (bread and wine) within the Church of England, while renouncing the Catholic doctrine of transtantiation (i.e., that the bread and wine become veritably the flesh and blood of Christ).[89]

Those who refused to swear such oaths and take communion were thus known as Non-Conformists or Dissenters. They included not only Presbyterians and other Calvinist 'Puritans' of Cromwell's Commonwealth (especially those known as the Independents, but later called Congregationalists), but also later sects that were not, strictly speaking, Calvinists: Baptists (related to continental Anabaptists), Unitarians (related to continental Socinians), Quakers (Society of Friends: established by George Fox in 1667), and finally Methodists (founded by John Wesley in 1739, but breaking with the Established church only in 1795).

The next political event that is so important in the story of the Dissenters and indeed also in English economic history was the Glorious Revolution of 1688-89: in which the openly Catholic king James II (1685-88) was overthrown, and then, after a short interregnum, was replaced by the Dutch Calvinist *stadhouder* (effectively ruler of the Republic of the United Provinces), William III of Orange. He was also the husband of James II's daughter May, so that both were invited to become joint monarchs of England (William & Mary), on 13 February 1689 (new style).[90]

In order to protect his Calvinist co-religionists in England, William demanded that Parliament enact the Toleration Act of 1689. It stipulated that Calvinists and other Dissenters were to enjoy religious toleration and full freedom of worship (though of course outside the institutions of the established Church of England). Nevertheless this act provided only a half-way house of toleration, for it did not supersede the 1661 Corporations Act and the 1673 Test Act, which remained official law until their repeal in 1828. Thus Dissenters continued to be denied any access to any state, parliamentary, other public, military, ecclesiastical, and educational institutions – an exclusion that obviously figures in the debate about their subsequent role in the English economy.

---

[88] *Statutes of the Realm*: 13 Charles II statute 2, cap. 1. Those subject to these provisions were also required to to take the Oaths of Allegiance and Supremacy.

[89] *Statutes of the Realm:* 25 Charles II, with the official title of: 'An act for preventing dangers which may happen from popish recusants'). Those subjected to swearing these oaths specifically had to deny the validity of the Catholic doctrine of transubstantation in the sacrament. In 1678, the provisions were extended to all members of Parliament, who had to take communion within the Church of England within three months or election or appointment.

[90] William III – coincidentally both William III of Orange and William III of England – ruled alone from 27 December 1694, with the death of Mary, to 8 March 1702, when he was succeeded by their daughter Anne (1702-1714), the last of the Stuarts. William's rule and the victory of the Glorious Revolution was not ensured, however, until William III's victory over James II and his Irish armies, at the Battle of the Boyne, in 1690. See Jack A. Goldstone, 'Europe's Peculiar Path: Would the World Be Modern if William III's Invasion of England in 1688 Had Failed?', in N. Lebow, G. Parker, and P. Tetlock, eds., *Counterfactual History* (New York, 2002); and Jack Goldstone, 'Efflorescences and Economic Growth in World History: Rethinking the Rise of the West and the British Industrial Revolution', *Journal of World History*, 13 (2002), 323-89.

Why are these Dissenters so important in English economic – and entrepreneurial – history? The answer lies in the undisputed fact that at least half – and probably more – of the known, documented entrepreneurs, 'inventors' and other major figures of the English Industrial Revolution era, from the mid eighteenth to early nineteenth centuries, were Dissenters. And yet Dissenters were then a very small minority: consisting of about 1250 congregations in eighteenth-century England, comprising about five and certainly under ten percent of the population. As Ralph Davis has stated, more explicitly:

> 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.[91]

Furthermore, R. K. Merton, in his study *Science, Technology, and Society in Seventeenth-Century England* found that Puritans and Dissenters accounted for almost as high a proportion of scientists and other members of Royal Society;[92] and he contended, in a highly quotable observation by David Landes, that 'it was the ethical content of early Protestantism that accounted for the disproportionate achievement of Dissenter scientists'.[93]

The Royal Society, it must be emphasized, was itself an important institution in the history of English entrepreneurship in this era. It was founded in London with the specific goal and proclaimed objective of applying science to industry, in order to improve and promote English industry, especially by fostering scientific experimentation and discoveries. This also took place during the so-called Scientific Revolution, or the Age of Newton (Sir Isaac Newton: 1642-1727), which also included the famous if less renowned older scientist Robert Boyle (1627-1691). Amongst its many renowned members during the Industrial Revolution era itself were such entrepreneurs and inventors in metallurgy as James Watt, Matthew Boulton, Joseph Wilkinson, John Smeaton, and (in the new potteries), Josiah Wedgwood. There is no counterpart to the Royal Society, in linking science so closely with industry, to be found on the continent, in this era.

In 1764, however, when the spirits and achievements of the Royal Society itself seemed to be flagging, Matthew Boulton himself, his partner Dr. William Small (a professor of Mathematics and Newtonian Physics), James Watt, Dr. Erasmus Darwin (physician and grandfather of Charles Darwin), all with the active support of the American Benjamin Franklin, founded a new society: the Lunar Society of Birmingham, with the same goals: in effect, to reinvigorate the Royal Society. Shortly after, its new members included John

---

[91] Ralph Davis, *Rise of the Atlantic Economies* (Ithaca, New York: Cornell University Press, 1973), p. 310.

[92] Robert K. Merton, *Science, Technology, and Society in Seventeenth-Century England*, revised edn. (New York, 1970), especially chapter IV: 'Puritanism and Cultural Values', pp. 55-79; and Chapter VI: 'Puritanism, Pietism, and Science', pp. 112-36.

[93] Landes, *Unbound Prometheus*, p. 31. See also the following literature on this topic: Robert K. Merton, 'Science, Technology, and Society in Seventeenth-Century England', *Osiris*, 4 (1938), 360- ; Robert K. Merton, 'Puritanism, Pietism, and Science', *Social Theory and Social Structure,* rev. edn. (New York, 1957), pp. 574-606; Isidor Thorner, 'Ascetic Protestantism and the Development of Science and Technology', *American Journal of Sociology*, 58 (1952), 25-33; S. F. Mason, 'Science and Religion in Seventeenth-Century England', *Past and Present*, no. 3 (Feb. 1953), 28-44; H. F. Kearney, 'Puritanism, Capitalism, and the Scientific Revolution', *Past and Present*, no. 28 (July 1964), 81-101; Christopher Hill, 'Puritanism, Capitalism, and the Scientific Revolution', *Past and Present*, no. 29 (Dec. 1964), 88-97.

Roebuck (Carron Ironworks in Scotland), Joseph Priestly (major figure in industrial chemistry); and Wedgewood. The famous British historian of science Lord Ritchie Calder has stated that it was 'one of the most important coteries in the history of science and technology' (noting that all of its members had had scientific training).[94]

But is there not a simpler explanation for this highly unusual and disproportionately important role of the Dissenters in the Age of the Scientific Revolution and in the subsequent era of the Industrial Revolution: namely, their minority status, yet without the burden of true oppression, in enjoying that 'half-way', house of full religious but only partial social toleration? Thus, 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, the world of business enterprise, commerce, and finance, etc. 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: that such minority status did not mean inferiority. At the same time, In so far as they were dealing with co-religionists in business, we can cite the importance of principal-agent relationships that were based on both knowledge and trust between those with a common religious, social, and business status.

Obviously, one can cite many other similar historical examples: the Chinese in south-east Asia, Jews in Europe and the Americas; Zoroastrians in India; Hindus and Sikhs in Africa, etc. And if one might object that English Catholics, similarly excluded but not truly oppressed, did not evidently manifest the same entrepreneurial spirit and business success in the Industrial Revolution era, others will respond with an obvious comment: Catholics, members of a universal European church – far outnumbering Protestants, did not consider themselves to be a minority.

But the famous and earliest major historian of the English Industrial Revolution, Thomas Southcote Ashton, had an even simpler explanation for the remarkable success of Dissenters in both the Scientific Revolution era and in the ensuing Industrial Revolution era. In his view, such success:[95]

> lies in the fact that, broadly speaking, the Nonconformists constituted the better educated section of the middle classes. This view is supported by a consideration of the part played in the economic movement by the stream of energy that poured into England from Presbyterian Scotland after the Union of 1707.

Since the Non-Conformists (Dissenters) were denied admission into the traditional schools run by the Church of England or sponsored by the state, they necessarily had to establish their own schools, collectively known as the 'Dissenting Academies', many of which were modelled after Scottish Presbyterian schools. Such schools focussed upon or emphasized mathematics, the physical and biological sciences, modern languages (English, French, and German especially); also included were such 'practical' subjects as accounting,

---

[94] Ritchie Calder, *Profile of Science* (London: Allen and Unwin, 1953). See also A. E. Musson and E. Robinson, 'Science and Industry in the Late Eighteenth Century', *Economic History Review*, 2nd ser. 13 (1960), 222-45; A. E. Musson and E. Robinson, *Science and Technology in the Industrial Revolution* (London: 1969); and A. E. Musson, *Science, Technology, and Economic Growth in the Eighteenth Century* (London: 1972)

[95] Thomas S. Ashton, *The Industrial Revolution, 1760 - 1830* (London, 1948); Thomas S. Ashton, *An Economic History of England: the Eighteenth Century* (London, 1955; reprinted 1961).

surveying, engineering. Necessarily eschewed – if only on grounds of opportunity cost – were the long traditional subjects favoured 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 with the same framework (theological) and emphasis; for indeed many Dissenters viewed Latin with some suspicion as still the fundamental language of the Catholic church. Certainly the focus on sciences were much different in the Dissenting Academies. Consider that the historical essence of Christianity has always been unquestioning faith, the unquestioning acceptance of religious dogma, if more so in Catholic than in Protestant Churches. In contrast, the role of the sciences was and is to engage in rational debate, to question accepted orthodoxies, and certainly to reject any form of religious (or other) dogma, and what was regarded as mere superstition.

Consider in particular the positive role of Newtonian Physics (which played such a major role both within the Royal and Lunar Societies), in developing, within English society, a much more mechanistic view of the world, and one that emphasized the auxiliary role of all experimental sciences. In a similar vein, David Landes has commented – in discussing the Scientific Revolution, Protestantism, and also seventeenth-century Mercantilism (to be discussed later), that 'these, it seems to me, are the crucial values of that European culture and society that gave birth to the modern industrial world: rationality in means and activist, as against quietest ends'; and that also included 'the Faustian spirit of mastery' over the universe.[96]

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 Scientific Revolution and then of the Industrial Revolution, and one more likely to inspire innovations in both. In their view as well, the educational standards of both Scottish schools and of the Dissenting Academies were considerably higher than that found in traditional English schools (an assertion difficult to prove).

The Ashton thesis does not really tell us, however, why these schools were so much more 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 the market demand: that most of the students (and perhaps a majority of the students) came from predominantly middle-class families that were then involved in the world of business, commerce, finance, and engineering.

In my view, these additional explanations do not permit us to discard the essence of the Weber-Tawny 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 some better historical perspective, let us recall that in France, in 1685 – just four years before William III's Toleration Act – King Louis XIV 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

[96] Landes, *Unbound Prometheus*, pp. 32-33.

Religion (1562-1598).[97] The Revocation of the Edict of Nantes soon led to the expulsion or emigration of a high proportion of the nation's Huguenots, so many of whom were, like the Dissenters, disproportionally active in French trade, commerce, and banking. Indeed, some of those who fled to England played a significant role in the establishment of the Bank of England, in 1694-97.[98] We should now consider the final sentence in the quotation from Ralph Davis, above, on the social and economic significance of the eighteenth-century English Dissenters: 'Their peculiar social position had no French counterpart, and France was economically the worse for this;' and he also observed that 'French society offered a less congenial climate to innovation that did [the English]'.[99]

Not all Huguenots left France, however, for when we examine French banking after the Napoleonic wars, we find that, again, a disproportionate number of bankers are Huguenots – and Jews. Perhaps in both cases, their nineteenth-century role in international banking in particular was facilitated by their widespread diaspora and socio-economic network of co-religionists who provided that element of trust in principal-agent relationships, so lacking with complete strangers, and so absolutely vital in the world of banking and finance.

Thus the message to be learned from the now unfashionable Weber-Tawney thesis debate is that its true importance, for the English economy and history of entrepreneurship lies not in Tawney's century itself (1540-1640), but rather, after more than a century of evolving religious and social ideas, for the later eras of the Scientific and Industrial Revolutions. Suppose, for a perhaps fanciful example of counter-factual history, had James II had won the Battle of the Boyne (July 1690) and regained the English — and also Scottish - throne? If England had again become officially Roman Catholic, had the Toleration Act been revoked – like the Edict of Nantes – and had the Dissenters been fully suppressed, would there have been an Industrial Revolution? [100]

The Age of Overseas Expansion I: The Development of the Atlantic 'Full-Rigged' Ship

If we now return, for the last time, to Tawney's century, we must consider yet another macro-economic phenomenon that so greatly fashioned and influenced the subsequent development of the English (and also Scottish) economies: the age of overseas maritime exploration, colonization, and trade – a commerce that truly 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

---

[97] 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 greater damage was done by Louis XIV in 1685.

[98] See François Crouzet, 'The Huguenots and the English Financial Revolution', in Patrice Higonnet, David Landes, and Henry Rosovsky, eds., *Favorites of Fortune: Technology, Growth, and Economic Development Since the Industrial Revolution* (Cambridge, Mass., Harvard University Press, 1991), pp. 221-66.

[99] Davis, *Rise of the Atlantic Economies*, pp. 310, 313.

[100] For such speculations, see Jack A. Goldstone, 'Europe's Peculiar Path: Would the World Be Modern if William III's Invasion of England in 1688 Had Failed?', in N. Lebow, G. Parker, and P. Tetlock, eds., *Counterfactual History* (New York, 2002); and Jack A. Goldstone, 'Efflorescences and Economic Growth in World History: Rethinking the Rise of the West and the British Industrial Revolution', *Journal of World History*, 13 (2002), 323-89.

Ship.[101] Portuguese shipyards, responding to demands from ocean-going mariners, 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 – really a very small boat – known as the *dhow* – but placing them on several masts on a much larger ship (40 to 200 tonnes) known as the *caravel*. It was that lateen-rigging that provided the *caravel* with the manoeuvrability to cope with these Atlantic Trade Winds, a task that proved to be impossible with the traditional square sails; and that allowed Portugese 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.

Subsequently, some unknown Iberian shipyards made the next advance in ship rigging by combining the large square canvas sails of the northern Hanseatic *cogge* – providing power and speed – with the lateen sails: a small lateen spritsail on the bow, the square sails in the middle, and a large lateen sail on the rear or mizzen-mast. These Full Rigged or Atlantic ships, better known as *carracks* and *galleons*, were much larger than the Portuguese *caravels*, expanding in size to 600 tons in the fifteenth century to 1500 tons by the 1590s. A major factor in that increased scale was the addition of naval artillery: up to 50 or 60 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 ocean up to the nineteenth century; and, it may be considered, along with Gutenberg's printing press (c. 1455, when a bible was printed), as the most important technological innovations of the fifteenth century – and 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. 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).

The Age of Overseas Expansion II: Foreign trade and the crisis on the Antwerp market in the 1550s

If we date the beginnings of this new era – the era indeed of European Imperialism – 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 opportunities – despite Henry VII's sponsorship of that successful English expedition to Newfoundland, or the Maritimes, under John Cabot (a Genoese mariner, to be sure), in 1497. One reason may have been that English exports, once predominantly in the form of wool, were, by the 1520s almost entirely in the form of woollen cloth – accounting for perhaps 90 percent of the total value of all exports. Almost all of this export trade was directed to the cross-Channel port and market

---

[101] On these developments, see Richard Unger, *The Ship in the Medieval Economy, 600-1600* (London and Montreal, 1980); Richard Unger, 'Warships and Cargo Ships in Medieval Europe', *Technology and Culture*, 22 (April 1981), 233 - 52; Richard Unger, 'Portuguese Shipbuilding and the Early Voyages to the Guinea Coast', in *Vice-Almirante A. Teixeira Da Mota, In Memoriam*, I (Lisbon, 1987), 229-49; Carlo Cipolla, *Guns, Sails, and Empires: Technological Innovation and the Early Phases of European Expansion 1400 - 1700* (New York, 1965); Charles Boxer, *The Portuguese Seaborne Empire, 1415 - 1825* (London, 1969); Martin Elbl, 'The Portuguese Caravel and European Shipbuilding: Phases of Development and Diversity', *Revista da Universidade de Coimbra*, 33 (1985), 543-72; M. Elbl, 'The Caravel and the Galleon', in Robert Gardiner, ed., *Conway's History of the Ship*, III: *Cogs, Caravels and Galleons* (London, 1994), pp. 91-98; Archibald Lewis and Timothy Runyan, *European Naval and Maritime History, 300 - 1500* (Bloomington, 1985).

of Antwerp. Indeed, the original tripod upon which Antwerp had gained its role as the pre-eminent commercial, financial, and industrial centre at the dawn of the modern era, from ca. 1460 to. ca 1560 (all seen earlier in this study) had consisted of: English woollen cloths; South German metals (silver, copper), fustians, and banking; and finally, from 1501, the staple in the Portuguese spice trade from the East Indies. English merchants, having been excluded from Flanders, from the Baltic, and the Mediterranean had found only this one available outlet, in the Antwerp market, where German merchants avidly sought their woollens (finished in the Antwerp region) as their chief return cargo, just as the Portuguese later so avidly sought South German silver, copper, and banking to conduct their new African and Asian trades.

The English cloth trade boom, from ca. 1460 to 1552 – almost entirely coinciding with the Tudor Enclosure movement – reached its culmination, from which ensued disaster, because of yet another monetary factor in the current Price Revolution: the Great Debasement of 1542-1552. It is now fashionable to dismiss the role of coinage debasements in affecting the course of the Price Revolution; but in fact, as noted earlier, the chief factor distinguishing the degrees of inflation in Spain, England, and the Netherlands in this era was precisely the relative degree of coinage debasement. Henry VIII undertook the Great Debasement for purely fiscal reasons (the profits of seigniorage in minting): common in continental Europe, but rare in English history. His series of debasements (and those of his successors the dukes of Somerset and Northumberland, regents for Edward VI) finally reduced the fine silver content of the coinage by an astounding 83.3 3 percent, rare even by continental standards.

One commercial consequence, as Gould, Challis, Van der Wee, and others have demonstrated, was to reduce the foreign exchange rate of the English pound sterling on the Antwerp market: i.e., to reduce the costs of buying English pounds, by which English woollens were sold, though not proportionately.[102] Consider that from the beginning of the 80-year cloth export boom, English cloth exports had risen from an annual average of 29,002 cloths in 1464-65 to 109,278 cloths in 1536-40, on the eve of the Great Debasement (an overall rise of 276.9 percent in 75 years); but in the following quinquennium 1546-50, mean annual exports rose by another 25,812 woollens, to 135,190 pieces, a rise of 23.7 percent in just ten years. Then, abruptly in 1552, Northumberland's Protectorate government abruptly revalued the English coinage by 253 percent (a 3.5 fold increase) to traditional sterling fineness (92.5 percent fine; but with a weight still inferior to that of the pre-1542 coinage). The obvious consequence of his drastic revaluation was a sharp rise on the foreign exchange value of the pound sterling, and hence a sharp increase (if again not fully proportional) in the cost of buying English woollens, whose sales soon plummeted on the Antwerp market. Since the previous debasements had provided such a stimulus to cloth exports, the Antwerp market may have experienced a glut, so that exports might have fallen, even without the revaluation (though not as much). By 1551-55 (with only incomplete data), total mean annual exports had fallen to 126,595; those from London itself, from 123,780 woollens in 1546-50 to 110,888 woollens in 1551-55, a decline of 10.4 percent. Thereafter, the Customs accounts have several gaps (so that we lack aggregate export statistics); but by the mid 1560s, London woollen cloth exports had fallen to just 85,952 woollens a year, an overall decline of 31 percent. [103] By the

---

[102] J.D. Gould, *The Great Debasement: Currency and the Economy in Mid-Tudor England* (Oxford, 1970), p. 136; Christopher E. Challis, 'The Circulating Medium and the Movement of Prices in Mid-Tudor England', in Peter Ramsey, ed., *The Price Revolution in Sixteenth-Century England*, Debates in Economic History series (London, 1971), pp. 117-46; Christopher E. Challis, 'The Debasement of the Coinage, 1542 - 1551', *Economic History Review*, 2nd ser., 20 (1967), 441-66; Christopher Challis, *The Tudor Coinage* (Manchester, 1978); Van der Wee, 'The Western European Woollen Industries, 1500 - 1750', pp. 397- 472.

[103] Statistics extracted from E.M. Carus-Wilson and Olive Coleman, *England's Export Trade, 1275-1547* (Oxford, 1963), pp. 36-116; A.R. Bridbury, *Medieval English Clothmaking: An Economic Survey* (London:

end of the decade the outbreak of the Revolt of the Netherlands (1568-1609) would make Antwerp quite inhospitable to English trade; but long before those events, the English had already undertaken their search for alternative trading ports.

For the 1552 crisis on the Antwerp cloth market had quickly led to a sharp rise in industrial unemployment in the major cloth working districts of England; and those events produced deep anxiety within both the government and Company of the Merchants Adventurers, a state-sanctioned mercantile guild,, governing the affairs of most cloth importers, above all those of London. [104] There is no doubt that these events had a traumatic effect that quickly led the crown and the London-based mercantile community to cut the centuries old umbilical cord that had for so long tied the commercial destinies of England and the southern Low Countries: by establishing new and long-distance overseas trading companies.

The Age of Overseas Expansion III: The new Joint Stock Companies (the Russia or Muscovy Company) and a revolution in business organization

The very first such overseas trading company, the Muscovy or Russia Company, was established in May 1553, in the direct aftermath of the Antwerp crisis.[105] It is also the first (historically verifiable) joint-stock company, a revolutionary new form of business organization.[106] The founders of this new venture (including Sebastian Cabot, son of John Cabot), subscribed a capital sum of £6,000 through the sale of shares 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 port in the Baltic), but the third reached Archangel. In 1554, the expedition leader Richard Chancellor received a grant of 'free passage' for English ships from Czar Ivan IV 'The Terrible': Grand prince of Moscow (1533–84) and first tsar of Russia (1547–84). On his return, Chancellor also 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 share or stock holders (i.e., an additional £14,400 to bring the total capital to £48,000).[107] When the Russians

---

Heinemann, 1982), Appendix F, pp. 118-22; Gould, *The Great Debasement*, p. 136; and F.J. Fisher, 'Commercial Trends and Policy in Sixteenth-Century England', *The Economic History Review*, 1st ser., 10 2 (Nov. 1940), 95-117.

[104] See n. below.

[105] Its original title was *the Mysterie and Companie of the Marchants Adventurers for the discoverie or regions, dominions, islands and place unknown.* In 1566, by an act of Parliament, its name was shortened to: *the Fellowship of English Merchants for discovery of New Trades*. See the following note.

[106] The classic study is and remains: William Robert Scott, *The Constitution and Finance of English, Scottish and Irish Joint-Stock Companies to 1720*, 3 vols. (Cambridge: Cambridge University Press, 1912; reissued: Gloucester, Mass.: Peter Smith, 1968). 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.

[107] Scott, *Joint Stock Companies,* vol. I, pp. 18-21; vol. II, pp. 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

captured the Livonian port of Narva (in modern day Estonia), the Company's commercial fortunes greatly improved, with this much shorter and safer Baltic Sea route – - until the Swedes seized Narva in 1581. The Company's trade, when extended to Persia via the Volga and the Caspian Sea, became very profitable, especially in the years 1566 to 1581, when the loss of Narva and increased Dutch competition certainly impaired the Company's fortunes. [108] It should also be noted that in the very same year in which the Russia Company was established so was another overseas joint-stock trading company, the 'Adventures to Guinie' Company (but without a charter or royal monopoly). The overseas commerce of these two companies does not really concern us here, except to the note that the latter was the forerunner of the far more famous and vastly more important joint-stock company, the Royal African Company (1662, and re-organized in 1672).[109]

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, but given a royal charter with certain monopoly rights on the cloth-export trade in 1505.[110] It was a 'Regulated Company' in the sense that it possessed such a charter and monopoly rights, whose enforcement required a governing council with an appointed Governor and his assistants and a Court in its overseas headquarters at Antwerp.

---

was not dissolved, however, until as late as 1917. See also Thomas S. Willan, *The Early History of the Russia Company, 1553 - 1603* (Manchester: Manchester University Press, 1956, repr. 1968); T.S. Willan, *The Muscovy Merchants of 1555* (New York: A. M. Kelly, 1973); T. S. Willan, *Studies in Elizabethan Foreign Trade* (New York: A. M. Kelly, 1968).

