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Money, Prices, Wages, and 'Profit Inflation' in Spain, the Southern Netherlands, and England during the Price Revolution era: ca. 1520 - ca. 1650

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This is a substantially revised version of an earlier Working Paper (posted in 2002, with a different title), based on much new data and other information. It re-examines Earl Hamilton's famous 1929 thesis on 'Profit Inflation' and the 'birth of modern industrial capitalism': namely, that the inflationary forces of the Price Revolution era produced a widening gap between prices and wages, thus providing industrial entrepreneurs with windfall profits, which they reinvested in larger-scale, more capital intensive forms of industry. Hamilton's analyses of price and wage data for 16th- and 17th-century Spain, France, and England led him to conclude 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 Hamilton's view, why Spain subsequently 'declined', while England became the homeland of the modern Industrial Revolution. A major reason for the significance and fame of the Hamilton thesis was its enthusiastic endorsement by John Maynard Keynes, in his *Treatise of Money*, published the following year, in 1930. Subsequently, the Hamilton 'profit inflation' thesis was subjected to severe attacks: by John Nef (1936-37) and David Felix (1956). But they had to rely on the same dubious and indeed often untrustworthy price and wage data for England and France (and of course on Hamilton's data for Spain, which was of much higher quality). Both rightly noted that the proper comparison had to be made between industrial wages and industrial prices, not the price level in general. Since industrial prices generally rose less than did the overall price level (heavily weighted with foodstuffs), they found much less evidence for 'profit inflation' than had Hamilton. Nef developed a counter thesis to argue that sharply rising raw material costs, especially for wood and charcoal, forced industrialists to devise new furnace technologies to burn coal instead of wood or charcoal: changes that not inly reduced such costs but resulted in much larger-scale, more capital-intensive forms of industry. In this revised paper, I offer new data to demonstrate that neither the 'energy' nor the new furnace technologies took place until after the 1640s.

This study is based on newer sets of price and wage indices that appeared after their publications: those by Phelps Brown and Hopkins for England (which I have modified, after using their data sheets in the LSE Archives), and for this version, additional price date for England. For the southern Netherlands, I have utilized Herman Van der Wee Consumer Price Index. My analyses of both industrial prices and industrial wages suggest that, for England, there is more evidence for potential 'profit inflation', in some industries, than Nef or Felix had been willing to concede. But the major discovery was that the Antwerp region continuously experienced, over the 16th and 17th centuries, the contrary phenomenon: what Keynes had called 'Profit Deflation' (for him, a truly negative force), in that industrial wages rose faster than industrial prices. And yet indisputably the southern Netherlands had a much more industrialized and more rapidly growing economy than did England, at least until the Revolt of the Netherlands (1568-1609). The concept of 'profit inflation' is not, therefore, a useful analytical tool, if based only on labour costs.

This study concludes with a brief examination of the effects on inflation on two other factor costs: land, in terms of real rents, and capital, in terms of real interest rates, which did fall with inflation. In all likelihood both such costs did lag behind industrial prices in early-modern England and the Low Countries (and contrary to Eric Kerridge's 1953 assertions on English rents), though real interest rates lagged more than did real rents. While disputing the Nef thesis, I do analyse the forms and nature of other new, larger-scale industries in this era (mining, metallurgy shipbuilding). I also provide a new appendix on the role of coinage debasements, as an another important monetary factor in determining regional differences in inflation rates; and this contradicts the almost universal assumption that debasements were irrelevant.

JEL Classifications: B2, E2, E3, J3, N1, N3, O1, O5

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Introduction: Hamilton, 'Profit Inflation', and the Historiography of the Price Revolution

In the twentieth-century historiography of the early-modern Price Revolution, and especially of its Spanish connections, no economic historian is more renowned – and indeed more controversial – than the late Earl Hamilton (1899-1989). His fame rests on two theses. The first is his explanation of that Price Revolution, in terms of the Quantity Theory of Money: that the long, sustained era of inflation, from the early sixteenth to the mid seventeenth century, was fundamentally the product of monetary factors. Of these the most important, though only from the 1550s, was the vast influx of treasure (gold and silver) from the Spanish Americas, above all, the silver from the mines of Potosí in modern-day Bolivia (then Peru) and Zacatecas, in Mexico.[1]

The second concerns the principal consequence of that Price Revolution: so-called 'profit inflation', which he saw as the fundamental instrument in the birth of modern industrial capitalism.[2] His theories have,

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[1] See John H. Munro, 'Classic Review of Earl Hamilton, *American Treasure and the Price Revolution in Spain, 1501-1650* (Cambridge, MA: Harvard University Press, 1934. xii + 428 pp.). Subtitled: *Hamilton and the Price Revolution: A Revindication of His Tarnished Reputation and of a Modified Quantity Theory of Money'*. Reviewed for EH.NET BOOK REVIEW, <eh.net-review@eh.net> on 15 January 2007. This review is archived at EH.NET, at this web site: http://eh.net/bookreviews/library/munro. See also John Munro, 'Price Revolution', in Steven N. Durlauf and Lawrence E. Blume, eds., *The New Palgrave Dictionary of Economics*, 2nd edition, 6 vols. (London and New York: Palgrave Macmillan, 2008), vol. 6, pp. 631-34; and 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 Munro, 'Inflation', in Jonathan Dewald, et al, eds., *Europe, 1450-1789: Encyclopedia of the Early Modern World* (New York: Charles Scribner's Sons/The Gale Group, 2004), Vol. 3, pp. 262-265; and John Munro, 'Money and Coinage: Western Europe', in Jonathan Dewald, et al, eds., *Europe, 1450-1789: Encyclopedia of the Early Modern World* (New York: Charles Scribner's Sons/The Gale Group, 2004), Vol. 4, pp. 174-184. See the next note.

[2] 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); 'Revisions in Economic History VIII: The Decline of Spain', *Economic History Review*, 1st ser., 8:2 (May 1938), 168-79; reprinted in E.M. Carus-Wilson, ed., *Essays in Economic History*, 3 vols (London: 1954-62), vol. I, pp. 215-26; *War and Prices in Spain, 1651-1800* (Cambridge, Mass: Harvard University Press, 1947) '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

of course, been subject to repeated attacks, and also to some unfair ridicule during the past seventy years.[3]

A few brief comments need to be offered here on his first and most famous thesis. First, in fairness to this oft-maligned and sadly misunderstood scholar, he had also contended that, in the first half of the sixteenth century, other monetary factors were probably more important than Spanish silver imports: in particular, the Central European silver-copper mining boom and also some unnamed 'financial innovations'. Regrettably, he failed to provide any elaboration, let alone economic analyses, of these two other monetary factors. Second, for the first half of the seventeenth century, he contended that the role of Spanish issues of copper *vellon* coinages was as important or even more important than the now diminishing influxes of Spanish American silver in producing the inflation that continued up to the 1650s.[4] Just the same, the very title of his famous monograph – *American Treasure and the Price Revolution in Spain* – has led most casual readers to believe that the 'prime mover' of that inflation was indeed 'American treasure'.

Hamilton, of course, was hardly the first to contend that the the influx of Spanish American silver had played such an important role in the European Price Revolution. Adam Smith had said as much in his famous *Wealth of Nations* (1776).[5] Even during the midst of the Price Revolution era itself, in 1568, the renowned French philosopher Jean Bodin won a signal victory over his debate opponent, Jean Cherruyt de Malestroit, in supposedly 'demonstrating' that the current inflation of prices in France was due far more to that Spanish silver influx than to any coinage debasements.[6] Less well known is an even earlier Spanish publication, a treatise of 1556, by the cleric Azpilcueta Navarra, of the Salamanca School, which made virtually the same contention about the role of Spanish American silver in the current rise of prices.[7]

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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.

[3] See above n. 1, and below, nn. 33, 43, 53.

[4] See note 2 above. Spanish-American imports into Seville had reached their peak, at a quinquennial mean of 273,704.54 kg. in 1591-95; then fell to a mean of 206,045.26 kg. in 1626-60; and to a mean of just 27,965.33 kg. in 1656-60, after which bullion imports were no longer taxed, and thus no longer recorded. See Munro, 'Monetary Origins', Table 1.2, pp. 4-5.

[5] Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* [1776], ed. with introduction by Edwin Cannan and Max Lerner, Modern Library Edition (New York, 1937), p. 34: 'the discovery of the mines of America diminished the value of gold and silver in Europe'.

[6] 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, 1946). See also Jean-Yves Le Branchu, ed., *Écrits notables dur la monnaie, XVIe siècle: De Copernic à Davanzati reproduits, traduits, d'après les éditions originales et les manuscrits, avec une introduction, des notices et des notes*, Collection des principaux économistes, nouvelle édition, 2 vols. (Paris, 1934): *Les paradoxes du Seigneur de Malestroict, conseiller du Roy, et Maistre ordinaire de ses comptes, sur le faict des monnoyes, presentez à sa Majesté, au mois de mars MDLXVI* (Paris, 1566); *La response de maistre Jean Bodin advocat en la cour au paradoxe des monsieur de Malestroit touchant l'enchérissement de toutes choses et le moyen d'y remedier* (Paris, 1568). As will be noted later, however, Bodin was not fully correct about the role of coinage debasements in the Price Revolution.

[7] Marjorie Grice-Hutchinson, *The School of Salamanca: Readings in Spanish Monetary Theory, 1544 - 1605* (Oxford, 1952): Appendix III, p. 95: 'And even in Spain, in times when money was scarcer, saleable

Yet, as recent critics have correctly noted — all of whom had not read Hamilton's work carefully, the influx of Spanish American silver cannot have provided the *initial* cause of that long sustained inflation, because it had commenced in Spain itself, the Low Countries, England, and elsewhere from about 1516-20, and thus long before any significant importations of such silver, i.e., from the later 1550s (see graph A and Table 1). But most of these critics are just as incorrect in ascribing the fundamental causes to demographic factors alone – for that is, quite simply, bad economic theory.

To be sure, population growth did play some important roles, especially in influencing relative price changes (i.e., in particular, in explaining why grain, timber, and wood-fuel prices rose more than other prices during this era). In terms of the modernized income-version of the so-called Quantity Theory, the consequences of demographic changes, especially those inducing structural changes in the economy, are reflected in two of the variables in the Equations of Exchange: M.V = P. y (income velocity equation) and M = k.P.y (cash balances equation). For population growth, in conjunction with many other 'real' factors, clearly had an influence on the *real* variable *y* (net national income at constant prices), and thus on the economy's ability or capacity to expand in response to increasing *monetized* aggregate demand (i.e., in terms of the elasticities of supply in the various economic sectors). And, as both Jack Goldstone and Peter Lindert have contended, demographically-induced structural changes in urbanization, market structures, and payments systems may also have increased *V* – the income velocity of high-powered money; or conversely, in reducing the variable *k:* i.e., the demand to hold real cash balances (influenced by real interest rates).[8]

Nevertheless, monetary forces do remain fundamental in any complete explanation of the Price Revolution. The *initial* monetary forces responsible for instigating the onset of the Price Revolution in the early sixteenth-century were, as Hamilton himself actually suggested (two of them), and as I have argued at great length, elsewhere, a combination of three factors: (1) the South German silver-copper mining boom (c. 1460-c.1535), which culminated in the 1530s, (2) structural changes in Mediterranean trade, with Ottoman conquests, that diverted more and more of the new silver flows away from the Levant to north-west Europe, from 1517; and (3) a veritable 'financial revolution', with the introduction of fully negotiable credit instruments, in the 1530s, in private and public finance, producing a dramatic expansion in the effective stocks and flows of European money supplies.[9] Subsequently, and certainly from the 1550s, the influx of Spanish American silver quite clearly served to add a more powerful fuel to the ongoing inflationary forces in the European economy, as did coinage debasements (and, in Spain, especially issues of copper *vellon*). Again, in this respect, Hamilton was perfectly correct. Though the interminable debate about the *causes* of the European 'Price Revolution' are not the focus of this study, some basic knowledge of both the monetary

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goods and labour were given for very much less than after the discovery of the Indies, which flooded the country with gold and silver'.

[8] Jack A. Goldstone, 'Urbanization and Inflation: Lessons from the English Price Revolution of the Sixteenth and Seventeenth Centuries', *American Journal of Sociology*, 89 (1984), 1122-60; Jack A. Goldstone','The Causes of Long Waves in Early Modern Economic History', in Joel Mokyr, ed., *The Vital One: Essays in Honor of Jonathan R. T. Hughes*, *Research in Economic History*, Supplement no. 6, (Greenwich, Conn., 1991), pp. 51 - 92; Jack A. Goldstone, 'Monetary Versus Velocity Interpretations of the 'Price Revolution': A Comment', *Journal of Economic History*, 51:1 (March 1991): 176 - 81; Peter Lindert, 'English Population, Wages, and Prices: 1541 - 1913', *The Journal of Interdisciplinary History*, 15 (Spring 1985), 609 - 34. But see also critiques of these views in Michael D. Bordo, 'Explorations in Monetary History: A Survey of the Literature', *Explorations in Economic History*, 23 (1986), 339-415.

[9] See Munro, 'Monetary Origins of the Price Revolution' and other of my publications cited in n. 1 above.

and real forces involved in producing that inflation is essential for comprehending its economic and social consequences, as elaborated in the following discussion.[10]

Prices in Spain, England, and Brabant, 1501 - 1650: the important role of coinage debasements

In considering the economic consequence of the inflationary Price Revolution, the economic historian must ask and answer three fundamental questions: (1) to what extent was that inflation a general European phenomenon; or was it just regional? (2) when did it begin and when did it end: thus, how long did it last? (3) What national or regional variations may be found for the entire era of the Price Revolution? We may answer these question with some statistical accuracy for only three West European countries or regions, for the period 1501 to 1650: Spain (chiefly Castile); the southern Netherlands (Habsburg Low Countries); and southern England. For only in these three regions have the archives provided sufficient data on a wide range of prices, and on an annual basis, to permit the construction of Consumer Price Indexes. Furthermore, only these three regions have also provided sufficient mint and monetary data.

For each of these regions, the decade 1501-10 has been chosen as the base period: so that all the index numbers for each quinquennium (five-year mean), for these three countries, represent its percentage value of the base period. Thus an index number of 120 means that the price-level, or the composite consumer price, was 20 percent higher than that of the base period. The period chosen for comparing price levels in these three countries is 1501-1650: and that choice was determined by E. J. Hamilton's construction of his composite price index for Spain, with no comparable data before 1500 and none after 1650.[11]

Table 1 and Graph A indicate that the Price Revolution was quite evidently a European-wide and not a local phenomenon; and that in all three countries it began in the years 1516-20 and ended in the 1650s.[12]

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[10] 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, Vol. 2 (Leuven, 1991), pp. 119 - 83; John Munro, 'Precious Metals and the Origins of the Price Revolution Reconsidered: The *Conjuncture* of Monetary and Real Forces in the European Inflation of the Early to Mid-Sixteenth Century', in Clara Eugenia Núñez, ed., *Monetary History in Global Perspective, 1500 - 1808*, Proceedings of the Twelfth International Economic History Congress at Madrid, August 1998 (Seville, 1998), pp. 35-50; and Munro, 'The Monetary Origins of the Price Revolution', pp. 1-34; and Munro, 'Price Revolution', pp. 631-34, and other publications cited in n. 1, above.

[11] These price index numbers are taken from E. J. Hamilton, *American Treasure and the Price Revolution in Spain, 1501-1650* (Cambridge, Mass., 1934; reissued 1965); and are further analyzed in nn. 22-24, and 53, below. Although Hamilton produced two more monographs on Spanish price history, for 1351-1500, and for 1651-1800 (see n. 2 above for the references), and although these also contained price indexes, he used totally different bases for each, without providing historians with the statistical means of splicing them together into one consecutive series.

[12] For purposes of temporal and spatial comparisons, Table 1 also includes the price indexes for Flanders, Brabant, and England, for the previous century: from 1401-05 to 1496-1500 (when the Flemish price data cease: see the sources for Table 1). For this century, the traditional statistical base of 1451-75= 100, has been used: i.e., that used to construct the Phelps Brown & Hopkins 'basket of consumables' price index for England, and the Van der Wee Composite Price Index for Brabant (see nn. 25 and 28 below, and Table 7). Because we do not have comparable price indexes for Spain before 1500, I had to use a base period of 1501-10: i.e., for the first decade of Hamilton's price data series. For reasons explained in the previous

Thus the Price Revolution, as an era of generally sustained, continuous inflation, lasted about 130 years. There is no other period in European economic history that demonstrates an inflation enduring so long.[13]

Nevertheless, this table and graph together do reveal some fascinating regional differences in the extent of the European Price Revolution. Over this period, from 1501-10 to 1646-50, the quinquennial mean Consumer Price Index (CPI) rose the most in the southern Low Countries (Brabant): from 104.43 to 845.07- an 8.09 fold increase. Southern England experienced an intermediate rise in its quinquennial mean CPI: from 101.43 to 697.54 - a 6.88 fold increase. Thus, surprisingly, Spain experienced the least extensive rise in its CPI, yet clearly an inflationary increase: from a mean of 92.43 to one of 343.36, when based solely on a silver-coinage price index – just a 3.71 fold increase ; but to a final quinquennial mean of 457.09 (a 4.95 fold increase), when based on a copper *vellon* prices index, with a growing divergence only from 1598, for reasons to be explained below. [14]

Surely, many historians will find it strange to discover that the Price Revolution was so much more muted in Spain than in these other two countries. As already demonstrated, however, and contrary to the still 'conventional wisdom', the Price Revolution did not begin with the influx of Spanish American treasure. The forms or nature and the impact of the various monetary and real forces obviously differed in all three countries, because of varying local economic circumstances.

One of the most important monetary differences surprisingly involved coinage debasements, which indeed largely explains the differences between these three national price trends. For, indeed, Jean Bodin was not fully correct in his supposed refutation of Malestroit's thesis concerning the role of coinage debasements, despite the unquestioned importance of Spanish American silver for western Europe as a whole, from the mid-sixteenth to mid-seventeenth centuries. As important as this topic is for understanding the forms and nature of the Price Revolution, most readers will probably not welcome a long digression on the complex and arcane subject of coinage debasements; and therefore this topic has been reserved for an appendix to this article.[15] In summary: one may conclude that the Price Revolution was indeed a European-wide inflation, essentially a monetary phenomenon, but one with national or regional variations that were the products of both local coinage debasements and, to a possibly lesser extent, the behaviour of particular real factors in each local economy.

Hamilton, Keynes, and the 'Profit Inflation' Debate

The more interesting questions concern the economic consequences of that inflation, especially in terms of what Hamilton called 'profit inflation', in the form of a widening gap between prices and industrial wages. But Hamilton failed to make clear whether he meant the general price level or some particular set of

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note, the Spanish price indexes in this table, necessarily based on Hamilton's Spanish price index, do not go beyond 1650; but the price data given in *War and Prices in Spain, 1651-1800* (see n. 2 above) do indicate, as do the sources for the price history of Brabant and England, that prices began to fall after the 1650s.

[13] See my evidence in my online review of: 'David Hackett Fischer, *The Great Wave: Price Revolutions and the Rhythm of History* (Oxford and New York: Oxford University Press, 1996)', reviewed for *EH.Net Review* <ehreview@eh.net>, 24 February 1999. This review is archived at EH.NET, at this web site: http://eh.net/bookreviews/library/0146

[14] See the sources for Tables 1-7, and the Appendix on Coinage Debasement.