[108] The Russian Czar Peter the Great (r. 1689 - 1725) captured Narva in 1704; and Russia held this port until 1919, when it became part of the new republic of Estonia.

[109] Scott, *Joint Stock Companies*, vol. I, pp. 21-22; vol. II, pp. 1-35. It should also be noted that in 1577 some members of the Russia Company, along with other 'Adventurers' set up another incorporated joint-stock company, *The Companye of Kathai*, whose fruitless objective was to seek a direct trading route to China via the famed and ill-fated 'North West Passage', i.e., via the then ice-bound Arctic Ocean above British North America (modern day Canada). See *Ibid*, Vol. II, pp. 76-82.

[110] Scott, *Joint Stock Companies*, vol. I, pp. 8-12. See also Eleanora Carus-Wilson, 'The Origins and Early Development of the Merchant Adventurers' Organization in London as Shown in their own Medieval Records', *The Economic History Review*, 1st ser., 4:2 (April 1933), 147-76; reprinted in Eleanora Carus-Wilson, *Medieval Merchant Venturers: Collected Studies* (London: Methuen and Co. , 1954), pp. 143-182; J.A. Van Houtte, 'La genese du grande marché international d'Anvers à la fin du moyen age', *Revue belge de philologie et d'historie*, 19 (1940), 87-126; S.T. Bindoff, 'The Greatness of Antwerp', in *The New Cambridge Modern History*, II: *The Reformation* (Cambridge: Cambridge University Press, 1958), pp. 50-69; J.A. Van Houte, 'Anvers aux XVe et XVIe siècle', *Annales: E.S.C.* 16 (1961), 248-78; Herman Van der Wee, *The Growth of the Antwerp Market and the European Economy, fourteenth to sixteenth centuries*, vol. II (The Hague, 1963), Part I, chapters 2-5; J.H. Munro, 'Bruges and the Abortive Staple in English Cloth: An Incident in the Shift of Commerce from Bruges to Antwerp in the Late Fifteenth Century', *Revue belge de philologie et d'histoire/Belgisch tijdschrift voor filologie en geschiedenis,* 44 (1966), 1137-59; J.H. Munro, *Wool, Cloth, and Gold: The Struggle for Bullion in Anglo-Burgundian Trade, 1340-1478* (Brussels and Toronto: Editions de l'Université de Bruxelles and University of Toronto Press, 1973), pp. 65-126; Wilfred Brulez, 'Bruges and Antwerp in the 15th and 16th Centuries: An Antithesis?' *Acta Historiae Neerlandicae*, 6 (1973), 1-26; Ralph Davis, 'The Rise of Antwerp and its English Connection', in D. C. Coleman and A. H. John, eds., *Trade, Government, and Economy in Pre-Industrial England: Essays Presented to F.J. Fisher* (London, 1976), pp. 2-20.

But the actual commerce, the cloth-export trade was conducted by a large number of private firms – family firms and simple partnerships – who operated under the protective umbrella of the Merchants Adventurers. They raised their capital by pooling funds of family members and/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 distance 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 woollens, on credit, at Blackwell Hall, and simply leased space on a small ships making this making 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 bi-lateral trade or to invest them by purchasing a bill of exchange from some other merchants about to embark on his 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. As we have already noted, the initial venture in 1553-54 required the purchase and operation of three ships, each fully loaded with a variety of cargoes, along with, of course, woollen cloth. Such a very large scale long term enterprise could hardly have been financed by the traditional methods of pooling funds from family members and a few partners. Instead the necessary initial capital stock could be raised only the sales of shares of ownership, to often 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.[111] 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 share-holders, as joint owners of the company: it was a collective business venture with a common capital, invested in the company, and not in individual participants. Each shareholder had the right to vote for the directors of the company, the votes being each of the shares held by each investor. Stockholders received a share of the profits, in the form of dividends declared per shares; and of course they had the right to sell their shares to other investors. 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; and thus the withdrawal or death of partner necessitated the legal cessation of the firm, which could continued only with a new partnership contract. But a joint-stock company continued to exist and as the same business venture, until such time as the shareholders voted to wind up the affairs of the company, and distribute the invested capital amongst the existing shareholders.

Other new joint-stock companies in sixteenth-century overseas trade: the Levant and East India companies

The other two major joint-stock companies in overseas trade, established in the later sixteenth century, were the following: (1) The Levant Company: originally created in 1581 as Turkey Company, and then re-organized as the far better known Levant Co in 1591; and (2) The East India Company: created in 1600, with a royal charter and a monopoly on trade with South Asia (i.e., with those parts of Asia not included in the

---

[111] Scott speculates that the Russia Company's first Governor, Sebastian Cabot (c. 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. See Vol. I, p. 18.

Russia Company's monopoly charter). Mention must also be made of another and even earlier overseas trading venture: the Eastland Company, established in 1579. Its founders, however, were members of the still thriving Merchants Adventurers Company, who created it as their offspring, as another Regulated Company (with a royal charter). It was not, therefore, a joint stock company. Its objectives were to market English woollens (principally) in Prussia and Livonia, and to bypass Dutch merchants in acquiring Baltic grain and timber. It marked England's first significant re-entry into the Baltic, in well over a century, since their virtual exclusion by the Treaty of Utrecht in 1464. In that long interval, however, the Dutch had gained such an overwhelming supremacy in the Baltic trades that their ships outnumbered the English by about 13:1; and in general, it was a failure in competing with the Dutch during the later sixteenth and early seventeenth centuries.[112]

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. Limitations of space do not permit any fair examination of its commercial activities, nor of those of the subsequent joint-stock companies, important

---

[112] On Dutch trade and Baltic commerce, see in particular Jonathan I. Israel, *Dutch Primacy in World Trade, 1585 - 1740* (Oxford: Clarendon Press, 1989); Jan Luiten Van Zanden, *The Rise and Decline of Holland's Economy: Merchant Capitalism and the Labour Market* (Manchester: Manchester University Press, 1993); Jan de Vries and Ad Van der Woude, *Nederland 1500 - 1815: De eerste ronde van moderne economische groei* (Amsterdam: Balans, 1995); republished in English translation as *The First Modern Economy: Growth, Decline, and Perserverance of the Dutch Economy, 1500 - 1815* (Cambridge and New York: Cambridge University Press, 1997); Richard W. Unger, *Ships and Shipping in the North Sea and Atlantic, 1400 - 1800*, Variorum Collected Series CS 601 (Aldershot and Brookfield, Vt., Ashgate, 1997); Violet Barbour, 'Dutch and English Merchant Shipping in the Seventeenth Century', *Economic History Review*, 1st Ser. 2 (1930); reprinted in E.M. Carus-Wilson, ed., *Essays in Economic History*, Vol. I (London, 1954), pp. 227-53; H.P.H. Jansen, 'Holland's Advance', *Acta Historiae Neerlandicae*, 10 (1978), 1-19; Aksel Christensen, *Dutch Trade to the Baltic About 1600: Studies in the Sound Toll Registers and Dutch Shipping Records* (Copenhagen, 1941), pp. 17-24, 34-48, 401-21; F. Ketner, *Handel en scheepvaart van Amsterdam in de vijftiende eeuw* (Brill, 1946); Michael Postan, 'Economic and Political Relations of England and the Hanse from 1400 to 1475', in Eileen Power and Michael Postan, eds., *Studies in English Trade in the Fifteenth Century* (London, 1933), pp. 91-153, especially pp. 91-104, 136-53; Marian Malowist, 'L'expansion économique des Hollandais dans le bassin de la Baltique aux XIVe et XVe siècles', from his *Studia z dziejow rzemiosla w okresie kryzysu feudalizmu w Europie Zachodniej w XIV i XV wieku* (Warsaw, 1954); republished in his *Croissance et regression en Europe, XIVe - XVIIe siècles*, in the series *Cahiers des Annales*, No. 34 (Paris: 1972), pp. 91-138; Philippe Dollinger, *La Hanse, XIIe - XVIIe siècles* (Paris, 1964): Part II, Chapters 5, 6; Part III, Chapters 1 - 2; republished in translation as *The German Hanse*, trans. and ed. by D.S. Ault and S.H. Steinberg (London: Macmillan, 1970); Artur Attman, *The Russian and Polish Markets in International Trade, 1500-1650* (Göteborg, 1973), pp. 119-88; Artur Attman, *The Struggle for Baltic Markets: Powers in Conflict* (Goteborg, 1979); Johanna Maria Van Winter, ed., *The Interactions of Amsterdam and Antwerp with the Baltic Region, 1400 - 1800 (De Nederlanden en het Oostzeegebied, 1400 - 1800)*, Het Nederlandsch Economisch-Historisch Archief no. 16 (Leiden: Martinus Nijhoff, 1983); Wim Blockmans, 'The Economic Expansion of Holland and Zeeland in the Fourteenth-Sixteenth Centuries', in Erik Aerts, Brigitte Henau, Paul Janssens, and Raymond Van Uytven, eds., *Studia Historica Oeconomica: Liber Amicorum Herman Van der Wee* (Leuven, 1993), pp. 41-58; Michael North, *From the North Sea to the Baltic: Essays in Commercial, Monetary and Agrarian History, 1500 - 1800*, Variorum Collected Studies Series CS 548 (Aldershot: Ashgate Publishing, 1996); Bas J. P. van Bavel and Jan Luiten van Zanden, 'The Jump-Start of the Holland Economy during the Late-Medieval Crisis, c. 1350 - c. 1500', *The Economic History Review*, 2nd ser., 57:3 (August 2004), 503-32.

though they are to the history of early-modern English entrepreneurship. But we should not fail to note some salient features of the Levant Company's history. As a far different counterpoint to the Eastland Company's sorry history in the Baltic, the Levant Company represents England's very first and remarkably successful entry into the still far more lucrative Mediterranean trade.[113] The circumstances that led to this English success, and the establishment of the Levant Company, were 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 against Venice, one more reliable than the French had been. They also wanted a secure supply of guns, munitions, and above European textiles, to reduce their recent dependence on the Venetian woollens. It must be noted that Venice, never a significant producer of fine woollens in the later-medieval era, suddenly emerged, about 1520, as the foremost Italian cloth manufacturer, displacing Florence from that role, to become in particular the most important European cloth exporter to the now vast and populous Ottoman markets, stretching from the Balkans through Anatolia into Syria, Palestine, Mesopotamia, Egypt, and much of North Africa; and that export trade also included the neighbouring Safavid Empire in Persia.[114] Venetian cloth production rose from a mere 1,310 woollens to reach its first peak in 1569, with 26,541 pieces, and its ultimate peak, of 28,728 woollens in 1602.[115] We

---

[113] Technically the first successful English maritime venture was the arrival of the *Swallow* in the harbour of Livorno (Leghorn) on 23 June 1573; and Livorno would continue to be very important for English trade in the Mediterranean. See Giglioa Pagano de Divitiis, *Mercanti inglesi nell'Italia del Seicento: Navi, traffici, egemonie* (Venice: Marsilio Editore), 1990; republished as *English Merchants in Seventeenth-Century Italy*, trans. by Stephen Parkin, Cambridge Studies in Italian History and Culture (Cambridge: University Press, 1997), p. 5. On the Levant Company, see also pp. 1-35. For the previous English attempt, a disastrous failure, thanks to the Genoese, see Stuart Jenks, *Robert Sturmy's Commercial Expedition to the Mediterranean (1457/8): With Editions of the Trial of the Genoese before King and Counci and of Other Sources*, Bristol Record Society's Publications, Vol. 58 (Bristol: Tempus Publishing, 2006).

[114] The traditional and still predominant explanations for the Venetian success in woollen cloth production can be found in Domenico Sella, *Commerci e industrie a Venezia nel secolo XVII* (Venice-Rome, 1961); and in Domenico Sella, 'Rise and Fall of the Venetian Woollen Industry', in Brian Pullan, ed., *Crisis and Change in the Venetian Economy in the Sixteenth and Seventeenth Centuries* (London, 1968), pp. 106-26; translated by the author, in a revised and expanded form, from 'Les mouvements longs de l'industrie lainière à Venise', *Annales: Économies, sociétés, civilisations*, 12 (1957), 29 - 45. For my own, recent, and very different views, see my forthcoming essay: John Munro, '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 Simonetta Cavaciocchi, ed., *Relazione economiche tra Europa e mondo islamico, seccoli XIII - XVIII*, Atti delle "Settimana di Studi" e altri convegni, no. 38, Istituto Internazionale di Storia Economica "Francesco Datini" (Florence: Le Monnier, 2007).

[115] See Munro, 'South German Silver, European Textiles', Table 5, for the Venetian cloth production statistics (corrected from those published in Walter Panciera, *L'Arte matrice: I lanifici della Repubblica di Venezia nei secoli XVII e XVIII,* Studi veneti, no. 5 (Treviso: Fondazione Benetton Studi Ricerche and Canova Editrice, 1996), Table 2, pp. 42-43, by a comparison with a photocopy of the original document in the Venetian archives (kindly given to me by Prof. Panciera).

should remember that large areas of these two Muslim empires consisted of high-level plateaux lands that were cold, not only in the winter, but even in Spring and Fall evenings; and that topography and climate made them suitable for the heavy-weight woollen broadcloths produced by England, Venice, and the Dutch Republic, as well.[116]

What the English wanted was not just a general entry into Mediterranean trade, but more specifically a new and more propitious market for their own woollens, in view of the serious difficulties still afflicting Antwerp and other potential northern markets for those clothes. English merchants also wanted a guaranteed access to the even more lucrative import trade in raw silk (Turkish and Persian) and Asian spices. In my view, but one strongly fortified by the research of Ralph Davis, Giglioa Pagano de Divitiis, and many others, the brilliant entrepreneurial success of the Levant Company was due principally to two factors.

The first was its ability to exploit the Ottoman's political desire to have such a willing European ally, and to have that alternative source to Venetian woollens, and to Venetian commerce in general (this was an era, after all, in which enemies did conduct trade with each other). The Levant Company initially relied on the export of cheap and narrow woollen kerseys; but from the 1590s, it switched to the export of the far finer, and far more expensive Suffolk 'Superfine' broadcloths, also known as 'Spanish medleys', using the same fine Spanish *merino* wools used in manufacturing Venetian woollens. From 1598 to 1634, the Levant Company's broadcloth exports rose from just 750 to about 17,000 pieces, while its kersey exports fell from 18,031 to 2,300 pieces. According to Pagano di Divitiis, by the 1630s, English woollens had gained 40 percent of cloth sales in the Levantine markets, thereby reducing the Venetian and French shares to 26 percent each, and the Dutch to just 8 percent.[117]

We should also note that the Levant Company proved to be equally successful in becoming the most important agency in marketing the much cheaper, and far lighter textiles of the so-called New Draperies of seventeenth-century Stuart England, in the other, far warmer climatic zones of the Mediterranean basin (including Spain, for re-export to the Spanish Americas). In the early 1640s, when textiles still accounted for 92.3 percent of all English exports by value, woollen exports (Old Draperies) still exceeded the value of those produced in 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.[118] By 1700, English exports of cloth from the New Draperies had now increased, in absolute and relative terms, to account for 58.8 percent of the total textile exports by value (£2.82 million); high-quality broadcloths, accounted for 25.4 percent; and the cheaper, coarser kerseys, dozens, and other 'narrow' woollens, for the remaining 15.8 percent.[119] Although the English textiles from

---

[116] 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'. Ralph Davis, 'England and the Mediterranean, 1570-1670', in F.J. Fisher, ed., *Essays in the Economic and Social History of Tudor and Stuart England* (London, 1961), pp. 117-26 (quotation on pp. 122-23).

[117] Pagano de Divitiis, *English Merchants in Seventeenth-Century Italy*, p. 32.

[118] C. G. A. Clay, *Economic Expansion and Social Change: England, 1500 - 1700*, Vol. II: *Industry, Trade, and Government* (Cambridge and New York, 1984), Table XIII, p. 144.

[119] Julia de Lacy Mann, *The Cloth Industry in the West of England from 1640 to 1880* (Oxford, 1971), Appendix I: Table B, p. 309 (total value of £2,818,871, excluding hosiery); Van der Wee, 'Western European Woollen Industries', Table 8.6, p. 457; Clay, *Economic Expansion*, Table XV, p. 146, with slightly different

the New Draperies were not in direct competition with the Venetian industry and export trade, they certainly did provide damaging competition to other Italian textile industries, and those of both France and the Low Countries as well; and over 50 percent of the New Draperies export products were marketed by the Levant Company.

The other major advantage to explain the Levant Company's overwhelming success was much superior naval technology and naval tactics. By the mid-seventeenth century, if not earlier, the English were building far larger, far stronger oak-based carracks, which were also more heavily gunned than were those of any of their rivals in the Mediterranean basin; and the English galleons proved to be largely invincible to both pirates and Muslim corsairs – which had so menaced the Mediterranean shipping lanes. While certainly their operating costs were higher, by about ten percent, than those for rival ships, their insurance rates were correspondingly much lower, with a commensurately higher certainty that their cargoes would safely reach their destinations.[120] It is indeed significant to note that the total tonnage of the English merchant fleet rose from just 50,000 tons in 1572 to 340,00 tons in 1686; and that reflects in part the ability of the English, the Levant Company in particular, to gain such a large share of the Mediterranean 'carrying' trades.[121] At the same time, the Venetian, other Italian, and Spanish ship-building industries were experiencing a veritable 'crisis' from the 1570s, from soaring costs that primarily reflected a scarcity of suitable ship timbers in the Mediterranean zone, compared to the very abundant and low cost supply available in the Baltic zone, but even (surprisingly, in view of the Nef thesis), even within England itself.[122]

In 1600, some leading stockholders in the Levant Company had also been instrumental in the establishment of what ultimately became an even more important overseas joint-stock trading company: the illustrious East India Company. The 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 1622, had forcibly evicted the English from Amboyna, one of the key East Indies spice islands, thereby enabling them 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 government support largely unavailable (especially over such vast distances) to the English East India Company. The East India Company directors then decided to 'sub-optimize' by focusing their commercial, political, and then military activities in gaining control of the Indian sub-continent, but were certainly not successful in doing so, nor in

---

figures, total textile exports worth £3,045,196, as the average of exports in 1699-1701: 41.15% in products of the Old Draperies; 51.96 % in products of the New Draperies, and 5.89% Miscellaneous (stockings, hats, others).

[120] See Ralph Davis, *English Overseas Trade, 1500 - 1700* (London, 1973), pp. 20-31; Ralph Davis, *The Rise of the English Shipping Industry in the Seventeenth and Eighteenth Centuries* (London, 1962), pp. 1-57, 228-56; Davis, 'England the Mediterranean', pp. 126-37; Pagano di Divitiis, *English Merchants*, pp. 41-55; see in particular, p. 43: 'While Holland was pre-eminent in the development of merchant shipping, England outdid all other countries in the design of warships'.

[121] Pagano di Divitiis, *English Merchants*, Table 2.1, p. 43; Davis, *English Shipping Industry*, pp. 7, 10, 15.

[122] Pagano di Divitiis, *English Merchants*, pp. 36-46, and the many secondary sources cited here.

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.[123] Certainly by that time, both companies had proved successful in terminating forever the role of both the Venetians and the Portuguese in the Asian spice trades; and the loss of that trade may also be a factor in the abrupt decline and fall of the Venetian cloth industry, whose output had plummeted from the peak of 28,728 pieces in 1602 (noted earlier) to just 1,689 pieces in 1723, when the statistical series ends.[124]

While the economically most important English joint-stock companies were those engaged in foreign trade (and, later, also in finance), some were also to be found in a few mining and manufacturing firms. The leading example is the Mines Royal Company, established as a partnership in 1561 and then as a joint stock company in 1564, with the sale of 24 shares (half sold in England and half in Germany). Its major objective was the production of copper, specifically to make brass cannon (with zinc); hence its royal support (from Elizabeth). In 1568, the Royal Mines was re-organized with a new royal charter, a charter of incorporation, while another royal charter established a new company, the Society of the Mineral and Battery Works.[125]

Growing hostility in late Elizabethan and Stuart England to monopolies, in both domestic industry and overseas trade, since most demanded and enjoyed monopoly rights – and but growing hostility as well to exports of 'treasure' (silver) -- hindered the creation of new joint-stock companies.[126] Thus not until after the Civil War and Protectorate era (1642-1660), with the Restoration under Charles II in 1660, were some 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 – and it continued to exist into the early twenty-first century; (3) The Bank of England: in 1694; (4) The New East India Company: in 1698 (established, with a large loan to the government, as rival to the original East India Co, but absorbed by, merged into, the original company in 1709); and finally, for this study, (5) The South Sea Company: in 1711.[127]

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 the law regarded joint-stock companies as nothing more

---

[123] In the decade 1710-20, the decennial mean exports of the English East India Company were 41,33.6 kilograms, compared to 37,108.1 kg by the Dutch Company. F.S. Gaastra, 'The Exports of Precious Metal from Europe to Asia by the Dutch East India Company, 1602-1795 A.D.', in John F. Richards, ed., *Precious Metals in the Medieval and Early Modern Worlds* (Durham, N.C., 1983), pp. 447-76; K. N. Chaudhuri, 'Treasure and Trade Balances: the East India Company's Export Trade, 1660-1720', *Economic History Review*, 2nd ser. 21 (Dec. 1968), Table 1, pp. 497-98.

[124] See above, n.

[125] Scott, *Joint Stock Companies*, vol. I, pp. 39-42; vol. II, pp.383-405.

[126] See Scott, *Joint Stock Companies*, Vol. I, chapter VI: 'The Discussion of Monopolies, 1597-1604', pp. 105-28.

[127] For Scottish joint-stock companies, in banking, see below, pp.

than large partnerships (except in being exempt from the six-member rule). 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 for 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 law, all were collectively and severally responsible for all of the debts, losses, and other liabilities of the firm. Thus, if, in a six-member partnership, five fled England to escape the clutches of the law, the one remaining partner – or shareholder – would have been totally and fully liable for all those losses and debts. This 'Sword of Damocles', this prospect of unlimited, possibly never extinguishable, debt undoubtedly discouraged most of those who did not have an intimate knowledge of the joint-stock company's business, and amongst even them, those who were even moderately risk averse, from buying shares in such companies.

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: the possession of a charter of incorporation. Such charters were derived from the constitutions of medieval English (London) guilds and civic corporations, which made them, as a *corpus*, a separate 'body' and legal entity that could sue and be sued in its own corporate name, without financially or otherwise legally obliging or involving in any way, the individual status or any liability on the part of its members;. For a joint-stock corporation that meant in particular 'limited liability': i.e., that the liability of each individual share holder was limited to the amount that he/she agreed to pay in buying the shares (since many bought shares 'on margin', i.e., with 'down payments' and the promise to pay the fully subscribed amount at a later date).[128]

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 1670: the *société en commandite*.[129] It permitted complete '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 to those shareholder owners who did take an active role in the firm's business activities. Of course, the whole issue of limited liability is really one of risk allocation: to the extent that shareholders, i.e., those with equity in the firm, are protected by limited liability creditors (lenders, bond or debenture holders) are subject to increased risk of loss in the event that those firms failed. As is well known, the British Parliament did not extend general rights of limited liability to shareholders until the statutes of 1855-57 (ending with the banks).[130]

---

[128] See in general, Scott, *Joint Stock Companies*, Vol. I, pp. 1-14; 150-65; 439-72. See also Santhi Hejeebu, 'The Firm: The Firm Before 1800', in Joel Mokyr, ed., *The Oxford Encyclopedia of Economic History*, 5 vols. (New York: Oxford University Press, 2003), pp.315-18.

[129] One can readily appreciate the connection with the medieval Italian *commenda* contract, in which those who supplied the capital, and took no part in the maritime venture itself, were not subject to any liability other than the loss of that capital, for they were not responsible for the debts or other liabilities contracted by the seafaring merchant. But that merchant in turn was not liable to make any payments to the investor in the event of shipwreck, capture, or other disaster, or even poor sales involving commercial losses. Obviously *commenda* contracts were not subject to the usury prohibition since no loan was ever made; the investor was in effect buying equity in the enterprise.

[130] See H. A. Shannon, 'The Coming of General Limited Liability', *Economic History*, 2 (1931), reissued in E. M. Carus-Wilson, ed., *Essays in Economic History*, Vol. I (London, 1954), pp. 358 - 79; H. A. Shannon, 'The Limited Companies of 1866 - 1883', *Economic History Review*, 1st ser. 4 (1933), reissued

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; i.e., a secondary market in securities. For obviously – as was argued earlier in the discussion of full-fledged negotiability – most investors would have been reluctant to buy shares in a joint-stock company without the opportunity or prospects of recovering their capital investment by sale of the shares to other parties. Indeed, one strong incentive, for many, to buy such shares was to realize a capital gain through the sale of such shares, even if, of course, they also bore a risk of capital losses, in doing so. While the wealthier, more prominent, and influential, in the world of business, did have some prospect of finding individual brokers to handle such stock sales (and purchases, for those who wished to acquire new or more shares), most potential investors did not. And very few had access to the Amsterdam *Beurs* (founded, as noted earlier, in 1608), which, in any event, did not trade in English securities and public debt (annuities) until the eighteenth century.[131] In the mid-1690s, however, England did gain its own London Stock Exchange (or Royal Exchange): from the now regularly scheduled meetings of stock brokers or 'jobbers' in (reputedly) the London coffee houses in or near Lombard street, and near the location of the new Bank of England, on Threadneedle Street.

The South Sea Bubble and the 'Bubble Act' of 1720

In that year of 1695, England already possessed 137 joint-stock companies, for domestic and foreign enterprises;[132] and the creation of the London Stock Exchange soon encouraged the formation of many more new, and generally unchartered and unincorporated, joint-stock companies. That in turn eventually spawned a speculative boom, especially in the years from 1711, with the formation of the South Sea Company (with a charter) to the infamous South Sea Bubble of 1720-21 – a speculative era much akin to that of the 1920s. That story is far too complex, if most fascinating, to discuss in any detail 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 controlled by Spain (its Mexico to Manila route was of the greatest importance). But its real purpose was to take over all or most of the outstanding national debt (which had ballooned during the costly Wars 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 (together they came to be known as the Three Sisters). In 1711, the South Sea Company took over large part of the government's short-term floating debt, by converting £9.47 million from a six series of short-term or callable loans, paying from 6.25 to 9.0 per cent or more, into South Sea Company stock, which paid an annual dividend of only 5.0 percent. The incentive for the public to participate in this conversion was two-fold: to acquire a 'perpetual stock' with a continuous or very long-term yield of 5.0 percent, much preferable to any high but very short term yield on a bond or loan; and, perhaps even more important, to gain a fully negotiable security that could be traded on the London Stock Exchange and used as effective collateral for private business loans. The Company then intended to use the stream of government interest payments on the loans and securities so purchased to

---

in E. M. Carus-Wilson, ed., *Essays in Economic History*, Vol. I (London, 1954), pp. 380 - 405; Peter L. Payne, 'Industrial Entrepreneurship and Management in Great Britain', in Peter Mathias and M.M. Postan, eds., *The Cambridge Economic History of Europe*, Vol. VII: *The Industrial Economies: Capital, Labour, and Enterprise*, Part I: *Britain, France, Germany, and Scandinavia* (Cambridge, 1978), pp. 193-210.

[131] See n. 12 above.

[132] Scott, *Joint Stock Companies*, Vol. I, pp. 333-45.

finance its other, commercial and financial activities.[133]

The culmination of the South Sea Company's financial activities, leading to the famous Bubble, began in 1719, when it proposed to take over almost all of the outstanding debt not held by the other two Sisters ('Corporations'): a vast total of £31,490,800 sterling, 63.2 percent of the total permanent national debt.[134] To do so required new stock issues (now called Initial Public Offerings); and it was in the personal interest of the South Sea Company directors to drive up their price on the London Stock Exchange, so that a lesser amount of more highly valued stock would be required for the conversions. Furthermore, many investors (including Company directors) were buying Company stock on margin, hoping to sell at high prices, for a large profit, then paying off their call loans, and buying more shares when, as expected, prices would fall. Nevertheless, the Company was concerned that, in this era of general speculation, competition in new issues from other companies was hindering its ability to sell new shares in a limited financial market – and thus to raise sufficient funds, since most buyers also bought on margin, promising to pay the difference later.

In April 1720, the Company sought to suppress such competition by securing a new act of Parliament: statute 6 George I cap. 18 – thereafter known as the 'Bubble Act', which forbade the sale of any shares, on the London Exchange, from 24 June 1720, by any joint-stock company that did not already possess a charter of incorporation, or that possessed a charter issued for some other purpose. Despite the fact that the act clearly endangered so many unchartered joint-stock companies, the speculative fever did not diminish. In August, the South Sea Company – unwisely, as it soon appeared – sought to enforce the act by securing writs of *scire facias* against some unchartered companies and companies with dubious charters, but chiefly those whose shares were selling at a premium.

The Company directors failed miserably to anticipate the consequences. As the stock market prices of the affected companies fell, and fell sharply, the creditors of those who had bought the stock on margin, or used the stock as collateral, 'called' the loans of those who had bought stock on margins: i.e., forcing them to pay the difference owed. That meant the sale of not only the affected stocks, but also of 'good stocks': it was the stock market equivalent of Gresham's Law. Within a month the prices of some of the accused companies fell as follows: York Buildings: from £305 to £30; London Assurance: from £175 to £30; Royal Exchange Assurance: from £250 to £60. South Sea Co stock , which had reached a peak of £1050 in mid-summer 1720 had fallen to £180 by 28 September 1720, and while fluctuating thereafter, reached a low of £121 on 14 December 1720. Shares of the Royal African Co fell even more precipitously: from £200 to £45 in that period (and to just £25 by February 1721), while Bank of England shares fell somewhat less sharply: from a peak of £265 to a low of £132.[135]

---

[133] For the complex, most detailed story, see Scott, *Joint Stock Companies*, Vol. I, pp. 387-438; and Vol. III, pp. 287-360. See also Peter G. M. Dickson, *The Financial Revolution in England : a Study in the Development of Public Credit, 1688-1756* (London, 1967); and Larry Neal, *The Rise of Financial Capitalism: International Capital Markets in the Age of Reason* (Cambridge and New York, 1990).

[134] That consisted of £16,546,202 in redeemable government perpetual stock; £13,331,322 in long-term annuities (99 years); and £ 1,703,366 in in shorter-term annuities (32 years). The remainder, amounting to £18, 321,872 was held by the Three Sisters: £ 3,375,028 by the Bank of England; £ 3,200,000 by the East India Company; and £11,746,844 directly by the South Sea Company. The data are taken from tables given in Dickson, *Financial Revolution* (see the previous note).

[135] Statistics taken from Scott, *Joint Stock Companies*, vol. III, pp. 324-26; somewhat different prices are given in Dickson, *Financial Revolution*, Table 17, p. 139. See also Ann M. Carlos, Nathalie Moyen,

The obvious political consequence of this horrendous stock market crash was a Parliamentary inquiry, which began on 8 December 1720. Amongst the major discoveries was indisputable evidence that South Sea Company officials had bribed government ministers and Members of Parliament, and other royal officials, as well as other corporations. 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 act was formally approved. That meant, of course, that very few if any small companies, especially those just starting operations, could afford to pay for such acts and acquire the required charters of incorporation.

In the 105 years of the 'Bubble' era that followed, until the act was finally repealed in 1825, the only notable exceptions, 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 clearly served the general public good, when such transportation improvements were desperately needed for the expanding market of the Industrial Revolution; they obviously could not raise the required capitals except by joint-stock financing; and, 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.[136]

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 argue 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. Hence, joint-stock companies were not then required — though Deane does agree that they were being needed, by the 1820s.[137]

The cotton industry of the early Revolution Industrial Revolution era would seem to fit Deane's model well; for it was generally very small scale, and, before the mechanization of weaving, using relatively simple and relatively low cost machinery (for carding and spinning). Even as late as 1841, the Lancashire district had 975 cotton textile firms (550 in spinning alone; 104 in weaving alone; and 321 that combined both spinning and weaving); and that number grew to 1,451 firms by 1856: numbers that indicate relatively small scale (and a structure of perfect competition).[138] Nevertheless Stanley Chapman has shown that, in financing one cotton spinning mill in 1815, the entrepreneurs had to borrow the surprisingly large sum of £36,000 by

---

and Jonathan Hill, 'Royal African Company Share Prices during the South Sea Bubble', *Explorations in Economic History*, 39:1 (January 2002), 61-87.

[136] See Ron Harris, *Industrializing English Law: Entrepreneurship and Business Organization, 1720-1844* (Cambridge: Cambridge University Press, 2000).

[137] Phyllis Deane, *The First Industrial Revolution* (London, 1965); Phyllis Deane and W. A. Cole, *British Economic Growth, 1688 - 1959: Trends and Structures* (Cambridge, 1964; 2nd edn. 1969

[138] V. A. Gatrell, 'Labour, Power, and the Size of Firms in Lancashire Cotton in the Second Quarter of the Nineteenth Century', *Economic History Review*, 2nd ser., 30:1 (February 1977), 98.

securing personal loans from 97 different creditors.[139]

When one considers the vastly larger scale in the iron industry – in mining, smelting, and refining – with an industrial structure approaching oligopolistic competition, 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 entrpreneurial profit reinvestment (or profit retention) all the more important for industrial capital formation during that early, pre-1825 phase, of the Industrial Revolution. The role of banks and other financial institutions in that capital formation will be discussed in the final topic of this study.[140]

Overseas trade and the 'Age of Mercantilism': macro-economic problems

Before considering that topic, however, we must return to the large joint-stock overseas trading companies in their seventeenth- and eighteenth-century heyday, one commonly known as the Age of Mercantilism, which is now, of course, yet another unfashionable theme in European economic history. For the British Marxist economic historian Eric Hobsbawm, the period from ca. 1620 to ca. 1740 also experienced 'The General Crisis of the Seventeenth Century'; and the more specific period from the 1660s to the Industrial Revolution itself marked the most intriguing part of this thesis: the abrupt transition from Old Colonialism to New Colonialism. While the former had fundamentally been based, from medieval times, on the pursuit of bullion (gold and silver) and spices, and a commercial economy focused on aristocratic and upper income markets, the latter was far more socially and economically 'democratic' in focusing on overseas plantation economies that engaged in the mass-production and global distribution of colonial products for mass markets.[141] For the far more conservative Ralph Davis (who largely ignored Hobsbawm), this very same era, from the 1660s, marked the so-called Commercial Revolution era, in which the large, overseas joint-stock trading companies (with the aforesaid additions of the Royal African and Hudson Bay Companies) finally became so successful and profitable, in developing an entirely new commerce in colonial re-exports: above all sugar, cotton, tobacco, coffee, tea, dyestuffs, etc.[142] In that respect, therefore, their theses are basically in harmony with each other.

No one can doubt the economic importance of the colonial re-exports: accounting for only 4.0 percent

---

[139] Sidney Chapman, *The Cotton Industry in the Industrial Revolution* (London, 1972), p. 20.

[140] See above, pp. ; and below, pp.

[141] Eric Hobsbawm, 'The Crisis of the Seventeenth Century', *Past and Present*, nos. 5 (May 1954), 33-53 & no. 6 (Nov. 1954), 44-65; and H. R. Trevor Roper, 'The General Crisis of the Seventeenth Century', *Past and Present*, no. 16 (Nov. 1959), 31-64, both reprinted in: Trevor Aston, ed., *Crisis in Europe, 1560-1660: Essays from Past and Present* (London, 1965), pp. 5-58, and 59-96; and Eric Hobsbawm, 'The Seventeenth Century in the Development of Capitalism', *Science and Society*, 24 (1960), 97-112. See also Geoffrey Parker and L.M. Smith, eds., *The General Crisis of the Seventeenth Century* (London, 1978); Theodore K. Rabb, *The Struggle for Stability in Early Modern Europe* (Oxford, 1976), pp. 3 - 34; Jan de Vries, *The Economy of Europe in an Age of Crisis, 1600-1750* (Cambridge, 1976), pp. 1 - 29.

[142] Davis, Davis, *Rise of the Atlantic Economies*, pp. 250-87 ; Davis, *English Overseas Trade, 1500-1700*, pp.

of total exports in 1640 (and then chiefly tobacco), they had risen to 31.0 percent of total exports in 1700; and throughout the eighteenth century, their share varied from a low of 28.6 percent to a high of 35.6 percent of total exports, which in turn rose 3.79 fold over that century.[143] These colonial re-exports promoted industrialization in what Hobsbawm calls 'roundabout and indirect ways': certainly in fostering a much more rapid growth of the shipbuilding industry, port facilities, inland transportation facilities, processing and refining industries (though chiefly labour intensive), and above all commercial, banking, and financial institutions.

The protection of the colonial and overseas shipping trades, and indirectly of shipbuilding itself, provided the single most important manifestation of English Mercantilism, in the form of the Navigation Laws: the first, enacted under Cromwell, in 1651; the others by the Restoration Parliaments of Charles II, in 1660, 1663 (the Staple Act), and 1673. Mercantilism itself is a most difficult term to define – one reason why so many historians eschew both the term and the concept, or condemn its use outright – as both Donald Coleman and Ronald Cameron have done. Apart from John Maynard Keynes – who had his own axe to grind in defending 'Mercantilists' against attacks from the Classical Economists (who were Keynes' chief opponent) – only two distinguished historians have defended their concepts: Charles Wilson and David Landes.[144] The latter, the more eloquent of the two, offers us these very valuable insights:[145]

> To be sure, mercantilist doctrine was shapeless, inconsistent. It was inconsistent because it reflected policy as much as guided it, and each state did with its economy what circumstances warranted, knowledge (or ignorance) suggested, and means permitted. Mercantilism was, in short, pragmatism guided by principle. Yet mercantilism was more than mere rationalization. Precisely because it was pragmatic, because it aimed at results, it contained the seeds of the [modern] sciences of human behaviour. Its principles were modelled on those propounded for the natural sciences: the careful examination of data, the use of inductive reasoning, the pursuit of the economical explanation, the effort to find a surrogate for the replicated experiment by the explicit use of international comparisons.

With the firm understanding that Mercantilism was never an organized body of economic doctrine –

---

[143] Statistics extracted or calculated from B. R. Mitchell and Phyllis Deane, *Abstract of British Historical Statistics* (Cambridge, 1962); and Peter Mathias, *The First Industrial Nation: An Economic History of Britain, 1700 - 1914*, 2nd revised edn. (London: Methuen and Co, 1983). [First edition: 1969]

[144] See John Maynard Keynes, *The General Theory of Employment, Interest, and Money* (London, 1936), chapter 23, 'Notes on Mercantilism...', pp. 333-51; and Charles Wilson, *Mercantilism*, Historical Association pamphlet No. 37 (London, 1958: reissued 1966); Charles Wilson, 'Treasure and Trade Balances: the Mercantilist Problem', *Economic History Review*, 2nd ser., 2:2 (1949), 152-61; Charles Wilson, 'Mercantilism: Some Vicissitudes of an Idea', *Economic History Review*, 2nd ser., 10:2 (1957), 181-85; Charles Wilson, 'The Other Face of Mercantilism', *Transactions of the Royal Society*, 5th ser. 9 (1959), all of which have been republished in Charles Wilson, *Economic History and the Historian: Collected Essays* (London, 1969). See also Charles Wilson, 'Trade, Society, and the State', in E.E. Rich and Charles Wilson, eds., *Cambridge Economic History of Europe*, Vol. IV: *The Economy of Expanding Europe in the 16th and 17th Centuries* (Cambridge, 1967), Chapter 8, pp. 487-575.

[145] Landes, *The Unbound Prometheus*, p. 32. But it is only to fair to note a qualifying comment: 'The preceding discussion is not intended to imply that mercantilism was uniformly promotive of European economic development; or even that it was so on balance'.

such as Classical, Marshallian, Marxist, Keynesian economics – we may say that this term embraces all those political and economic philosophies or ideas, policies, laws, and administrative measures by which national state governments acted in the economic sphere, with two key but intertwined and mutually dependent goals: to increase both national wealth and national power. National power was probably the more important of the two, in the sense that without power a nation could not hope either to acquire or to maintain its wealth, though obviously wealth was necessary to create that power.

Thus we also find common to most expressions or manifestations of European but especially English mercantilism the following interrelated considerations: economic nationalism and a stated-based or state-promoted international competition for both wealth and power; an emphasis upon increasing military power, in the belief that such competition – especially for in acquiring colonies and supremacy in trade routes – would inevitably lead to war; and 'protectionism', with tariffs, import quotas, export bounties, particularly of those industries and trades deemed essential to an increase in national power – and wealth. For many merchants and business entrepreneurs in general the significance of Mercantilist philosophies and the related state-supported or state-enforced economic policies was 'rent-seeking': both to maximize and to justify rents acquired from commercial, financial, and other related business transactions.

Landes himself highlighted the importance of economic nationalism in Mercantilism, for European economic development, in stating that:[146]

> European science and technology derived considerable advantage from the fact that the continent as divided into nation-states, rather than united under the rule of an ecumenical empire. Fragmentation, as we have seen, entailed competition, specifically competition among equals.

To what extent the English and then British governments succeeded in enforcing the Navigation Laws to achieve both goals is still a matter of great debate, despite relatively few publications on this subject.[147] On the one hand, few would question the proposition that both before and after the French Revolutionary and Napoleonic Wars (1792-1815), British power, for both defence and aggression, fundamentally rested on its heavily armed navies. And those sympathetic to the Mercantilist notion that national power and national wealth are interwined would similarly argue that such power was responsible for the growing wealth of Britain and its overseas Empire On the other hand, when the Dutch finally lost their long-held supremacy in commercial shipbuilding, they lost it not to England but to New England, which thus benefited more from the Navigation Laws than the American colonies were willing to admit, even after the American Revolution

---

[146] Landes, *Unbound Prometheus*, p. 31. The same point was made by Jared Diamond, in *Guns, Germs, and Steel: the Fates of Human Societies* (New York, 1999), pp. , in comparing advances in a divided Europe with economic stagnation in unified imperial China. Diamond notes that while an imperial despot, in, say, early-modern China, could suppress innovations, European nations could not. If one state sought to suppress an innovation, another would adopt it, and then threaten either the security or economic well-being of its neighbours, forcing them all to adopt it, for defensive reasons.

[147] See, for example, Gary Walton, 'The New Economic History and the Burdens of the Navigation Acts', *Economic History Review*, 2nd ser., 24:4 November (1971), 533-42. See also O. M. Dickerson, *The Navigation Acts and the American Revolution* (New York, Octagon Books, 1951; reissued 1978); Lawrence A. Harper, *The English Navigation Laws: a Seventeenth-Century Experiment in Social Engineering* (New York: Octagan Books, 1964).

(1776-1783) had really terminated the national utility of those laws for Great Britain.[148]

Even more contentious is the Mercantilist concept of 'wealth', so often vaguely defined. The actual term was coined, so to speak, by the eighteenth-century French Physiocrats, who firmly believed that 'wealth' consisted only of a nation's natural resources (including fisheries, whose importance the Dutch had made most manifest). They contemptuously referred to their opponents as believers in the false god of 'mercantilisme': i.e., the dual belief that wealth was instead precious metals (gold and silver), and that those nations that lacked gold and/or silver mines could gain precious metals only through foreign trade. That in turn necessarily meant maintaining a so-called 'favourable balance of trade', by which the state had to ensure that the influx of precious metals gained from the export of both goods and services always exceeded the outflow of such metals in paying for foreign goods and services. In France itself, the most famous expression of that view, and one so intimately linking 'wealth' and 'power' is to be found in Jean Colbert's letter to King Louis XIV in 1670:[149] 'I suppose that anyone would readily agree with this principle, namely, that it is simply and solely the abundance of money within a state that makes the difference in its grandeur and power'. In England, in that very same year, the eminent Roger Coke firmly stated, as an obvious axiom, that: 'Foreign Trade is the only means to enrich this Kingdom'.[150]

Copying the Physiocrats, Adam Smith introduced the term, or more specifically the term 'mercantile system', into the English language, in 1776, in his famous *Wealth of Nations*, the founding bible of the Classical School of Economics. To a large extent, it was an attack on all aspects of Mercantilism, thus advocating its opposite (implicitly or explicitly): the absence of state intervention in most forms, and thus Free Trade, and its corollary, the Law of Comparative Advantage, whose principles were better formulated by his disciple, David Ricardo.[151]

Classical economists ridiculed in particular the concept that wealth consisted of gold and silver; and tried to demonstrate the futility and folly of pursuing policies designed to ensure an ever greater influx of precious metals. In essence, they contended that any such influx of precious metals, by increasing the money supply,

---

[148] The Navigation Acts remained on the parliamentary statute books, however, until 1849, when Free Trade was finally and firmly achieved in Great Britain.

[149] *Mémoire au Roi sur les Finances* (1670), published in P. Clémont, *Lettres, instructions et mémoires de Colbert*, 7 vols (Paris, 1870), vol. VII, p. 252: cited in English translation in Eli F. Hecksher, *Mercantilism*, 2 vols., translated by Mandel Shapiro; revised edn ed. by E. F. Söderlund (London: Allen and Unwin; New York: Macmillan, 1955), p. 48.

[150] Roger Coke, *A Discourse of Trade in Two Parts: The first treats of the reason of the decay of the strength, wealth, and trade of England, the latter, of the growth and increase of the Dutch trade above the English* (London: H. Brome, 1670; republished London, S.R. Publishers, 1970).

[151] Adam Smith, *An Inquiry Into the Nature and Causes of the Wealth of Nations* [1776], ed. Edwin Cannan (New York: Modern Library Random House, 1937), in particular Book IV: chapter I, 'Of the Principle of the Commercial or Mercantile System', pp. 398-419. Surprisingly the *Oxford English Dictionary* (on-line version) cites the first example of the word 'mercantilism' as late as 1873. See also David Ricardo, *The Principles of Political Economy and Taxation* (London, 1817); and Samuel Hollander, *Studies in Classical Political Economy,* vol. I*: The Economics of Adam Smith* (Toronto: University of Toronto Press and London: Heinemann, 1973); and his *Studies in Classical Political Economy*, vol. II: *The Economics of David Ricardo* (Toronto: University of Toronto Press, and London: Heinemann, 1979).

would automatically lead to inflation, indeed in the form of a proportional rise in prices, which, in turn, would curb exports, when they became too high priced; it would similarly encourage imports, as they became relatively cheaper, so that all the recently acquired bullion would flow out to pay for them, until import prices rose and export prices correspondingly fell, to restore equilibrium.

Even Keynes did not point out the full extent of error in that view: that it is based on a very crude and indeed quite fallacious Quantity Theory of Money. In historical fact, increases in the effective money supply are never proportional or even directly related to bullion influxes; and, while an increased money supply may prove to be inflationary, prices never rise in proportion to increases in the money supply (when one takes account of countervailing changes in the income velocity of money, and changes in real net output of goods and services). The same analysis applies, of course, to bullion outflows and deflation, especially with pronounced 'wage stickiness' in the early-modern economy. [152] As Heckscher also pointed out, real trade balances even then were generally adjusted by fluctuations on exchange rates on bills of exchange, and related credit instruments, and not by specie movements. [153]

Nor should early-modern Mercantilists be blamed for inventing such concepts equating wealth with precious metals; for that was the fundamental core of late-medieval 'bullionism', whose concepts and policies were discussed earlier in this study, relating the economic consequences of incessant warfare and periodic 'bullion famines' in the fourteenth and fifteenth centuries.[154] England was by far the most severe and all-embracing in banning the export of precious metals, in all forms, beginning with the *Statutum de False Moneta* of May 1299 (banning silver exports) and culminating in Edward III's parliamentary statute of January 1364, which prohibited the export of all precious metals, in any form.[155] Most other countries banned only the export of bullion (defined as precious metals to be delivered to the mint), but not of their own coins as well.[156]

Somewhat surprisingly a combination of very self-interested propaganda on part of the East India Company and a more evolved Mercantilist concept of precious metals in foreign trade led to the revocation of the ban on bullion exports. As noted earlier, the East India Company had encountered growing hostility for its growing exports of silver to Asia. In 1628, a Company official named Thomas Mun wrote a tract entitled *England's*

---

[152] For my evidence and analyses, see, for example, Munro, 'Wage Stickiness, Monetary Changes, and Real Incomes', pp. 185 - 297; Munro, 'The Monetary Origins of the "Price Revolution," pp. 1-34.

[153] Eli Heckscher, *Mercantilism*, 2 vols., 1st edition, 1931; 2nd edition revised by Eli Heckscher and ed. by E.F. Soderlund, trans. by Mendel Shapiro (London, 1955): Part IV: 'Mercantilism as a Monetary System', Vol. II, pp. 175-66.

[154] See above, pp. ; and also Munro, *Wool, Cloth and Gold* (1973); Munro, *Bullion Flows and Monetary Policies in England and the Low Countries.*

[155] *Statutuum de False Moneta*, in Great Britain, Record Commission (T. E. Tomlins, J. Raithby, et al.), eds., *Statutes of the Realm*, 6 vols. (London, 1810-22), Vol. I, pp. 131-35; and Statute 36 Edwardi III, in *Statutes of the Realm*, vol. I, p, 383. These statutes, however, permitted such exports by royal licences, which, of course, had to be purchased, often at high cost.