[15] See below, pp. 000

prices. Inflation and its opposite, deflation, are usually measured by the movement of some form of price index, as a weighted average of prices for a group of selected commodities. Some historians have fallaciously contended that, if and when monetary forces produce an inflation, they should act equally on all prices. But any examination of the several available price indices for the European economy, from medieval to modern times, shows that the prices of its component commodities virtually never moved together in tandem.[16]

The irregular behaviour of such individual prices is not just due to the fact that, as noted earlier, changes in demographic and various other real factors had an almost continuous, if regionally varying, impact in altering relative or individual prices. For concurrent monetary factors themselves frequently also influenced such changes. In particular, distributions of increased money stocks, regionally or nationally, may have benefited some economic sectors more than others, thus allowing some groups or socio-economic strata to gain relatively greater increases in money incomes. By their impact on price and income elasticities of demand and thus also on elasticities of supply of commodities so demanded, the consequent changes in their savings and expenditure patterns would have subsequently altered the relative prices of a wide variety of individual goods and services. The short-run supply of grains in early-modern Europe, for example, was far less elastic than was the supply of various textiles, so that increased monetized demand would have led (as indeed recorded) to greater price increases for grains than for woollen or linen cloth (see graphs D and H). Furthermore, if wages and other money incomes for the lower and middle classes did not rise proportionately with the general level of prices, many such persons, facing household budget constraints, would have been forced to spend proportionately more of their reduced real incomes on foodstuffs, fuels, and other necessities, and thus proportionately less on many industrial goods (or more luxurious foodstuffs), thereby reducing the relative demand for such goods, which in turn would have led to a fall in their *relative* prices (if not in their current or nominal money prices).

Labour, of course, is one of those commodities (or providers of service) whose price, in the form of wages, generally did not rise in tandem with the Consumer Price Index. The population growth that accompanied such periods of inflation, especially before the era of modern industrialization (i.e., before the 1860s), provided one major and obvious demographic reason for that differential between prices and wages: 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 agricultural labour – a subject requiring further analysis -- and thus (supposedly) in the real wage. Another reason for this price-wage gap is 'wage-stickiness', especially for institutional money wages involving either implicit or explicit contracts.[17]

To be sure, that phenomenon seems to have manifested a greater rigidity during deflationary eras. As Keynes rightly observed: 'Every trade union will put up some resistance to a cut in money-wages, however small...', but 'no trade union would dream of striking on every occasion of a rise in the cost of living', unless, of course, the gap between money wages and rising wages became severe enough to produce

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[16] For example, see J.D. Gould, 'The Price Revolution Reconsidered', *Economic History Review*, 2nd ser., 17:2 (1964-5), 249-66; reprinted in Ramsey, *Price-Revolution in Sixteenth-Century England*, pp. 91-116 (see n. 2 above). In her review of Frank Spooner, *The International Economy and Monetary Movements in France, 1493-1725* (Cambridge, Mass., 1972), 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'.

[17] 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 - 297.

a drastic reduction in living standards.[18]

Thus most economists and economic historians would surely agree with Hamilton that, in general, wage increases generally do lag behind rising consumer prices during inflationary eras – past and present. Hamilton himself first introduced this concept in a seminal article, published in 1929, on 'American Treasure and the Rise of Capitalism'.[19] 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 growth. If Hamilton had not explicitly used this term, Keynes certainly did.[20]

Any fair discussion of Hamilton's thesis should commence by examining 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: [21]

> 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 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

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[18] John Maynard Keynes, *The General Theory of Employment, Interest and Money* (London, 1936), pp. 14-15. Preceded by this sentence: 'Thus it is fortunate that the workers, though unconsciously, are instinctively more reasonable economists than the classical school, inasmuch as they resist reductions of money-wages, which are seldom or never of an all-round character, even though the existing real equivalent of those wages exceeds the marginal disutility of the existing employment; whereas they do not resist reductions of real wages, which are associated with increases in aggregate employment and leave relative money-wages unchanged, unless the reduction proceeds so far as to threaten a reduction of the real wage below the marginal disutility of the existing volume of employment.'

[19] See n. 1 above.

[20] 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, but 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.'

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

enterprise.

Prices in Spain, England, and Brabant, 1501 - 1650: a critical analysis of the price statistics

Hamilton's graphs and tables for prices and wages in England and France, in sharp contrast to his fully and carefully researched data for Spain, were based on studies now regarded as far too imperfect to be useful for current research: for England, those by Georg Wiebe, compiled from data published by James A. Thorold Rogers; and for France, those by le Vicomte d'Avenel.[22] In his 1929 article on 'American Treasure and the Rise of Capitalism', Hamilton's Spanish data were based on a set of Andalusian prices that he himself had published the previous year.[23] Subsequently, in his famed monograph, *American Treasure and the Price Revolution in Spain, 1501-1650* (1934), Hamilton expanded the presentation of his Spanish price data to include as well those from New Castile, Old Castile-Léon, and Valencia; and, from those, he produced composite price and money wage indices for Spain as a whole.[24]

About twenty years after that publication appeared a far superior set of wage and price indices for southern England, in two now famous articles by Henry Phelps Brown and Sheila Hopkins, in 1955 and 1956, subsequently republished in a collection of the former's essays, *A Perspective on Wages and Prices* (London, 1981), which contains additional statistical appendices – the sub-indices for six groups of commodities –

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[22] Georg Wiebe, *Zur Geschichte der Preisrevolution des XVI. und XVII. Jahrhunderts*, Staats- und sozialwissenschaftliche Beiträge, II:2 (Leipzig, 1895), largely based on price data in James E. Thorold Rogers, *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), especially vols. IV and V; Comte d'Avenel, *Histoire économique de la propriété, des salaires, des denrées, et de tous prix en général*, 7 vols. (Paris, 1894 - 1926).

[23] Hamilton, 'American Treasure and Andalusian Prices', 1-35 (see n. 2 above)

[24] In Hamilton, *American Treasure*, see Table 27 (p. 271): 'Composite Index Numbers of Money Wages, 1501-1650'; Table 29 (p. 278): 'Composite Index Numbers of Real Wages, 1501 - 1650 ('obtained by dividing the indices of money wages in Table 27 by the composite index numbers of commodity prices'); and Appendix VIII: 'Composite Index Numbers of Silver Prices, 1501-1650'. He did not provide any indication, however, of how the index was weighted (if at all). All provinces but Valencia used a money-of-account and coinage based on the *maravedís*, which contained an unvarying amount of fine silver, 0.094 gram, from 1497 to 1686. The coinage and money-of-account of Valencia was based on the *diner*, which, from 1501 to 1609, contained an unvarying amount of fine silver: 0.1389 g. Thereafter, Spain adopted a copper or *vellon* coinage, whose inflationary impact produced a premium or *agio* on the fine silver coinage, whose values Hamilton presented in Table 7 and Chart 4, for the years 1620- 1650, on pp. 95-97: ranging from 4.0 percent in 1620 to 104.2 percent in 1650, then falling to 25.0 percent and rising again to 44.9 percent in 1650. He did not, however, provide a table for *vellon* price indices for the period 1601-50; and such indices have to be computed by dividing his real wages indices by the money wage indices for this period (and that technique for the period 1501-1600 produces results virtually identical to those in his Composite Index Numbers of Silver Prices, in Appendix VIII. All of these tables used the base 1581-90 = 100, which I have converted to the base 1501-10 = 100. Graph A and Tables 1 and 6, in this study, present prices in both silver and *vellon.*

not provided in the original publication, or in subsequent reprints.[25] Although also based to a considerable extent on the price-data published by Thorold Rogers, Phelps Brown and Hopkins used his series with much greater care, and also utilized, for the period after the 1560s, an even better source: William Beveridge's price data for early-modern England (much of it never published).[26]

I myself have utilized the working papers in both the Phelps Brown Papers Collection and the Beveridge Price and Wage History Collection, now housed in the British Library of Political and Economic Science, to correct some compilation errors in their annual series and to interpolate missing data. For this current study, I have also utilized an index of prices for English industrial goods compiled by Robert Doughty, which contains a somewhat greater variety of products than contained in the Phelps Brown and Hopkins index (though his inclusion of salt is not necessarily helpful).[27]

Unfortunately nobody has yet advanced upon the work of Comte d'Avenel to present a better and more reliable set of price and wage indices for France; and for that reason, France has been omitted from this current study. An excellent, and in some respects, an even better replacement is now available for the southern Low Countries, from 1400 to 1700: more specifically, the Antwerp-Lier-Brussels region of the duchy of Brabant. Essentially employing the Phelps Brown and Hopkins set of price and wage indices as his model, Professor Herman Van der Wee published these indices, originally in a Dutch-language essay, in 1975.[28]

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[25] E.H. Phelps Brown and Sheila V. Hopkins, 'Seven Centuries of Building Wages', *Economica*, 22 (August 1955), reprinted in E.M. Carus-Wilson, ed., *Essays in Economic History*, 3 vols. (London, 1954-62), Vol. II (1962), pp. 168-78; E.H. Phelps Brown and Sheila V. Hopkins, *A Perspective of Wages and Prices* (London, 1981), pp. 1- 12; E.H. Phelps Brown and S.V. Hopkins, 'Seven Centuries of the Prices of Consumables Compared with Builders' Wage-Rates', *Economica*, 23 (Nov. 1956), reprinted in E.M. Carus-Wilson, ed., *Essays in Economic History*, Vol. II, pp. 179-96; in Peter Ramsey, ed., *The Price Revolution* (London, 1971), pp. 18-41; and in E.H. Phelps Brown and Sheila V. Hopkins, *A Perspective of Wages and Prices* (London, 1981), pp. 13-59. The justification for their fixed commodity weights in their basket, especially for the base 1451-75=100, was taken from the account books of the Savernak household, in Dorset, published in K.L. Wood-Legh, *A Small Household of the Fifteenth Century* (Manchester, 1956).

[26] Sir William Beveridge, *Prices and Wages in England from the Twelfth to the Nineteenth Centuries*, vol. I: *Price Tables: Mercantile Era* (London, 1939; republished London, 1965). No other volume was ever published; and this volume regrettably contains no wage data.

[27] Robert Doughty, 'Industrial Prices and Inflation in Southern England, 1401-1640', *Explorations in Economic History*, 12 (1975), 177-92. It contains fifteen products: bricks, slates, plain tiles, lime, iron, lead, pewter, solder, woollen cloth, canvas, linen shirting, candles, charcoal, paper, and salt (with woollen cloth given double weight). For the period 1500 - 1750, the Phelps Brown and Hopkins index contains six products: charcoal, candles, oil, woollen cloth, canvas, and linen shirting. See Tables 3 and 7 below.

[28] Herman Van der Wee, 'Prijzen en lonen als ontwikkelingsvariabelen: Een vergelijkend onderzoek tussen Engeland en de Zuidelijke Nederlanden, 1400 - 1700', in *Album offert à Charles Verlinden à l'occasion de ses trente ans de professoriat* (Wetteren: Universum, 1975), pp. 413-35; reissued in English translation (Lizabeth Fackelman) as: 'Prices and Wages as Development Variables: A Comparison between England and the Southern Netherlands, 1400-1700', *Acta Historiae Neerlandicae*, 10 (1978), 58-78; and republished in Herman Van der Wee, *The Low Countries in the Early Modern World* (Cambridge and New York: Cambridge University Press; and Variorum: Ashgate Publishing, 1993), pp. 223-41. Only the original Dutch publication contains tables with the annual price and wage data. A more detailed series of wages and prices, though only to 1600, were published earlier in Herman Van der Wee, *The Growth of the Antwerp*

While containing fewer commodities than the Phelps Brown and Hopkins index, his Consumer Price Index presents not just the index numbers, but actual annual prices and wages, given in terms of Brabant's silver coinage based money-of-account, in *deniers groot.* [29] We may thus present the annual values of the Van der Wee 'Basket of Consumables' in these monetary terms and then compute how many of these baskets a master mason or carpenter, working about 210 days a year, could have purchased with the annual sum of his money wage income. [30]

For his base period of 1451-75, the same one used in the Phelps Brown and Hopkins 'basket of consumables' index, Van der Wee utilized very similar weights; but he chose the weights on the basis of the physical quantities in the Phelps Brown & Hopkins index, rather than on the percentage weights that the latter had given to each commodity group. While those commodity percentage weights remained fixed and frozen throughout the span of the Phelps Brown and Hopkins index (1264-1954), they necessarily varied in the Van der Wee index, over time, with major shifts in relative prices. Thus, during the sixteenth and early seventeenth centuries, when grain prices rose to a greater extent than did industrial prices, the share of the value of the total basket for the farinaceous/grain sub-index consequently rose, as indeed did the aggregate share for foodstuffs, while the percentage share for industrial goods correspondingly fell. In this respect, the Van der Wee composite index better reflects the changing pattern of consumer expenditures during the Price Revolution era than does the Phelps Brown and Hopkins index, as the following table A demonstrates.[31]

Table A: A Comparison of the Commodity Component Weights in the Phelps Brown & Hopkins

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Market and the European Economy, 14th - 16th Centuries, 3 vols. (The Hague: Martinus Nijhoff, 1963), Vol. I: *Statistics*. For a further justification of the commodity weights in his 'basket', see Herman Van der Wee, 'Voeding en Dieet in het Ancien Régime', *Spiegel Historiael*, 1 (1966), 94-101, republished in translation: as 'Nutrition and Diet in the Ancien Régime', in Herman Van der Wee, *The Low Countries in the Early Modern World* , trans. by Lizabeth Fackelman (Cambridge and New York, 1993), pp. 279-87. See also Table 7 below.

[29] From 1434-35, with the monetary unification of the Burgundian Low Countries, the Brabantine money-of-account, in *ponden groot*, became tied to the Flemish *pond groot* in a permanently fixed ratio of 1.5:1, so that 30s *groot* Brabant = 20s or 1 *pond groot* Brabant, until 1792. See Van der Wee, *Growth of the Antwerp Market*, Vol. I, Table XIII, pp. 123-25; John Munro, *Wool, Cloth, and Gold: The Struggle for Bullion in Anglo-Burgundian Trade, 1340-1478* (Brussels and Toronto, 1973), pp. 99-103; John Munro, 'Mint Outputs, Money, and Prices in Late-Medieval England and the Low Countries', in Eddy Van Cauwenberghe and Franz Irsigler, eds., *Münzprägung, Geldumlauf und Wechselkurse/ Minting, Monetary Circulation and Exchange Rates*, Trierer Historische Forschungen, vol. 7 (Trier, 1984), pp. 31-122.

[30] See n. 50 below.

[31] See a more detailed analysis of the two baskets, with all their commodities, in Table 7 below. The Phelps Brown and Hopkins index contains fourteen commodities: wheat, rye, barley, and peas (farinaceous group); sheep, butter, cheese, red and white herrings (meat-dairy-fish group); charcoal, candles, and oil (fuel and light group); and woollen cloth, canvas, and linen shirting (textiles group). As the Phelps Brown working papers reveal, butter and cheese prices are missing from 1430 to 1561; but their Table 2, in 'Seven Centuries of the Prices of Consumables', p. 20, showing the structure of their four 'commodity baskets' erroneously suggests that butter and cheese are entirely absent for the basket labelled 1500-1725. The Van der Wee index contains ten commodities: rye (for grains), beef, cheese, butter, and herrings (for the meat-dairy-fish grouping); barley (for barley-malt, for the drink group); charcoal and tallow candles (fuel and light); and woollen and linen cloth (textiles).

and Van der Wee Composite Price Indices (base: 1451-75 = 100)

Commodity Group	Phelps Brown & Hopkins Basket, 1451-75: percentage weight (fixed)	Van der Wee Basket, 1451-75: percentage weight	Van der Wee Basket, 1501-05: percentage weight	Van der Wee Basket, 1596-1600: percentage weight
Farinaceous (grains, peas)	20.00	18.24	18.76	25.22
Meat and Fish	25.00	27.82	26.06	25.80
Dairy: Butter and Cheese	12.50	11.05	10.87	11.43
Drink: Barley malt	22.50	17.08	19.55	23.08
Fuel and Light	7.50	7.82	6.55	4.98
Textiles: Woollen & Linens	12.50	18.00	18.20	9.49
Totals	100.00	100.00	100.00	100.00

Sources: see the sources for Table 7

The Attacks on the Hamilton Thesis: John Nef (1936-37) and David Felix (1956)

It is thus important to note that the first two articles attacking the Hamilton-Keynes thesis of Profit Inflation, and really the only two important ones, were published before these much more highly refined and reliable wage and price series became available. Indeed for England, the two major critics still had to rely on their interpretations of the price and wage data from Thorold Rogers, principally via Georg Wiebe. Since France has been omitted from this current study, their views on the relevance of the Hamilton thesis to the early-modern French economy, similarly based on the dubious d'Avenel data, will be largely ignored.[32]

[32] See, however, the index numbers for a 'composite unit of consumables' in Alsace, from 1401 to 1700 (1451-75=100), published in E. Henry Phelps Brown and Sheila Hopkins, 'Wage-Rates and Prices: Evidence for Population Pressure in the Sixteenth Century', in *Economica*, 24:97 (November 1957), 289-305; republished in Phelps Brown and Hopkins, *A Perspective of Wages and Prices* (London, 1981), pp. 60-77, Table 2 (pp. 74-75), based on L'Abbé A. Hanauer, *Études économiques sur l'Alsace ancienne et moderne*, 2 vols. (Paris, 1876-78), vol. II. Alsace, part of modern France, was then part of the duchy of Lorraine within the German Habsburg Empire, until 1648 (Treaty of Westphalia). Hanauer's prices were quoted in terms of the 19th century French franc (with 4.5 grams silver), which the authors converted 'to an index of prices expressed in the denier of the unit of account, by use of Table III, of *Monnaies Stasbourgeoises*' (Vol. I, pp. 496-97). While there may have been no other option, such a technique would not likely produce accurate current money-of-account prices. In Table 3, p. 76, they also provide quarter-century mean index numbers for a similar 'composite basket of consumables', again based on d'Avenel's data (but taken from *Séances et travaux de l'Académie des Sciences Morales et Politiques: Compte Rendu* (Paris, 1892), pp. 349-419. See also E. Henry Phelps Brown and Sheila Hopkins, 'Builders' Wage-Rates, Prices and Population: Some Further Evidence', *Economica*, 26:101 (February 1959), 18-38; also republished in their *Perspective on Wages and Prices*, pp. 78-98. It provides annual index numbers for a similar 'composite

The first major assault came from Professor John Nef, in a paper that he delivered in London in July 1936 on the topic: 'Prices and Industrial Capitalism in France and England, 1540 - 1640'.[33] He noted, first of all, that from the presentation of the Hamilton's tables, France appeared to have experienced a far greater degree of 'profit inflation' than did England during this century (now known as 'Tawney's Century);[34] but the historic record demonstrates instead that England then enjoyed much more industrial growth. One major reason was this was that England was spared the horrendous wars that afflicted France: especially the Wars of Religion, from 1562 to 1598 ; and subsequently the Thirty Years War from 1618 to 1648 (wars far more drastic and destructive than the English Civil Wars of the 1640s). Not surprisingly, the intervening period of relative peace also marked a major spurt of French industrial growth; but this was also a period in which real wages apparently rose in France, i.e., one in which 'profit-inflation' (if any) probably diminished.

For England, Nef does admit that 'there is certainly a remarkable coincidence between profit-inflation, which reflects the fall in real wages, and the growth of industrial capitalism ... in the first three of the four periods' under consideration; i.e., up to about 1620 (but not from then to the 1640s). His major challenge lay in the contention that 'more recent evidence' on wages, that supplied by the Beveridge Price History Commission, indicate that money rates rose much more than indicated in Wiebe's data. In particular, from 1571-82 to 1633-42, 'they rose more than 50 per cent', while Wiebe's data indicate a rise in daily

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basket' and corresponding 'real-wage' indices for: Valencia, from 1413 to 1607; Augsburg, from 1499 to 1753; and Vienna, from 1520 to 1720 (and decennial means for Münster, from 1501-10 to 1551-60). The Valencia data were extracted from the Hamilton's two major monographs, cited in n. 2 above. None of these series, in either article, provides index numbers for industrial goods. A surprisingly useless source is: François Simiand, *Recherches anciennes et nouvelles sur le mouvement général des prix du XVIe au XIXe siècle*, École Pratique des Hautes Études, Section des Science historiques et philologiques, Conférences d'Histoire et Statistique économiques, 1930-1932 (Paris, 1932). Not even a single table is contained in its text of 677 pp. (crudely reproduced from a typescript); and the volume ends with a series of 16 hand-drawn graphs portraying the price-indices produced by d'Avenel, Hanauer, Thorold Rogers, Hamilton, Jevons, and others. His study has no new data.