[156] See John Munro, 'Bullionism and the Bill of Exchange in England, 1272-1663: A Study in Monetary Management and Popular Prejudice', in The Center for Medieval and Renaissance Studies of the University of California (Fredi Chiappelli, director), ed., *The Dawn of Modern Banking* (New Haven and London: Yale University Press, 1979), pp. 169-239; and other sources cited in n. 90.

Treasure by Foreign Trade, in which he contended that the Company in fact supplied England with much more bullion than it exported, from the resale of Asian goods in Europe and the Americas. At the same time, he fully explained why the Company had no choice but to export such quantities of bullion in conducting its Asian trade.[157] In his day, East India Company records for the period 1601 to 1624 reveal that of the total value of all commodities exported to Asia, 'treasure' accounted for 68.20 percent and thus merchandise accounted for only 31.8 percent.[158] By the later seventeenth and early eighteenth centuries (1660-1720), the 'imbalance' was even greater: 78.9 percent of the value of all exports were in the form of precious metals (chiefly silver) and thus only 21.1 percent were in merchandise – which certainly did not include woollen textiles. Indeed, in view of the very high transportation and transaction costs involved in voyages to Asia, over 10,000 km, there was not that much European merchandise that could be sold in Asia, for a profit.[159] Mun's pamphlet, however, evidently was not widely circulated until more propitious times, with the Restoration of the monarchy in 1660. Parliament was so impressed with its arguments that, in May 1663, it repealed Edward III's statute to permit the free export of gold or silver bullion (but not coin).[160] Evidently, Parliament saw the wisdom of viewing foreign trade in terms of the overall 'balance', rather than the balance between individual countries.

Nevertheless, concerns about bullion exports and the money supply were not entirely unfounded.[161] For many Mercantilist concerns about the supply and circulation of precious metals were related to the particular monetary problems of the so-called 'General Crisis' era, especially in the later seventeenth century. In the first place, the influx of precious metals from the Americas into Europe had seriously diminished. By 1656-60, the total recorded silver outputs from all Spanish American mines had fallen from the peak of mean of 219,457.4 kg in 1591-95 to a mean of 130,084.2 kg; but silver imports into Seville had fallen even further: from a peak of 273,704.5 kg in 1591-95 to one of just 27,965.33 kg in 1656-60 (when last recorded in the extant Seville archives). The explanation for the decline in the mined output itself is simply the law-of-diminishing returns, combined with the failure to discover new sources of silver (to be found later, however, in the early eighteenth century). The explanation for the even greater fall in silver shipments to Seville is two-fold: a much higher proportion of silver was then being retained to accommodate economic development in the Americas, while an increasing share was also being shipped across the Pacific to finance trade (particularly in silks) with the Philippines, China, and Japan.[162]

---

[157] Thomas Mun, *England's Treasure by Forraign Trade* [1664] (reissued Oxford, 1937).

[158] K. N. Chaudhuri, 'The East India Company and the Export of Treasure in the Early Seventeenth Century', *Economic History Review*, 2nd ser., 16:1 (1963), 24.

[159] Chaudhuri, 'Treasure and Trade Balances, Table 1, pp. 497-98. In this same period, silver accounted for 81.35% of the bullion exports, by value, and gold for only 18.65%.

[160] In Statute 15 Carolus II. c, 7, in *Statutes of the Realm*, vol. V, p. 451, sec. 9.

[161] If this study focuses on Mercantilist monetary concerns, that was, of course, not their only concern. Another was population and employment, also reflecting macro-economic trends of this era, during which all of Europe experienced either demographic stagnation or decline, even in the advanced nations of The Netherlands and England, whose population (with Wales added) declined from its mid-17th century peak of 5.773 million in 1656 to a nadir of 5.393 million in 1686. See Wrigley, Davies, Oeppen, and S. Schofield, *English Population History from Family Reconstitution*, pp. 613-17.

[162] Data taken from: Earl J. Hamilton, 'Imports of American Gold and Silver Into Spain, 1503 - 1600', *Quarterly Journal of Economics*, 43 (1929). 436-72; Hamilton, *American Treasure and the Price Revolution*

By the 1660s, the outflow of silver in European trade with Asia (including the Levant) and the Baltic combined may well have exceeded the now much reduced influx of silver from the Spanish Americas. Nevertheless, the silver imports into Seville just cited, for the final years of available data, were still more than the mean value of combined total silver exports of the two East India companies, in 1660-69: 17,292.7.[163] Furthermore, while Spanish American silver mining (Peru and Mexico combined) had reached a low ebb of just 101,534 kg in 1661-65, it thereafter recovered to reach a new peak of 156,497 kg in 1681-85; and there are some, if very imprecise indications, from the Amsterdam gazettes of a recovery of silver imports into Europe at the same time.[164] Thereafter, Spanish American silver mining again fell, to reach a new low of 78,361.9 kg in 1711-15, recovering thereafter with the exploitation of new mines in Mexico.[165] From 1660 to 1720, it should be noted, the aggregate exports of silver to Asia by the two East India Companies had amounted to 3,437,557.2 kg of fine silver.[166]

To some considerable extent these bullion flows and monetary changes are reflected in the behaviour of the Consumer Price Indexes in both England and the Southern Low Countries (Brabant). As noted earlier, the inflation of the Price Revolution era had peaked in the quinquennium of 1646-50. In terms of the standard base period 1451-75 = 100, the English price index then stood at 646.404, and the Brabant price index, at 1015.138 (the difference explained, again, largely by coinage debasements). As also noted earlier, both countries then experienced deflation (but with evidence then given in decennial means). By 1686-90, the price indexes in both countries had fallen to a seventeenth-century nadir: a quinquennial mean of 477.565 in England (a fall of 26.12 percent); and one of 652.217 in Brabant (an even greater and quite remarkable fall of 35.75 percent). Thereafter

---

in Spain, 1501-1650 , Table 1, p. 34; Table 2, p. 40; Table 3, p. 42; John H. TePaske, 'New World Silver, Castile, and the Philippines, 1590-1800', in John F. Richards, ed., *Precious Metals in the Later Medieval and Early Modern Worlds* (Durham, N.C., 1983), pp. 425-45; Table 1, p. 441; Peter Bakewell, 'Registered Silver Production in the Potosi District, 1550 - 1735', *Jahrbuch für Geschichte von Staat, Wirtschaft und Gesellschaft Lateinamerikas*, 12 (1975), 68-103; Peter Bakewell, 'Mining in Colonial Spanish America', in Leslie Bethell, ed., *The Cambridge History of Latin America*, 2: *Colonial Latin America* (Cambridge and New York: Cambridge University Press, 1984), 105-51; Peter Bakewell, *Silver Mining and Society in Colonial Mexico: Zacatecas, 1546 - 1700* (Cambridge, 1971); Harry E. Cross, 'South American Bullion Production and Export, 1550-1750', in John F. Richards , ed. *Precious Metals in the Later Medieval and Early Modern Worlds* (Durham, N.C., 1983), 425-39; Richard L. Garner, 'Long-term Silver Mining Trends in Spanish America: A Comparative Analysis of Peru and Mexico', *American Historical Review*, 67:3 (1987), 405-30; D.A. Brading, 'Mexican Silver Mining in the Eighteenth Century: the Revival of Zacatecas', *Hispanic American Historical Review*, 50:4 (1970), 665-81.

[163] Gaastra, 'The Exports of Precious Metal from Europe to Asia', pp. 447-76; and Chaudhuri, 'Treasure and Trade Balances', Table 1, pp. 497-98.

[164] See n. 97, above; and see Michel Morineau, *Incroyables gazettes et fabuleux métaux: les retours des trésors américains d'après les gazettes hollandaises (XVIe - XVIIIe siècles)*, Studies in Modern Capitalism (Paris: Editions de la Maison des Sciences de l'Homme; and Cambridge and New York: Cambridge University Press, 1985). I do not find these data as trustworthy as those that Hamilton had extracted from the Seville archives; but regrettably the outbreak of the Spanish civil war prevented him from continuing this research, which nobody else has taken up since then.

[165] See sources in n. 97 above.

[166] See the sources in n. 96 above.

a combination of warfare, bad harvests, influxes of Brazilian gold, and the banking activities discussed below promoted some recovery of the price indexes (in England, by 1696-1700, to 627.49; and in Brabant, to 967.995).[167]

A mercantilist concern about monetary scarcities and deflation are the same as those outlined earlier for the late-medieval economy, in two major respects: the increase in real factor costs from the 'stickiness' of wages, interest rates, and rents – those defined by longer-term contracts; and the negative impact on credit, i.e., on the willingness to lend funds - or indeed, even to borrow for those who anticipated higher real interest costs.[168]

Institutional responses to deflation: the London Goldsmiths and deposit banking

But this time, unlike the circumstances in the late-medieval era, English businessmen and entrepreneurs did respond to produce an almost ideal remedy for monetary scarcity in the form of an entirely new system of deposit-and-transfer banking. Deposit-and-transfer banking can be found in ancient Greece, as far back as the fourth century BCE; and thereafter it flourished in Alexandrine (Hellenistic) Egypt and Rome; and if it virtually died out with the decline of the Roman Empire in the West, it was revived in twelfth-century Genoa and Lombardy, and thereafter spread to medieval Catalonia and Flanders, as also noted earlier. As Raymond Bogaert, Raymond de Roover, A.P. Usher, Reinhold Mueller, Richard Goldthwaite, and Herman Van der Wee have fully demonstrated, everywhere, from ancient Greece to medieval Flanders, deposit-and-transfer banking arose solely from private-enterprise money-changing (even if money-changers usually operated under government licences).[169] Because money-changers necessarily had to possess the tools to assay and evaluate coins or other precious metals and to maintain adequate security to protect their valuable inventories, most offered their clients as well their services in safeguarding their coins, precious metals, and valuables. They also readily discovered that, by maintaining a sufficiently high reserve ratio (usually a third), they could safely lend out the remainder, in short-term interest bearing loans, disguising the interest by some of the means suggested earlier. They could also permit those clients who maintained deposit accounts to make transfer payments, with verbal and then written instructions (and ultimately, therefore, by cheques). Such transfer payments of course greatly economized on the use of scarce coin; and it was often preferable, when so many coins were clipped,

---

[167] See Table 1, and n. 1, above; and also pp. above.

[168] See above, pp.

[169] Raymond Bogaert, 'Banking in the Ancient World', in Herman Van der Wee and G. Kurgan-Van Hentenryk, eds., *A History of European Banking*, 2nd edn. (Antwerp, 2000), pp. 13-70, esp. pp. 27-31; Raymond de Roover, *Money, Banking, and Credit in Mediaeval Bruges: Italian Merchant-Bankers, Lombards, and Money Changers* (Cambridge, Mass., 1948), especially chapter IV, pp. 48-75; Raymond de Roover, *The Rise and Decline of the Medici Bank, 1397-1494* (Cambridge, Mass. 1963), especially chapters II (pp. 9-34) and VI (pp. 108-41); Raymond de Roover, 'Early Banking Before 1500 and the Development of Capitalism', *Review of the History of Banking*, 4 (1971), 1-16; Usher, *Early History of Deposit Banking,* (Chiefly on Catalonia, 1240-1723); Reinhold C. Mueller, 'The Role of Bank Money in Venice, 1300-1500', *Studi Veneziani*, new series, 3 (1979), 47-96; Richard Goldthwaite, 'Local Banking in Renaissance Florence', *Journal of European Economic History*, 14 (Spring 1985), 5 -55; Herman Van der Wee, 'The Medieval and Early-Modern Origins of European Banking', in Dino Puncuh and Giuseppe Felloni, eds., *Banchi pubblici, banchi privati e monti di pietà nell'Europa preindustriale: Amministrazione, tecniche operative e ruoli economici*, Atti della Società Ligure di Storia Patria, new series, vol. 31, 2 vols. (Genoa: Società Ligure di Storia Patria, 1991, pp. 1157 - 73; Van der Wee, 'European Banking in the Middle Ages and Early Modern Period (476-1789)', pp. 71 - 266.

counterfeit, or otherwise debased.

In England, however, true deposit banking did not develop until after the English Civil Wars. The reason is not to be found in any supposed economic 'backwardness' but rather in a severe institutional impediment: the long held royal monopoly on money-changing, dating from at least 1222, when the office of the Royal Exchanger was evidently first established. He and the officials whom he employed, aided by the sheriffs, had the power to enforce all the bullionist statutes: in particular the power to suppress any private commerce in precious metals, to purchase or confiscate all foreign coins, and to deliver them to the Tower Mint for recoinage.[170]

Nevertheless, the later-medieval English economy had certainly enjoyed the full services of merchant-banking, with bills of exchange and letters obligatory, as was demonstrated earlier in this study, in the Burton vs Davy case in the London Mayor's Court of 1436.[171] In sixteenth-century Tudor England, some very rudimentary forms of bank-lending can also be found: undertaken by various merchants, brokers, scriveners (notaries public, who drew up letters obligatory and bonds), and some goldsmiths. The goldsmiths, as members of an ancient guild of jewellers (chartered in 1327), had also served as illicit precious-metal merchants; and thus they were the most logical ones to become true bankers. But, according to A.D. Richards, they were in fact the least significant of these four groups before the Civil War era.[172] That the office of the Royal Exchanger continued to prevent them from assuming that role can be demonstrated in legal writs dated as late as 1627, when the London goldsmiths were prosecuted for illegally 'acting as exchangers and buying and selling bullion, selecting the best money and melting it down [for export]'.[173]

---

[170] Rogers Ruding, ed., *Annals of the Coinage of Great Britain and Its Dependencies: From the Earliest Period of Authentic History to the Reign of Victoria*, 3 vols. (London, 1840), vol. II, pp. 138-39. A subsequent proclamation of September 1232 similarly forbade anyone to 'exchange new coins for old or make exchanges except at the King's Exchanger'. See Thomas Rymer, ed., *Foedera, conventiones, literae, et acta publica*, 12 vols. (London, 1709-12), vol. I.i, p. 207. The *Statute of Westminster* April 1275, (3 Edwardi I, c 15) had banned the importation of all suspected counterfeit or other defective coins, requiring them to be turned over and sold for their bullion contents to the office of the Royal Exchanger. See Munro, 'Bullionism and the Bill of Exchange', pp. 187-90, and Appendix A, pp. 216-19. This rigorous ban was relaxed, and then only temporarily, in May and November 1522, when Henry VIII, seeking an alliance with Emperor Charles V, permitted the circulation of and Habsburg *carolus* coins, Italian ducats, florins, and French *écus* as legal tender. Paul L. Hughes and James F. Larkin, eds., *Tudor Royal Proclamations*, 3 vols. (New Haven and London, 1964-69), vol. I: *The Early Tudors (1485-1553)* (London, 1964), no. 88, p. 136 (25 May 1522); no. 95, p. 141 (24 Nov. 1522); no. 102, p. 145 (6 July 1525); no. 103, p. 146 (8 July 1525); Robert Steele and James Lindsay (Earl of Crawford), eds., *A Bibliography of Royal Proclamations of the Tudor and Stuart Sovereigns, 1485- 1714*, 4 vols. (London, 1910), I, nos. 82, 88, p. 9 (May and November 1522); see also *ibid.*, no. 105, p. 20 (Nov. 1526); no. 1792 (Mar 1539).

[171] See above, pp.

[172] See R. D. Richards, *The Early History of Banking in England* (London, 1929; reissued 1958), pp. 1-2292-131; esp. p. 15. See also J. R. Anonymous, 'The Goldsmith Bankers', in B.L. Anderson and P.L Cottrell, eds., *Money and Banking in England: the Development of the Banking System, 1694-1914* (London, 1974), pp. 159-65.

[173] Steele and Crawford, *Royal Proclamations*, vol. I, no. 1512, p. 178 (25 May 1627). The royal proclamation reiterated that 'the exchange of money is a royal prerogative prohibited by Acts and

How the London goldsmiths subsequently emerged as full fledged 'modern' bankers is too complex a subject to be considered here. Possibly, the breakdown of royal authority during the Civil War of 1640s was the key factor, for the office of Royal Exchanger had evidently ceased to function from that era. The most popular story, in part possibly apocryphal, is that the crucial event was Charles I's seizure of mercantile deposits in the London Tower Mint; therefore, no longer trusting the Mint, merchants and other businessmen sought out the goldsmiths to place their coins, bullion, and valuables into their safekeeping. Since the London goldsmiths, like medieval moneychangers, had to provide security for their own inventories of precious metals, who could better offer such services?

Whatever the reason – and, in my view, the lapse in the royal monopoly on money-changing is the key factor -- we do find that, in the post-1660 Restoration era, the London Goldsmiths had become full-fledged deposit-and-transfer bankers. But what is even more significant, and evidently a unique situation for these later seventeenth-century London goldsmith bankers, is that they managed to combine all the four functions of modern banking under one roof, which not even the Dutch deposit bankers had yet really done. Not only did these goldsmiths provide traditional deposit-and-transfer banking, holding deposits, allowing transfer payments by cheque, and engaging in lending on a fractional reserve system (with a one-third reserve ration), but also they offered two more, really new functions.

First, they engaged in bills-of-exchange banking – which, historically, in continental Europe, had almost always been a mercantile function, undertaken by merchants engaged in long-distance trade, and thus separate from purely local deposit banking. Furthermore, their services in bills-of-exchange banking, including promissory notes, also now included discounting, which again was evidently practised more widely in later seventeenth-century England than on the continent. Discounting may have been their most important function, certainly more important than fractional reserve lending; and that was also true of the later Industrial Revolution era. Thus, for example, an entrepreneur who ran a cotton-spinning mill typically made a future sales contract to deliver so many thousand yards of yarn, and in return received a 'bill' (promissory note, inland bill of exchange), which he then sold to his local banker at discount, usually receiving not cash but a credit in his deposit account, allowing him to write cheques and withdraw some cash to pay for his raw cotton, to pay the weekly wages of his employees (in silver coin), to pay the rent and other mill expenses. In providing such discounting services, these banks supplied industrialists with the necessary 'working capital' to conduct their enterprises.

Second, as the final of the four functions offered, the goldsmith banks began issuing paper banknotes, though exactly when they first started to do so remains uncertain. Originally, they were not actually 'banknotes' but promissory notes, issued on the general credit of the bank itself; and they were simple holograph (handwritten) documents, often made out, often for odd amounts, in the name of the recipient – who received them instead of silver coin – in transacting loans or in discounting bills. And, although they were fully transferable, fully negotiable, they had to be endorsed. Such impediments were gradually removed, as goldsmith bankers began issuing notes for fixed, even sums, and payable to bearer; and then finally, printed bank notes.[174] Of course, these banknotes could be redeemed – i.e., converted into silver or gold coin, or deposited into bank

---

Proclamations', citing statutes back to 9 Ed. III, c. 6, 9, 10 (1335), stipulating again that no one other than the Royal Changer (Henry Earl of Holland) or his deputies were permitted to exchange coins or purchase bullion. The proclamation strictly enjoined the goldsmiths 'not to melt current coin, or to select the weightier pieces .. [or] to intermeddle with foreign money or bullion.' All such provisions were to be enforced in Star Chamber with severe penalties.

[174] The first to issue printed banknotes (and in t his form) was Childs Bank in 1729. See the next note.

accounts – only at and by the issuing bank. Therefore, those who used and accepted such notes had to retain confidence in that bank's ability and willingness to effect such redemptions on demand.

The remarkable and growing popularity of these banknotes has to be explained not only by the relative scarcity of silver coin, but the parlous nature of the coinage circulation. For the last recoinage had taken place under Elizabeth I in 1601; and but the later seventeenth century, much of the still circulating coinage was both 'clipped' and worn, and thus often seriously deficient in the legal silver contents. Therefore, the banknotes may have been preferred as a more trustworthy medium of exchange, a better store of value, as it were, over coins, for the same reasons that in Holland 'bank florins', as the accounting unit for funds held on deposit in the *Wisselbank van Amsterdam*, often commanded an *agio* or premium over silver coin. In England, the poor state of the coinage forced the crown to undertake a new, general recoinage from February 1697 through 1698.[175]

In sum, by the 1690s, and probably somewhat earlier, the London Goldsmith banks had established the widespread circulation and general public acceptance of three new forms of fully transferable and fully negotiable monetary instruments: the cheque, the discountable bill of exchange and promissory note, and the new banknotes. They were not, of course, fiat money, and they were certainly not divorced from the silver and gold money supplies, since their real value lay, as just emphasized, in the public confidence in their ready convertibility into 'true' money, i.e., into the coinage of the realm. They were also not legal tender (a true test of which is the government's willingness to accept such monetary instruments in payment of taxes). But they did serve most of the functions of money: they significantly expanded the money supply, as well as the income velocity of money.[176] That they did so may also help to explain why the English price level rose from the late 1680s, though that story also involves the next major financial innovation, in the 1690s: the establishment of the Bank of England and the establishment of a permanent funded national debt.[177]

The Origins and Early History of the Bank of England

The establishment of the Bank of England and, at the same time, of a permanent funded national debt was truly another financial revolution, even if the latter aspect, the nature of the new national debt, was largely based on the Dutch model. When, following the Glorious Revolution, England's new Dutch king, William III (1689-1702), along with his wife Queen Mary II (1689-1694), ascended the English throne, he brought with him a major new and exceptionally costly war: The War of the League of Augsburg (1688-1697), against Louis XIV (1643-1715) of France.[178] How such a war would be financed was the question uppermost in the minds of the

---

[175] Sir Albert Feavearyear, *The Pound Sterling: A History of English Money*, 2nd revised edn, by E. Victor Morgan (Oxford: Clarendon Press, 1963), pp. 146-49. The recoinage was authorized by Parliament: statute 8 & 9 William III, c. 20. The English coinage remained unaltered until 1816.

[176] See sources by Van der Wee in n. xx above; Richards, *Early History*, pp. 23-91; Daniel Coquillette, 'The Mystery of the New Fashioned Goldsmiths: From Usury to the Bank of England (1622-1694)', in Vito Piergiovanni, ed., *The Growth of the Bank as Institution and the Development of Money-Business Law* (Berlin, 1993), pp. 91-117; Stephen Quinn, 'The Glorious Revolution's Effect on English Private Finance: A Microhistory, 1680-1705', *Journal of Economic History*, 61:3 (Sept. 2001), 593-615.

[177] See n. above.

[178] Also known as the 'War of the Grand Alliance' and the 'Nine Years War'. The League consisted of the Holy Roman Emperor (Leopold I), the German princes of the Palatinate, Bavaria, and Brandenburg, who were then joined by Spain, Portugal, Sweden, the United Provinces (Dutch Republic), and finally England,

new royal government and of the leaders of Parliament. If one of the principal issues in the English Civil War of the 1640s had been 'who controls the purse strings' of the government, that question was settled once and for all with the Glorious Revolution of 1688-89. The initial solution, undertaken in 1693, was Parliament's issue of the so-called Million Pound Loan, which also marks the beginning of permanent national debt. This was not, in fact, a loan but a self-liquidating lifetime annuity, equivalent to a Dutch *lijfrent*, paying an extremely high rate of 14.0 percent (especially high in an era of recent deflation).[179]

The much more effective solution, marking the second step in the evolution of the permanent funded national debt, came the next year, 1694, with the establishment of the Bank of England. The proposal to do so came from a Scottish entrepreneur and 'projector', William Paterson and his ally Sir Charles Montagu(e), Chancellor of the Exchequer (i.e., the finance minister).[180] They offered Parliament (and the crown) a permanent loan (i.e., with no date of maturity) of £1,200,000 and the then very reasonable rate of interest of 8.0 percent; and in return they wanted the right to establish a chartered, incorporated joint-stock bank, with, in effect, a dual monopoly: a monopoly on government banking and a monopoly on joint-stock banking – i.e., to be the only joint-stock bank permitted to operate in England. By early July, the entire capital stock had been 'subscribed', allowing Parliament, on 27 July 1694 issue the required charter of incorporation for *The Governor and Company of the Bank of England*. It prohibited the Bank from having debts in excess of its capital and from engaging in any merchandise trade, while permitting it to issue notes, to lend on the security of merchandise, and to deal freely in both bullion and bills of all kinds.[181]

The loan of £1,200,000 was made by the Bank itself, it must be emphasized, and not by the shareholders. In fact, by July 1694, only £720,000 in cash had been raised from the entire subscription, i.e., just 60 percent, since shareholders were allowed to buy stock, 'on margin', with only a 25-percent down payment. Therefore, the Bank issued an additional £480,000, in its own sealed 'bills', i.e., Bank of England banknotes, thereby, in effect, monetizing the debt. The whole loan was, in fact, made in Bank notes. Undoubtedly the inflation of the

---

after the deposition of James II. The war (also fought in North America) came to an inclusive end with the Treaty of Ryswick, in 1697, restoring the *status quo ante bellum*.

[179] See Dickson, *Financial Revolution in England*, pp. 39-245 (especially pp. 52-53), 522-33; Peter G.M. Dickson and John Sperling, 'War Finance, 1689-1714', in J.S. Bromley, ed., *The New Cambridge Modern History* (Cambridge, 1970), vol. VI: *The Rise of Great Britain and Russia, 1699-1715-25* (Cambridge: Cambridge University Press, 1970), pp. 284-315. Alternatively subscribers could receive 10% annually to 1700, when their survivors would share a payment fund called a *tontine*, by which the last survivor, dying in 1783, was receiving £1,000 interest annually on a bond certificate of £100. Most chose the 14% lifetime annuity

[180] For the following, see Scott, *Joint Stock Companies*, vol. III, pp. 199-245; Sir John Clapham, *The Bank of England: A History*, 2 vols. (Cambridge and New York: Cambridge University Press, 1944); John Giuseppi, *The Bank of England, a History from its Foundation in 1694* (London: H. Regnery, 1966); Andreas M. Andreades, *History of the Bank of England, 1640-1903,* translated by Christabel Meredith, with a pref. by H.S. Foxwell, and a new introduction by Paul Einzig (New York: Frank Cass, 1966); Richard Roberts and David Kynaston, eds., *The Bank of England: Money, Power, and Influence, 1694 - 1994* (Oxford and New York: Oxford University Press, 1995).

[181] The enabling parliamentary statute was a Ways and Means Bill: 6 William & Mary c. 20. The charter did not provide complete limited liability: for Shareholders were liable up to three times their subscribed capital if the bank violated the statute and charter by acquiring debts in excess of its capital stock.

later 1690s is partly attributable to this method of financing and paying the government loan.

The brilliance of this entrepreneurial scheme can be best be understood in the political (constitutional), social and economic context of the 1690s. On the one hand, King William III did get the bank that he wanted, in order to assist in financing his wars and more generally to finance government operations. Parliament, on the other hand, rightly considered the new bank to be its own creation and creature, a view reinforced by subsequent parliamentary statutes and charter renewals in 1697, 1709, 1742, 1764, 1781, and – the most famous and important of all – the Bank Charter Act of 1844. The London financial and mercantile community, on the other hand, generally still distrustful of the state, rightly viewed the bank as its own: for it was, after, a privately owned joint-stock company bank, retaining that private status until 1946, when the post-war Labour government nationalized the bank (by then a fully-functioning central bank).

For these reasons, the Bank was a great success, from its very beginnings (apart from a minor crisis in 1697). As a private bank, and with its monopoly on joint-stock banking, it earned profits from engaging in the very same type of activities as did the other London 'goldsmith' banks: i.e., in deposit-and-transfer banking, discounting, and note issues. Bank of England notes (printed, payable to bearer), it must be emphasized, were the only such banknotes that enjoyed full status as legal tender – and thus were fully acceptable in paying taxes. Not surprisingly, Bank of England notes soon displaced those of other private banks, but only within the London area, since redemption of the notes (conversion into precious metals) had to take place at the Bank's only location, on Threadneedle Street (hence its nickname: 'The Old Lady of Threadneedle Street'). Its services as a private bank, however, were really limited to just a few large clients personally approved by the Board of Directors: some leading London and Amsterdam banks; and large English business corporations such as the East India Co, Hudson Bay Co., Royal African Co., and The South Sea Company.

Since it was really created to serve as the government's banker, not surprisingly about 75 percent of its business and income came from that source. First, it received from the government an annual income stream of £96,000, representing the 8.0 percent interest on the loan; and second, it also received an additional government management fee of £4,000 per year, for its services in handling government financial accounts, at home and abroad, and in serving as the Mint's bullion agent. One of its most important functions, and involving yet another most significant financial innovation, which began in 1696: the issue of Exchequer bills. Exchequer Bills were simply government-authorized promissory notes, short-term notes, that were interest- bearing and negotiable by endorsement. They were issued by the Bank of England, on behalf of the Exchequer, allowing the government to pay for supplies, munitions, construction, food, clothing, payment of wages and salaries, etc. Those who received Exchequer Bills in payment could then sell them at slight discount at banks that were clients of the Bank of England, or at other financial institutions, and receive Bank of England notes in return (or the Exchequer could discount these notes itself with the Bank of England). By 1700, the volume of such Exchequer bills had grown to about £5 million; and from then on they represented a very large part of the Bank's business: in buying them from other banks and financial houses.

The next major change in the Bank's role in serving the government's financial requirements came in 1709, when the government sought an additional loan. The Bank readily agreed to provide another £400,000, but interest free, thereby effectively lowering the annual interest rate from 8.0 to 6.0 percent. In return, Parliament (by statute 7 Anne c. 7) permitted the Bank to double its capital stock, to £4,402,343 (by issuing £2,201,171 10s 0d, at £115 per share). At the same time, this important act, in closing a loophole, firmly entrenched the Bank's monopoly on joint-stock banking within England, and clarified as well the legal-tender status of its notes. The act also authorized the Bank's issue of an additional £2,500,000 in Exchequer Bills. Obviously that permitted a substantial increase in the effective money supply. By Parliament's renewal of the Bank Charter in 1742, the interest rate on the Bank's permanent loan was reduced to just 3.0 percent (3.75 percent if the management fee is also included, a rate reconfirmed in 1757, by which time the Bank's total direct lending to

the government had increased to £11,686,800 (see below).

The Bank of England and the National Debt

As already indicated, the founding and evolution of the Bank of England is an integral aspect of England's establishment of a permanent funded national debt. The debt was 'permanent' in the sense that government was under no obligation to redeem ('pay off') that debt; and it rarely chose to redeem any of it. The debt was 'funded' in the sense that Parliament – and not the crown – authorized annual interest or annuity payments on the debt by statutes that authorized the collection of specific taxes, either import duties or excise taxes. The Bank of England, itself, for example, was commonly called the Tunnage Bank, in its early days, because Parliament, in 1694, had agreed to establish a new tax on ship tunnage in order to pay the 8.0 percent annual interest. This is in stark contrast to the previous, pre-Glorious Revolution era, history of English royal finances, when crown and not the Parliament was chiefly responsible for government debts, almost all of which were in the form of short term, and high interest-bearing, loans.[182] It is also important to remember (see p. above) that excise taxes on consumption, which had been used to finance payments on public debt, especially in the form of *renten* (i.e., annuities) in the Low Countries since the thirteenth century, were not introduced into England until 1643, in the Civil-War era 'Long Parliament' (by John Pym).[183]

We have already noted the first two steps in the establishment of England's permanent funded national debt: the Million Pound Loan (14 percent life annuity) of 1693, and the Bank of England charter of 1694, with that important £1,200,000 loan. In 1698, the government secured a new and much larger permanent loan of £2,000,000, also at 8 percent, from the New East India Company, i.e., permitting it to challenge the trade of the traditional East India Company; and in 1709, the original East India Company provided a loan of £1,200,000 (possibly at 8 percent as well) to force the New Company to amalgamate with it. Then, from 1704 to 1710 the Exchequer issued a series of 99 year annuities that yielded payments ranging from 6.25 to 6.60 percent; and in 1710 a 32-year annuity yielding 9.0 percent. The next year, as already discussed, the South Sea Company, the third of the Three Sisters, was created as an incorporated joint-stock company, to convert £9.471 million in short-term government debt into 5-percent perpetual stock. We have also already noted that the South Sea Company's attempt to convert a further £31.58 million in both the 32- and 99-year annuities, and a series of Exchequer debentures, issued from 1711 to 1719, resulted in the infamous South Sea Bubble (during which only £13.985 million was in fact so converted).

After that debacle, the Bank of England now became virtually the sole manager of the national debt. From that date until 1750, the Bank of England, along with the Exchequer (playing a subsidiary role) issued or sold a total of £26,709,395 in perpetual but redeemable government 'stock' (some with lottery provisions), with annual 'interest' payments of 3.0, 3.5, and 4.0 percent.[184]

---

[182] See Dickson, *Financial Revolution*, pp. 39-50. See also Douglass North and Barry Weingast, 'Constitution and Commitment: The Evolution of Institutions Governing Public Choice in Seventeenth Century England', *Journal of Economic History*, 39:2 (1989), 379-99; Douglass C. North and Barry R. Weingast, 'Introduction: Institutional Analysis and Economic History', *Journal of Economic History*, 60:2 (June 2000), 414-17. Introduction to a symposium, featuring in particular in this issue: John Wells and Douglas Wills, 'Revolution, Restoration, and Debt Repudiation: The Jacobite Threat to England's Institutions and Economic Growth', pp. 418-41.

[183] See above, nn. and Munro, 'The Medieval Origins of the Financial Revolution', pp. 505-62.

[184] Dickson, *The Financial Revolution in England*, table 230, p. 242.

That brings us to the very eve of the culmination of the 'financial revolution', in what is known today as Pelham's Conversion, of 1749-52.[185] In 1749, the aggregate long-term redeemable debt was £70,441,296: of which 27.75 percent (£19,549,484) was in the form of debts owed to the Three Sisters (of which the Bank of England itself held 11,686,800, as noted earlier). The Bank of England and the South Sea Company, reorganized as holding company after 1721, also managed 69.90 percent of the debt (£49,241,891) in perpetual stock, Old and New Annuities. The Exchequer accounted for the small remaining portion: 2.34 percent (£1,649,821). Because of prior national debt conversions undertaken by the South Sea Company, the national debt now had just three components in terms of interest-bearing securities: those at 3.0 percent, accounting for 17.52 percent of the total (£12,337,821); those at 3.5 percent, accounting for just 0.57 percent (£400,000 - by the Exchequer); and by far the largest proportion, 81.92 percent, in 4.0 percent stock and South Sea Annuities. The first step of Pelham's Conversion, undertaken in 1750, was to convert those 4.0 percent securities, amounting to £57,703,475, into 3.5 percent perpetual but redeemable stock, the Consolidated Stock of the Nation, popularly known thereafter as 'Consols'. He succeeded in converting 87.95 percent (£50,750,649), thus leaving 12.05 percent (£6,952,826) for intense and bitter negotiations with the South Sea Company, which held almost all of this remainder (after the East India Company had capitulated in April 1750). The second and final step was the conversion of the new 3.5 percent Consols into 3.0 percent Consols in 1757;[186] and in achieving this manoeuvre, the government and South Sea Company finally agreed that the Company's 4.0 percent stock would also be converted into 3.0 percent Consols at Christmas 1757.[187]

Again we may ask: why would investors give up higher yielding securities, especially those that were now fully negotiable, and traded on the London Stock Exchange, and (most) on the Amsterdam *Beurs*, as well. The answer lies in the fact that all of these were redeemable, at any time, whenever the government saw fit to do so; and, as was explained in the earlier discussion of *rentes* or annuities, that right of redemption lay solely with the government issuer. The British government, in effect, had promised not to exercise that right of redemption for at least thirty years; and in fact, the government did not redeem or convert those 3.0 percent Consols until 1888, with Goschen's 'Conversion' into 2.75 percent Consols.[188] In view of the fact that long term trends in interest rates in the first half of the eighteenth century were generally falling; and, in the 1750s, an investor with 'rational expectations' might have anticipated a further decline (which did not, in fact, occur). Thus to hold a truly perpetual and, practically speaking, a non-redeemable stock at 3.0 percent would have appeared to be highly advantageous.

What were the contributions of this 'financial revolution' itself, indeed in both Holland and Great Britain, to their economic development? First, it provided a remarkably stable and highly effective form of public

---

[185] For the following, see Dickson, *Financial Revolution*, pp. 216-45, with many statistical tables.

[186] *Ibid*., table 26, p. 232, table 29, p. 239, table 30, p. 242.

[187] The South Sea Company was allowed to borrow £2.1 million at 3% in order to discharge the unsubscribed South Sea annuities, totaling £2,276,894. See Dickson, *Financial Revolution*, p. 240.

[188] See Dickson, *Financial Revolution*, pp. 486-520; Ranald Michie, *The London Stock Exchange: a History* (Oxford and New York, 1999). Goschen converted them into 2.75 Consols, with the provision that, in 1903, the rate be further reduced to 2.50 percent. Furthermore, from 1923, the new Goschen Consols were to be redeemable at par. See C. Knick Harley, 'Goschen's Conversion of the National Debt and the Yield on Consols', *Economic History Review*, 2nd ser. 29:1 (Feb 1976), 101-06. They continue to trade on the LSE as 2.5 percent Consols to this very day. On 12 October 2006, 2.5 percent Consols were trading at £56.47 (for par value £100) on the London Stock Exchange, thus providing a yield of 4.28%.

finance, with a very significant reduction in the cost of government borrowing: in England, from 14 percent in 1693 to 3 percent in 1757. According to Dickson, that conversion 'reduced the cost of servicing the funded debt as a whole by about 12% and nearly 25% from 1757, though by that date the fall had been offset by new borrowing on a large scale'. [189]

Second, much of the public — not just the affluent but even those of very modest means – came to consider such Consols a remarkably attractive form of investment, readily available and readily negotiable. Indeed, the major activity of the London Stock Exchange from Pelham's Conversion until the railway boom of 1830s (when joint-stock financing was again freely available) was the trade in Consols. That Consols, or *renten* in general, were so much more marketable, with far lower transaction costs, may explain why so many preferred holding them to much higher interest bearing loans, bonds, or debentures.

Indeed, for that reason, and thus for our third reason, Consols provided perhaps the most important form of collateral for short-term borrowing, especially for merchants and industrialists during the 'Industrial Revolution' era (and after), and certainly when far less marketable bonds and debentures often traded at very high discounts.[190] In that respect the Consol was indeed a most important financial instrument for post-1750 entrepreneurship.

For the government there were three obvious advantages to such a system of public finance essentially based upon perpetual annuities. First, as just indicated (and for reasons explored elsewhere), the cost of financing this form of public debt was far, far lower than in financing bonds, debentures, and short term loans. Second, as also stressed earlier, the government was never under any obligation to redeem Consols; and the reason that the British government did so in 1888 was an ongoing and deepening deflation, which raised real interest rates (and was reflected in rising market prices for Consols). Finally, we come back, surprisingly to the question of usury. Since *renten* and all annuities were not loans, they were not subject to the usury laws. Few historians seem to be aware of the fact that, long after England became Protestant, its government enforced usury laws, and, it also progressively lowered the legal interest rate, with the gradual long-term fall in the real rate of interest: from 10 percent, permitted in the 1571 Elizabethan statute, to 8 per cent in 1623; to 6 per cent in 1660, and finally to 5 per cent in 1713. Not until 1854 (statute 17-18 Victoria c. 90) were the English usury laws finally abolished.[191] If it may be objected that, after 1713, the British government's issues of annuities and perpetual stock bore 'interest' coupons at 5 percent or under, we must remember that historically, from the thirteenth century, European issues of *rentes* or annuities were always issued, without exception, at rates well under the interest rates on actual loan contracts.[192]

If we take Pelham's Conversion, in the mid-eighteenth century, as a necessary terminal point for this study (though it really cannot be), we may now ask what contributions the Bank of England, as such a significant entrepreneurial enterprise as well as a vitally important institution, actually made to the development of the British economy up to the eve of the modern Industrial Revolution. Its major contribution did indeed lie in the realm of public finance, especially in contributing so much to the fall in the rate of government borrowing, as

---

[189] Dickson, *Financial Revolution*, p. 239.

[190] Long term interest rates consistently had a downward trend. See Homer and Sylla, *History of Interest Rates*, pp.89-143, especially Table 11 (pp. 137-38), and Chart 2 (p. 140).

[191] See Richards, *The Early History of Banking in England,* pp. 19-20.

[192] See Munro, 'Medieval Origins of the Financial Revolution', pp. 505-62.

discussed above. To be sure, the Bank was not the only factor in the sharp decline in interest rates from the 1690s to the 1750s; and, to be sure, as well, interest rates on government debts were not the same as the interest rates that prevailed in the market for commercial and industrial loans. At the same time, there was a strong element of 'crowding out' involved, for any government at war, deeming national defence as its prime duty, paid and will pay whatever rate is necessary for those objectives. The higher the rate on government borrowing, especially when the public does not believe that the government would renege on its debt obligations (the last time being the Stop of the Exchequer in 1672, under Charles II), the more private business firms and other entrepreneurs would have to pay, especially for riskier loans, when they sought to borrow.

Second, the Bank of England provided not just financial but also monetary stability, especially after the Recoinage of 1697-98 (in which it also played a major role); for, as noted there were no further currency depreciations until the very minor one of 1816.[193] Furthermore, the Bank helped to remedy an obviously severe scarcity of money, so obvious in the deflationary later seventeenth century, by providing legal tender banknotes, which always commanded compete confidence; and, furthermore, as already indicated, the Bank's issue of fully negotiable Exchequer Bills also helped to reflate and expand the money supply.

Thirdly, in acting as a credit bank, and in acting as a 'bankers bank' for many British and even Dutch banks and other financial firms, the Bank of England proved to be a much superior institution to the *Wisselbank van Amsterdam*, which, confined to its role as a giro-bank, could not legally extend credit. Thus, during four major financial crises of the later eighteenth century – those of 1763, 1773, 1783, and 1793 – the ability of the Bank of England to rescue its clients while the Wisselbank – being only a giro-bank, and not a credit bank (except for the government) – could offer no assistance was a major factor in allowing London to displace Amsterdam as Europe's leading financial centre. In 1795, with the invasion of the French Revolutionary armies, and their creation of the satellite Dutch Republic of Batavia (lasting until 1806), the Wisselbank's financial operations were effectively terminated.

Just the same, not until the panic and financial crisis of 1797, when a Napoleonic invasion of Great Britain seemed imminent, did the Bank of England finally agree to extend rediscounting privileges to other banks and financial houses, those that were not its clients, to enable them to replenish their cash reserves (in Bank notes); and thus it final began its embryonic role as a true Central Bank. It did so after having suspending specie payments and convertibility – in the 'Bank Restriction' era, or the era of the 'paper pound', 1797-1821.

One may also offer a few more criticisms of the Old Lady of Threadneedle street in its eighteenth-century banking activities. The first is its refusal to establish any other branches, until Parliament finally forced it to do so, by the Bank Act of 1826. As indicated earlier, that severely limited its note circulation to just London, since only at Threadneedle Street could its notes be converted, if required, into specie. Second, Bank of England notes were issued only in exceptionally high denominations, also limiting their role as an effective medium of exchange: in £20 notes, from 1694 to 1759; in £10 notes as well, from 1759 to 1793; with additions of £5 notes from 1793 to 1797. But its issuance of £1 notes with the 1797 crisis – which other banks soon did as well – without convertibility led to a very severe inflation that began to end only with Napoleon's final defeat in 1815 (and really only with the restoration of the gold-convertible pound in 1821).

Finally, the Bank's firmly exercised monopoly on joint-stock banking within England, a monopoly that endured until that same Bank Act of 1826, thereby limited the size of all other English banks to just six-member partnerships or family firms, so that England experienced very severe weaknesses in its banking structure during that crucial first phase of the Industrial Revolution, with numerous bank failures. That led to yet another

---

[193] See Feavearyear, *Pound Sterling*, pp. 120-24, 212-14, Appendix I, p. 435.

financial form of Gresham's Law, whereby the failure of a few poorly operated, over extended banks, led to panic, a 'run of the ban', and the collapse of perfectly good banks (even when maintaining a reserve ratio of one third).

Scotland, however, in preserving its own commercial code after the 1707 Act of Union, had no such restrictions in bank size or corporate structure. The Bank of Scotland was the first Scottish joint-stock bank, formed in 1695, just a year after the Bank of England; and the second, the Royal Bank of Scotland, was formed in 1727. After the Napoleonic Wars, two more joint-stock banks were established: the Commercial Bank in 1810; and the National Bank of Scotland in 1825. But even partnership banks had no real restrictions on size; and the Bank of Aberdeen had over four hundred partners. Size matters; that and intense competition led to the creation of a very soundly based and secure branch banking system. The only Scottish bank to fail in this era was the Ayr Bank (1772) – a small partnership bank without branches.[194] Finally, when a severe commercial-financial crisis in 1824 led to the collapse of 93 English and Welsh banks, about 13 percent of the then total of 715 English-Welsh banks, a crisis in which again no Scottish banks failed, Parliament was forced to act: first, in 1825, with the Repeal of the Bubble Act, and then the aforementioned 1826 Bank Act, which quickly led to the formation of many English joint stock banks (with branches): by 1850, 99 joint stock banks (reduced to 41 in 1913).[195] But those events, of course, lie far beyond the scope of this study, which is supposed to end with the eve of the Industrial Revolution – but did not, demonstrating once again that history, above all economic history, is a seamless web.

---

[194] See Rondo Cameron, 'England, 1750-1844' (chapter 2), and 'Scotland, 1750-1845', in Rondo Cameron, ed., *Banking in the Early Stages of Industrialization* (London, 1967), pp. 15-59, 60-99; Richard Saville, *The Bank of Scotland : a History, 1695-1995* (Edinburgh: Edinburgh University Press, 1996); Alan Cameron, *The Bank of Scotland, 1695-1995 : a Very Singular Institution* (London: Mainstream Publications, 1995); Charles Alexander Malcolm, *The Bank of Scotland, 1695-1945* (Edinburgh: R & R Clark, 1945).

[195] See Michael Collins, *Banks and Industrial Finance in Britain, 1800 - 1939*, Studies in Economic and Social History (London: Macmillan, 1991); Michael Collins, *Money and Banking in the U.K.: A History* (London, 1988).

List of References

Allen, Robert, 'Tracking the Agricultural Revolution in England', *The Economic History Review*, 2nd ser., 52:2 (May 1999): 209-35.

Andreades, Andreas M. , *History of the Bank of England, 1640-1903,* translated by Christabel Meredith, with a pref. by H.S. Foxwell, and a new introduction by Paul Einzig (New York: Frank Cass, 1966).

Anonymous, J. R. , 'The Goldsmith Bankers', in B.L. Anderson and P.L Cottrell, eds., *Money and Banking in England: the Development of the Banking System, 1694-1914* (London, 1974), pp. 159-65.

Ashton, Thomas Southcote, *Iron and Steel in the Industrial Revolution* (Manchester, 1924; reprinted 1951).

Ashton, Thomas Southcote; and J. Sykes, *Industry of the Eighteenth Century* (Manchester, 1929; reprinted 1964).

Ashton, Thomas S., *The Industrial Revolution, 1760 - 1830* (London, 1948).

Ashton, Thomas S., *An Economic History of England: the Eighteenth Century* (London, 1955; reprinted 1961).

Attman, Artur, *The Russian and Polish Markets in International Trade, 1500-1650* (Göteborg, 1973).

Attman, Artur, *The Struggle for Baltic Markets: Powers in Conflict* (Goteborg, 1979).

Bainton, Roland, *The Reformation of the Sixteenth Century* (Boston, 1952).

Bakewell, Peter, *Silver Mining and Society in Colonial Mexico: Zacatecas, 1546 - 1700* (Cambridge, 1971).

Bakewell, Peter, 'Registered Silver Production in the Potosi District, 1550 - 1735', *Jahrbuch für Geschichte von Staat, Wirtschaft und Gesellschaft Lateinamerikas*, 12 (1975), 68-103.

Bakewell, Peter, 'Mining in Colonial Spanish America', in Leslie Bethell, ed., *The Cambridge History of Latin America*, 2: *Colonial Latin America* (Cambridge and New York: Cambridge University Press, 1984), 105-51.

Barbour, Violet, 'Dutch and English Merchant Shipping in the Seventeenth Century', *Economic History Review*, 1st Ser. 2 (1930); reprinted in E.M. Carus-Wilson, ed., *Essays in Economic History*, Vol. I (London, 1954), pp. 227-53.

Batho, Gordon, 'Noblemen, Gentlemen, and Yeomen', in Joan Thirsk, ed., *The Agrarian History of England and Wales*, Vol. IV: *1500-1640* (Cambridge, 1967), pp. 276-305.

Bindoff, S. T., 'The Greatness of Antwerp', in *The New Cambridge Modern History*, II: *The Reformation* (Cambridge: Cambridge University Press, 1958), pp. 50-69.

Blanchard, Ian, 'Technological Diffusion in the International Mining and Metallurgical Industries: Introduction', in Ian Blanchard, Anthony Goodman, and Jennifer Newman, eds., *Industry and Finance in Early Modern History: Essays Presented to George Hammersley on the Occasion of his 74th Birthday*, Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte, Beheift series no. 98 (Franz Steiner Verlag: Stuttgart, 1992), pp. 143-60

Blanchard, Ian, *International Lead Production and Trade in the 'Age of the Saigerprozess', 1460 - 1560*, Zeitschrift für Unternehmensgeschichte-Beheifte, Band 85 (Franz Steiner Verlag: Stuttgart, 1995).