[33] Published as: John U. Nef, 'Prices and Industrial Capitalism in France and England, 1540-1640', *Economic History Review*, 1st ser., 7:2 (May 1937), 155-85; reprinted in both: E.M. Carus-Wilson, ed., *Essays in Economic History*, Vol. I (London, 1954), pp. 108-34; and Frederic Lane and Jellie Riemersma, eds., *Enterprise and Secular Change* (London, 1953), pp. 292-321. This article was partly based on his prior research on industrial growth, previously published as: John U. Nef, 'The Progress of Technology and the Growth of Large-Scale Industry in Great Britain, 1540 - 1640', *Economic History Review*, 1st ser., 5:1 (Oct. 1934), 3-24; also republished in Carus Wilson, ed., *Essays in Economic History*, Vol. I (London, 1954), pp. 88-107; and also John Nef, 'A Comparison of Industrial Growth in France and England, 1540-1640', *Journal of Political Economy*, 44:5 (Oct. 1936), 643-66; reprinted in John Nef, *Conquest of the Material World* (Chicago, 1964), pp. 144-212. See also 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; and especially Chapter 2, 'An Early Industrial Revolution', pp. 165-89; and John Nef, *Industry and Government in France and England, 1540-1640* (New York, 1940), which does not, however, deal with these theses.

[34] See F. J. Fisher, 'Tawney's Century', in F. J. Fisher, ed., *Essays in the Economic and Social History of Tudor and Stuart England: in Honour of R. H. Tawney* (Cambridge and New York: Cambridge University Press, 1961), pp. 1-14.

money wages of 'only' 39 percent.[35]

That contention is not fully supported by the publication of Phelps Brown and Hopkins's data on building wages, which, for this period, lie between the Wiebe and Nef estimates: in that money wages rose from a quinquennial mean of 10.20d per day in 1571-75 to one of 14.90d in 1636-40, i.e., a rise of 46.1 percent. As the subsequent analysis will reveal, this somewhat more generous estimate of the rise in money wages for English building craftsmen does not really mitigate the very grim picture of sharply falling real wages that not only Hamilton but many subsequent historians have portrayed for this era (see graph C and Table 3).[36] Furthermore, Nef's complaint that estimates of real wages were based almost entirely on cereal products has been partly met by the much more diversified composition of the Phelps Brown and Hopkins basket. Admittedly, however, that basket still contains far more prices for raw materials (e.g., grains) than for finished food products: e.g., none for bread and beer. These products, involving a much higher labour component, very likely rose to a much lesser degree than the former – especially, during this era, with significant technological changes in both brewing and baking.[37] Nef concluded this part of his argument by contending – as many others have since (including even Keynes) – that had 'the standard of living among the English working people really fallen by anything approaching half [50 percent – as indicated by Thorold Rogers's data], the advantages which employers derived from hiring labour cheaply might have been offset by the reduction in the amount [that] workmen could have spent on manufactured goods'.[38]

Nef's major and certainly his most powerful argument is that even if real wages had fallen, or, more precisely, the real cost of labour to the employer (see *infra*), other industrial costs were rising: in particular, the cost of timber (a major industrial input) and especially the cost of wood-charcoal fuels. In Nef's view, this dramatic rise or relative increase in wood-fuel prices presented many industrialists with a dangerous price-cost squeeze that threatened them with poverty or extinction if they had not responded with cost-

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[35] Nef, 'Prices and Industrial Capitalism', p. 116. The Beveridge LSE research project effectively came to an end with the outbreak of World War II, when, as indicated in n. 26 above, the one and only volume was published. While the early-modern wage data have never been published, Beveridge did publish some medieval wage data in two articles: William Beveridge, 'Wages in the Winchester Manors', *Economic History Revie*w, 1st ser., 7:1 (Nov. 1936), 22-43; William Beveridge, 'Westminster Wages in the Manorial Era', *Economic History Revie*w, 2nd ser., 8:1 (1955), 18 - 35. The voluminous wage data that I myself have gleaned from the Beveridge Price and Wage History Collection (LSE) do not contradict the evidence on wages published by Phelps Brown and Hopkins. See the next note.

[36] Phelps Brown and Hopkins did utilize some of the unpublished Beveridge wage data, as well as those from Thorold Rogers. Nef also contended that some wage-earners received part of their pay in food and drink from their employers; and that many possessed plots of land on which they could grow some food. For some similar arguments, see also Donald Woodward, 'Wage Rates and Living Standards in Pre-Industrial England', *Past and Present*, No. 91 (May 1981), pp. 28-46. The evidence on English wages that I have examined indicate that most artisans received money wages alone; and the wage data used in the indices in this study are those for money-wages alone.

[37] In 'Prices and Industrial Capitalism', p. 118, Nef notes that herring prices rose to a somewhat lesser degree than did building wages; and herrings do form part of the PB&H 'basket of consumables'. For the technological changes and Nef's thesis of 'an early industrial revolution' in Tudor-Stuart England, involving the adoption of new coal-burning furnaces in particular, see 'The Progress of Technology and the Growth of Large-Scale Industry', pp. 88-107. See also below, nn. 38-42 below.

[38] Nef, 'Prices and Industrial Capitalism', p. 135.

reducing technological innovations. In his thesis, the key innovations were those that did result in 'an early industrial revolution' in later Tudor and early Stuart England (1540-1640) – i.e., in 'Tawney's Century'.

This supposed 'industrial revolution' principally involved much more capital intensive, larger-scale forms of industry. The principal examples were those were those industries that, experiencing a price-cost squeeze, were forced to create an entirely new furnace technology, based on relatively and ever cheaper coal fuels. Since coal is a 'dirty' contaminating fuel – while charcoal is a pure-burning fuel – that new technology required vastly more complex and thus much larger reverberatory furnaces, which isolated the combustion of the fuels and its gases by reflecting the heat during the manufacturing processes: in making bread, beer, soap, glass, gunpowder, alum and dyestuff processing, metal-refining, etc.[39]

Although some seemingly impressive statistical evidence, chiefly drawn from J. A. Thorold Roger's still widely used *History of Agriculture and Prices in England* , [40] can be used to support John Nef's thesis, my own recent compilation of a wide variety of English prices for wood, wood-charcoal, coal, and industrial prices does not indicate any significant disparity between wood-charcoal and coal prices during 'Tawney's Century, and not until after the 1640s. Only then does that disparity – increasingly favouring the use of coal and then its purified form, coke – become increasingly pronounced, right into the early phase of the Industrial Revolution, from the 1760s. Those dramatic changes in relative prices can be seen in Table 8.[41]

The Nef thesis has also come under considerable attack for many other reasons: principally on the grounds that the 'new' coal-burning manufacturing industries in the Tudor-Stuart era still formed only a very small component of the English industrial economy, particularly in comparison with the various textile industries (New and Old Draperies); furthermore, that it provided virtually no new exports of any economic significance; and finally, that it did little to alter the overall structure of the still basically agrarian and textile-based English economy. But this debate also lies well beyond the scope of this study.[42]

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[39] See n. 20 above.

[40] In 7 vols. (Oxford, 1866-1902): in particular, see vol. IV: *(1401-1582)*, pp. 383-7; and vol. V (*1583-1702*), pp. 398-402.

[41] See John Munro,'Tawney's Century (1540-1640): the Roots of Modern Capitalist Entrepreneurship', in William Baumol, David Landes, and Joel Mokyr, eds., *A Global History of Entrepreneurship: from Antiquity to Modern Times* (Princeton: Princeton University Press, forthcoming). The data in Table 8, below, in this article, are not reproduced as such in this Princeton volume, but rather in the form of a graph. Thus, this table is worth publishing here.

[42] See in particular Donald C. Coleman, *Industry in Tudor and Stuart England*, Studies in Economic and Social History (London: Macmillan, 1975), pp. 35-49; Donald C. Coleman, *The Economy of England, 1450 -1750* (Oxford and New York: Oxford University Press, 1977), pp. 69-90, 151-72; Sybil Jack, *Trade and Industry in Tudor and Stuart England* (London, 1977), especially chapter 2, pp. 66-121; and Munro, 'Tawney's Century' (see n. 41 above). In defence of the Nef thesis, see Brinley Thomas, 'Was There an Energy Crisis in Great Britain in the 17th Century?' *Explorations in Economic History*, 23 (April 1986), 124 - 52; and Brinley Thomas, 'Escaping from Constraints: The Industrial Revolution in a Malthusian Context', *The Journal of Interdisciplinary History*, 15:4 (Spring 1985), 729-54, reprinted in R. I. Rotberg and T. K. Rabb, eds., *Population and Economy: Population and History from the Traditional to the Modern World* (Cambridge, 1986), pp. 729-54. Implicitly supporting Nef are: John Hatcher, *The History of the British Coal Industry*, vol. I: *Before 1700: Towards the Age of Coal* (Oxford: Clarendon Press 1993); E. Anthony Wrigley, *Continuity, Chance and Change: The Character of the Industrial Revolution in England*

The next (and last major attack) on the Hamilton thesis on 'profit inflation' came in 1956 in a very well argued article by David Felix in the prestigious *Quarterly Journal of Economics*.[43] By this time, undaunted by Nef's critique (and evidently still relishing Keynes's support), Hamilton had published, in this same journal (1942), another major article on the same theme, for a later era: 'Profit Inflation and the Industrial Revolution, 1751 - 1800'. Finally, in 1952, the *Journal of Economic History* published his Presidential Address (for the Economic History Association) in the article: 'Prices as a Factor in Business Growth: Prices and Progress'.[44]

Felix necessarily deals with Hamilton's views on the Industrial Revolution era as well (and also those on France), which are beyond the purview of the study and hence will not be discussed here. In sum, Felix concludes that:

> industrial profit inflation is not much in evidence in the periods to which he refers ... [and] it is even possible that it was nonexistent, although this may be too bold a counterclaim in view of the gaps and obscurities in the evidence. But even if it did exist in a much reduced degree, it does not appear to have been a decisive force in determining rates of industrial growth'.

His more particular and principal objection, after surveying the evidence, was that 'there is no correlation either between the degree of price inflation and the degree of profit inflation, or between the rates of profit inflation and the apparent rates of industrial growth'.[45] We can take this argument as 'given' or settled and

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(Cambridge University Press, 1988); 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 Transition to an Advanced Organic Economy: Half a Millennium of English Agriculture', *The Economic History Review*, 2nd ser., 59:3 (August 2006), 425-480. For a contrary view, see Gregory Clark, and David Jacks, 'Coal and the Industrial Revolution, 1700 - 1869', *European Review of Economic History*, 11:1 (April 2007), 39-72.

[43] David Felix, 'Profit Inflation and Industrial Growth: the Historic Record and Contemporary Analogies', *Quarterly Journal of Economics*, 70:3 (August 1956), 441-63; republished in Roderick Floud, ed., *Essays in Quantitative Economic History* (Oxford, 1974), pp. 133-51. It necessarily repeats but also modifies Nef's attack on Hamilton, while largely supporting Nef's key arguments.

[44] See n. 2 above. In his published Presidential Address, Hamilton does respond to Nef's argument (if unconvincingly, by curtly and unfairly dismissing his evidence on timber prices); and he does admit (p. 338) that 'it would be manifestly absurd to contend that the great lag of wages behind prices in England, southern Germany, and perhaps France and other areas during the Price Revolution of the sixteenth and seventeenth centuries was solely responsible to the rise of modern capitalism.' Nevertheless he also states that 'it is difficult, however, to see how anything else could have been more important that the great lag of wages behind prices in certain economically advanced countries during the Price Revolution. Capitalism required *capital*, and it would not be easy to imagine a more powerful instrument for providing it than forced saving through a highly favorable price-wage ratio.' His article also deals with the modern Industrial Revolution era; but overall provides little that is new for the debate.

[45] Felix, 'Profit Inflation', pp. 441-43. He also deals with 'contemporary analogies' and notes that the renowned economist and economic historian W. Arthur Lewis had made 'a case for inflation in currently underdeveloped countries', citing his *Aspects of Industrialization*, National Bank of Egypt, Fiftieth

not deal with it further, with one important exception.

The contention that 'during the seventeenth century English wages rose more rapidly than prices' is very misleading, in part because it is based on faulty data from Wiebe's index. The more serious fault is to ignore the fact that the Price Revolution era in England had come to an end in the mid-seventeenth century, to be followed by long-term, generally sustained *deflation* (except in the 1690s). Surely the Hamilton thesis must be evaluated in terms of the inflationary Price Revolution era alone. The (refined) Phelps Brown and Hopkins indices indicate the following for the period 1601-05 to 1646-50, with a revised base of 1501-10=100: a rise in the Composite Price Index (CPI) from 438.12 to 697.54 (a 59.21 percent rise); a rise in Nominal Wage Index (NWI) from 200.00 (12d per day) to 283.33 (17d per day, a 41.67 percent rise); and thus a fall in Real Wage Index (RWI), from 45.65 to 40.69. *Thereafter*, post Price-Revolution, prices did fall (to a CPI of 584.76 in 1671-75), nominal wages continued to rise (to 18d or NWI of 300.00), and thus the RWI rose to 51.30, by 1671-75 – but that is for an era also beyond the scope and temporal span of this article.[46]

Felix's most successful and certainly valid argument is that much of the inflation experienced in Spain, France, and England during the Price Revolution era was in terms of 'agricultural and wood product prices' and that when a comparison is made with industrial prices alone 'industrial profit inflation shrinks to quite modest proportions'. Felix also repeats the Nef argument that price increases for many finished goods evidently lagged behind the rise in the cost of their raw material components, especially timber and wool fuels; and he thus endorses Nef's that such changes in relative prices provided a key incentive for technological changes leading to more capital-intensive forms of industrial production.[47]

A renewed debate about Profit Inflation in the light of current evidence: general considerations

We thus come to the core critique or essential component in evaluating the Hamilton thesis on 'Profit Inflation'. Certainly the quotation cited earlier from Hamilton's seminal 1929 article (and essentially repeated in all his subsequent publications) implies that Spanish industrial prices moved in tandem with the overall shifts in the general price level (CPI). Unfortunately, in presenting his own data for Spain (and for the four regional components: Andalusia, Valencia, Castile, New Castile-Léon), Hamilton never provided any numerical indices for any of the commodity groupings in this composite price index. He offered only some small-scale graphs, which can be read only with great difficulty. They suggest that agricultural prices and prices for a variety of commodities (a few industrial products) moved more or less in tandem with the price level. I have, however, calculated and added the mean grain prices for his four regions, and presented the results that are produced in Tables 2 and 6, below. They indicate that, from the 1560s, this index of grain prices often, if not always, moved above the composite price index; and such a movement would imply, therefore, that industrial prices from the 1560s did not generally rise as much as did the composite price index. Hamilton, it must further be noted, also believed that there was no appreciable gap between not only

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Commemoration Lectures (Cairo, 1953), pp. 15-19.

[46] See Table 3, and its sources, below.

[47] Felix, 'Profit Inflation', p. 446, and Tables I and II, also based on Wiebe's data, in decennial means, but not consecutive, and for oddly defined periods (e.g., 1643-52). Felix also contends that profit inflation 'disappears in such expanding industries as iron, textiles, and paper', but that verdict cannot be vindicated without some knowledge of the actual money wages – and other production costs – in these industries. Felix is also, and naturally, sympathetic to Nef's erroneous contention that Weibe's money wage index should be elevated by 20 percent. See nn. 33-39 above.

industrial and agricultural prices but also between prices and wages, at least not from the later sixteenth-century, so that Spain experienced by far the least degree of 'profit inflation' of the three countries he examined (Spain, France, England). [48]

The tables and graphs for prices in England and Brabant (Tables 3 - 6) provide the components of the composite price index in three groups: farinaceous (grains, peas, and barely malt, for 'drink); meat-fish-dairy products; and industrial goods. The weighting of the 'baskets' for these sub-components can be seen in Table 7 below. What these tables 2-5 and graphs D and H clearly show, for the entire Price Revolution era, is that the grain/farinaceous prices consistently, in these two regions, rose at a faster rate than other prices, though usually followed by a somewhat lesser rise in the other food prices. Conversely, and quite expectedly, for the reasons given above, the rise in industrial prices – and virtually all prices did rise in this era (including the price of labour) – lagged well behind the rise in the prices of foodstuffs (and certain industrial raw materials, as already noted, for England).

What therefore remains mystifying about Hamilton's presentation of his Profit Inflation thesis – all the more mystifying from a renowned scholar who was a professional economist – is why such 'profit inflation' should be measured in terms of crude real wages, i.e., computed by dividing the Nominal (Money) Wage Index by the Composite Price Index. Thus, why and how would any industrialist in England (or France) gain from a fall in the real wages of his employees, if the principal reason for that fall was the rise in the costs of foodstuffs? As Nef had suggested, such a fall in real wages may well have led to a reduction in the demand of industrial employees for manufactured goods.

If that conjecture may well be perfectly correct, one should observe, however, that in Tudor-Stuart England only a minority of the adult population lived by money-wages alone, and that a far higher proportion of the population earned incomes from agricultural, commercial, and related economic activities, which clearly benefited form a disproportionate rise in their prices and thus (or to some extent) their net incomes. Thus a fall in demand for industrial products from money-wage earners may have been much more than offset, during this era, by an increased demand from landlords, tenant farmers, and even agricultural employees (most of whom would have grown or raised their own food), as well as from traders and merchants, petty capitalist producers, etc. Nevertheless, while such an increased aggregate demand – if it did occur – may have benefited industrial producers, these circumstances did not necessarily produce any 'profit inflation'.

Clearly the only correct method of measuring 'profit inflation', and one that would permit better conclusions on the thesis, would be to compare the actual money wages, and other costs, with the wholesale prices for each and every form of industrial production. That is surely a commendable ideal, but a task that is just impossible to fulfill.

What may be done is much more modest, and perhaps ultimately still too modest: namely, to compare the annual wages for building craftsmen (chiefly master masons and carpenters) with the annual prices for a small number of industrial goods, those contained in the Phelps Brown & Hopkins and the Van der Wee indices, and those in one other industrial-products index constructed by Robert Doughty – as shown in graphs E and I (Tables 3 - 6). Unfortunately, wage-data for most other industrial employees are lacking – certainly lacking for any long-term comparisons to be made. Furthermore, those employed in textiles and many other industrial occupations wages were not paid by the day (from eight hours in winter months to fourteen in the

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[48] See the sources cited in n. 2 above. The task of collecting, in terms of Spanish *maravedís* (silver-based money-of-account), industrial prices for these four regions and then composing an national index, was too arduous a task to complete for the composition of this article.

summer) – as they were for building craftsmen – but by piece-work, making such comparisons all the more difficult.

How legitimate, therefore, is the use of wages for building craftsmen: both nominal and real? Any long-term survey of the movement of their real wages does not lend support for the standard view in economic theory that they reflect productivity changes. In the medieval era, such real wages reached their peak in the 1460s (when the cost of living was unusually low), a level not again attained in England until the early 1880s. It is difficult to believe that industrial productivity fell so much from the fifteenth century, even with the population growth of the sixteenth century (from the 1520s), and did not regain that medieval peak even during periods of undisputed economic and industrial growth from the later seventeenth century (with some depopulation) and through the Industrial Revolution era. Yet it must also be noted that the relationship between productivity and wages is oversimplified, for the true formula in economic theory for the real wage is: $W_L = MRP_L$; and thus the marginal revenue product could fall with a decline in the real price of the product that the unit of labour produces, even if labour productivity did not fall (or even rose).[49]

The one justification for using the money wages of building craftsmen (masons and carpenters) as a proxy for industrial wages is the opportunity-cost argument. Thus those who employed such craftsmen – and most worked for a wide variety of employers – had to pay a wage that would keep these artisans in that occupation and in their employ; and thus presumably they would have had to match wages that were being paid in comparable industrial occupations.

In the following comparisons, involving Spain, southern England, and Brabant, from 1501 to 1650, i.e., to the end of the Price Revolution era, the real wages have been computed by two methods. The first is, of course, the standard method: by dividing the annual nominal or money wage index (NWI) by the Composite Price Index (CPI), or 'basket of consumables' index, for each year. The second was used only for Brabant, for which, as noted earlier, the annual prices for all commodities within the 'basket' are available. The average number of days that master building craftsmen worked each year has been estimated, on the basis of data supplied by Van der Wee, at 210 days; and that number was multiplied by the average annual money wage (the mean annual wage of master masons and carpenters) to obtain an estimate of the annual money wage income.[50] That amount was divided by the annual money value of the Van der Wee 'basket of consumables' to produce, therefore, an estimate of real wage incomes in terms of the number of baskets so purchased.

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[49] On this question see also John Munro, 'Builders' Wages in Southern England and the Southern Low Countries, 1346 -1500: A Comparative Study of Trends in and Levels of Real Incomes', in Simonetta Cavaciocchi, ed., *L'Edilizia prima della rivoluzione industriale, secc. XIII-XVIII,* Atti delle "Settimana di Studi" e altri convegni, no. 36, Istituto Internazionale di Storia Economica "Francesco Datini" (Florence: Le Monnier, 2005), pp. 1013-76.

[50] Van der Wee, *Growth of the Antwerp Market,* vol. I: *Statistics*, section ii: Wages, pp. 333-34; 339-41, 457-61, Appendix 48, pp. 541-42. The wage rate chosen was the summer wage, which prevailed throughout most of the year; and it is not clear that all masters were subjected to the lower winter wage in this period (data on winter wages are in any event scarce). See John Munro, 'Urban Wage Structures in Late-Medieval England and the Low Countries: Work-Time and Seasonal Wages' in Ian Blanchard, ed., *Labour and Leisure in Historical Perspective, Thirteenth to Twentieth Centuries,* Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte Beiheft series 116 (Stuttgart 1994) 65-78; Jan de Vries, 'An Inquiry into the Behaviour of Wages in the Dutch Republic and the Southern Netherlands, 1580-1800', *Acta Historia Neerlandica,* 10 (1978) 79-97; reprinted in Maurice Aymard, ed., *Dutch Capitalism and World Capitalism* (Cambridge, 1982) 37-62.

Much (but not all) of the data in the graphs are presented in both arithmetic and semi-logarithmic scales; and for most purposes of international comparisons, the latter is the better in revealing comparative rates of changes. In the tables, in which all the data are presented in quinquennial means, those for real wages have been computed in terms of the harmonic and not arithmetic mean, which is the better method for computing average quantities of goods purchased with a given sum of money.[51] Proof of the pudding may be seen in the fact that the computations of the harmonic means of the real wages for building craftsmen in Brabant produce identical results by both of these techniques (Table 4). This experiment therefore validates the Phelps Brown and Hopkins' computation of real-wages indices, in using the same formula, for each year in their series: RW = NWI/CPI. [52] But for the reasons just indicated, the most apt comparison is the changing relationship between nominal (money) wages and current industrial prices, which has been computed by dividing the NWI by the Industrial Price Index (IPI) alone. Again, a second computation was made for Brabant: by dividing the annual value of all the industrial products in the Van der Wee 'basket of consumables' by the estimated annual wage income of master building craftsmen (as explained above).

Since Hamilton never did provide a composite index of industrial prices, such a comparison is not possible for early-modern Spain (or for any of its four regions). Nevertheless, as Tables 2 and 6 and graphs J and K, and indeed as Hamilton himself noted, money wages did not lag to any significant extent behind the composite price index during the 150 year period from 1501 to 1650. With the base 1501-10 = 100, the real wage index (harmonic means) fell below 90 in only four quinquennia: in 1546-50 (88.08), 1571-75 (89.32), 1596-1600 (86.84), and 1646-50 (89.79). Indeed, from 1606 to 1620, real wages actually experienced a significant rise (peaking at 115.66 in 1611-15). If wages did keep such a pace with a composite price index heavily weighted by foodstuffs – whose prices often did rise above the CPI (Table 1) – then it seems unlikely, for reasons elaborated above (p. 000), that they ever fell behind the presumed rise in industrial prices. For Hamilton, the absence of any such lag in wages, and thus the lack of any detectable 'profit inflation', as noted earlier, was a prime explanation for Spain's failure to achieve any significant industrial growth in the early modern era and thus also an important if not the only reason for Spain's 'economic decline'.[53] But this debate also does not have any relevance for this current study.

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[51] The *harmonic mean* is 'the reciprocal of the arithmetic mean of the reciprocals of the individual numbers in a given series.' See F.C. Mills, *Introduction to Statistics* (New York, 1956) , pp. 108-12, 401. The mathematical expression for this harmonic mean is: $HM = 1/ [\sum (1/r_1 + 1/r_2 + 1/r_3 + ... 1/r_n)] / N$ That can be rewritten in a two-part equation, for each quinquennium (five-year period): $HM = 1/x$, when $x = \sum (1/r_1 + 1/r_2 + 1/r_3 + 1/r_4 + 1/r_5) / 5$.

[52] The annual index numbers used for the CPI are those from my modified or corrected version of the Phelps Brown and Hopkins index. See the sources for Table 8 below.

[53] See Hamilton, 'The Decline of Spain', pp. 215-26 (n. 2 above); and Earl Hamilton, *War and Prices in Spain, 1651-1800* (Cambridge, Mass., 1947); for other views, see Maurice Schwarzmann, 'Background Factors in the Spanish Economic Decline', *Explorations in Entrepreneurial History*, 3:4 (April 1951), 221-47; J.H. Elliott, 'The Decline of Spain', *Past and Present*, No. 20 (Nov. 1961), pp. 52 - 75; revised edn. published in Trevor Aston, ed., *Crisis in Europe, 1560 - 1660: Essays from Past and Present* (London, 1965), pp. 167 - 93; and in Carlo Cipolla, ed., *The Economic Decline of Empires* (London, 1970), pp. 168-97; R. Trevor Davies, *The Golden Century of Spain, 1501-1621* (London, 1961), pp. 227-94; R. Trevor Davies, *Spain in Decline, 1621-1700* (London, 1965); Henry Kamen, 'The Decline of Castile: The Last Crisis', *Economic History Review*, 2nd ser. 17 (1964), 63-76; J.H. Elliott, *Imperial Spain, 1469-1716* (London, 1964), pp. 242-382; Jaime Vicens Vives, 'The Decline of Spain in the Seventeenth Century', in his *Economic History of Spain*, translated by Frances Lopez-Morillas (Princeton, 1969), Chapters 29-30; republished in Cipolla, *Economic Decline of Empires*, pp. 121-67.

A search for Profit Inflation in England during the Price Revolution era

For England, however, graphs C and E, and Table 3 together reveal an entirely and strikingly different picture. Thus, despite Nef's criticisms of the older set of real wages indices (Thorold Rogers-Wiebe), the subsequent set of more highly refined indices produced by Phelps Brown and Hopkins (further refined, as noted earlier) still show a very stark fall in real wages. Again, with an adjusted base of 1501-10 = 100, the real wage index (NWI/CPI, in quinquennial harmonic means) had fallen to 52.92 as early as 1556-60 and to a nadir of 39.16 in 1631-35; and it was only 49.33 in 1656-60, when the forces of the Price Revolution were beginning to be reversed.. The most significant drop was in the early to mid sixteenth century; and since England and Wales were, by any measure, quite underpopulated in the 1520s, with less than 2.5 million inhabitants (vs. 4.5 to 6.5 million ca. 1300), and had no more than 3.2 million in 1561 – perhaps about half of the medieval peak, it seems unlikely that population growth was the sole culprit responsible for this stark decline in real wages.[54]

However, the more relevant index is that for the ratio of English money wages (per day) to the sub-index for a weighted basket of industrial product prices extracted from the Phelps Brown and Hopkins 'basket of consumables': NWI/IPI.[55] Those index numbers (again in terms of quinquennial harmonic means) fall to only 86.92 in 1556-60, declining slowly if irregularly thereafter, reaching a nadir of 68.55 in 1616-20, and climbed to a peak (for this period) of 89.12 in 1651-55, then declining to 80.84 in 1666-70. But, as noted earlier, England experienced deflation (in terms of the CPI) from the 1650s, while money wages continued to rise, albeit slowly (for a master mason: from 17d per day in 1646-50 to 18d per day by 1656-60).[56]

The somewhat more varied index of industrial prices compiled by Robert Doughty has also been used in this study, even though it terminates in 1640;[57] and its index numbers also are presented in Table 3. It reveals a somewhat greater potential for industrial 'profit inflation', since the index numbers for the ratio of NWI/IPI (with the same 1501-10 base) fell to 76.58 in 1556-60 and then, despite a slight jump in 1581-85 (to 82.08) they fell to a much more significant nadir of 61.81 in 1626-30, and then rose to 70.96 in the final quinquennium of 1636-40, even before deflation had begun to set in. If this table seems to offer somewhat more evidence of at least potential industrial 'profit inflation' in early modern England than either Nef or Felix had been willing to concede, the relevant evidence – with these comparisons involving industrial prices – is nevertheless far too weak to support Hamilton's overly and quite unrealistically optimistic case for establishing why England became the homeland of modern capitalistic industrialization. As noted earlier, however, we simply lack sufficient evidence, for all three regions, to conduct the optimum test: i.e., to compare the actual money wages and wholesale product prices in every major industry, along with changes

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[54] E.Anthony Wrigley and R.S. Schofield, *The Population History of England, 1541 - 1871: A Reconstruction* (Cambridge: Cambridge University Press, 1980), pp. 528 - 29, for the years 1541 - 1871. The figures they present are for England alone, less the country of Monmouthshire. To present the figures in the usual form, for England and Wales together, I have divided their annual data by 0.93383 (as indicated on p. 557, note to Table A5.3). For late-medieval England, see the debated discussed in Pamela Nightingale, 'The Growth of London in the Medieval English Economy', in Richard Britnell and John Hatcher, eds., *Progress and Problems in Medieval England* (Cambridge: Cambridge University Press, 1996), pp. 89-106.

[55] See above p. 9 and n. 27; and below Tables 3 and 7.

[56] See Phelps Brown and Hopkins, 'Building Wages', in n. 25 above.

[57] See the previous note.

in other costs.

A search for 'profit inflation' in Brabant (southern Low Countries) during the Price Revolution

An even more strikingly different picture, and different for generally opposite reasons, is to be found across the channel, in early-modern Brabant, or more precisely in the Antwerp-Lier-Brussels region. Rather surprisingly, the behaviour of real wages there is much more in accordance with the Spanish experience than with the English. For the real-wage index, whether measured by the ratio of money wages indices to those for the 'basket of consumables' (i.e., NWI/CPI), or by the ratio of money wages to the value of that basket (in d. *groot* Brabant), again with harmonic means for the five-year averages, shows very little decline for most of the Price Revolution era (see graphs F - I; Tables 4-6). The real-wage index (1501-10=100) falls below 90 only in five quinquennia before the war-torn years of the 1580s (falling from 106.53 in 1576-80 to 72.34 in 1586-90); and indeed in five quinquennia, that index rises above 100. That low-point of 1586-90 is surpassed only once, in 1646-50 (RWI of 69.55). And if the second quarter of the seventeenth century seems to be relatively bleak, when the real-wage index falls below 80, the first quarter of the seventeenth century was one of strongly rising real wages, when the mean real wage index was consistently above 110, until 1620. One explanation for that rise, and then the subsequent fall, was that this period (1601-20) marked the relatively peaceful interim between the Truce of 1609 and this region's involvement in the Thirty Years' War (1618-48).[58]

Far more revealing are the index numbers for the quinquennial mean ratios between the nominal money wage index and the index of the composite of industrial prices (NWI/IPI). For there is no indication whatsoever of any industrial 'profit inflation'; and that ratio rises to 140.53 in 1536-40, falling somewhat thereafter, but with one sharp upsurge in 1561-65, reaching 185.56, then falling to 117.68 (in 1571-75) – but still well above that crucial 100 mark indicator – and then rising to 167.95 in 1611-15. During the first half of the seventeenth century this ratio of money wages to industrial prices consistently remained well above that mark, and generally above 130, except in the decade 1641-50, when it fell to about 124. That decade also marked the end of the Price Revolution era in the Low Countries, as well; and thereafter, while prices fell, wages did not (stable at 72d. *groot* per day for both masons and carpenters from 1600 to 1668, then rising to 78d: see Table 5). Another way to look at this ratio is to compute the value of annual money wages as a proportion of the composite of industrial prices in the Van der Wee basket. It rose from 15.68 percent in 1511-15 (i.e., before the actual onset of the Price Revolution in the Low Countries) to a peak of 30.56 percent in 1561-65, but thereafter it was virtually always above 20 percent, and frequently above 25 percent (Table 5).

This is a situation that, for both Hamilton and Keynes, was the exact and negative opposite of Profit Inflation. For, indeed, Keynes called his readers' attention to 'the extra-ordinary correspondence between the periods of Profit Inflation and of Profit Deflation respectively with those of national rise and decline.'[59] Surely, at least for that latter case, this represents a gross historical inaccuracy for the early-modern Low Countries. Most historians would agree that, during the sixteenth and seventeenth centuries, this region (including Holland) was economically much more advanced than England, let alone Spain: with far more extensive and richer industrial, commercial, and financial sectors, which together promoted a far more

[58] See Van der Wee, 'Prices and Wages', p. 240; and n. 28 above. The Truce ended in 1621.

[59] Keynes, *Treatise on Money*, Vol. II, p. 161.

extensive degree of urbanization in the Low Countries.[60] Certainly for most of the sixteenth century, at least until the 1570s, Brabant itself probably experienced more substantial industrial growth, especially in textiles and various luxury oriented crafts, than did England (despite the overwhelming success of its broadcloth industry). Antwerp's 'Golden Age' was, after all, the century from the 1460s to the 1560s, i.e., to outbreak of the Revolt of the Netherlands in 1566-68. One of its most important industries was in finishing textiles, especially English woollens. Subsequently, however, Van der Wee does concede that 'the Eighty Years' War was clearly an important factor in the structural decline of the economy of Brabant [and the southern Netherlands more generally].'[61]

Nevertheless, we should not paint too bleak a picture of the economy of the southern Low Countries during the seventeenth century, even if it clearly fell behind the north (i.e., the 'United Provinces' or Dutch Republic). It did achieve some significant recovery in the first third, even during the Thirty Years War (1618-48) , as can be seen, for example, in industrial statistics for the Flemish Hondschoote sayetterie, which, before the Revolt, had been northern Europe's leading producer of the light worsted-type say fabrics. Its sales , having reached a peak of 93,057 says in 1566-70 (mean), with the outbreak of the Revolt, then fell sharply to a mean of just 12,128 says in 1586-90; but it then recovered to 54,767 says in 1626-30, its seventeenth century peak. By that time its English rival, the so-called New Draperies, largely created (or re-created) by Flemish refugee artisans in East Anglia, from the 1570s, had successfully displaced the Flemish (and the Dutch, to the north), as the north European leader in producing these cheap, light fabrics.[62] As Van der Wee has so rightly noted, the 'economic decay of Brabant' from the second quarter of the seventeenth century has to be explained by a complex set of other factors, including changes in international trade. Yet

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[60] See Van der Wee, *Growth of the Antwerp Market*, vol. II, pp. 41-280, 369-88; Herman Van der Wee, 'The Economy as a Factor in the Revolt of the Southern Low Countries', *Acta Historia Neerlandica*, 5 (1971), pp. 52-67, reprinted in his collection *The Low Countries in the Early Modern World* (Cambridge, 1993), pp. 264-78. See also Herman Van der Wee, 'Structural Changes and Specialization in Southern Netherlands Industry, 1100 - 1600', *Economic History Review*, 2nd ser., 28:2 (May 1975), 203-21; republished in the same volume, pp. 201-22; and also: Hermann Van der Wee, 'Industrial Dynamics and the Process of Urbanization and De-Urbanization in the Low Countries from the Late Middle Ages to the Eighteenth Century: A Synthesis', in Herman Van der Wee, ed., *The Rise and Decline of Urban Industries in Italy and in the Low Countries: Late Middle Ages - Early Modern Time* (Leuven, 1988), pp. 307-81; Herman Van der Wee and Jan Materné, 'Antwerp as a World Market in the Sixteenth and Seventeenth Centuries', in J. Van der Stock, ed., *Antwerp: Story of a Metropolis, 16th - 17th Centur*y, Antwerp 93, Hessenhuis 25 June - 10 October 1993 (Ghent, 1993), 19-31; 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: Success, Failure, and Perseverance of the Dutch Economy, 1500 - 1815* (Cambridge and New York, 1997).

[61] Van der Wee, 'Prices and Wages', p. 240.

[62] See Émile Coornaert, *La draperie-sayetterie d'Hondschoote, XIVe-XVIIIe siècles* (Paris, 1930); Émile Coornaert, 'Draperies rurales, draperies urbaines: l'evolution de l'industrie flamande au moyenâge et au XVI siècle', *Belgische tijdschrift voor filologie en gescheidenis/Revue belge de philologie et d'histoire*, 28 (1950), 60-96; Jan Craeybeckx, 'L'industrie de la laine dans les anciens Pays-Bas méridionaux de la fin du XVIe au début du XVIIIe siècle', in Marco Spallanzani, ed., *Produzione, commercio e consumo dei panni di lana* (Florence, 1976), pp. 21-43; John H. Munro, 'The Origins of the English 'New Draperies': The Resurrection of an Old Flemish Industry, 1270 - 1570', in Negley Harte, ed., *The New Draperies in the Low Countries and England, 1300 - 1800,* Pasold Studies in Textile History no. 10 (Oxford and New York, 1997), pp. 35-127.

it is far from clear that demographic variables – population growth during the 1609-21 Truce, followed by decline – and changing real wages have that much explanatory power, especially since real wages rose the most strongly during that Truce, and then fell with the ensuring demographic and economic decline.[63]

In any event, the two more general and related conclusions must stand. First and foremost, throughout this period Brabant almost consistently experienced, in Keynes' terminology, 'Profit Deflation', at least in terms of the ratio of nominal wages to industrial prices, without any apparent negative consequences for industrial growth, certainly not during the two-thirds of the sixteenth century preceding the Revolt and during the first two decades of the seventeenth (i.e., during the 1609-21 Truce). Second, building craftsmen, and presumably many other industrial workers, in sixteenth-century Brabant, and also for much of the seventeenth century, were far more successful in maintaining or even in improving their real wages than were their English counterparts.

Since inflation was often more severe in Brabant than in England, especially also with a more pronounced rise in the price of foodstuffs (see graph H), the explanation must lie in the ability of urban building craftsmen in Brabant to secure better compensation in terms of rising money wages.[64] Quite possibly, as Van der Wee suggests, their success lay in superior corporate organization and more effective guild powers.[65] Clearly there was far less nominal 'wage stickiness' than in England during the sixteenth century, though certainly just as much in the seventeenth century (during both the inflationary and deflationary periods), as may be seen in Tables 3-6.

At the same time, it is so tempting to believe, as Van der Wee suggests, that the superior performance of the more highly advanced Brabantine economy, compared to England's still basically agrarian economy, would explain the striking disparities in real-wage trends between these two regions, at least until the later seventeenth century. But one set of statistics does not really support that assumption: for in 1401-05, the annual money income of a master carpenter and mason (mean wage) could have purchased 10.821 of the Van der Wee commodity baskets, an amount finally exceeded in the 1460s, but not again matched, until the mid sixteenth century. At the beginning of the fifteenth century, it must be noted, Antwerp was in fact

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[63] See Tables 4-5 below; and Van der Wee, 'Prices and Wages', p. 240 (n. 28 above). Perhaps Van der Wee means that the subsequent fall in real wages, from 1621-25 to 1646-50 inclusive, was a time-lagged effect of prior population increase; but this longer period of falling real wages also encompassed a period of prolonged demographic decline, for a which a time-lagged effect is more difficult to explain. Van der Wee also maintains (p. 240) that the earlier war-induced demographic decline had led to 'a rise in the real *per capita* wage income from 1587 onwards'; but that seems to be contradicted by Table 4 below: real wages fell from 100.88 in 1581-85 to 72.34 in 1586-90 recovering only to 87.43 in 1596-1600, but to 115.31 in 1601-05.