Blockmans, Wim, 'The Economic Expansion of Holland and Zeeland in the Fourteenth-Sixteenth Centuries', in Erik Aerts, Brigitte Henau, Paul Janssens, and Raymond Van Uytven, eds., *Studia Historica Oeconomica: Liber Amicorum Herman Van der Wee* (Leuven, 1993), pp. 41-58.

Bogaert, Raymond, 'Banking in the Ancient World', in Herman Van der Wee and G. Kurgan-Van Hentenryk, eds., *A History of European Banking*, 2nd edn. (Antwerp, 2000), pp. 13-70.

Bowie, G. G. , 'Watermeadows in Wessex: A Re-evaluation for the Period 1640 - 1850', *Agricultural History Review*, 35 (1987), 151-58.

Bowden, Peter, 'Agricultural Prices, Farm Profits, and Rents', in Joan Thirsk, ed., *The Agrarian History of England and Wales*, Vol. IV: *1500 - 1640* (Cambridge: Cambridge University Press, 1967), pp. 593-695; and Statistical Appendix, pp. 814-870.

Boxer, Charles, *The Portuguese Seaborne Empire, 1415 - 1825* (London, 1969).

Brading, D. A., 'Mexican Silver Mining in the Eighteenth Century: the Revival of Zacatecas', *Hispanic American Historical Review*, 50:4 (1970), 665-81.

Braudel, Fernand, *La Méditerranée et le monde méditerranéen à l'époque de Philippe II*, 2nd rev edn. (Paris, 1966; original edn. 1949); republished as *The Mediterranean and the Mediterranean World in the Age of Philip II*, translated by Sian Reynolds, 2 vols. (London and New York, 1972-73)

Braunstein, Philippe; 'Innovations in Mining and Metal Production in Europe in the Late Middle Ages', *The Journal of European Economic History*, 12 (1983): 573-91.

Brenner, Robert , 'Agrarian Class Structure and Economic Development in Pre-Industrial Europe', *Past and Present*, no. 70 (Feb. 1976), 30-75; republished in T. H. Aston and C.H.E. Philipin, eds., *The Brenner Debate: Agrarian Class Structure and Economic Development in Pre-Industrial Europe* (Cambridge, 1987).

Brenner, Robert, 'The Agrarian Roots of European Capitalism', *Past and Present*, No. 97 (Nov. 1982), 16-113.

Bridbury, A. R., *Medieval English Clothmaking: An Economic Survey* (London: Heinemann, 1982).

Brulez, Wilfred, 'Bruges and Antwerp in the 15th and 16th Centuries: An Antithesis?' *Acta Historiae Neerlandicae*, 6 (1973), 1-26.

Calder, Ritchie, *Profile of Science* (London: Allen and Unwin, 1953).

Cameron, Rondo, 'England, 1750-1844', and 'Scotland, 1750-1845', in Rondo Cameron, ed., *Banking in the Early Stages of Industrialization* (London, 1967), pp. 15-59, 60-99.

Cameron, Alan, *The Bank of Scotland, 1695-1995 : a Very Singular Institution* (London: Mainstream Publications, 1995).

Campbell, Bruce M. S., 'The Population of Early Tudor England: A Re-evaluation of the 1522 Muster Returns

and the 1524 and 1525 Lay Subsidies', *Journal of Historical Geography*, 7 (1981), 145-54.

Campbell, Bruce M.S.; James A. Galloway, Derek Keene, and Margaret Murphy, *A Medieval Capital and Its Grain Supply: Agrarian Production and Distribution in the London Region c. 1300*, Institute of British Geographers, Historical Geography Research Series no. 30 (London, 1993).

Carus-Wilson, Eleanora M., 'The Origins and Early Development of the Merchant Adventurers' Organization in London as Shown in their own Medieval Records', *The Economic History Review*, 1st ser., 4:2 (April 1933), 147-76; reprinted in Eleanora Carus-Wilson, *Medieval Merchant Venturers: Collected Studies* (London: Methuen and Co. , 1954), pp. 143-182.

Campbell, Bruce M. S.; and Mark Overton, 'A New Perspective on Medieval and Early Modern Agriculture: Six Centuries of Norfolk Farming, c.1250 - c.1850', *Past & Present*, no. 141 (November 1993), 38 - 105.

Carlos, Ann M.; Nathalie Moyen, and Jonathan Hill, 'Royal African Company Share Prices during the South Sea Bubble', *Explorations in Economic History*, 39:1 (January 2002), 61-87.

Carus-Wilson, E. M.; and Olive Coleman, *England's Export Trade, 1275-1547* (Oxford, 1963).

Challis, Christopher E., 'The Debasement of the Coinage, 1542 - 1551', *Economic History Review*, 2nd ser., 20 (1967), 441-66.

Challis, Christopher E., 'The Circulating Medium and the Movement of Prices in Mid-Tudor England', in Peter Ramsey, ed., *The Price Revolution in Sixteenth-Century England*, Debates in Economic History series (London, 1971), pp. 117-46.

Challis, Christopher E., *The Tudor Coinage* (Manchester, 1978).

Chapman, Sidney, *The Cotton Industry in the Industrial Revolution* (London, 1972).

Chaudhuri, K.N., 'The East India Company and the Export of Treasure in the Early Seventeenth Century', *Economic History Review*, 2nd ser., 16:1 (1963), 23-38.

Chaudhuri, Kirti N. , 'Treasure and Trade Balances: the East India Company's Export Trade, 1660-1720', *Economic History Review*, 2nd ser. 21 (Dec. 1968), 480-502.

Christensen, Aksel, *Dutch Trade to the Baltic About 1600: Studies in the Sound Toll Registers and Dutch Shipping Records* (Copenhagen, 1941).

Cipolla, Carlo, *Guns, Sails, and Empires: Technological Innovation and the Early Phases of European Expansion 1400 - 1700* (New York, 1965).

Ćirković, S., 'The Production of Gold, Silver, and Copper in the Central Parts of the Balkans from the 13th to the 16th Century', in Hermann Kellenbenz, ed., *Precious Metals in the Age of Expansion* (Stuttgart, 1981), 41-69.

Clapham, Sir John, *The Bank of England: A History*, 2 vols. (Cambridge and New York: Cambridge University Press, 1944).

Clarkson, L.A., *The Pre-Industrial Economy in England, 1500-1750* (London, 1971)

Clay, Christopher, *Economic Expansion and Social Change: England, 1500-1700*, 2 vols. (Cambridge, 1984), Vol. I: *People, Land, and Towns*.

Clay, Christopher G. A. , *Economic Expansion and Social Change: England, 1500 - 1700,* Vol. II: *Industry, Trade, and Government* (Cambridge, 1984).

Clémont, P. *, Lettres, instructions et mémoires de Colbert*, 7 vols (Paris, 1870).

Cliffe, J. T., *Puritans in Conflict: The Puritan Gentry during and after the Civil Wars* (London: Routledge, 1988).

Coke, Roger, *A Discourse of Trade in Two Parts: The first treats of the reason of the decay of the strength, wealth, and trade of England, the latter, of the growth and increase of the Dutch trade above the English* (London: H. Brome, 1670; republished London, S.R. Publishers, 1970).

Coleman, Donald C., 'Industrial Growth and Industrial Revolutions', *Economica*, new ser. 23 (1956), reprinted in: E.M. Carus-Wilson, ed., *Essays in Economic History*, Vol. III (London, 1962), pp. 334-52.

Coleman, Donald C., *Industry in Tudor and Stuart England* (London, 1975).

Coleman, Donald C., *The Economy of England, 1450-1750* (London, 1977).

Collins, Michael, *Money and Banking in the U.K.: A History* (London, 1988).

Collins, Michael, *Banks and Industrial Finance in Britain, 1800 - 1939*, Studies in Economic and Social History (London: Macmillan, 1991).

Cooper, J.P., 'The Counting of Manors', *Economic History Review*, 2nd ser., 8 (1956), 377 - 86.

Cooper, J.P., 'The Social Distribution of Land and Men in England, 1436 - 1700', *Economic History Review*, 20:3 (December 1967), 419-40.

Cooper, J. P., 'In Search of Agrarian Capitalism', *Past and Present*, No. 80 (August 1978), 20-65.

Coquillette, Daniel, 'The Mystery of the New Fashioned Goldsmiths: From Usury to the Bank of England (1622-1694)', in Vito Piergiovanni, ed., *The Growth of the Bank as Institution and the Development of Money-Business Law* (Berlin, 1993), pp. 91-117.

Cornwall, Julian, 'The Early Tudor Gentry', *Economic History Review*, 2nd ser., 17 (1965), 456 - 71.
Cross, Harry E., 'South American Bullion Production and Export, 1550-1750', in John F. Richards , ed. *Precious Metals in the Later Medieval and Early Modern Worlds* (Durham, N.C., 1983), 425-39.

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

Crouzet, François, 'The Huguenots and the English Financial Revolution', in Patrice Higonnet, David Landes, and Henry Rosovsky, eds., *Favorites of Fortune: Technology, Growth, and Economic Development Since the*

Industrial Revolution (Cambridge, Mass., Harvard University Press, 1991), pp. 221-66.

Davis, Ralph, *English Overseas Trade, 1500 - 1700* (London, 1973), pp. 20-31; Ralph Davis, *The Rise of the English Shipping Industry in the Seventeenth and Eighteenth Centuries* (London, 1962)

Davis, Ralph, 'England and the Mediterranean, 1570-1670', in F.J. Fisher, ed., *Essays in the Economic and Social History of Tudor and Stuart England* (London, 1961).

Davis, Ralph, 'The Rise of Antwerp and its English Connection', in D. C. Coleman and A. H. John, eds., *Trade, Government, and Economy in Pre-Industrial England: Essays Presented to F.J. Fisher* (London, 1976), pp. 2-20.

Davis, Ralph, *Rise of the Atlantic Economies* (Ithaca, New York: Cornell University Press, 1973).

Day, John, 'The Great Bullion Famine of the Fifteenth Century', *Past and Present*, no. 79 (May 1978): 1-54; reprinted with other relevant studies in John Day, *The Medieval Market Economy* (Oxford, 1987), 1-54.

De Roover, Raymond, *Money, Banking, and Credit in Mediaeval Bruges: Italian Merchant-Bankers, Lombards, and Money Changers* (Cambridge, Mass., 1948).

De Roover, Raymond, *Gresham on Foreign Exchange: An Essay on Early English Mercantilism* (Cambridge, Mass. 1949).

De Roover, Raymond, *The Rise and Decline of the Medici Bank, 1397-1494* (Cambridge, Mass. 1963).

De Roover, Raymond, 'Early Banking Before 1500 and the Development of Capitalism', *Review of the History of Banking*, 4 (1971), 1-16.

De Vries, Jan, *The Economy of Europe in an Age of Crisis, 1600-1750* (Cambridge, 1976).

De Vries, Jan; and Ad Van der Woude, *Nederland 1500 - 1815: De eerste ronde van moderne economische groei* (Amsterdam: Balans, 1995); republished in English translation as *The First Modern Economy: Growth, Decline, and Perserverance of the Dutch Economy, 1500 - 1815* (Cambridge and New York: Cambridge University Press, 1997).

De Zeeuw, J.W., 'Peat and the Dutch Golden Age: the Historical Meaning of Energy Attainability', *Afdeling Agrarische Geschiedenis (AAG) Bijdragen*, 21 (1978), 3-31.

Deane, Phyllis; and W. A. Cole, *British Economic Growth, 1688 - 1959: Trends and Structures* (Cambridge, 1964; 2nd edn. 1969.

Deane, Phyllis, *The First Industrial Revolution* (London, 1965).

Diamond, Jared, *Guns, Germs, and Steel: the Fates of Human Societies* (New York, 1999).

Dickerson, O. M. , *The Navigation Acts and the American Revolution* (New York, Octagon Books, 1951; reissued 1978).

Dickson, Peter G. M., *The Financial Revolution in England : a Study in the Development of Public Credit,*

1688-1756 (London, 1967);

Dickson, Peter G.M.; and John Sperling, 'War Finance, 1689-1714', in J.S. Bromley, ed., *The New Cambridge Modern History* (Cambridge, 1970), vol. VI: *The Rise of Great Britain and Russia, 1699-1715-25* (Cambridge: Cambridge University Press, 1970), pp. 284-315.

Dollinger, Philippe, *La Hanse, XIIe - XVIIe siècles* (Paris, 1964) republished in translation as *The German Hanse*, trans. and ed. by D.S. Ault and S.H. Steinberg (London: Macmillan, 1970).

Durston, Christopher; and Jacqueline Eales, ed., *The Culture of English Puritanism, 1560 - 1700* (London and Basingstoke: MacMillan, 1996).

Elbl, Martin, 'The Portuguese Caravel and European Shipbuilding: Phases of Development and Diversity', *Revista da Universidade de Coimbra*, 33 (1985), 543-72

Elbl, Martin, 'The Caravel and the Galleon', in Robert Gardiner, ed., *Conway's History of the Ship*, III: *Cogs, Caravels and Galleons* (London, 1994), pp. 91-98.

Elliott, John H. , *Imperial Spain, 1469 - 1716* (New York, 1964).

Endrei, Walter, 'The Productivity of Weaving in Late Medieval Flanders,' in Negley B. Harte, and K. G. Ponting, eds., *Cloth and Clothing in Medieval Europe: Essays in Memory of Professor E. M. Carus-Wilson*, Pasold Studies in Textile History no. 2 (London, 1983), pp. 108-19.

Endrei, Walter 'Manufacturing a Piece of Woollen Cloth in Medieval Flanders: How Many Work Hours,' in Erik Aerts and John Munro, eds., *Textiles of the Low Countries in European Economic History*, Proceedings of the Tenth International Economic History Congress, Studies in Social and Economic History, Vol. 19 (Leuven, 1990), pp. 14-23.

Engerman, Stanley, 'Max Weber as Economist and Economic Historian', in Stephen P. Turner, ed., *Cambridge Companion to Weber* (Cambridge, 2000), pp. 256-71.

Feavearyear, Sir Albert, *The Pound Sterling: A History of English Money*, 2nd revised edn, by E. Victor Morgan (Oxford: Clarendon Press, 1963).

Fischoff, Ephraim, 'The Protestant Ethic and the Spirit of Capitalism: The History of a Controversy', *Social Research*, 11 (1944), 61-77.

Fisher, F. J., 'Commercial Trends and Policy in Sixteenth-Century England', *The Economic History Review*, 1st ser., 10 2 (Nov. 1940), 95-117.

Flinn, Michael, 'Timber and the Advance of Technology: A Reconsideration', *Annals of Science*, 15 (1959), 109-20.

Flinn, Michael , 'The Growth of the English Iron Industry, 1660-1760', *Economic History Review*, 2nd ser. 11 (1958), 144-53.

Gaastra, F.S., 'The Exports of Precious Metal from Europe to Asia by the Dutch East India Company, 1602-1795 A.D.', in John F. Richards, ed., *Precious Metals in the Medieval and Early Modern Worlds* (Durham,

N.C., 1983), pp. 447-76.

Garner, Richard L. , 'Long-term Silver Mining Trends in Spanish America: A Comparative Analysis of Peru and Mexico', *American Historical Review*, 67:3 (1987), 405-30.

Gatrell, V. A., 'Labour, Power, and the Size of Firms in Lancashire Cotton in the Second Quarter of the Nineteenth Century', *Economic History Review*, 2nd ser., 30:1 (February 1977), 95-139.

Gilliodts-Van Severen, Louis, ed., *Coutume de la ville de Bruges*, Commission Royale d'Histoire (Brussels, 1875), II, no. 127, p. 318.

Giuseppi, John, *The Bank of England, a History from its Foundation in 1694* (London: H. Regnery, 1966).

Goldstone, Jack A., 'Efflorescences and Economic Growth in World History: Rethinking the Rise of the West and the British Industrial Revolution', *Journal of World History*, 13 (2002), 323-89.

Goldstone, Jack A., 'Europe's Peculiar Path: Would the World Be Modern if William III's Invasion of England in 1688 Had Failed?', in N. Lebow, G. Parker, and P. Tetlock, eds., *Counterfactual History* (New York, 2002).

Goldthwaite, Richard , 'Local Banking in Renaissance Florence', *Journal of European Economic History*, 14 (Spring 1985), 5 -55.

Gould, J.D., *The Great Debasement: Currency and the Economy in Mid-Tudor England* (Oxford, 1970).

Gould, J.D., 'The Price Revolution Reconsidered', *Economic History Review*, 2nd ser., 17 (1964-5), 253; reprinted in Ramsey, *Price-Revolution in Sixteenth-Century England,* pp. 91-116.

Great Britain, Record Commission (T. E. Tomlins, J. Raithby, et al.), eds., *Statutes of the Realm*, 6 vols. (London, 1810-22).

Grice-Hutchison, Marjorie, *The School of Salamanca: Readings in Spanish Monetary Theory, 1544 - 1605* (Oxford, 1952).

Habakkuk, H.J., 'English Land Ownership, 1680-1740', *Economic History Review*, 1st ser. , 10 (1940), 2-17.

Hamilton, Alastair, 'Max Weber's *Protestant Ethic and the Spirit of Capitalism*', in Stephen P. Turner, ed., *Cambridge Companion to Weber* (Cambridge, 2000), pp. 151-71

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

Hamilton, Earl J., 'American Treasure and the Rise of Capitalism, 1500-1700', *Economica*, 27 (Nov. 1929), 338-57.

Hamilton, Earl J., 'Imports of American Gold and Silver into Spain, 1503-1660', *Quarterly Journal of Economics*, 43 (1929), 436-72.

Hamilton, Earl J., *American Treasure and the Price Revolution in Spain, 1501-1650* (Cambridge, Mass., 1934;

reissued 1965).

Hamilton, Earl J., *Money, Prices, and Wages in Valencia, Aragon, and Navarre, 1351 - 1500* (Cambridge, Mass., 1936).

Hamilton, Earl J., 'The Decline of Spain', *Economic History Review*, 1st ser., 8:2 (1937-38), reprinted in E.M. Carus-Wilson, ed., *Essays in Economic History*, 3 vols (1954-62), vol. I, pp. 215-26;

Hamilton, Earl J., 'Profit Inflation and the Industrial Revolution, 1751-1800', *Quarterly Journal of Economics*, 56:2 (February 1942), 256-73; reprinted in F.C. Lane and J.C. Riemersma, eds., *Enterprise and Secular Change: Readings in Economic History* (London, 1953), pp. 322-49.

Hamilton, Earl J., 'Prices as a Factor in Business Growth: Prices and Progress', *Journal of Economic History*, 12:4 (Autumn 1952), 325-49.

Hammersley, George, 'The Crown Woods and their Exploitation in the Sixteenth and Seventeenth Centuries', *Bulletin of the Institute of Historical Research, University of London*, 30 (1957), 154-59.

Hammersley, George, 'The Charcoal Iron Industry and its Fuel, 1540-1750', *Economic History Review*, 2nd ser. 26 (1973), 593-613.

Hammersley, George, 'The State and the English Iron Industry in the Sixteenth and Seventeenth Centuries', in Donald Coleman and A. H. John, eds., *Trade, Government, and Economy in Pre-Industrial England: Essays Presented to F. J. Fisher* (London, 1976), pp. 166 - 86;

Harkness, Georgia, *John Calvin: The Man and His Ethics* (New York, 1958).

Harley, C. Knick, 'Goschen's Conversion of the National Debt and the Yield on Consols', *Economic History Review*, 2nd ser. 29:1 (Feb. 1976), 101-06.

Harper, Lawrence A., *The English Navigation Laws: a Seventeenth-Century Experiment in Social Engineering* (New York: Octagan Books, 1964).

Harris, J.R., *The British Iron Industry*, Studies in Economic and Social History series (London: Macmillan, 1988).

Harris, Ron, *Industrializing English Law: Entrepreneurship and Business Organization, 1720-1844* (Cambridge: Cambridge University Press, 2000).

Hatcher, John, *The History of the British Coal Industry*, vol. I: *Before 1700: Towards the Age of Coal* (Oxford: Clarendon Press 1993).

Havinden, Michael A., 'Agricultural Progress in Open-Field Oxfordshire', *Agricultural History Review*, 9 (1961), 73-83; reprinted in W.E. Minchinton, ed., *Essays in Agricultural History* (London, 1968), Vol. I, pp. 147-60; E.L. Jones, ed., *Agriculture and Economic Growth in England, 1650-1815* (London, 1967), pp. 66-79.

Hecksher, Eli F. , *Mercantilism*, 2 vols., translated by Mandel Shapiro; revised edn ed. by E. F. Söderlund (London: Allen and Unwin; New York: Macmillan, 1955).

Hejeebu, Santhi, 'The Firm: The Firm Before 1800', in Joel Mokyr, ed., *The Oxford Encyclopedia of Economic History*, 5 vols. (New York: Oxford University Press, 2003), pp.315-18.

Hexter, Jack, 'Storm Over the Gentry', *Encounter*, 10 (1958); reprinted in J.H. Hexter, *Reappraisals in History* (London, 1961).

Hill, Christopher, 'Protestantism and the Rise of Capitalism', in F. J. Fisher, ed., *Essays in the Economic and Social History of Tudor and Stuart England* (London: 1961), pp. 15-39.

Hill, Christopher, 'Puritanism, Capitalism, and the Scientific Revolution: A Debate', *Past and Present*, no. 29 (1964), pp. 88-97.

Hobsbawm, Eric, 'The Crisis of the Seventeenth Century', *Past and Present*, nos. 5 (May 1954), 33-53 & no. 6 (Nov. 1954), reprinted in: Trevor Aston, ed., *Crisis in Europe, 1560-1660: Essays from Past and Present* (London, 1965), pp. 5-58 (with additional comments).

Hobsbawm, Eric, 'The Seventeenth Century in the Development of Capitalism', *Science and Society*, 24 (1960), 97-112.

Hollander, Samuel, *Studies in Classical Political Economy,* vol. I*: The Economics of Adam Smith* (Toronto: University of Toronto Press and London: Heinemann, 1973).

Hollander, Samuel, *Studies in Classical Political Economy*, vol. II: *The Economics of David Ricardo* (Toronto: University of Toronto Press, and London: Heinemann, 1979).

Homer, Sidney; and Richard Sylla, *A History of Interest Rates*, 3rd rev. edn (New Brunswick, 1991).

Hudson, Patricia, 'Land Markets, Credit and Proto-Industrialization in Britain and Europe', in Simonetta Cavaciocchi, ed., *Il mercato della terra, seccoli XIII - XVIII*, XXXV Settimana di Studio, Istituto Internazionali di Storia Economica 'Francesco Datini', vol. 35 (Florence: 2003), pp. 721-42

Hughes, Paul L.; and James F. Larkin, eds., *Tudor Royal Proclamations*, 3 vols. (New Haven and London, 1964-69).

Hyde, Charles K., *Technological Change and the British Iron Industry, 1700-1870* (Princeton, 1977).

Israel, Jonathan I., *Dutch Primacy in World Trade, 1585 - 1740* (Oxford: Clarendon Press, 1989).

Jack, Sybil, *Trade and Industry in Tudor and Stuart England* (London, 1977)

Jansen, H.P.H., 'Holland's Advance', *Acta Historiae Neerlandicae*, 10 (1978), 1-19.

Jenks, Stuart, *Robert Sturmy's Commercial Expedition to the Mediterranean (1457/8): With Editions of the Trial of the Genoese before King and Counci and of Other Sources*, Bristol Record Society's Publications, Vol. 58 (Bristol: Tempus Publishing, 2006).

Jones, E.L. , 'Capitalism: One Origin or Two?', *Journal of Early Modern History: Contacts, Comparisons, Contrasts*, 1:1 (February 1997), 71-76.

Kerridge, Eric, *The Agricultural Revolution* (London, 1967).

Kerridge, Eric, *Agrarian Problems in the Sixteenth Century and After*, Historical Problems: Studies and Documents no. 6 (London: George Alan and Unwin; New York: Barnes and Noble, 1969).

Kerridge, Eric, *The Farmers of Old England* (London: George Allen and Unwin, 1973).

Ketner, F., *Handel en scheepvaart van Amsterdam in de vijftiende eeuw* (Leiden: E. J. Brill, 1946).

Keynes, John Maynard, *A Treatise on Money*, two vols. (London, 1930).

Keynes, John Maynard, *The General Theory of Employment, Interest, and Money* (London, 1936).

Kearney, H. F., 'Puritanism, Capitalism, and the Scientific Revolution', *Past and Present*, no. 28 (July 1964), 81-101.

Kussmaul, Anne, *A General View of the Rural Economy of England, 1538 - 1840* (Cambridge University Press, 1990).

Landes, David, *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present*, 2nd edn. (Cambridge and New York: Cambridge University Press, 2003).

Laurent, C.; M. J. Lameere, and H. Simont, eds., *Recueil des ordonnances des Pays Bas, deuxième série, 1506 - 1700*, Commission Royale d'Histoire, 5 vols. (Brussels, 1907).

Lehmann, Hartmut; and Guenther Roth, eds., *Weber's Protestant Ethic: Origins, Evidence, Contexts*, Publications of the German Historical Institute (Cambridge and New York: Cambridge University Press, 1985).

Lewis, Archibald; and Timothy Runyan, *European Naval and Maritime History, 300 - 1500* (Bloomington, 1985).

Luiten Van Zanden, Jan, *The Rise and Decline of Holland's Economy: Merchant Capitalism and the Labour Market* (Manchester: Manchester University Press, 1993).

MacKinnon, Malcolm, 'The Longevity of the Thesis: A Critique of the Critics', in Hartmut Lehmann and Guenther Roth, eds., *Weber's Protestant Ethic: Origins, Evidence, Contexts*,(Cambridge and New York, 1993), pp. 211-43.

Malcolm, Charles Alexander, *The Bank of Scotland, 1695-1945* (Edinburgh: R & R Clark, 1945).
Collins, Michael, *Banks and Industrial Finance in Britain, 1800 - 1939*, Studies in Economic and Social History (London: Macmillan, 1991)

Malowist, Marian, 'L'expansion économique des Hollandais dans le bassin de la Baltique aux XIVe et XVe siècles', from his *Studia z dziejow rzemiosla w okresie kryzysu feudalizmu w Europie Zachodniej w XIV i XV wieku* (Warsaw, 1954); republished in his *Croissance et regression en Europe, XIVe - XVIIe siècles*, in the series *Cahiers des Annales*, No. 34 (Paris: 1972), pp. 91-138.

Mann, Julia de Lacy, *The Cloth Industry in the West of England from 1640 to 1880* (Oxford, 1971).

Martins, Susanna Wade; and Tom Williamson, 'Floated Water-Meadows in Norfolk: A Misplaced Innovation', *Agricultural History Review*, 42:I (1994), 20 - 37.

Mason, S. F. , 'Science and Religion in Seventeenth-Century England', *Past and Present*, no. 3 (Feb. 1953), 28-44.

Mathias, Peter, *The First Industrial Nation: An Economic History of Britain, 1700 - 1914*, 2nd revised edn. (London: Methuen and Co, 1983). [First edition: 1969].

McClelland, David C.; *The Achieving Society* (New York, 1961).

Merton, Robert K., 'Science, Technology, and Society in Seventeenth-Century England', *Osiris*, 4 (1938), 360-.

Merton, Robert K.,'Puritanism, Pietism, and Science', *Social Theory and Social Structure,* rev. edn. (New York, 1957), pp. 574-606.

Merton, Robert K., *Science, Technology, and Society in Seventeenth-Century England,* rev. edn. (New York, 1970).

Michie, Ranald, *The London Stock Exchange: a History* (Oxford and New York, 1999).

Mingay, George, *English Landed Society in the Eighteenth Century* (London, 1963).

Mingay, George E., *The Gentry: The Rise and Fall of a Ruling Class* (London, 1976).

Miskimin, Harry A., *The Economy of Early Renaissance Europe, 1300-1460* (1969; reissued Cambridge, 1976.

Mitchell, B. R. ; and Phyllis Deane, *Abstract of British Historical Statistics* (Cambridge, 1962).

Mokyr, Joel, *Industrialization in the Low Countries, 1795 - 1850*, Yale Studies in Economic History (New Haven and London, 1976), pp. 204-06.

Moore, ed. George A., *The Response of Jean Bodin to the Paradoxes of Malestroit and The Paradoxes, translated from the French Second Edition, Paris 1578* (Washington, D.C.: Country Dollar Press, 1946).

Morineau, Michel, *Incroyables gazettes et fabuleux métaux: les retours des trésors américains d'après les gazettes hollandaises (XVIe - XVIIIe siècles)*, Studies in Modern Capitalism (Paris: Editions de la Maison des Sciences de l'Homme; and Cambridge and New York: Cambridge University Press, 1985).

Mueller, Reinhold C., 'The Role of Bank Money in Venice, 1300-1500', *Studi Veneziani*, new series, 3 (1979), 47-96.

Mueller, Reinhold, ' "Chome l'ucciello di passegio": la demande saisonnière des espèces et le marché des changes à Venise au moyen âge' , in John Day, ed., *Études d'histoire monétaire, XIIe-XIXe siècles* (Université de Paris VII, Lille, 1984), pp. 195-220;

Mun, Thomas, *England's Treasure by Forraign Trade* [1664] (reissued Oxford, 1937).

Munro, John H. , 'Bruges and the Abortive Staple in English Cloth: An Incident in the Shift of Commerce from Bruges to Antwerp in the Late Fifteenth Century', *Revue belge de philologie et d'histoire/Belgisch tijdschrift voor filologie en geschiedenis,* 44 (1966), 1137-59.

Munro, John H., *Wool, Cloth, and Gold: The Struggle for Bullion in Anglo-Burgundian Trade, 1340-1478* (Brussels and Toronto: Editions de l'Université de Bruxelles and University of Toronto Press, 1973).

Munro, John, 'The Weber Thesis Revisited -- and Revindicated?' *Revue belge de philologie et d'histoire*, 51 (1973), 381-91.

Munro, John H., 'Industrial Protectionism in Medieval Flanders: Urban or National?' in Harry Miskimin, David Herlihy, and A. L. Udovitch, eds., *The Medieval City* (New Haven and London: Yale University Press, 1977), pp. 229-68

Munro, John H., 'Bullionism and the Bill of Exchange in England, 1272-1663: A Study in Monetary Management and Popular Prejudice', in The Center for Medieval and Renaissance Studies of the University of California (Fredi Chiappelli, director), ed., *The Dawn of Modern Banking* (New Haven and London: Yale University Press, 1979), pp. 169-239.

Munro, John H. 'The Medieval Scarlet and the Economics of Sartorial Splendour', in Negley B. Harte and Kenneth G. Ponting, eds., *Cloth and Clothing in Medieval Europe: Essays in Memory of Professor E. M. Carus-Wilson*, Pasold Studies in Textile History No. 2 (London: The Pasold Research Fund and Heinemann Educational Books, 1983), pp. 13-70.

Munro, John H. , 'Industrial Transformations in the North-West European Textile Trades, c. 1290 - c. 1340: Economic Progress or Economic Crisis?' in Bruce M. S. Campbell, ed., *Before the Black Death: Studies in the 'Crisis' of the Early Fourteenth Century* (Manchester and New York, 1991), pp. 110 - 48.

Munro, John H., 'The Central European Mining Boom, Mint Outputs, and Prices in the Low Countries and England, 1450 - 1550', in Eddy H.G. Van Cauwenberghe, ed., *Money, Coins, and Commerce: Essays in the Monetary History of Asia and Europe (From Antiquity to Modern Times)*, Studies in Social and Economic History (Leuven: Leuven University Press, 1991), pp. 119 - 83,

Munro, John H., *Bullion Flows and Monetary Policies in England and the Low Countries, 1350 - 1500*, Variorum Collected Studies series CS 355 (Aldershot, Hampshire; and Brookfield, Vermont: Ashgate Publishing Ltd., 1992).

Munro, John H. *Textiles, Towns, and Trade: Essays in the Economic History of Late-Medieval England and the Low Countries*, Variorum Collected Studies series CS 442 (Aldershot, Hampshire; and Brookfield, Vermont: Ashgate Publishing Ltd., 1994).

Munro, John H. , 'The Low Countries' Export Trade in Textiles with the Mediterranean Basin, 1200-1600: A Cost-Benefit Analysis of Comparative Advantages in Overland and Maritime Trade Routes', *The International Journal of Maritime History*, 11:2 (Dec. 1999), 1 - 30.

Munro, John H., 'English "Backwardness" and Financial Innovations in Commerce with the Low Countries, 14th to 16th centuries', in Peter Stabel, Bruno Blondé, and Anke Greve, eds., *International Trade in the Low Countries (14th - 16th Centuries): Merchants, Organisation, Infrastructure*, Studies in Urban, Social, Economic, and Political History of the Medieval and Early Modern Low Countries (Marc Boone, general editor), no. 10

(Leuven-Apeldoorn: Garant, 2000), pp. 105-67

Munro, John H., The "New Institutional Economics" and the Changing Fortunes of Fairs in Medieval and Early Modern Europe: the Textile Trades, Warfare, and Transaction Costs', *Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte*, 88:1 (2001), 1 - 47.

Munro, John H. 'Wage Stickiness, Monetary Changes, and Real Incomes in Late-Medieval England and the Low Countries, 1300 - 1500: Did Money Matter?' *Research in Economic History*, 21 (2003), 185 - 29.

Munro, John H., 'The Monetary Origins of the "Price Revolution:" South German Silver Mining, Merchant-Banking, and Venetian Commerce, 1470-1540', in Dennis Flynn, Arturo Giráldez, and Richard von Glahn, eds., *Global Connections and Monetary History, 1470 - 1800* (Aldershot and Brookfield, Vt: Ashgate Publishing, 2003), pp. 1-34.

Munro, John H., 'The Medieval Origins of the Financial Revolution: Usury, *Rentes*, and Negotiablity', *The International History Review*, 25:3 (September 2003), 505-62.

Munro, John H., 'Industrial Energy from Water-Mills in the European Economy, 5th to 18th Centuries: the Limitations of Power', in Simonetta Cavaciocchi, ed., *Economia ed energia, seccoli XIII - XVIII***,** Atti delle 'Settimane di Studi' e altrie Convegni, Istituto Internazionale di Storia Economica, 'Francesco Datini da Prato', vol. 34 (Florence, Le Monnier: 2003), pp. 223-69.

Munro, John H., 'Manufacturing and Industry', in William Chester Jordan, ed., *Dictionary of the Middle Ages: Supplement 1* (New York: Charles Scribner's Sons, 2004), pp. 345-55.

Munro, John H., '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 Simonetta Cavaciocchi, ed., *Relazione economiche tra Europa e mondo islamico, seccoli XIII - XVIII*, Atti delle "Settimana di Studi" e altri convegni, no. 38, Istituto Internazionale di Storia Economica "Francesco Datini" (Florence: Le Monnier, 2007), forthcoming.

Musson, A. E. ; and E. Robinson, 'Science and Industry in the Late Eighteenth Century', *Economic History Review*, 2nd ser. 13 (1960), 222-45

Musson, A. E. and E. Robinson, *Science and Technology in the Industrial Revolution* (London: 1969).

Musson, A. E., *Science, Technology, and Economic Growth in the Eighteenth Century* (London: 1972).

Neal, Larry, *The Rise of Financial Capitalism: International Capital Markets in the Age of Reason* (Cambridge and New York, 1990).

Nef, John U. , *The Rise of the British Coal Industry*, 2 vols. (London, 1923; reprinted 1966).

Nef, John U. , 'The Progress of Technology and the Growth of Large Scale Industry in Great Britain, 1540-1640', *Economic History Review*, 1st ser. 5 (1934), reprinted in John Nef, *Conquest of the Material World* (Chicago, 1964), pp. 121-43.

Nef, John U. , 'A Comparison of Industrial Growth in France and England, 1540-1640', *Journal of Political Economy*, 44 (1936), reprinted in Nef, *Conquest of the Material World* (1964), pp. 144-212.

Nef, John U. , 'Prices and Industrial Capitalism in France and England, 1540-1640', *Economic History Review*, 1st. 7 (1937), reprinted in F.C. Lane and J.C. Riemersma, eds., *Enterprise and Secular Change: Readings in Economic History* (London, 1953), 292-321.

Nef, John U., 'Silver Production in Central Europe, 1450-1618', *Journal of Political Economy*, 49 (1941), 575-91.

Nef, John U. , *War and Human Progress: An Essay on the Rise of Industrial Civilization* (New York, 1950; reprinted 1963.

Nef, John U., 'Mining and Metallurgy in Medieval Civilisation', in *The Cambridge Economic History of Europe*, 2: *Trade and Industry in the Middle Ages*, 2nd rev. edn., ed. M. M. Postan and E. E. Rich (Cambridge, 1987), 691-761 (1st edn. published in 1952)

Nightingale, Pamela, 'Monetary Contraction and Mercantile Credit in Later Medieval England', *Economic History Review*, 2nd ser. 43 (November 1990), 560 - 75.

Nightingale, Pamela, 'The Growth of London in the Medieval English Economy', in Richard Britnell and John Hatcher, eds., *Progress and Problems in Medieval England* (Cambridge and New York: Cambridge University Press, 1996), pp. 89-106.

North, Douglass C.; and Barry Weingast, 'Constitution and Commitment: The Evolution of Institutions Governing Public Choice in Seventeenth Century England', *Journal of Economic History*, 39:2 (1989), 379-99.

North, Douglass C.; and Barry R. Weingast, 'Introduction: Institutional Analysis and Economic History', *Journal of Economic History*, 60:2 (June 2000), 414-17.

North, Michael, *From the North Sea to the Baltic: Essays in Commercial, Monetary and Agrarian History, 1500 - 1800*, Variorum Collected Studies Series CS 548 (Aldershot: Ashgate Publishing, 1996).

Overton, Mark, 'The Diffusion of Agricultural Innovations in Early-Modern England: Turnips and Clover in Norfolk and Suffolk, 1580 - 1740', *Transactions of the Institute of British Geographers*, new series, 10 (1985), 205-21.

Overton, Mark, *Agricultural Revolution in England: The Transformation of the Agrarian Economy, 1500 - 1800*, Cambridge Studies in Historical Geography (Cambridge and New York: Cambridge University Press, 1996).

Pagano de Divitiis, Giglioa, *Mercanti inglesi nell'Italia del Seicento: Navi, traffici, egemonie* (Venice: Marsilio Editore), 1990; republished as *English Merchants in Seventeenth-Century Italy*, trans. by Stephen Parkin, Cambridge Studies in Italian History and Culture (Cambridge: University Press, 1997).

Panciera, Walter, *L'Arte matrice: I lanifici della Repubblica di Venezia nei secoli XVII e XVIII,* Studi veneti, no. 5 (Treviso: Fondazione Benetton Studi Ricerche and Canova Editrice, 1996).

Parker, Geoffrey; and L.M. Smith, eds., *The General Crisis of the Seventeenth Century* (London, 1978).

Payne, Peter L., 'Industrial Entrepreneurship and Management in Great Britain', in Peter Mathias and M.M. Postan, eds., *The Cambridge Economic History of Europe*, Vol. VII: *The Industrial Economies: Capital,*

Labour, and Enterprise, Part I: *Britain, France, Germany, and Scandinavia* (Cambridge, 1978), pp. 193-210.

Pettegree, Andrew; Alastair Duke, and Gillian Lewis, eds., *Calvinism in Europe, 1540 - 1620* (Cambridge and New York: Cambridge University Press, 1994).

(August 1955), 195-206; reprinted in E.M. Carus-Wilson, ed., *Essays in Economic History*, 3 vols. (London, 1954-62), vol. II, 168-78, and in E.H. Phelps Brown and Sheila V. Hopkins, *A Perspective of Wages and Prices* (London, 1981), pp. 1-12.

Phelps Brown, E.H., and Sheila V. Hopkins, 'Seven Centuries of the Prices of Consumables, Compared with Builders' Wage Rates', *Economica*, 23:92 (November 1956), 296-314; reprinted in E.M. Carus-Wilson, ed., *Essays in Economic History*, 3 vols. (London, 1954-62), vol. II, pp. 179-96, and in E.H. Phelps Brown and Sheila V. Hopkins, *A Perspective of Wages and Prices* (London, 1981), pp. 13-59.

Phelps Brown, E.H. and Sheila V. Hopkins, *A Perspective of Wages and Prices* (London, 1981).

Pollard, Sidney , 'A New Estimate of British Coal Production, 1750-1850', *Economic History Review*, 2nd ser. 33 (1980), 212-35.

Postan, Michael, 'Economic and Political Relations of England and the Hanse from 1400 to 1475', in Eileen Power and Michael Postan, eds., *Studies in English Trade in the Fifteenth Century* (London, 1933).

Quinn, Stephen, 'The Glorious Revolution's Effect on English Private Finance: A Microhistory, 1680-1705', *Journal of Economic History*, 61:3 (Sept. 2001), 593-615.

Rabb, Theodore K. , *The Struggle for Stability in Early Modern Europe* (Oxford, 1976).

Rackham, Oliver, *Ancient Woodlans: Its History, Vegetation and Uses in England* (London, 1980).

Rackham, Oliver, *Trees and Woodland in the British Landscape* (London, 1976).

Ricardo, David, *The Principles of Political Economy and Taxation* (London, 1817).

Richards, R.D., *The Early History of Banking in England* (London, 1929; reissued 1958).

Riden, Philip , 'The Output of the British Iron Industry Before 1870', *Economic History Review*, 2nd ser. 30 (1977), 442-59.

Roberts, Richard; and David Kynaston, eds., *The Bank of England: Money, Power, and Influence, 1694 - 1994* (Oxford and New York: Oxford University Press, 1995).

Rogers, James E. Thorold, *A History of Agriculture and Prices in England, from the year after the Oxford Parliament (1259) to the Commencement of the Continental War (1793): Compiled Entirely from Original and Contemporaneous Records*, 7 vols. (Oxford, 1866-1902).

Ruding, Rogers, ed., *Annals of the Coinage of Great Britain and Its Dependencies: From the Earliest Period of Authentic History to the Reign of Victoria*, 3 vols. (London, 1840).

Ruiz-Martin, Felipe, 'Credito y banca: comercio y transportes en la Etapa del capitalismo mercantil', *Jornados*

de metodologia aplicada de las Ceincias Historicas 24-27 April 1973, Santiago de Compostella (Santiago de Compostella, 1973).

Rymer, Thomas, ed., *Foedera, conventiones, literae, et acta publica*, 12 vols. (London, 1709-12)

Saville, Richard, *The Bank of Scotland : a History, 1695-1995* (Edinburgh: Edinburgh University Press, 1996).

Schnapper, Bernard, *Les rentes au XVI siècle: histoire d'un instrument de crédit*, S.E.V.P.E.N , École Pratique des Hautes Études: Centre de recherches historiques: Affaires et gens d'affaires, vol. 12 (Paris, 1957).

Schnapper, Bernard, 'Les rentes chez les théologiens et les canonistes du XIIIe au XVIe siècles', in Georges Vedel (Centre National de la Recherche Scientifique), ed., *Études d'histoire du droit canonique dédiées à Gabriel le Bras*, 2 vols. (Paris, 1965), vol. I, pp. pp. 977-87

Schubert, H. R., *The History of the British Iron and Steel Industry from ca. 450 B.C. to A.D. 1775* (London, 1957).

Scott, William Robert, *The Constitution and Finance of English, Scottish and Irish Joint-Stock Companies to 1720*, 3 vols. (Cambridge: Cambridge University Press, 1912; reissued: Gloucester, Mass.: Peter Smith, 1968).

Sella, Domenico, *Commerci e industrie a Venezia nel secolo XVII* (Venice-Rome, 1961); and in Domenico Sella, 'Rise and Fall of the Venetian Woollen Industry', in Brian Pullan, ed., *Crisis and Change in the Venetian Economy in the Sixteenth and Seventeenth Centuries* (London, 1968), pp. 106-26; translated by the author, in a revised and expanded form, from 'Les mouvements longs de l'industrie lainière à Venise', *Annales: Économies, sociétés, civilisations*, 12 (1957), 29 - 45.

Shannon, H. A., 'The Coming of General Limited Liability', *Economic History*, 2 (1931), reissued in E. M. Carus-Wilson, ed., *Essays in Economic History*, Vol. I (London, 1954), pp. 358 - 79.

Shannon, H. A., 'The Limited Companies of 1866 - 1883', *Economic History Review*, 1st ser. 4 (1933), reissued in E. M. Carus-Wilson, ed., *Essays in Economic History*, Vol. I (London, 1954), pp. 380 - 405

Simpson, Alan, *The Wealth of the Gentry, 1540-1660* (Chicago, 1961)

Skeat, W.W., ed., *The Book of Husbandry by Master Fitzherbert* [*The Boke of Husbandry*, 1534] (London, 1882).

Smith, Adam, *An Inquiry Into the Nature and Causes of the Wealth of Nations* [1776], ed. Edwin Cannan (New York: Modern Library Random House, 1937)

Smith, Sir Thomas, *De Republica Anglorum* [1600], ed. L. Alston (London, 1906).

Spooner, Frank, *The International Economy and Monetary Movements in France, 1493-1725* (Paris, 1956; Harvard, 1972, for the English edn).

Spufford, Peter, *Money and Its Use in Medieval Europe* (Cambridge, 1988).

Steele, Robert; and James Lindsay (Earl of Crawford), eds., *A Bibliography of Royal Proclamations of the Tudor and Stuart Sovereigns, 1485- 1714*, 4 vols. (London, 1910).

Stone, Lawrence, *The Crisis of the Aristocracy, 1558-1641* (Oxford, 1956).

Stone, Lawrence , ed., *Social Change and Revolution in England, 1540-1640, Problems & Perspectives* Series (London, 1965).

Tann, Jennifer, 'Fuel Saving in the Process Industries during the Industrial Revolution: a Study in Technological Diffusion', *Business History*, 15 (1973), 149-59.

Tawney, Richard H., 'The Rise of the Gentry, 1558-1640', *Economic History Review*, 1st ser. 11 (1941). Reprinted with a postscript (1954) in E.M. Carus-Wilson, ed., *Essays in Economic History*, Vol. I (London, 1954), pp. 173-214.

Tawney, Richard, *The Agrarian Problem in the Sixteenth Century* (London, 1912).

Tawney, Richard H., *Religion and the Rise of Capitalism: : A Historical Study* (London: 1926).

TePaske, John H., 'New World Silver, Castile, and the Philippines, 1590-1800', in John F. Richards, ed., *Precious Metals in the Later Medieval and Early Modern Worlds* (Durham, N.C., 1983), pp. 425-45.

Thirsk, Joan, ed., *The Agrarian History of England and Wales*, Vol. IV: *1500-1640* (Cambridge, 1967).

Thomas, Brinley, 'Escaping from Constraints: The Industrial Revolution in a Malthusian Context', *The Journal of Interdisciplinary History*, 15 (Spring 1985), 729 - 54.

Thomas, Brinley, 'Was There an Energy Crisis in Great Britain in the 17th Century?' *Explorations in Economic History*, 23 (April 1986), 124 - 52.

Thompson, F.M.L, 'The Social Distribution of Landed Property in England Since the Sixteenth Century', *Economic History Review*, 2nd ser., 19:3 (December 1966), 505-17.

Thorner, Isidor, 'Ascetic Protestantism and the Development of Science and Technology', *American Journal of Sociology*, 58 (1952), 25-33.

Trevor-Roper, Hugh R. (Lord Dacre), *The Gentry, 1540-1640: Economic History Review Supplement*, no. 1 (Cambridge University Press, 1953), pp. 1 - 55

Trevor Roper, Hugh R., 'The General Crisis of the Seventeenth Century', *Past and Present*, no. 16 (Nov. 1959), 31-64, reprinted in: Trevor Aston, ed., *Crisis in Europe, 1560-1660: Essays from Past and Present* (London, 1965), pp. 59-96.

Unger, Richard, *The Ship in the Medieval Economy, 600-1600* (London and Montreal, 1980).

Unger, Richard, 'The Dutch Coal Trade in the Seventeenth and Eighteenth Centuries', *Mededelingen van de Nederlandse Vereinging voor Zeegeschiedenis*, 43 (1981), 6-14; republished in Richard W. Unger, *Ships and Shipping in the North Sea and Atlantic, 1400 - 1800*, Variorum Collected Series CS 601 (Aldershot and Brookfield, Vt., Ashgate, 1997).

Unger, Richard W., 'Warships and Cargo Ships in Medieval Europe', *Technology and Culture*, 22 (April 1981), 233 - 52.

Unger, Richard W., 'Energy Sources for the Dutch Golden Age: Peat, Wind and Coal', *Research in Economic History*, 9 (1984), 221-53.

Unger, Richard W., 'Portuguese Shipbuilding and the Early Voyages to the Guinea Coast', in *Vice-Almirante A. Teixeira Da Mota, In Memoriam*, I (Lisbon, 1987), 229-49

Unger, Richard W. , *Ships and Shipping in the North Sea and Atlantic, 1400 - 1800*, Variorum Collected Series CS 601 (Aldershot and Brookfield, Vt., Ashgate, 1997).