[64] See n. 17 above; and John Munro, 'The Usury Doctrine and Urban Public Finances in Late-Medieval Flanders (1220 - 1550): Rentes (Annuities), Excise Taxes, and Income Transfers from the Poor to the Rich', in Simonetta Cavaciocchi, ed., *La fiscalità nell'economia Europea, secc. XIII - XVIII/ Fiscal Systems in the European Economy from the 13th to the 18th Centuries*, Atti della 'Trentanovesima Settimana di Studi', Fondazione Istituto Internazionale di Storia Economica "F. Datini", Prato, Serie II: Atti delle "Settimane de Studi" et altri Convegni 39 (Florence: Firenze University Press, 2008), pp. 973-1026.

[65] Van der Wee, 'Prices and Wages', p. 240; and Van der Wee, *Growth of the Antwerp Market*, vol. II, pp. 381-88, 419-22.

experiencing population growth;[66] but it was still an economic 'backwater', subservient to Flanders, and many decades away from commencing its role as an international entrepôt and financial centre. Thus in 1531-35, when Antwerp's economy had clearly become far more highly advanced, a builders' annual money wage income could have purchased only 7.811 consumer baskets (though 10.104 baskets in 1546-50); and only in 1561-65 – and in the only quinquennium of the sixteenth century – was that amount exceeded, with 12.279 baskets (falling to 6.662 baskets in 1586-90). Economic recovery in the Truce years of 1609-21 did mean a recovery in purchasing power to just over 10 such consumer baskets a year, i.e., again about the level of the early fifteenth century (Table 5).

Thus such studies in the behaviour of real wages, let alone a search for potential 'profit inflation', tell us very little, if anything at all, about the sources of industrial and economic growth.[67] Indeed the penultimate conclusion about the Hamilton thesis, and more generally about any concepts of 'profit inflation' as a factor promoting industrial growth in early-modern Europe, is that they make little sense, and for many reasons beyond those proposed by Nef and Felix.

Inflation and other factor costs: capital and the real rate of interest

Indeed, such theses do not explain why capitalist industrialists in early-modern western Europe, if they actually did secure more and more profits from any widening gap between prices and industrial wages, would have been inspired to invest them in more capital-intensive, large scale enterprises. For if, as so many historians still assume, population growth was chiefly responsible for the fall in real wages during this Price Revolution era, why would rational industrial capitalists have replaced an ever increasing and cheapening factor of production, namely labour, with the presumably more expensive factor, capital? Thus, even if population growth may have induced diminishing returns in arable agriculture, with a falling marginal productivity of labour, we may well doubt that population growth had the same consequences, for industrial crafts, apart from reducing real wages. Thus, we may presume that most industrialists would have sought to expand production by hiring more and more cheap labour, with evidently very elastic supplies, rather than by increasing capital investments – *ceteris paribus*. In this respect, the Nef thesis, as posed, does make much more sense than the Hamilton thesis.

Nevertheless, there was another macro-economic factor that probably did encourage relatively greater capital investments. As J. D. Gould suggested so long ago, long-term inflation, especially that experienced in the Price Revolution, often did cheapen the costs of capital investments.[68] For, nominal interest rates rarely adjusted for inflation in this era; and if they did not do so, then *real* interest rates fell, which they most certainly did. 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

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[66] Van der Wee, 'Wages and Prices', pp. 232, 238; see also n. 60 above.

[67] Van der Wee, 'Wages and Prices', p. 240, seems to be somewhat sympathetic to the concept of Profit Inflation in stating that 'falling real wage rates in the 16th century had long helped the export of traditional textiles'; and, on p. 241, that the 'very low 16th-century wage level opened wide prospects of extra profits for those entrepreneurs who succeeded in developing and launching new products'. But, as indicated earlier, we simply lack the specific price and wage data to substantiate these views.

[68] Gould, 'The Price Revolution Reconsidered', p. 95 (see n. 16 above). See also his useful comments about the 'profit inflation' debate (chiefly based on Nef and Felix).

percent in 1550 (but 14 percent in 1555).[69] Consider, therefore, the prospects for real gains then being offered to many industrialists, those in the more capital intensive industries, in particular. Typically, in borrowing capital, the loan contracts stipulated annual interest payments and repayment of the principal, on the loan's maturity, in terms of nominal money-of-account: e.g., in pounds sterling, *livres tournois, ponden groot*. The real values of those capital payments would have fallen, year by year, while the value of their outputs rose.

Capital Intensive Industries in the Price Revolution Era

One may well ask, however, what important large-scale capital intensive industries may be found in the Price Revolution era? That question becomes all the more important if our revision of the Nef thesis, and the careful examination of his historical evidence for the 'new' larger-scale industries, especially the necessarily large-scale coal-burning industries using the capital costly reverberatory furnace technology, are chiefly to be found from and after the 1640s, when the Price Revolution had come to an end.[70]

Nevertheless, there were indeed many and much more important examples of large-scale capital intensive industries to be found in this era. Even if some of them owed their origins, with much different economic circumstances, to the deflationary fifteenth century, they did experience very considerable expansion and growth in the Price Revolution era. The first to be cited was a veritable revolution in mining and smelting. The industrial revolution in mining involved capital-costly innovations in mechanical engineering: to cope with the inevitable problem of flooding with much deeper mine shafts, and thus to reach and safely exploit vast deposits of hitherto untouched silver-copper ores. That resolution of that crucial problem was the invention and application of an advanced form of hydraulic machinery to create vacuum powered drainage machinery. The closely related other industrial revolution, in smelting copper and silver ores, was developed in chemical engineering: the *Seigerhütten* process, using lead, in smelting the cupric-argentiferous ores, in order to separate these two previously inseparable metals.[71] As noted earlier, those two innovations in mining and metallurgy were responsible for the South-German Central European mining boom, from the 1460s to the 1530s, which in turn provided the initial monetary foundations for the European Price Revolution.

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[69] Van der Wee, *Growth of the Antwerp Market*, vol. I: *Statistics*, Appendix 45/1 - 2, pp. 525-27. No usable data are available after 1555 because the government was obtaining short-term funds from other sources; and the Spanish bankruptcy of 1557 disturbed relations with traditional lenders. For other evidence on falling interest rates in the Price Revolution era, see Sidney Homer and Richard Sylla, *A History of Interest Rates*, 3rd rev. edn (New Brunswick, 1991), especially Table 11 (pp. 137-38), and Chart 2 (p. 140); and Ian Blanchard, 'International Capital Markets and Their Users, 1450 - 1750', in Maarten Prak, ed., *Early Modern Capitalism: Economic and Social Change in Europe, 1400 - 1800*, Routledge Explorations in Economic History no. 21 (London and New York, 2001), pp. 107-24, esp. figure 6.1, 'Northern European Base Interest Rates, 1265-1635' (p. 108), and fig. 6.4 (p. 116).

[70] See nn. 33-39, above, and Tables 1 and 8 below.

[71] See, also in n. 1, 10 above; in particular, Munro, 'Origins of the Price Revolution', pp. 1-14 (especially Table 1.3, pp. 8-9); Munro, 'The Central European Silver Mining Boom', pp. 119-83; and also John Nef, 'Silver Production in Central Europe, 1450-1618', *Journal of Political Economy*, 49 (1941), 575-91; John Nef, 'Mining and Metallurgy', in M.M. Postan and E. E. Miller, eds., *Cambridge Economic History*, Vol. II: *Trade and Industry in the Middle Ages*, revised edn. (Cambridge, 1987), pp. 691-761, especially pp. 721-46.

The *Seigerhütten* process also used hydraulic machinery, in this case, to power the smelter's bellows, as did another new, indeed revolutionary form of metallurgy: the vast brick-kiln blast furnace, to smelt and produce either cast and pig iron.[72] Though its origins may lie in the late-fourteenth-century Rhineland, and became prominent in the fifteenth-century eastern Low Countries, the blast smelter was introduced into England only in the very late fifteenth century. Subsequently, during the sixteenth and early seventeenth-centuries, it enjoyed a remarkable expansion. The output of pig iron rose from about 1,200 tons in the 1530s (with 6 blast furnaces) to a peak of about 23,000 tons in the 1650s (with 86 blast furnaces), a 19.17 fold expansion.[73] For its fuel, the blast furnace was necessarily confined to using wood-charcoal, because iron production or 'winning' requires the direct contact of the carbon in charcoal (pure) with the oxygen in the iron ore — ferric oxide: Fe_2O_3 – in order to liberate the iron from the oxygen, and thus, as the liberated oxygen combines with the carbon in the fuel, to produce the residual gas carbon dioxide (CO_2).

By the 1650s, high fuel costs (along with limitations on free water sites), as demonstrated in Table 8, was making the English iron industry uncompetitive with imports from heavily forested Sweden and Russia (with higher quality ores): so much so that iron imports had expanded from just 1,700 tons in the 1580s to 23,000 tons in the 1680s, then accounting for over half of England's iron consumption.[74] Coal had far too many contaminants to permit its use in iron smelting. That fuel problem was not resolved until the development of ultimately lower-cost coke – ie., purified coal, with virtually pure carbon. That began, ca. 1710, with Abraham Darby's first successful coke-fired blast furnace; but it was really not fully cost-effective until the application of James Watt's new coal-fired steam engine, in 1776, to the air-pistons producing the blast, thereby cutting the fuel costs by one-third.[75]

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[72] The smelted iron, if to be used as a consumer product, was poured molten into a cast or mould: hence its name 'cast iron'. The term 'pig iron' was applied to exactly the same product when the smelted iron was then taken to a forge for refining into purified wrought or malleable iron. The hydraulic machinery was used to power the bellows to create the proper blast for the furnace. Various forms of hydraulic machinery were used in many other new or relatively new industries of this era: including the tilt hammers in refinery forges. 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 also Terry S. Reynolds, *Stronger than a Hundred Men: A History of the Vertical Water Wheel* (Baltimore and London, 1983).

[73] Data from George Hammersley, 'The Charcoal Iron Industry and its Fuel, 1540-1750', *Economic History Review*, 2nd ser. 26:4 (1973), 593-613 (esp. table on p. 595); Charles Hyde, *Technological Change and the British Iron Industry, 1700-1870* (Princeton, 1977); Philip Riden, 'The Output of the British Iron Industry before 1870', *Economic History Review*, 2nd ser., 30:3 (Aug. 1977), 442-59.

[74] Thomas, 'Was There an Energy Crisis in Great Britain', pp. 124 - 52 (see n. 42 above). See also the sources cited in the previous and following notes, which indicate that, in 1720, charcoal accounted for 71.0% of the costs of smelting a ton of pig iron, compared to 15.2% for the iron ore, and only 3.0% for the furnace labour.

[75] See the sources cited in n. 73-74 above; and also in Thomas S. Ashton, *Iron and Steel in the Industrial Revolution (*Manchester: University Press, 1924; reprinted 1951), pp. 1-23; 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 History of the British Coal Industry,* Vol II: *1700 - 1830: The Industrial Revolution* (Oxford: Clarendon Press, 1984), esp. pp. 23-35, 286-328; Charles K. Hyde, 'The Adoption of Coke-Smelting by the British Iron Industry, 1709-1790', *Explorations in Economic History,* 10:4 (1973), 397-418; J. R.. Harris, *The*

The other major form of large-scale capital-intensive industry of even greater economic importance in this era was ship-building: especially in the evolution of the so-called Atlantic Ship, from the Portuguese *caravels* of the mid-fifteenth to the *carracks* and *galleons* of the early sixteenth centuries. Their size and scale further increased from about 600 tonnes in the early sixteenth century to 1500 tonnes by the 1590s. That increased scale was in part the consequence of military technology: the addition of naval artillery, with up to 50 or 60 cannons, placed both on deck and below deck. These heavily armed, powerfully rigged ships allowed Europeans to dominate the world's oceanic trade routes from the sixteenth to the late nineteenth century; and for England itself, her larger, sturdily oak-built, and heavily-gunned *galleon*s (of the Levant Company, discussed below) allowed her merchants to dominate Mediterranean trade by the later seventeenth century. [76]

That leads us to another crucial factor in increased scales in ships and the shipbuilding industry itself, from the 1550s: the creation of chartered joint-stock overseas trading companies to engage in long-distance, truly global trade with the Mediterranean, all parts of Asia, Africa, and the Americas: first by the English, then by the Dutch, French, and other Europeans.[77] Although the principal form of financing these new, highly capital intensive overseas trading companies was the revolutionary innovation of joint-stock, or sales of shares of ownership to hundreds of investors, they also depended heavily on loans and other forms of borrowed capital.[78]

British Iron Industry, Studies in Economic and Social History series (London: Macmillan, 1988).

[76] See in particular Richard Unger, *The Ship in the Medieval Economy, 600-1600* (London and Montreal, 1980); and Richard Unger, *Dutch Shipbuilding before 1800 : Ships and Guilds* (Assen, 1978). For England, see: 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*: *In Honour of R. H. Tawney* (Cambridge: Cambridge University Press, 1961) , pp. 117-26; Ralph Davis, *English Overseas Trade, 1500 - 1700.* Studies in Economic History (London: Macmillan, 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; 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), pp. 41-55, especially Table 2.1, p. 43.

[77] The first known or first documented joint-stock company was England's Muscovy or Russia Company, created in 1553. 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.), vol. I, pp. 18-21; vol. II, pp. 36-69. 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). England's other prominent overseas joint-stock trading companies of this era were: (1) The Levant Company: originally created in 1581 as the Turkey Company, and then re-organized in 1591, as the far better known Levant Company; 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 Russia Company's monopoly charter).

[78] For example the Muscovy Company was originally established with £6,000 sterling raised by the sales of shares to 240 investors, another £4,000 was raised through loans. See the previous note.

Inflation and Other Factor Costs: Land and real rents

Price or cost changes in the one remaining factor of production, land and thus landed rents, might also offer another form of 'profit inflation' (as Hamilton himself had suggested). For most historians, however, any confidence in that hypothesis was virtually destroyed in 1953 by Eric Kerridge's classic article on 'The Movement of Rent' in Tudor Stuart England.[79] For his data showed that private agricultural rents had variously risen eight- to ten-fold from 1510-19 to 1650-59 (or from 4.38 to 7.03 fold from 1530-39), and thus in close correspondence with the overall rise in English agricultural prices.[80] But such rents were only for 'new takings', and from only two estates; indeed, rents on new takings on crown lands rose far less: 2.93 fold from 1510-19 to 1600-09 (when that series ends). To meet the obvious objection that so much land was in the form of copyhold tenures with fixed customary rents, he replied that 'the rise in rent took largely the form of increased entry fines' [i.e., an inheritance tax paid by the new tenant]. That reply ignores the obvious fact that such increases could take place only every seven, fourteen, or twenty-one years (or after an actual lifetime) at best.[81]

An English industrial 'capitalist' who required land would presumably have leased it by a contract that, for a number of years – say, five, ten, or twenty (or even ninety-nine) -- would have established a fixed rent in current pounds sterling. If, during that same period, he benefited from rising prices for his product, he would thus have gained from cheaper *real* rents. In response to the query 'what industrial capitalists', one may cite not only the preceding facts but also the crucial fact that iron, coal, and copper mines, blast furnaces and refining forges, shipyards, etc., all required the use of land, someone's lands, which were so often rented (and, if owned by the capitalist, involved implicit rents).

In sum, such meagre evidence at hand would suggest that if industrial entrepreneurs could periodically have gained from cheaper *real* rents during inflationary eras, such gains were probably less than those to be derived from a fall in *real* interest rates. In any search for 'profit inflation' during the Price Revolution era, especially in north-west, the positive economic gains of inflation, especially in promoting larger-scale, more capital intensive forms of industry – the heart of both the Hamilton and Nef theses – are to be found in the ways in which it cheapened factor costs for the industrial entrepreneur: in capital, land, and labour, in that order – and without any convincing evidence concerning relative labour costs.

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[79] Eric Kerridge, 'The Movement of Rent, 1540 - 1640', *Economic History Review*, 2nd ser., 6:1 (1953), 16-34; reprinted in Eleanora Carus-Wilson, *Essays in Economic History*, Vol. II (London: Macmillan, 1962), pp. 208-26.

[80] See the sources given for Table 7. See also Thorold Rogers, *History of Agriculture and Prices*, vol. IV: *1401-1582*, 383-7; and vol. V: *1583-1702*, 398-402.

[81] From just the Herbert and Seymour estates. Subsequently, in Eric Kerridge, *Agrarian Problems in the Sixteenth Century and After*, Historical Problems: Studies and Documents no. 6 (London, 1969), pp. 17-31, 94-136, in opposing Tawney's views on landlords's arbitrary enclosures, he noted the regional variations in the ability of landlords' to engage in such tactics, suggesting that many rents did not rise. Across the Channel, Van der Wee's data on polder rents in the Antwerp vicinity indicate a 9.89 fold rise from 1510 to 1630. Nevertheless, throughout this era, for periods generally from five to ten years, those rents remained fixed (evidently by contract or lease). Van der Wee, *Growth of the Antwerp Market*, Vol. I, Appendix 40/1, pp. 477-82.

Appendix: Coinage Debasement in Early-Modern Western Europe

Some clarification of the nature and consequences of coinage debasement must be fully understood, all the more so since this subject, vital to this article, is far too often badly or even wrongly presented in the literature of European economic history. Debasement simply means the reduction of the quantity of precious metal contained in the currently circulating coins, and in particular in the silver coin – e.g., the penny – that provides the direct link between the coinage and the local money-of-account: e.g., the English pound sterling, the French *livre tournois*, the Flemish *pond groot*, the Spanish *ducat* (= 375 *maravedís*). Such reductions took place by either a reduction in the weight of the coin itself, or in its silver fineness (i.e. by adding proportionately more base metal — copper), or commonly by both methods combined. The consequence was to increase the number of coins with a given face value – e.g., the penny, or the shilling (12d) – that was minted from a pound or *marc* weight of commercially silver; and that meant as well that the nominal money-of-account value of that pound or *marc* of silver also correspondingly increased. That increase in the number of coins produced was shared between the merchants suppling bullion to the mint, by the mint-master (in his brassage fees), and by the prince (in his seignorage fees – as a tax on coinage).

The objective of a debasement was to induce – by prospects of increased profits – a much greater influx of precious metals into the prince's mint: from both domestic and foreign bullion and coins (demonetized). The prince's often substantially augmented mint profits came from two sources: the substantial increases in bullion influxes and thus in the mint outputs themselves; and usually also from an increase in the rate of seigniorage.[82] Provided that each of these economic agents – endowed with asymmetric information unavailable to the general public – spent these debased coins quickly, before any inflation ensued, they would all achieve net real gains, in terms of extra goods and serviced acquired.

A major consideration in the success of late-medieval and early-modern debasements was the crudity in the mechanics of minting: using hammers, dies, and shears, to produce what is known as 'hammered coinage' (as opposed to more modern mechanically 'milled' coinages). The consequence was that individually cut coins of the same face value were never exactly identical to any other coins of the same issue. Thus, minor changes in fineness and weight were difficult to detect, even for those few merchants who had scales and touchstones. Almost all of the populace accepted coin by 'tale', at 'face value', and for that value.[83]

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[82] For detailed evidence on mint profitability, in late-medieval Flanders, and elsewhere, see Munro, *Wool, Cloth, and Gold* (n. 29, above): chapter 1: 'Late Medieval Monetary Policies and the Economics of Bullionism', pp. 11-41; pp. 43-92, Tables B-K, pp. 190-212; other studies republished in John 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); Peter Spufford, *Money and Its Use in Medieval Europe* (Cambridge: Cambridge University Press, 1988), chapter 13: 'The Scourge of Debasement', pp. 289-318; Peter Spufford, *Monetary Problems and Policies in the Burgundian Netherlands, 1433 - 1496* (Leiden: E. J. Brill, 1971), pp. 130-46, 214-16 (Appendix VI); Hans Van Werveke, 'Currency Manipulation in the Middle Ages: The Case of Louis de Male, Count of Flanders', *Transactions of the Royal Historical Society*, 4th ser. 31 (1949), 115-127, reprinted in his *Miscellanea Mediaevalia* Hans Van Werveke, *Miscellanea Mediaevalia: Verspreide opstellen over economische en sociale geschiedenis van de middeleeuwn* (Ghent: E. Story-Scientia, 1968) , pp. 255-67.

[83] For medieval coinages, see also Philip Grierson, *Numismatics* (Oxford, 1975); Philip Grierson, *Les monnaies de moyen âge* (Paris, 1976); Philip Grierson, *Later Medieval Numismatics (11th - 16th Centuries): Selected Studies* (London: Variorium Reprints, 1979). For views very contrary to those expressed here, see Arthur J. Rolnick, François R. Velde, and Warren E. Weber, 'The Debasement Puzzle: An Essay on Medieval Monetary History', *Journal of Economic History*, 56:4 (December 1996), 789-808. In my view

Though inflation was generally the consequence of debasement, it was neither immediate nor proportional. The common assumption that a 10 percent debasement would quickly lead to a 10 percent rise in prices is simply false. In the first place, the mathematical relationship involves reciprocals, so that a 10.00 percent reduction of the silver contents of a penny would lead to a 11.11 percent increase in the coined value of a pound of fine silver. The formula for this inversely proportional relationship is:

$$T\ (\textit{traite}) = [1/(1 - x)] - 1,$$

in which x is the percentage reduction in the silver content of the penny or other coin linked to the money-of-account: the pound of 20 shillings and 240 pence (with 12d to the shilling). The *traite* – here, for the silver coinage – is the coined value of the mint weight of silver. Its formula is:

$$T = tM.V/F:$$

in which tM = the *taille* or number of coins cut per *marc*; V = the nominal or face value of the coin; and F = the fineness or purity of the coin, expressed as a percentage of commercial purity of the silver.[84]

Second, and on the other hand, my regression analyses of the relationships between coinage debasements and price changes in fifteenth-century Flanders indicate that in virtually every case, the consequent, time-lagged rise in prices was less than the expected percentage increase.

Third, the consequent inflation, if principally the result of the increase in the circulating money supply, has to be understood in terms of the modernized form of the quantity theory: M.V = P.y. Thus any inflationary rise in P (Consumer Price Index) from of an increase in M – principally the coined money supply – could have been offset by a reduction in V – the income velocity of money – and also by an induced or autonomous rise

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– and in the view of many of my colleagues in medieval monetary history – their arguments and supposed evidence are complete and utter nonsense. But it would require another and complex article to refute them effectively. Otherwise see the publications in n. 82, above.

[84] The silver coinage of the later-medieval and early-modern Low Countries was based on the French *marc argent-le-roy* = 244.753 g., of commercially fine silver, composed of 12 *deniers argent le roy*, with 24 *grains* per *denier* = 23/24 or 95.833% pure. For example, the Flemish silver-coinage debasement of November 1428 involved: (1) a reduction in the silver fineness from 50.00% (6 deniers *argent-le-roy*) to 44.44% commercially fine silver (5 *deniers* 8 *grains*) – or, from 47.92% to 42.59% pure silver; and a reduction in weight, from 3.599 grams (68 cut to the *marc*) to 3.573 grams (68.5 to the *marc*). That meant an overall loss of a 11.76% reduction in the pure silver content of the *dubbel groot* or 2d coin (from 1.725 g. to 1.522 g.). That in turn resulted in a 13.32% increase in the nominal money-of-account value of the *traite*: from 22.667s. (22s.8d.) to 25.6875s. (25s.8d.6m.) per fine silver *marc argent-le-roy*. The merchant selling bullion received 144 *dubbel groot* coins – an increase of 17 over the previous mint price (127 *dubbel groot* coins); the prince's seigniorage increased from 2 to 3 *dubbel groot* coins: a 50% increase; but the mint-master's brassage increased only from 7 to 7.125 *dubbel groot* coins. That should refute the common notion that mint-masters were responsible for instigating debasements. The prince was. From 1427-28 to 1428-29, in the Burgundian Low Countries, the duke's seigniorage revenues increased from £815 *groot* to £3,582 *groot*. See Munro, *Wool, Cloth, and Gold*, pp. 77-83 (Table III, on p. 83), p. 97 (graph IV), p. 99; and for this example, John Munro, 'Deflation and the Petty Coinage Problem in the Late-Medieval Economy: The Case of Flanders, 1334 - 1484', *Explorations in Economic History*, 25:4 (October 1988), 387-423: Table 1, pp. 390-91; reprinted in Munro, *Bullion Flows*, no. 8.

in 'y': i.e., the real value of the Net National Product or Net National Income. [85] In sum, while coinage debasements in late-medieval and early modern Europe almost always had a delayed inflationary consequence, the extent of debasement was always less than that expected from the reduction of the precious metals contents of the coinage, and for these reasons.

The contrast of the debasements in the three countries considered here is very striking. For the sake of comparison, let us begin with the worst offender of the three countries mentioned. In the southern Low Countries, which included the duchy of Brabant, the Burgundian-Habsburg governments debased the silver coinage – in both fineness and weight – a total of twelve times from 1521 to 1644: reducing the fine silver content of penny and thus of the *pond groot* from 0.33 g. to 0.17 g., for an overall loss of 48.5 percent (and thus a 94.17 per cent increase in the money-of-account value of the coined silver *marc*.)[86]

In England, for the entire period of the Price Revolution, from ca. 1520 to 1650, its silver penny and pound sterling money-of-account lost 35.5 percent of their silver contents: from 0.719 g to 0.464 g., in the penny. Virtually all and even more of that loss occurred during the Henrician 'Great Debasement' of 1544-1553. When the Great Debasement had reached its nadir under Henry VIII's successor (Northumberland, regent for Edward VI), in June 1553, the fine silver contents of the penny had been reduced (in both weight and fineness) to just 0.108 g. fine silver: for an overall reduction in the silver content of 83.1 percent from that contained in the previous coinage, issued in 1526. In 1560-61, Elizabeth I reformed the badly debased coinage: by reminting all of the circulating silver coins into those of sterling silver fineness of 92.50 per cent (with 7.50 percent copper): so that the penny now contained 0.480 g fine silver (i.e., 75.1 percent of the silver in the 1526 coinage). The English silver coinage remained untouched until July 1601, when its weight and fine silver contents were reduced by a very modest 3.23 per cent (to. 0.464 g). Thereafter the English silver coinage remained untouched until 1817: when the silver contents were reduced, for a final time, by another 6.06 percent.[87]

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[85] This can also be expressed in terms of the Cambridge Cash Balances approach: M = k.P.y. Here M stands for high-powered money held in non-earning cash balances; and 'k' represents the fraction or share of Net National Income (y) that the public chooses to hold in such cash balances, and is thus a measure of Keynesian Liquidity Preference. According to Keynes, 'k' is very sensitive to real interest rates, so that 'k' will decline with a rise of real interest rates, since the opportunity cost of holding cash balances is the foregone interest or other investment income. V, as the income velocity of money, is the mathematical reciprocal of 'k': i.e., as V falls, 'k' rises. A fall in V may reflect the public's reaction to an increased supply of money, thereby reducing the need to economise on its use; at the same, such an increase in M – *ceteris paribus* – should lead to a fall in interest rates, thus reducing the opportunity cost of holding cash balances, and thus leading – again – to a rise in 'k': qed [*quod erat demonstrandum*].

[86] Van der Wee, *Growth of the Antwerp Market,* Vol. I: *Statistics,* Monetary Tables: Table XV, pp. 126-29.

[87] See Christopher Challis, 'The Circulating Medium and the Movement of Prices in Mid-Tudor England', in Peter Ramsey, ed., *The Price Revolution in Sixteenth-Century England* (London, 1971), pp. 117-46; Christopher Challis, 'Spanish Bullion and Monetary Inflation in England in the Later Sixteenth Century', *Journal of European Economic History,* 4 (1975), 381-92; Christopher Challis, *The Tudor Coinage* (Manchester, 1978); Christopher Challis, 'Les trésors d'Espagne et l'inflation monétaire en Angleterre à la fin du XVIe siècle', in John Day, ed., *Etudes d'histoire monétaire, XIIe - XIXe siècles* (Lille, 1984), pp. 179 - 91; Christopher Challis, *Currency and the Economy in Tudor and Early Stuart England* (Oxford and New York: Oxford University Press, 1989); Christopher Challis, 'Lord Hastings to the Great Silver Recoinage, 1464 - 1699', in Christopher Challis, ed., *A New History of the Royal Mint* (Cambridge: Cambridge

Across the Channel (La Manche), in France, monetary changes were far more complex. Its silver coinage had become so impoverished from successive debasements over the course of the fifteenth century that the penny known as the *denier tournois* was no longer a useful coin, and the government replaced it as the standard or link coin for the money-of-account (*livre tournois*) with the *blanc couronne* or *douzain* (= 12d *tournois*, in effect the shilling). Strengthened in 1488, to contain 1.023 g pure silver, it remained unaltered until 1519, when Francis I's minor debasement (reducing slightly both fineness and weight) diminished its fine silver content by 11.73 percent to 0.903 g. When this coin underwent its final alteration in 1572, it had lost another 22.18 percent of its fine silver (with only 0.703 g) , so that it contained only 68.72 percent of the silver in the 1488 *blanc couronne*. Thereafter, with an entirely new series of silver coinages, the fine silver contents were even more drastically reduced, so that at the end of the Price Revolution era, the prevailing French silver coin, the *écu blanc* (of 1646) contained less than half the silver of the 1488 *blanc couronne*: i.e., just 42.47 percent – but still slightly less than the overall extent of the Habsburg debasements.[88]

Finally, we come to Spain, which had become a very significant anomaly in European monetary history. For, unlike almost all other European countries of this era, Spain underwent no debasements of the gold and silver coinages: none at all, remarkably, from 1497 to 1686. [89] The principal reason for the absence of coinage debasements was the Spanish monarchy's renunciation of mint profits: i.e., of the seignorage tax on coinage. For it must be fully understood that medieval and early-modern coinage debasements were fundamentally undertaken not as a monetary but strictly as a fiscal policy – as already demonstrated – in order to produce such seigniorage revenues.[90] That seignorage-renunciation policy – unique in Europe of this era – had first been enunciated in Henry IV of Castile's *Pragmatica*, issued in 1471. That renunciation was deemed to be a necessary component of the crown's monetary reform policy to suppress all competing baronial

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University Press, 1992), pp. 179-397; J. D. Gould, *The Great Debasement: Currency and the Economy in Mid-Tudor England* (Oxford: Oxford University Press, 1970).

[88] From 1488 to 1646, the grams of fine silver represented in the *livre tournois* had declined from 20.455 g to 8.687 g: an overall decline of 57.53 percent. Data extracted from tables in Adrian Blanchet and Alphonse Dieudonné, *Manuel de numismatique française*, 2 vols. (Paris: Ricard, 1916), Vol. II. For further details, see Munro, 'Money and Coinage: Western Europe', pp. 174-184 (n. 1 above).

[89] From 1497 to 1686, the Spanish crown consistently minted (with one exceptional, minor deviation in 1642-43) two silver coins at 93.06 percent fineness. The first and most important was the *Real*, with 3.195g pure silver (67 cut from an alloyed marc of 230.0465 g., with a silver fineness of 11 *dineros* and 4 grains = 93.056%) and a nominal money-of-account value of 34 *maravedís* (375 to the ducat money of account; 350 to the peso money of account). In fact, it differed from the earlier *Real*, struck from 1471, only in its money-account-value, having been raised from 31 to 34 maravedís. The second, also struck from 1497, was the heavy-weight *Real* known as the 'piece of eight *(real de a ocho*), with just over eight times as much fine silver, 25.997 g, and a value of 272 maravedís. In 1686, it was subjected to a very minor weight reduction that reduced its fine silver content to 25.919 g. The American dollar can trace its descent from this Spanish coin. Hamilton, *American Treasure* (1934), chapter III, pp. 46-72; Hamilton, *War and Prices in Spain, 1651-1800*, chapter II, pp.9-35; Modesto Ulloa, 'Castilian Seignorage and Coinage in the Reign of Philip II', *Journal of European Economic History*, 4 (1975), 459-80; Akira Motomura, 'The Best and Worst of Currencies: Seigniorage and Currency Policy in Spain, 1597 - 1650', *The Journal of Economic History*, 54:1 (March 1994), 104 - 27; Akira Motomura, 'New Data on Minting, Seigniorage, and the Money Supply in Spain (Castile), 1597 - 1643', *Explorations in Economic History*, 34:3 (July 1997), 331-67; Munro, 'Money and Coinage: Western Europe', pp. 174-184.

[90] See n. 82 above.

mints (about 150); but not until Ferdinand and Isabella confirmed this *Pragmatica* in 1479, as joint rulers of Castile (from 1474), was this policy finally put into practice. With their new coinage of 1497, Ferdinand and Isabella formally and forever revoked the recently united Spanish crown's right to exact seigniorage on gold and silver coins.[91] Any royal revenue losses from foregone seigniorage were more than made up by the duties imposed on the importation of precious metals from the Americas.[92]

The absence of both seigniorage and debasement in Spain's silver and gold coinages did not apply, however, to its petty coinage: the previously mentioned *vellon,* largely and then finally entirely copper, whose role in the Spanish Price Revolution became so very important in the seventeenth century.[93] From at least 1471, the Castilian and then Spanish kings had issued a largely copper fractional coinage called *blancas*, with a nominal money-of-account value of 0.5 *maravedí* (compared to a value of 34 *maravedí*s for the silver *real*): but with a very small amount of silver 10 grains = 3.47 percent), to convince the public that it was indeed precious-metal 'money'.[94] In 1497, that fineness was reduced to 2.43 percent (7 grains); in 1552, to 1.909 percent (5.5 grains); in 1566, to 1.39 percent (4 grains); in 1583, to a fineness of just 1.39 percent (containing only 0.0146 g silver), and a nominal value 0.5 *maravedís*. Subsequently, in 1597, Philip II (r.1556-1598) agreed to the issue of a coin worth exactly one *maravedí* , with a fineness of only 0.34 percent (just 1 grain of silver); but whether any were actually issued is not clear.

In 1599, the new king Philip III (r. 1598-1621) issued Spain's first purely copper coin: 140 coins struck per copper *marc* of 230.0465 g. But shortly after, from 1602, it was then minted with only half as much copper: at 280 per marc). Certainly some of the ensuing inflation in seventeenth-century Spain, with a widening gap between nominal and silver-based prices, ranging from 4.0 percent in 1620 to 104.2 percent in 1650, has to be explained by such issues of copper *vellon* coinages.[95]

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[91] Ferdinand II of Aragon married Isabella of Castile in 1469; in 1474, they became joint rulers of Castile; in 1479, Ferdinand became king of Aragon; and in 1492, the conquest of Muslim Granada completed their effective unification of Spain. Isabella died in 1504; Ferdinand, in 1516, bequeathing his rule to his grandson, who became the Holy Roman Emperor Charles V, in 1519.

[92] For the monetary details, see Marie-Thérèse Boyer-Xambeu, Ghislain Deleplace, and Lucien Gillard, *Private Money and Public Currencies: The 16th Century Challenge*, trans. by Azizeh Azodi: from *Monnaie privée et pouvoir des princes: l'économie des relations monétaire à la Renaissance* (Paris: Editions de CNRS, 1986) (London: M.E. Sharpe, 1994), pp. 109-111. Another reason may be found in Spufford, *Money and Its Use*, p. 314: he notes that from about 1354 to 1471, the Castilian silver coinage had lost about 95 percent of its fine metal contents, 'a greater long-term fall in value than that of any other European money'. See also Table 5 (p. 295) and the monetary graphs on pp. 296-99.

[93] Europe's first entirely-copper petty coinage was issued not in Habsburg Spain but in the Habsburg Netherlands, in 1543: H. E. Van Gelder and Marcel Hoc, *Les monnaies des Pays-Bas bourguignons et espagn;ols, 1434-1713: Répertoire générale* (Amsterdam, 1960); Van der Wee, *Antwerp Market*, vol. I, pp. 123-35; Munro, 'Money and Coinage: Western Europe', pp. 174-84.

[94] The Castilian *blanca* issued in 1471 had a silver fineness of 10 grains or 3.47%, weighing 1.107g. The silver fineness was based on theoretical purity of 12 *dineros*, with 24 grains each, and thus a total of 288 grains. The weight was defined as the number cut from an alloyed marc of 230.0465 grams. See Hamilton, *American Treasure*, pp. 49-64.

[95] *Ibid.,* pp. 49-64. See also the sources cited in n. 2, 14, 24, and 93 above.

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Table 1. Composite Price Indices of Flanders, Brabant, England, Spain (Castile)

in quinquennial means: 1401-05 to 1646-50
Indices: mean of 1451-75 = 100; and mean of 1501-10 = 100

Years 5 yr means	FLANDERS 1451-75=100	BRABANT 1451-75=100	ENGLAND 1451-75=100	BRABANT 1501-10=100	ENGLAND 1501-10=100	SPAIN 1501-10=100 Silver	SPAIN 1501-10=100 Vellon fr 1597
1401-05	88.531	64.269	114.840	53.501	109.078		
1406-10	105.261	68.552	111.235	57.067	105.654		
1411-15	95.309	73.971	108.105	61.578	102.681		
1416-20	107.381	80.542	113.403	67.049	107.713		
1421-25	112.182	90.193	101.476	75.082	96.384		
1426-30	117.773	100.153	112.267	83.374	106.634		
1431-35	123.512	102.759	108.475	85.543	103.032		
1436-40	140.166	125.432	122.010	104.418	115.888		
1441-45	113.504	105.477	92.525	87.806	87.883		
1446-50	109.984	99.577	100.900	82.894	95.837		
1451-55	100.902	98.545	100.250	82.035	95.220		
1456-60	117.855	114.577	97.055	95.382	92.185		
1461-65	88.705	91.070	102.733	75.813	97.578		
1466-70	96.520	96.953	106.745	80.710	101.389		
1471-75	96.017	98.854	97.755	82.293	92.850		
1476-80	117.213	120.693	90.055	100.473	85.537		
1481-85	156.853	155.752	127.380	129.658	120.989		
1486-90	184.511	174.098	102.770	144.931	97.614		
1491-95	144.981	133.216	106.795	110.898	101.437		
1496-00	100.255	115.352	96.700	96.026	91.848		
1501-05		125.449	106.793	104.432	101.434	92.433	92.433
1506-10		114.801	103.773	95.568	98.566	107.569	107.569
1511-15		137.904	108.520	114.800	103.075	98.981	98.981
1516-20		150.264	120.438	125.090	114.395	104.280	104.280
1521-25		179.938	146.045	149.792	138.717	122.139	122.139

Years 5 yr means	FLANDERS 1451-75=100	BRABANT 1451-75=100	ENGLAND 1451-75=100	BRABANT 1501-10=100	ENGLAND 1501-10=100	SPAIN 1501-10=100 Silver	SPAIN 1501-10=100 Vellon fr 1597
1526-30		178.519	157.345	148.611	149.450	131.573	131.573
1531-35		173.995	155.640	144.845	147.831	132.444	132.444
1536-40		185.641	152.330	154.540	144.687	138.734	138.734
1541-45		208.340	176.545	173.435	167.687	147.904	147.904
1546-50		199.420	229.640	166.010	218.118	165.892	165.892
1551-55		260.515	275.453	216.870	261.633	176.023	176.023
1556-60		300.717	315.846	250.337	299.999	194.006	194.006
1561-65		313.937	289.311	261.342	274.795	223.434	223.434
1566-70		318.290	292.292	264.965	277.627	227.728	227.728
1571-75		423.432	296.095	352.492	281.239	246.766	246.766
1576-80		480.716	336.495	400.179	319.612	247.816	247.816
1581-85		617.424	337.515	513.984	320.580	269.068	269.068
1586-90		799.754	387.170	665.767	367.744	274.969	274.969
1591-95		688.333	416.010	573.013	395.137	284.424	284.424
1596-00		752.946	540.540	626.801	513.419	320.973	320.982
1601-05		612.324	461.265	509.738	438.121	349.918	352.430
1606-10		615.893	496.995	512.709	472.059	330.114	335.311
1611-15		636.132	532.840	529.557	506.105	316.813	322.676
1616-20		626.963	520.390	521.925	494.280	328.561	335.642
1621-25		815.752	529.720	679.085	503.142	317.853	344.721
1626-30		919.647	525.060	765.574	498.715	328.044	410.813
1631-35		908.534	608.383	756.322	577.857	329.905	395.126
1636-40		967.668	615.125	805.549	584.261	323.466	409.666
1641-45		987.167	560.495	821.781	532.372	313.495	432.481
1646-50		1015.138	734.390	845.067	697.542	343.360	457.094

Sources :

For Spain (1501-1650):

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 in these tables: 1501-10 = 100.