Usher, Abbott Payton, *The Early History of Deposit Banking in Mediterranean Europe*, vol. I: *The Structure and Functions of the Early Credit System: Banking in Catalonia: 1240-1723*, Harvard Economic Studies, vol. 75 (Cambridge, Mass., 1943; reissued New York, 1967).

Van Winter, Johanna Maria, ed., *The Interactions of Amsterdam and Antwerp with the Baltic Region, 1400 - 1800 (De Nederlanden en het Oostzeegebied, 1400 - 1800)*, Het Nederlandsch Economisch-Historisch Archief no. 16 (Leiden: Martinus Nijhoff, 1983).

Van Bavel, Bas J. P. ; and Jan Luiten van Zanden, 'The Jump-Start of the Holland Economy during the Late-Medieval Crisis, c. 1350 - c. 1500', *The Economic History Review*, 2nd ser., 57:3 (August 2004), 503-32.

Van Houte, J.A., 'Anvers aux XVe et XVIe siècle', *Annales: E.S.C.* 16 (1961), 248-78.

Van der Wee, Herman, *Growth of the Antwerp Market and the European Economy, 14th to 16th Centuries*, 3 Vols. (The Hague, 1963).

Van der Wee, Van der Wee, Herman, 'Structural Changes in European Long-Distance Trade, and Particularly in the Re-export Trade from South to North, 1350 - 1750', in James D. Tracy, ed., *The Rise of Merchant Empires: Long-Distance Trade in the Early Modern World, 1350 - 1750* (Cambridge and New York: Cambridge University Press, 1990), pp. 14 - 33

Van der Wee, Herman, 'Anvers et les innovations de la technique financière aux XVIe et XVIIe siècles', *Annales: E.S.C.*, 22 (1967), 1067-89, republished as 'Antwerp and the New Financial Methods of the 16th and 17th Centuries', in Herman Van der Wee, *The Low Countries in the Early Modern World* , trans. by Lizabeth Fackelman, Variorum Series (Cambridge: Cambridge University Press, 1993), pp. 145-66.

Van der Wee, Herman, 'Monetary, Credit, and Banking Systems', in E.E. Rich and Charles Wilson, eds., *The Cambridge Economic History of Europe*, V: *The Economic Organization of Early Modern Europe* (Cambridge, 1977), p. 325.

Van der Wee, Herman, 'The Medieval and Early-Modern Origins of European Banking', in Dino Puncuh and Giuseppe Felloni, eds., *Banchi pubblici, banchi privati e monti di pietà nell'Europa preindustriale: Amministrazione, tecniche operative e ruoli economici*, Atti della Società Ligure di Storia Patria, new series, vol. 31, 2 vols. (Genoa: Società Ligure di Storia Patria, 1991, pp. 1157 - 73.

Van der Wee, Herman, 'European Banking in the Middle Ages and Early Modern Period (476-1789)', in Herman Van der Wee and G. Kurgan-Van Hentenryk, eds., *A History of European Banking*, 2nd edn. (Antwerp: Mercator Fonds, 2000), pp. 152-80

Van der Wee, Herman (in collaboration with John Munro), 'The Western European Woollen Industries, 1500 -

1750', in David Jenkins, ed., *The Cambridge History of Western Textiles*, 2 vols. (Cambridge and New York: Cambridge University Press, 2003), Vol. I, chapter eight, pp. 397- 472.

Van Houtte, J.A., 'La genese du grande marché international d'Anvers à la fin du moyen age', *Revue belge de philologie et d'historie*, 19 (1940), 87-126.

Van Stuivenberg, J. H., 'The Weber Thesis: Attempt at Reinterpretation', *Acta Historiae Neerlandica*, 8 (1975), 50-66.

Walton, Gary, 'The New Economic History and the Burdens of the Navigation Acts', *Economic History Review*, 2nd ser., 24:4 November (1971), 533-42.

Weber, Max, *Die Protestantische Ethik und der Geist des Kapitalismus* (Berlin, 1904-05); reissued in English translation as *The Protestant Ethic and the Spirit of Capitalism*, by Talcott Parsons (New York, 1930). Forward by Tawney and Preface by Weber (pp. 1-31).

Wells, John; and Douglas Wills, 'Revolution, Restoration, and Debt Repudiation: The Jacobite Threat to England's Institutions and Economic Growth', *Journal of Economic History*, 60:2 (June 2000), 418-41.

Westermann, Ekkehard, 'Die Bedeutung des Thüringer Saigerhandels für den mitteleuropäischen Handel an der Wende vom 15. zum 16. Jahrhundert', *Jahrbuch für die Geschichte Mittel- und Ostdeutschlands*, 21 (1972), 68-92. [Ed. by Wilhelm Berges, Hans Herzfeld, and Henryk Skrzypczak].

Westermann, Ekkehard 'Die Unternehmungsform der Saigerhandelsgesellschaft und ihre Bedeutung für den oberdeutschen Frühkapitalismus: Forschungs-stand und - aufgeben', in Simonetta Cavaciocchi, ed., *L'impresa industria, commercio, banca seccoli XIII - XVIII*, Istituto internazionale di storia economica 'F. Datini' Prato, series II, Atti delle 'Settimane di Studi' e altri Convegni vol. 22 (Prato, 1991), 577-86.

Weston, Sir Richard, *A Discourse of Husbandrie Used in Brabant and Flanders* (London, 2nd ed., 1652).

Willan, Thomas S., *The Early History of the Russia Company, 1553 - 1603* (Manchester: Manchester University Press, 1956, repr. 1968).

Willan, Thomas S., *Studies in Elizabethan Foreign Trade* (New York: A. M. Kelly, 1968).

Willan, Thomas S., *The Muscovy Merchants of 1555* (New York: A. M. Kelly, 1973)

Wilson, Charles, 'Treasure and Trade Balances: the Mercantilist Problem', *Economic History Review*, 2nd ser., 2:2 (1949), 152-61.

Wilson, Charles, *Mercantilism*, Historical Association pamphlet No. 37 (London, 1958: reissued 1966).

Wilson, Charles, 'Mercantilism: Some Vicissitudes of an Idea', *Economic History Review*, 2nd ser., 10:2 (1957), 181-85.

Wilson, Charles, 'The Other Face of Mercantilism', *Transactions of the Royal Society*, 5th ser. 9 (1959), republished in Charles Wilson, *Economic History and the Historian: Collected Essays* (London, 1969).

Wilson, Charles, 'Trade, Society, and the State', in E.E. Rich and Charles Wilson, eds., *Cambridge Economic*

History of Europe, Vol. IV: *The Economy of Expanding Europe in the 16th and 17th Centuries* (Cambridge, 1967), Chapter 8, pp. 487-575.

Wrigley, E. Anthony, 'The Supply of Raw Materials in the Industrial Revolution', *Economic History Review*, 2nd ser., 15 (1962), 1-16.

Wrigley, E. Anthony, *Continuity, Chance and Change: The Character of the Industrial Revolution in England* (Cambridge University Press, 1988).

Wrigley, E. Anthony, 'The Divergence of England: the Growth of the English Economy in the Seventeenth and Eighteenth Centuries', *Transactions of the Royal Society*, 6th ser., 10 (2000), 117-41.

Wrigley, E. Anthony; R.S. Davies, J.E. Oeppen, and R. S. Schofield, *English Population History from Family Reconstitution*, Cambridge Studies in Population, Economy and Society in Past Time no. 32 (Cambridge and New York: Cambridge University Press, 1997).

Youings, Joyce, 'The Church', in in Joan Thirsk, ed., *The Agrarian History of England and Wales*, Vol. IV: *1500 - 1640* (Cambridge: Cambridge University Press, 1967), pp. 306-56.

Zell, Michael, *Industry in the Countryside: Wealden Society in the Sixteenth Century* (Cambridge: Cambridge University Press, 1993).

Table 1. Composite Consumer Price Indexes for Southern England, Brabant, and Spain in quinquennial means, from 1451-55 to 1696-1700 (1501 - 1650 for Spain)
Base A: mean of 1451-75 = 100
Base B: mean of 1501-10 = 100

Years	ENGLAND: A Phelps Brown & Hopkins (Revised) base: 1451-75 =100	ENGLAND: B Phelps Brown & Hopkins (Original) base: 1451-75 =100	BRABANT: Van der Wee Index base: 1451-75 =100	SPAIN: Hamilton Index Silver base base: 1501-10 = 100	SPAIN: Hamilton Index Vellon base base: 1501-10 = 100	ENGLAND: A Phelps Brown & Hopkins (Revised) base: 1501-10 =100	BRABANT: Van der Wee Index base: 1501-10 =100
1451-55	101.750	100.400	98.545			96.245	82.035
1456-60	97.961	97.000	114.577			92.661	95.382
1461-65	101.497	102.800	91.070			96.006	75.813
1466-70	102.720	106.400	96.953			97.164	80.710
1471-75	96.072	97.800	98.854			90.875	82.293
1476-80	92.667	91.000	120.693			87.654	100.473
1481-85	121.383	129.800	155.752			114.816	129.658
1486-90	101.269	102.800	174.098			95.791	144.931
1491-95	102.545	103.400	133.216			96.997	110.898
1496-1500	98.538	96.800	115.352			93.208	96.026
1501-05	106.386	110.600	125.449	92.43	92.43	100.631	104.432
1506-10	105.052	99.800	114.801	107.57	107.57	99.369	95.568
1511-15	106.014	108.600	137.904	98.98	98.98	100.279	114.800
1516-20	123.827	120.600	150.264	104.28	104.28	117.128	125.090
1521-25	146.989	145.000	179.938	122.14	122.14	139.037	149.792
1526-30	159.872	157.400	178.519	131.57	131.57	151.223	148.611
1531-35	162.862	155.600	173.995	132.44	132.45	154.051	144.845
1536-40	153.694	152.400	185.641	138.73	138.74	145.380	154.540
1541-45	179.615	175.400	208.340	147.90	147.90	169.898	173.435
1546-50	230.060	229.600	199.420	165.89	165.89	217.615	166.010

Years	ENGLAND: A Phelps Brown & Hopkins (Revised) base: 1451-75 =100	ENGLAND: B Phelps Brown & Hopkins (Original) base: 1451-75 =100	BRABANT: Van der Wee Index base: 1451-75 =100	SPAIN: Hamilton Index Silver base base: 1501-10 = 100	SPAIN: Hamilton Index Vellon base base: 1501-10 = 100	ENGLAND: A Phelps Brown & Hopkins (Revised) base: 1501-10 =100	BRABANT: Van der Wee Index base: 1501-10 =100
1551-55	272.123	273.200	260.515	176.02	176.02	257.401	216.870
1556-60	320.268	305.800	300.717	194.01	194.01	302.942	250.337
1561-65	288.711	279.667	313.937	223.43	223.43	273.093	261.342
1566-70	283.439	285.200	318.290	227.73	227.73	268.106	264.965
1571-75	300.217	295.750	423.432	246.77	246.76	283.976	352.492
1576-80	327.590	338.200	480.716	247.82	247.82	309.868	400.179
1581-85	325.519	337.000	617.424	269.07	269.07	307.909	513.984
1586-90	354.849	387.800	799.754	274.97	274.98	335.653	665.767
1591-95	373.779	416.200	688.333	284.42	284.43	353.559	573.013
1596-1600	487.788	540.400	752.946	320.98	320.98	461.400	626.801
1601-05	410.001	461.400	612.324	349.92	352.43	387.821	509.738
1606-10	463.302	497.200	615.893	330.12	335.31	438.239	512.709
1611-15	480.944	532.800	636.132	316.82	322.68	454.926	529.557
1616-20	474.693	520.400	626.963	328.56	335.64	449.013	521.925
1621-25	487.633	529.800	815.752	317.86	344.72	461.253	679.085
1626-30	489.918	523.800	919.647	328.05	410.81	463.414	765.574
1631-35	564.974	607.000	908.534	329.91	395.13	534.410	756.322
1636-40	552.268	614.800	967.668	323.47	409.67	522.392	805.549
1641-45	524.076	560.200	987.167	313.50	432.48	495.724	821.781
1646-50	646.404	733.200	1015.138	343.36	457.09	611.435	845.067
1651-55	547.229	601.000	904.328			517.625	752.821
1656-60	595.074	640.200	843.466			562.882	702.155
1661-65	602.474	673.000	880.614			569.882	733.080
1666-70	532.507	598.400	738.109			503.699	614.449
1671-75	565.779	615.600	828.706			535.172	689.868
1676-80	544.446	611.800	785.958			514.993	654.282
1681-85	525.522	595.000	736.552			497.092	613.153

Years	ENGLAND: A Phelps Brown & Hopkins (Revised) base: 1451-75 =100	ENGLAND: B Phelps Brown & Hopkins (Original) base: 1451-75 =100	BRABANT: Van der Wee Index base: 1451-75 =100	SPAIN: Hamilton Index Silver base base: 1501-10 = 100	SPAIN: Hamilton Index Vellon base base: 1501-10 = 100	ENGLAND: A Phelps Brown & Hopkins (Revised) base: 1501-10 =100	BRABANT: Van der Wee Index base: 1501-10 =100
1686-90	477.565	547.600	652.217			451.730	542.947
1691-95	520.997	605.000	896.157			492.812	746.019
1696-1700	627.490	720.200	967.995			593.545	805.821

Sources:

Spain: the consumer price index has been calculated from data in Earl J. Hamilton, 'American Treasure and the Rise of Capitalism, 1500-1700', *Economica*, 27 (Nov. 1929), 338-57; Earl Hamilton, *American Treasure and the Price Revolution in Spain, 1501-1650* (Cambridge, Mass., 1934; reissued 1965), Chapter XII: 'Wages: Money and Real', pp. 262-82; and Chapter XIII: 'Why Prices Rose', pp. 283-308; Appendices (pp. 309-403), with statistical tables on prices and wages. I have changed the base from the original, 1581-90 = 100, to the one used here: 1501-10 = 100.

Brabant: the consumer price index has been calculated from tables in Herman Van der Wee, 'Prijzen en lonen als ontwikkelingsvariabelen: Een vergelijkend onderzoek tussen Engeland en de Zuidelijke Nederlanden, 1400-1700', in *Album aangeboden aan Charles Verlinden ter gelegenheid van zijn dertig jaar professoraat* (Gent, 1975), pp. 413-47; reissued in English translation (without the tables) as 'Prices and Wages as Development Variables: A Comparison Between England and the Southern Netherlands, 1400-1700', *Acta Historiae Neerlandicae*, 10 (1978), 58-78; republished in Herman Van der Wee, *The Low Countries in the Early Modern World* , trans. by Lizabeth Fackelman (Cambridge and New York: Cambridge University Press and Variorum, 1993), pp. 223-41.

Southern England: the English consumer price index has been calculated from data in: The Phelps Brown Papers Collection: boxes Ia:324, J.IV.2a; the Archives of the British Library of Political and Economic Science. Because of my corrections of many stastistical errors and especially because of my very different methods in dealing with statistical lacunae, my index numbers differ from those published in: E. H. Phelps Brown and Sheila V. Hopkins, 'Seven Centuries of the Prices of Consumables, Compared with Builders' Wage Rates', *Economica*, 23:92 (November 1956), 296-314: reprinted in E.H. Phelps Brown and Sheila V. Hopkins, *A Perspective of Wages and Prices* (London, 1981), pp. 13-39 (with price indexes for sub-groups not in the original publication).

Table 2. Price Relatives for Fuels and Components of the Phelps Brown and Hopkins 'Basket of Consumables' (Revised Version) 1451-60 to 1781-90, in decennial means
Base (1) 1451 - 1475 = 100 Base (2) 1581-90 = 100

Decade	Charcoal Index 1451-75 = 100	Charcoal Index 1581-90 = 100	Coal Index 1451-75 = 100	Coal Index 1581-90 = 100	Timber Index 1451-75 = 100	Timber Index 1581-90 = 100	Phelps Brown & Hopkins Baset of Consumables Index 1451-75 = 100	Phelps Brown & Hopkins Baset of Consumables Index 1581-90 = 100
							112.801 d. sterling	
1451-60	101.901	42.582			109.451	32.174	99.855	29.353
1461-70	88.482	36.975			94.712	27.841	102.109	30.016
1471-80	99.226	41.464			94.155	27.678	94.370	27.741
1481-90	87.791	36.686			108.235	31.817	111.326	32.725
1491-1500	81.152	33.912			92.332	27.142	100.542	29.555
1501-10	88.261	36.882			86.254	25.355	105.719	31.077
1511-20	93.910	39.243			99.291	29.187	114.921	33.782
1521-30	95.125	39.751			102.816	30.224	153.430	45.102

Decade	Charcoal Index 1451-75 = 100	Charcoal Index 1581-90 = 100	Coal Index 1451-75 = 100	Coal Index 1581-90 = 100	Timber Index 1451-75 = 100	Timber Index 1581-90 = 100	Phelps Brown & Hopkins Baset of Consumables Index 1451-75 = 100	Phelps Brown & Hopkins Baset of Consumables Index 1581-90 = 100
							112.801 d. sterling	
1531-40	90.205	37.695			97.954	28.794	158.278	46.527
1541-50	106.839	44.646			120.644	35.464	204.838	60.214
1551-60	171.315	71.589			181.625	53.390	296.195	87.069
1561-70	187.847	78.498			179.498	52.765	286.075	84.094
1571-80	208.752	87.233			216.066	63.514	313.903	92.275
1581-90	239.303	100.000	274.605	100.000	248.987	100.000	340.184	100.000
1591-1600	254.108	106.186	260.707	94.939	295.583	118.714	430.784	126.632
1601-10	280.911	117.387	288.045	104.894	349.473	140.358	436.652	128.357
1611-20	329.714	137.781	288.171	104.940	408.732	164.158	477.818	140.459
1621-30	325.204	135.896	316.146	115.128	455.835	183.076	488.775	143.680
1631-40	332.175	138.809	354.618	129.138	494.834	198.739	558.621	164.211
1641-50	433.398	181.108	530.691	193.256	528.363	212.205	585.240	172.036

Decade	Charcoal Index 1451-75 = 100	Charcoal Index 1581-90 = 100	Coal Index 1451-75 = 100	Coal Index 1581-90 = 100	Timber Index 1451-75 = 100	Timber Index 1581-90 = 100	Phelps Brown & Hopkins Baset of Consumables Index 1451-75 = 100	Phelps Brown & Hopkins Baset of Consumables Index 1581-90 = 100
							112.801 d. sterling	
1651-60	539.616	225.495	473.712	172.507			571.151	167.895
1661-70	607.687	253.940	454.453	165.493			567.490	166.819
1671-80	593.218	247.894	502.520	182.997			555.113	163.180
1681-90	572.798	239.360	400.096	145.699			501.543	147.433
1691-1700	572.030	239.040	488.295	177.817			574.244	168.804
1701-10	685.289	286.368	535.404	194.973			603.321	177.351
1711-20	727.951	304.196	503.508	183.357			646.880	190.156
1721-30	727.951	304.196	486.866	177.297			604.489	177.695
1731-40	729.749	304.947	516.680	188.154			557.411	163.856
1741-50	757.913	316.716	545.668	198.710			593.490	174.461
1751-60	757.913	316.716	593.049	215.964			633.596	186.251

Decade	Charcoal Index 1451-75 = 100	Charcoal Index 1581-90 = 100	Coal Index 1451-75 = 100	Coal Index 1581-90 = 100	Timber Index 1451-75 = 100	Timber Index 1581-90 = 100	Phelps Brown & Hopkins Baset of Consumables Index 1451-75 = 100	Phelps Brown & Hopkins Baset of Consumables Index 1581-90 = 100
							112.801 d. sterling	
1761-70	794.754	332.111	604.946	220.297			710.712	208.92
1771-80	794.754	332.111	656.900	239.217			806.887	237.191
1781-90	794.754	332.111	669.944	243.967			838.616	246.518

coal	Cambridge coal: spliced to combined charcoal index over 1586-1635multiplier = 20.15607
coal	Westminster coal: spliced to combined charcoal index over 1586-1635multiplier = 17.3983

Source: The Phelps Brown Papers Collection, Archives of the British Library of Political and Economic Science (LSE Archives); Peter Bowden, 'Agricultural Prices, Farm Profits, and Rents', in Joan Thirsk, ed., *The Agrarian History of England and Wales*, Vol. IV: *1500 - 1640* (Cambridge: Cambridge University Press, 1967), Table VI, pp. 846-850. I have converted his original base, 1450-99= 100 (7.99s for 100 faggots) to the PBH base of 1451-75,

Phelps Brown and Hopkins 'basket of consumables' composite price index
index numbers for each component of the basket accounted for by each component
Mean of 1451-75 = 100

	A	B	C	D	E	F	G	H
Decade	**Total Grains Wheat, Rye, barley, peas**	**Meat pigs, mutton beef**	**Fish: herring & cod**	**Dairy Products Butter & cheese**	**Drink: Malt, Hops, Sugar**	**Fuel & Light**	**Textiles: Woollens Canvas/Linen**	**Total Basket**
	21.799 d. sterling	23.950 d. sterling	6.595 d. sterling	15.579 d. sterling	24.227 d. sterling	8.153 d. sterling	12.499 d. sterling	112.801 d. sterling
1451-60	98.205	101.274	100.484	101.973	97.516	102.908	99.586	99.855
1461-70	102.284	103.566	96.702	104.281	102.624	98.520	100.498	102.109
1471-80	103.038	86.718	102.964	82.797	91.711	95.517	108.211	94.370
1481-90	128.783	108.696	85.993	102.140	116.090	97.384	110.594	111.326
1491-1500	101.801	107.231	82.025	100.763	94.904	83.970	116.758	100.542
1501-10	116.135	110.012	91.043	103.377	98.096	90.767	114.520	105.719
1511-20	119.173	128.566	89.038	116.859	106.600	97.628	120.004	114.921
1521-30	157.441	186.591	104.485	162.794	155.329	98.358	129.290	153.430
1531-40	178.652	185.055	112.226	161.454	152.833	102.054	139.002	158.278

	A	B	C	D	E	F	G	H
Decade	**Total Grains Wheat, Rye, barley, peas**	**Meat pigs, mutton beef**	**Fish: herring & cod**	**Dairy Products Butter & cheese**	**Drink: Malt, Hops, Sugar**	**Fuel & Light**	**Textiles: Woollens Canvas/Linen**	**Total Basket**
	21.799 d. sterling	23.950 d. sterling	6.595 d. sterling	15.579 d. sterling	24.227 d. sterling	8.153 d. sterling	12.499 d. sterling	112.801 d. sterling
1541-50	181.268	272.304	167.060	237.576	190.562	128.158	173.480	204.838
1551-60	285.846	350.572	185.443	305.862	352.783	191.712	214.901	296.195
1561-70	264.061	366.025	188.204	296.198	285.009	213.906	259.432	286.075
1571-80	313.913	414.454	185.475	297.801	306.580	239.777	271.588	313.903
1581-90	431.527	366.004	130.824	334.891	331.327	277.880	306.264	340.184
1591-1600	604.781	384.699	118.343	407.013	514.884	292.103	337.544	430.784
1601-10	588.605	385.281	119.448	442.823	519.007	317.750	347.663	436.652
1611-20	664.049	434.253	121.249	513.017	538.147	349.062	347.801	477.818
1621-30	671.182	443.118	128.373	481.933	591.550	357.414	343.285	488.775
1631-40	785.347	478.144	131.753	520.137	743.186	379.521	349.664	558.621
1641-50	829.531	518.351	153.599	547.188	721.800	485.661	362.773	585.240
1651-60	722.526	556.496	158.338	543.490	693.343	497.464	398.726	571.151
1661-70	705.818	565.890	157.958	529.850	673.967	524.972	413.640	567.490

	A	B	C	D	E	F	G	H
Decade	**Total Grains Wheat, Rye, barley, peas**	**Meat pigs, mutton beef**	**Fish: herring & cod**	**Dairy Products Butter & cheese**	**Drink: Malt, Hops, Sugar**	**Fuel & Light**	**Textiles: Woollens Canvas/Linen**	**Total Basket**
	21.799 d. sterling	23.950 d. sterling	6.595 d. sterling	15.579 d. sterling	24.227 d. sterling	8.153 d. sterling	12.499 d. sterling	112.801 d. sterling
1671-80	703.111	559.379	157.958	527.606	631.799	525.039	403.619	555.113
1681-90	583.210	519.598	159.033	453.570	605.067	474.401	382.064	501.543
1691-1700	766.594	523.382	183.232	503.960	719.238	525.925	380.604	574.244
1701-10								603.321
1711-20								646.880
1721-30								604.489
1731-40								557.411
1741-50								593.490
1751-60								633.596
1761-70								710.712
1771-80								806.887
1781-90								838.616

Source: The Phelps Brown Papers Collection, Archives of the British Library of Political and Economic Science (LSE Archives).