For Brabant (Southern Netherlands) (1401-1650)

Herman Van der Wee, *Growth of the Antwerp Market and the European Economy, 14th to 16th Centuries*, 3 Vols. (The Hague, 1963). Vol. I: *Statistics*; and Vol. III: *Graphs*.

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I have changed the base from the original, 1451-75 = 100, to the one used in these tables: 1501-10 = 100.

For Flanders (1401-1500):

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), Table 8, pp. 249-50. Note that these index numbers are based on my revised calculations and thus differ, marginally, from those that I had provided in some earlier publications.

For England (1401-1650):

E.H. Phelps Brown and Sheila V. Hopkins, 'Seven Centuries of Building Wages', *Economica*, 22 (August 1955), reprinted 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 S.V. Hopkins, 'Seven Centuries of the Prices of Consumables Compared with Builders' Wage-Rates', *Economica*, 23(Nov. 1956), reprinted 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. I have corrected a number of the indices from the Phelps Brown Papers Collection, now housed in the Archives of the British Library of Political and Economic Science (LSE), in uncatalogued boxes; and I have also interpolated missing data in their annual series, for both prices and wages.

Although I have now reconstructed their price indexes, following the methodology of Herman Van der Wee, with commodity weights dependent on changes in relative prices, I have not yet published this revised series of the Phelps Brown and Hopkins 'Basket of Consumables', and have used their original index numbers, using fixed commodity price shares, though corrected as indicated above.

Table 2.

SPAIN : Prices and Wages, in quinquennial means, 1501-05 to 1646-50
Base: 1501-10 = 100

Years	Composite Price Index Based on CPI: A (Silver)	Composite Price Index Based on CPI: B (Vellon after 1600)	Spanish Grain Price Index	Money-Wage Index	Real Wage Index harmonic means
1501-05	92.43	92.43	92.71	95.34	103.13
1506-10	107.57	107.57	107.29	104.66	96.88
1511-15	98.98	98.98	84.55	110.35	111.49
1516-20	104.28	104.28	80.43	115.29	110.54
1521-25	122.14	122.14	102.22	120.69	98.82
1526-30	131.57	131.57	139.50	120.85	91.78
1531-35	132.44	132.45	117.12	124.03	93.58
1536-40	138.73	138.74	119.88	130.86	94.33
1541-45	147.90	147.90	132.52	136.01	91.93
1546-50	165.89	165.89	163.72	146.08	88.08
1551-55	176.02	176.02	140.61	166.71	94.51
1556-60	194.01	194.01	200.78	188.23	96.93
1561-65	223.43	223.43	197.18	204.35	91.44
1566-70	227.73	227.73	206.47	216.32	94.90
1571-75	246.77	246.76	213.74	220.43	89.33
1576-80	247.82	247.82	262.76	231.26	93.37
1581-85	269.07	269.07	305.17	249.77	92.82
1586-90	274.97	274.98	282.63	267.03	97.07
1591-95	284.42	284.43	326.09	275.05	96.71
1596-00	320.98	320.98	366.41	278.60	86.84
1601-05	349.92	352.43	347.68	350.15	99.20
1606-10	330.12	335.31	400.39	372.46	111.05

SPAIN : Prices and Wages, in quinquennial means, 1501-05 to 1646-50
Base: 1501-10 = 100

Years	Composite Price Index Based on CPI: A (Silver)	Composite Price Index Based on CPI: B (Vellon after 1600)	Spanish Grain Price Index	Money-Wage Index	Real Wage Index harmonic means
1611-15	316.82	322.68	318.28	373.24	115.66
1616-20	328.56	335.64	384.67	374.11	111.45
1621-25	317.86	344.72	355.10	371.34	107.70
1626-30	328.05	410.81	435.91	384.65	93.55
1631-35	329.91	395.13	419.20	400.84	101.44
1636-40	323.47	409.67	419.46	406.46	99.22
1641-45	313.50	432.48	466.09	403.92	93.40
1646-50	343.36	457.09	573.78	410.25	89.79

Sources :

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 in these tables: 1501-10 = 100.

Table 3.

ENGLAND : Prices and Wage Indices, in quinquennial means, 1501-05 to 1656-60
Base: 1501 - 10 = 100

Years	Index A PBH Farinaceous Price Index	Index B PBH Fish, Meat Dairy Product	Index C PBH Ind Price Index	PBH Composite Price Index	Doughty Industrial Price Index	Daily Money Wage in d. for Master Mason, Carp	Bldg Craftsmen: Nominal Wage Index for Master Mason/Carpenter	Bldg Craftsmen: Real Wage Index harmonic mean
1501-05	109.40	92.52	101.18	101.43	100.40	6.00	100.00	98.59
1506-10	90.60	107.48	98.82	98.57	99.61	6.00	100.00	101.46
1511-15	98.27	107.32	105.38	103.08	101.58	6.00	100.00	97.02
1516-20	113.69	119.48	106.20	114.39	104.74	6.00	100.00	87.42
1521-25	128.43	165.34	110.14	138.72	114.03	6.00	100.00	72.09
1526-30	163.17	149.62	119.34	149.45	119.57	6.00	100.00	66.91
1531-35	154.12	155.49	119.53	147.83	111.46	6.00	100.00	67.65
1536-40	141.52	159.28	123.66	144.69	115.81	6.50	108.33	74.87
1541-45	145.54	213.07	129.00	167.69	126.48	6.90	115.00	68.60
1546-50	210.34	263.07	149.06	218.12	157.71	7.20	120.00	55.01
1551-55	255.79	311.55	178.87	261.63	189.72	8.40	140.00	53.40
1556-60	359.82	292.61	184.21	300.00	209.09	9.60	160.00	52.92
1561-65	264.01	319.95	211.88	274.79	230.24	10.00	166.67	60.65
1566-70	265.50	322.25	218.64	277.63	224.11	10.00	166.67	60.03
1571-75	273.83	322.29	218.83	281.24	234.78	10.20	170.00	60.55
1576-80	353.75	329.61	226.36	319.61	240.91	11.40	190.00	59.40
1581-85	337.61	342.42	241.84	320.58	243.68	12.00	200.00	62.39
1586-90	401.01	388.64	255.55	367.74	263.44	12.00	200.00	54.39
1591-95	436.29	421.78	254.83	395.14	270.55	12.00	200.00	50.62
1596-00	673.37	458.40	271.29	513.42	294.66	12.00	200.00	38.96
1601-05	494.99	458.33	275.98	438.12	282.81	12.00	200.00	45.65
1606-10	554.94	480.05	276.80	472.06	301.78	12.00	200.00	42.37

ENGLAND : Prices and Wage Indices, in quinquennial means, 1501-05 to 1656-60
Base: 1501 - 10 = 100

Years	Index A PBH Farinaceous Price Index	Index B PBH Fish, Meat Dairy Product	Index C PBH Ind Price Index	PBH Composite Price Index	Doughty Industrial Price Index	Daily Money Wage in d. for Master Mason, Carp	Bldg Craftsmen: Nominal Wage Index for Master Mason/Carpenter	Bldg Craftsmen: Real Wage Index harmonic mean
1611-15	597.13	517.80	286.07	506.11	314.63	12.00	200.00	39.52
1616-20	555.38	530.81	291.74	494.28	302.77	12.00	200.00	40.46
1621-25	593.65	515.15	283.63	503.14	306.13	12.00	200.00	39.75
1626-30	573.47	521.46	292.88	498.72	328.85	12.20	203.33	40.82
1631-35	747.56	536.65	288.15	577.86	340.51	13.60	226.67	39.16
1636-40	728.40	568.56	301.28	584.26	349.80	14.90	248.33	42.45
1641-45	597.92	565.03	327.60	532.37		16.10	268.33	50.40
1646-50	885.22	675.63	331.89	697.54		17.00	283.33	40.69
1651-55	606.26	646.91	350.10	571.16		17.80	296.67	51.86
1656-60	710.97	633.33	336.62	608.13		18.00	300.00	49.33

Table 3, continued

ENGLAND : Prices and Wage Indices, in quinquennial means, 1501-05 to 1656-60
Base: 1501 - 10 = 100

Years	Bldg Craftsmen: Real Wage Index harmonic mean	Ratio of Money Wages to PBH Ind Prices harmonic means	Ratio of Money Wages to Doughty Ind Prices harmonic means
1501-05	98.586	98.831	99.606
1506-10	101.455	101.197	100.397
1511-15	97.017	94.891	98.444
1516-20	87.417	94.158	95.472
1521-25	72.089	90.794	87.695
1526-30	66.912	83.795	83.636
1531-35	67.645	83.660	89.716
1536-40	74.874	87.606	93.544
1541-45	68.599	89.109	90.950
1546-50	55.009	80.569	76.251
1551-55	53.397	78.042	73.678
1556-60	52.918	86.920	76.580
1561-65	60.651	78.662	72.389
1566-70	60.033	76.229	74.368
1571-75	60.549	77.579	72.365
1576-80	59.400	83.840	78.777
1581-85	62.387	82.699	82.076
1586-90	54.386	78.262	75.919
1591-95	50.615	78.484	73.923
1596-00	38.955	73.721	67.874
1601-05	45.649	72.470	70.720
1606-10	42.368	72.255	66.274
1611-15	39.517	69.913	63.568

ENGLAND : Prices and Wage Indices, in quinquennial means, 1501-05 to 1656-60
Base: 1501 - 10 = 100

Years	Bldg Craftsmen: Real Wage Index harmonic mean	Ratio of Money Wages to PBH Ind Prices harmonic means	Ratio of Money Wages to Doughty Ind Prices harmonic means
1616-20	40.463	68.553	66.057
1621-25	39.750	70.514	65.332
1626-30	40.823	69.448	61.806
1631-35	39.155	78.641	66.527
1636-40	42.454	82.380	70.956
1641-45	50.403	81.892	
1646-50	40.694	85.364	
1651-55	51.858	84.732	
1656-60	49.332	89.120	

Sources:

E.H. Phelps Brown and Sheila V. Hopkins, 'Seven Centuries of Building Wages', *Economica*, 22 (August 1955), reprinted 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 S.V. Hopkins, 'Seven Centuries of the Prices of Consumables Compared with Builders' Wage-Rates', *Economica*, 23(Nov. 1956), reprinted 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. I have corrected a number of the indices from the Phelps Brown Papers Collection, now housed in the Archives of the British Library of Political and Economic Science (LSE), in uncatalogued boxes; and I have also interpolated missing data in their annual series, for both prices and wages.

Robert Doughty, 'Industrial Prices and Inflation in Southern England, 1401-1640', *Explorations in Economic History*, 12 (1975), 177-92.

Table 4.

BRABANT : Prices and Wage Indices, in quinquennial means, 1501-05 to 1656-60
Base: 1501 - 10 = 100

Year	Index A Van der Wee Farinaceous Price Index	Index B Van der Wee Fish, Meat Dairy Product	Index C Van der Wee Industrial Price Index	Van der Wee Composite Price Index	Nominal Wage Index for Master Bldg Craftsmen	Real Wage Index harmonic	NWI:IPI Ratio of NWIndex to Ind Pr Ind harmonic
1501-05	111.58	102.84	97.06	104.43	100.00	95.76	103.03
1506-10	88.42	97.17	102.94	95.57	100.00	104.64	97.14
1511-15	120.77	109.15	114.72	114.80	109.80	95.35	95.21
1516-20	132.95	125.53	113.89	125.09	122.45	97.89	107.52
1521-25	177.08	141.01	125.42	149.79	124.08	82.77	99.01
1526-30	165.86	148.36	125.74	148.61	126.12	84.77	100.34
1531-35	169.81	155.39	96.38	144.85	122.86	84.82	127.43
1536-40	188.82	160.54	99.93	154.54	140.41	90.67	140.53
1541-45	207.27	178.37	120.93	173.44	155.92	90.12	128.75
1546-50	165.08	189.29	134.48	166.01	182.04	109.70	135.37
1551-55	265.14	220.08	147.36	216.87	193.47	89.22	131.35
1556-60	290.38	265.82	174.62	250.34	214.29	84.53	123.07
1561-65	317.75	260.13	187.10	261.34	349.39	133.32	185.56
1566-70	303.44	278.29	194.41	264.97	291.02	109.04	148.80
1571-75	456.11	332.19	241.57	352.49	284.90	80.60	117.68
1576-80	526.58	374.13	266.68	400.18	433.47	106.53	160.93
1581-85	644.31	530.17	315.71	513.98	531.43	100.88	166.38
1586-90	993.01	564.57	367.68	665.77	484.90	72.34	131.79
1591-95	734.25	583.85	340.66	573.01	499.59	87.51	146.58
1596-00	844.29	622.11	340.58	626.80	548.57	87.43	160.84
1601-05	616.45	526.41	342.57	509.74	587.76	115.31	171.57

Year	Index A Van der Wee Farinaceous Price Index	Index B Van der Wee Fish, Meat Dairy Product	Index C Van der Wee Industrial Price Index	Van der Wee Composite Price Index	Nominal Wage Index for Master Bldg Craftsmen	Real Wage Index harmonic	NWI:IPI Ratio of NWIndex to Ind Pr Ind harmonic
1606-10	640.44	505.79	350.48	512.71	587.76	114.64	167.70
1611-15	692.39	501.40	349.97	529.56	587.76	110.99	167.95
1616-20	606.91	541.17	380.40	521.93	587.76	112.61	154.51
1621-25	910.44	657.27	398.31	679.09	587.76	86.55	147.56
1626-30	1023.08	773.31	407.96	765.57	587.76	76.77	144.07
1631-35	960.52	797.65	423.18	756.32	587.76	77.71	138.89
1636-40	1053.89	819.47	451.57	805.55	587.76	72.96	130.16
1641-45	994.05	902.72	475.84	821.78	587.76	71.52	123.52
1646-50	1070.59	897.76	467.21	845.07	587.76	69.55	125.80
1651-55	914.34	833.43	421.83	752.82	587.76	78.07	139.33
1656-60	850.72	779.25	393.55	702.16	587.76	83.71	149.35

Sources: see sources for Tables 1 and 5.

Table 5.

BRABANT : Prices and Wages in d groot Brabant, in quinquennial means, 1501-05 to 1656-60
With the Composite Price and Money Wage Index: Base: 1501 - 10 = 100

Year	Grains: Van der Wee Farinaceous prices in d groot Brab	Meat: Van der Wee Fish, Meat prices in d groot Brab	Industrial: Van der Wee Industrial prices in d groot Brab	Van der Wee Composite prices in d groot Brab	Van der Wee Composite Price Index 1501-10 = 100	Master Builder's Daily Wage in d gr	Nominal Wage Index 1501-10 = 100
1501-05	111.8	107.7	72.2	291.70	104.43	12.25	100.00
1506-10	88.6	101.8	76.6	266.94	95.57	12.25	100.00
1511-15	121.0	114.4	85.3	320.66	114.80	13.45	109.80
1516-20	133.2	131.5	84.7	349.40	125.09	15.00	122.45
1521-25	177.4	147.7	93.3	418.40	149.79	15.20	124.08
1526-30	166.1	155.4	93.5	415.10	148.61	15.45	126.12
1531-35	170.1	162.8	71.7	404.58	144.85	15.05	122.86
1536-40	189.1	168.2	74.3	431.66	154.54	17.20	140.41
1541-45	207.6	186.9	90.0	484.44	173.44	19.10	155.92
1546-50	165.3	198.3	100.0	463.70	166.01	22.30	182.04
1551-55	265.6	230.6	109.6	605.76	216.87	23.70	193.47
1556-60	290.8	278.5	129.9	699.24	250.34	26.25	214.29
1561-65	318.3	272.5	139.2	729.98	261.34	42.80	349.39
1566-70	303.9	291.6	144.6	740.10	264.97	35.65	291.02
1571-75	456.8	348.0	179.7	984.58	352.49	34.90	284.90
1576-80	527.4	392.0	198.4	1117.78	400.18	53.10	433.47
1581-85	645.3	555.5	234.9	1435.66	513.98	65.10	531.43
1586-90	994.6	591.5	273.5	1859.62	665.77	59.40	484.90
1591-95	735.4	611.7	253.4	1600.54	573.01	61.20	499.59
1596-00	845.6	651.8	253.4	1750.78	626.80	67.20	548.57
1601-05	617.4	551.5	254.8	1423.80	509.74	72.00	587.76

Year	Grains: Van der Wee Farinaceous prices in d groot Brab	Meat: Van der Wee Fish, Meat prices in d groot Brab	Industrial: Van der Wee Industrial prices in d groot Brab	Van der Wee Composite prices in d groot Brab	Van der Wee Composite Price Index 1501-10 = 100	Master Builder's Daily Wage in d gr	Nominal Wage Index 1501-10 = 100
1606-10	641.5	529.9	260.7	1432.10	512.71	72.00	587.76
1611-15	693.5	525.3	260.3	1479.16	529.56	72.00	587.76
1616-20	607.9	567.0	283.0	1457.84	521.93	72.00	587.76
1621-25	911.9	688.6	296.3	1896.82	679.09	72.00	587.76
1626-30	1024.7	810.2	303.5	2138.40	765.57	72.00	587.76
1631-35	962.1	835.7	314.8	2112.56	756.32	72.00	587.76
1636-40	1055.6	858.6	335.9	2250.06	805.55	72.00	587.76
1641-45	995.6	945.8	354.0	2295.40	821.78	72.00	587.76
1646-50	1072.3	940.6	347.6	2360.44	845.07	72.00	587.76
1651-55	915.8	873.2	313.8	2102.78	752.82	72.00	587.76
1656-60	852.1	816.4	292.8	1961.26	702.16	72.00	587.76

Table 5, continued:

BRABANT :

Prices and Wages in d groot Brabant, in quinquennial means, 1501-05 to 1656-60
With the Composite Price and Money Wage Index: Base: 1501 - 10 = 100

Year	Master's Annual Wage Income (210 Days) in Commodity Baskets	Real Wage: in Commodity Baskets Harmonic Mean: 1501-10 = 100	Real Wage: RWI = NWI/CPI Harmonic Mean 1501-10 = 100	Ratio of Money Wages to Industrial Prices arithmetic	Ratio of Money Wages to Industrial Prices harmonic
1501-05	8.819	95.756	95.756	16.99%	16.97%
1506-10	9.637	104.638	104.638	16.03%	16.00%
1511-15	8.781	95.348	95.348	15.75%	15.68%
1516-20	9.015	97.889	97.889	17.71%	17.71%
1521-25	7.623	82.772	82.772	16.34%	16.30%
1526-30	7.807	84.766	84.766	16.54%	16.52%
1531-35	7.811	84.815	84.815	21.35%	20.98%
1536-40	8.351	90.674	90.674	23.29%	23.14%
1541-45	8.300	90.117	90.117	21.22%	21.20%
1546-50	10.104	109.703	109.703	22.34%	22.29%
1551-55	8.217	89.216	89.216	21.69%	21.63%
1556-60	7.785	84.525	84.525	20.39%	20.27%
1561-65	12.279	133.320	133.320	30.79%	30.56%
1566-70	10.043	109.041	109.041	24.71%	24.50%
1571-75	7.423	80.603	80.603	19.58%	19.38%
1576-80	9.811	106.529	106.529	26.70%	26.50%
1581-85	9.291	100.876	100.876	28.16%	27.40%
1586-90	6.662	72.340	72.340	21.96%	21.70%
1591-95	8.059	87.508	87.508	24.20%	24.14%

Year	Master's Annual Wage Income (210 Days) in Commodity Baskets	Real Wage: in Commodity Baskets Harmonic Mean: 1501-10 = 100	Real Wage: RWI = NWI/CPI Harmonic Mean 1501-10 = 100	Ratio of Money Wages to Industrial Prices arithmetic	Ratio of Money Wages to Industrial Prices harmonic
1596-00	8.052	87.433	87.433	26.53%	26.49%
1601-05	10.619	115.305	115.305	28.26%	28.25%
1606-10	10.558	114.637	114.637	27.62%	27.62%
1611-15	10.222	110.990	110.990	27.69%	27.66%
1616-20	10.372	112.613	112.613	25.46%	25.44%
1621-25	7.971	86.551	86.551	24.39%	24.30%
1626-30	7.071	76.773	76.773	23.75%	23.72%
1631-35	7.157	77.712	77.712	22.93%	22.87%
1636-40	6.720	72.963	72.963	21.48%	21.43%
1641-45	6.587	71.522	71.522	20.49%	20.34%
1646-50	6.406	69.551	69.551	20.84%	20.72%
1651-55	7.190	78.074	78.074	22.96%	22.94%
1656-60	7.709	83.707	83.707	24.62%	24.59%

Sources:

Herman Van der Wee, *Growth of the Antwerp Market and the European Economy, 14th to 16th Centuries*, 3 Vols. (The Hague, 1963). Vol. I: *Statistics*; and Vol. III: *Graphs*.

Herman Van der Wee, 'Prijzen en lonen als ontwikkelingsvariabelen: Een vergelijkend onderzoek tussen Engeland en de Zuidelijke Nederlanden, 1400 - 1700', in *Album offert à Charles Verlinden à l'occasion de ses trente ans de professoriat* (Wetteren: Universum, 1975), pp. 413-35. English translation: 'Prices and Wages as Development Variables: A Comparison Between England and the Southern Netherlands, 1400-1700', *Acta Historia Neerlandica*, 10 (1978), 58-78, republished in Herman Van der Wee, *The Low Countries in the Early Modern World*, translated by Lizabeth Fackelman, Variorum Publications (Aldershot, 1993), pp. 223-41. Only the Dutch version in this original publication contains the specific annual data in tabular form.

I have changed the base from the original, 1451-75 = 100, to the one used in these tables: 1501-10 = 100.

Table 6

Comparison of Price and Nominal Wage Indices in Spain, Brabant, and England, 1501-05 to 1656-60 in quinquennial means, 1501-10 = 100

Years	SPAIN Composite Price Index Based on CPI: B (Vellon after 1600)	SPAIN Money-Wage Index	BRABANT Van der Wee Composite Price Index	BRABANT Van der Wee Industrial Price Index	BRABANT Nominal Wage Index for Master Bldg Craftsmen	BRABANT NWI:IPI: Ratio of NWIndex to Ind Pr Ind harmonic
1501-05	92.43	95.34	104.43	97.06	100.00	103.03
1506-10	107.57	104.66	95.57	102.94	100.00	97.14
1511-15	98.98	110.35	114.80	114.72	109.80	95.21
1516-20	104.28	115.29	125.09	113.89	122.45	107.52
1521-25	122.14	120.69	149.79	125.42	124.08	99.01
1526-30	131.57	120.85	148.61	125.74	126.12	100.34
1531-35	132.45	124.03	144.85	96.38	122.86	127.43
1536-40	138.74	130.86	154.54	99.93	140.41	140.53
1541-45	147.90	136.01	173.44	120.93	155.92	128.75
1546-50	165.89	146.08	166.01	134.48	182.04	135.37
1551-55	176.02	166.71	216.87	147.36	193.47	131.35
1556-60	194.01	188.23	250.34	174.62	214.29	123.07
1561-65	223.43	204.35	261.34	187.10	349.39	185.56
1566-70	227.73	216.32	264.97	194.41	291.02	148.80
1571-75	246.76	220.43	352.49	241.57	284.90	117.68
1576-80	247.82	231.26	400.18	266.68	433.47	160.93
1581-85	269.07	249.77	513.98	315.71	531.43	166.38
1586-90	274.98	267.03	665.77	367.68	484.90	131.79
1591-95	284.43	275.05	573.01	340.66	499.59	146.58
1596-00	320.98	278.60	626.80	340.58	548.57	160.84

Comparison of Price and Nominal Wage Indices in Spain, Brabant, and England, 1501-05 to 1656-60
in quinquennial means, 1501-10 = 100

Years	SPAIN Composite Price Index Based on CPI: B (Vellon after 1600)	SPAIN Money-Wage Index	BRABANT Van der Wee Composite Price Index	BRABANT Van der Wee Industrial Price Index	BRABANT Nominal Wage Index for Master Bldg Craftsmen	BRABANT NWI:IPI: Ratio of NWIndex to Ind Pr Ind harmonic
1601-05	352.43	350.15	509.74	342.57	587.76	171.57
1606-10	335.31	372.46	512.71	350.48	587.76	167.70
1611-15	322.68	373.24	529.56	349.97	587.76	167.95
1616-20	335.64	374.11	521.93	380.40	587.76	154.51
1621-25	344.72	371.34	679.09	398.31	587.76	147.56
1626-30	410.81	384.65	765.57	407.96	587.76	144.07
1631-35	395.13	400.84	756.32	423.18	587.76	138.89
1636-40	409.67	406.46	805.55	451.57	587.76	130.16
1641-45	432.48	403.92	821.78	475.84	587.76	123.52
1646-50	457.09	410.25	845.07	467.21	587.76	125.80
1651-55			752.82	421.83	587.76	139.33
1656-60			702.16	393.55	587.76	149.35

Table 6, continued.

Comparison of Price and Nominal Wage Indices in Spain, Brabant, and England, 1501-05 to 1656-60

Base: 1501-10 = 100

in quinquennial means, 1501-10 = 100

Years	ENGLAND PBH Composite Price Index	ENGLAND PBH Industrial Price Index	ENGLAND Bldg Craftsmen: Nominal Wage Index for Master Mason/Carpenter	ENGLAND Ratio of Money Wages to PBH Ind Prices harmonic means
1501-05	101.43	101.18	100.00	98.83
1506-10	98.57	98.82	100.00	101.20
1511-15	103.08	105.38	100.00	94.89
1516-20	114.39	106.20	100.00	94.16
1521-25	138.72	110.14	100.00	90.79
1526-30	149.45	119.34	100.00	83.80
1531-35	147.83	119.53	100.00	83.66
1536-40	144.69	123.66	108.33	87.61
1541-45	167.69	129.00	115.00	89.11
1546-50	218.12	149.06	120.00	80.57
1551-55	261.63	178.87	140.00	78.04
1556-60	300.00	184.21	160.00	86.92
1561-65	274.79	211.88	166.67	78.66
1566-70	277.63	218.64	166.67	76.23
1571-75	281.24	218.83	170.00	77.58
1576-80	319.61	226.36	190.00	83.84
1581-85	320.58	241.84	200.00	82.70

Comparison of Price and Nominal Wage Indices in Spain, Brabant, and England, 1501-05 to 1656-60

Base: 1501-10 = 100

in quinquennial means, 1501-10 = 100

Years	ENGLAND PBH Composite Price Index	ENGLAND PBH Industrial Price Index	ENGLAND Bldg Craftsmen: Nominal Wage Index for Master Mason/Carpenter	ENGLAND Ratio of Money Wages to PBH Ind Prices harmonic means
1586-90	367.74	255.55	200.00	78.26
1591-95	395.14	254.83	200.00	78.48
1596-00	513.42	271.29	200.00	73.72
1601-05	438.12	275.98	200.00	72.47
1606-10	472.06	276.80	200.00	72.26
1611-15	506.11	286.07	200.00	69.91
1616-20	494.28	291.74	200.00	68.55
1621-25	503.14	283.63	200.00	70.51
1626-30	498.72	292.88	203.33	69.45
1631-35	577.86	288.15	226.67	78.64
1636-40	584.26	301.28	248.33	82.38
1641-45	532.37	327.60	268.33	81.89
1646-50	697.54	331.89	283.33	85.36
1651-55	571.16	350.10	296.67	84.73
1656-60	608.13	336.62	300.00	89.12

Sources:

See sources for Tables 1 - 5.

Table 7.

The 'Baskets of Consumables' for Southern England and Brabant:
The Phelps Brown & Hopkins and the Van der Wee Composite Price Indices

		ENGLAND: Phelps Brown & Hopkins Composite Index			**BRABANT: Van der Wee Composite Index**				
FARINACEOUS	**Metric Units**	**Quantity**	**Price in 1500 in d. ster**	**Weight/ Percentage**	**Quantity**	**Mean Value in 1451-75 in d. gr. Brabant**	**Weight/ Percentage in 1451-75**	**Mean Value in 1501-05 in d. gr. Brabant**	**Weight/ Percentage in 1501-05**
wheat	litres	45.461							
rye	litres	36.369			126.000	42.404	18.24%	54.720	18.76%
barley	litres	18.184							
peas	litres	24.243							
Sub-total	litres	124.257	20.80	20.00%		42.404	18.24%	54.720	18.76%
MEAT-DAIRY-FISH									
sheep	number	1.5							
beef: salted	kg				23.500	54.704	23.53%	64.840	22.23%
white herrings	number	15.000							
red herrings	number	25.000			40.000	9.988	4.30%	11.180	3.83%
Sub-total: meat/fish				25.00%		64.692	27.82%	76.020	26.06%
butter	kg	4.536		6.25%	4.800	19.728	8.48%	23.520	8.06%
cheese	kg	4.536		6.25%	4.700	5.968	2.57%	8.200	2.81%
Sub-total: dairy				12.50%		25.696	11.05%	31.720	10.87%

The 'Baskets of Consumables' for Southern England and Brabant:
The Phelps Brown & Hopkins and the Van der Wee Composite Price Indices

			ENGLAND: Phelps Brown & Hopkins Composite Index		BRABANT: Van der Wee Composite Index				
FARINACEOUS	**Metric Units**	**Quantity**	**Price in 1500 in d. ster**	**Weight/ Percentage**	**Quantity**	**Mean Value in 1451-75 in d. gr. Brabant**	**Weight/ Percentage in 1451-75**	**Mean Value in 1501-05 in d. gr. Brabant**	**Weight/ Percentage in 1501-05**
Sub-total of group			39.00	37.50%		90.388	38.87%	107.740	36.94%
DRINK									
barley malt or barley	litres	163.659	23.40	22.50%	162.000	39.712	17.08%	57.040	19.55%
FUEL & LIGHT									
charcoal	litres	154.567			162.000	10.568	4.54%	10.160	3.48%
candles	kg	1.247			1.333	7.608	3.27%	8.940	3.06%
oil	litres	0.284							
Sub-total			7.80	7.50%		18.176	7.82%	19.100	6.55%
TEXTILES									
woollen cloth	metres	0.305			1.125	24.844	10.68%	29.700	10.18%
canvas	metres	0.610							
linen shirting	metres	0.457			1.800	17.000	7.31%	23.400	8.02%

The 'Baskets of Consumables' for Southern England and Brabant:
The Phelps Brown & Hopkins and the Van der Wee Composite Price Indices

			ENGLAND: Phelps Brown & Hopkins Composite Index		BRABANT: Van der Wee Composite Index			
FARINACEOUS	**Metric Units**	**Quantity**	**Price in 1500 in d. ster**	**Weight/ Percentage**	**Quantity**	**Mean Value in 1451-75 in d. gr. Brabant**	**Weight/ Percentage in 1451-75**	**Mean Value in 1501-05 in d. gr. Brabant**	**Weight/ Percentage in 1501-05**
Sub-total			13.00	12.50%		41.844	18.00%	53.100	18.20%
GRAND TOTAL			104.00	100.00%		232.524	100.00%	291.700	100.00%
Farinaceous/Drink			44.20	42.50%		82.116	35.32%	111.760	38.31%
Meat/Dairy/Fish			39.00	37.50%		90.388	38.87%	107.740	36.94%
Industrial Products			20.80	20.00%		60.020	25.81%	72.200	24.75%
Total			104.00	100.00%		232.524	100.00%	291.700	100.00%

Sources:

E.H. Phelps Brown and S.V. Hopkins, ‘Seven Centuries of the Prices of Consumables Compared with Builders’ Wage-Rates’, *Economica*, 23 (Nov. 1956), reprinted in E.H. Phelps Brown and Sheila V. Hopkins, *A Perspective of Wages and Prices* (London, 1981), pp. 13-59.

Herman Van der Wee, ‘Prijzen en lonen als ontwikkelingsvariabelen: Een vergelijkend onderzoek tussen Engeland en de Zuidelijke Nederlanden, 1400 - 1700’, in *Album offert à Charles Verlinden à l’occasion de ses trente ans de professoriat* (Wetteren: Universum, 1975), pp. 413-35; republished in English translation as: ‘Prices and Wages as Development Variables: A Comparison between England and the Southern Netherlands, 1400-1700’, *Acta Historiae Neerlandicae*, 10 (1978), 58-78.

Table 8. **Price Relatives for Fuels and Components of the Phelps Brown and Hopkins 'Basket of Consumables' (Revised Version)**

1451-60 to 1741-50, 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 Basket of Consumables Index 1451-75 = 100	Phelps Brown & Hopkins Basket of Consumables Index 1581-90 = 100
							112.801 d. sterling	
1501-10	88.26	36.88			86.25	25.36	105.72	31.08
1511-20	93.91	39.24			99.29	29.19	114.92	33.78
1521-30	95.13	39.75			102.82	30.22	153.43	45.10
1531-40	90.21	37.70			97.95	28.79	158.28	46.53
1541-50	106.84	44.65			120.64	35.46	204.84	60.21
1551-60	171.32	71.59			181.63	53.39	296.20	87.07

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 Basket of Consumables Index 1451-75 = 100	Phelps Brown & Hopkins Basket of Consumables Index 1581-90 = 100
							112.801 d. sterling	
1561-70	187.85	78.50			179.50	52.77	286.08	84.09
1571-80	208.75	87.23			216.07	63.51	313.90	92.28
1581-90	239.30	100.00	274.61	100.00	248.99	100.00	340.18	100.00
1591-1600	254.11	106.19	260.71	94.94	295.58	118.71	430.78	126.63
1601-10	280.91	117.39	288.05	104.89	349.47	140.36	436.65	128.36
1611-20	329.71	137.78	288.17	104.94	408.73	164.16	477.82	140.46
1621-30	325.20	135.90	316.15	115.13	455.84	183.08	488.78	143.68
1631-40	332.18	138.81	354.62	129.14	494.83	198.74	558.62	164.21
1641-50	433.40	181.11	530.69	193.26	528.36	212.21	585.24	172.04
1651-60	539.62	225.50	473.71	172.51			571.15	167.90
1661-70	607.69	253.94	454.45	165.49			567.49	166.82
1671-80	593.22	247.89	502.52	183.00			555.11	163.18

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 Basket of Consumables Index 1451-75 = 100	Phelps Brown & Hopkins Basket of Consumables Index 1581-90 = 100
							112.801 d. sterling	
1681-90	572.80	239.36	400.10	145.70			501.54	147.43
1691-1700	572.03	239.04	488.30	177.82			574.24	168.80
1701-10	685.29	286.37	535.40	194.97			603.32	177.35
1711-20	727.95	304.20	503.51	183.36			646.88	190.16
1721-30	727.95	304.20	486.87	177.30			604.49	177.70
1731-40	729.75	304.95	516.68	188.15			557.41	163.86
1741-50	757.91	316.72	545.67	198.71			593.49	174.46

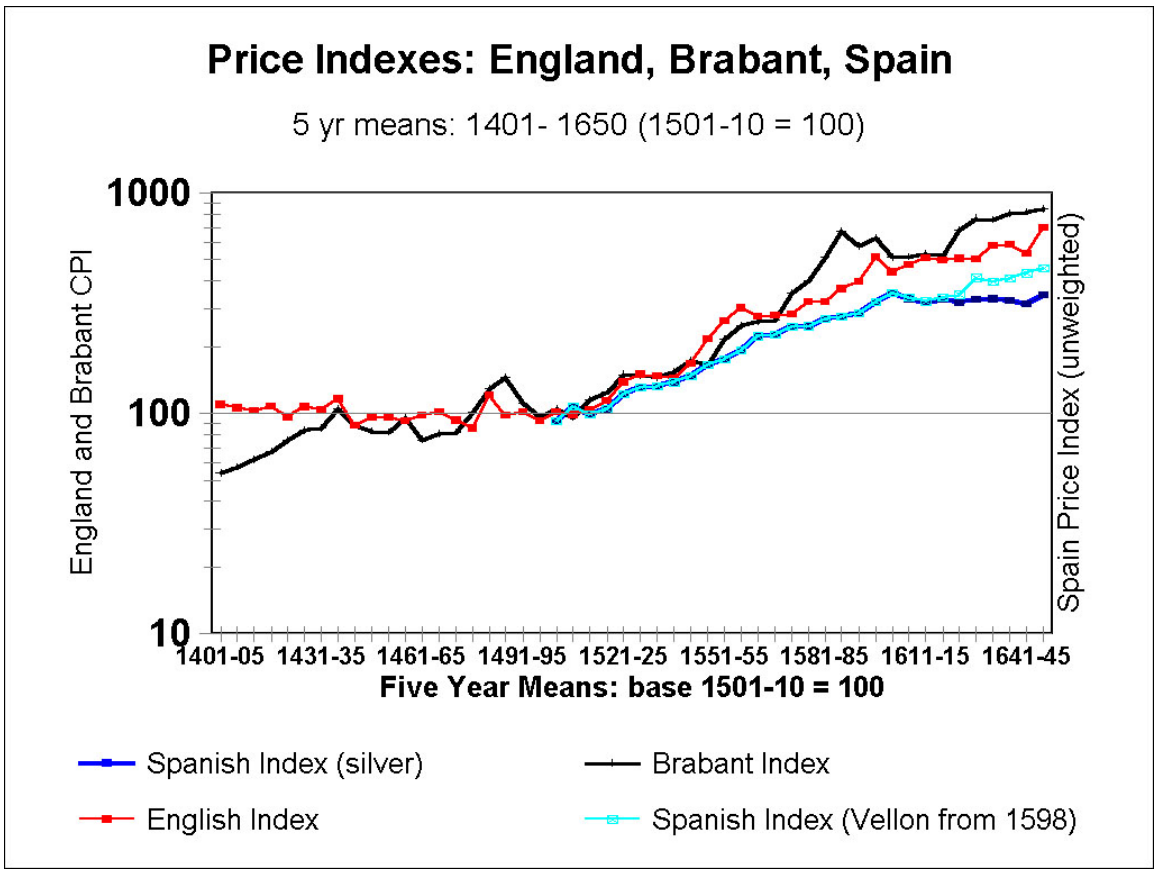
coal	Cambridge coal: spliced to combined charcoal index over 1586-1635multiplier = 20.15607
coal	Westminster coal: spliced to combined charcoal index over 1586-1635multiplier = 17.3983

Sources:

charcoal and coal: The Phelps Brown Papers Collection, Archives of the British Library of Political and Economic Science (LSE Archives).
The index numbers, computed here as decennial means, are those calculated by my reconstruction of their index, using component price weights based on the movements of relative prices, rather than on fixed percentage shares, therefore differ from those that Phelps Brown and Hopkins published. See n. above.

timber: 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.

Money, Prices, Wages, and 'Profit Inflation' in Spain, the Southern Netherlands, and England during the Price Revolution era: 1520 - 1650

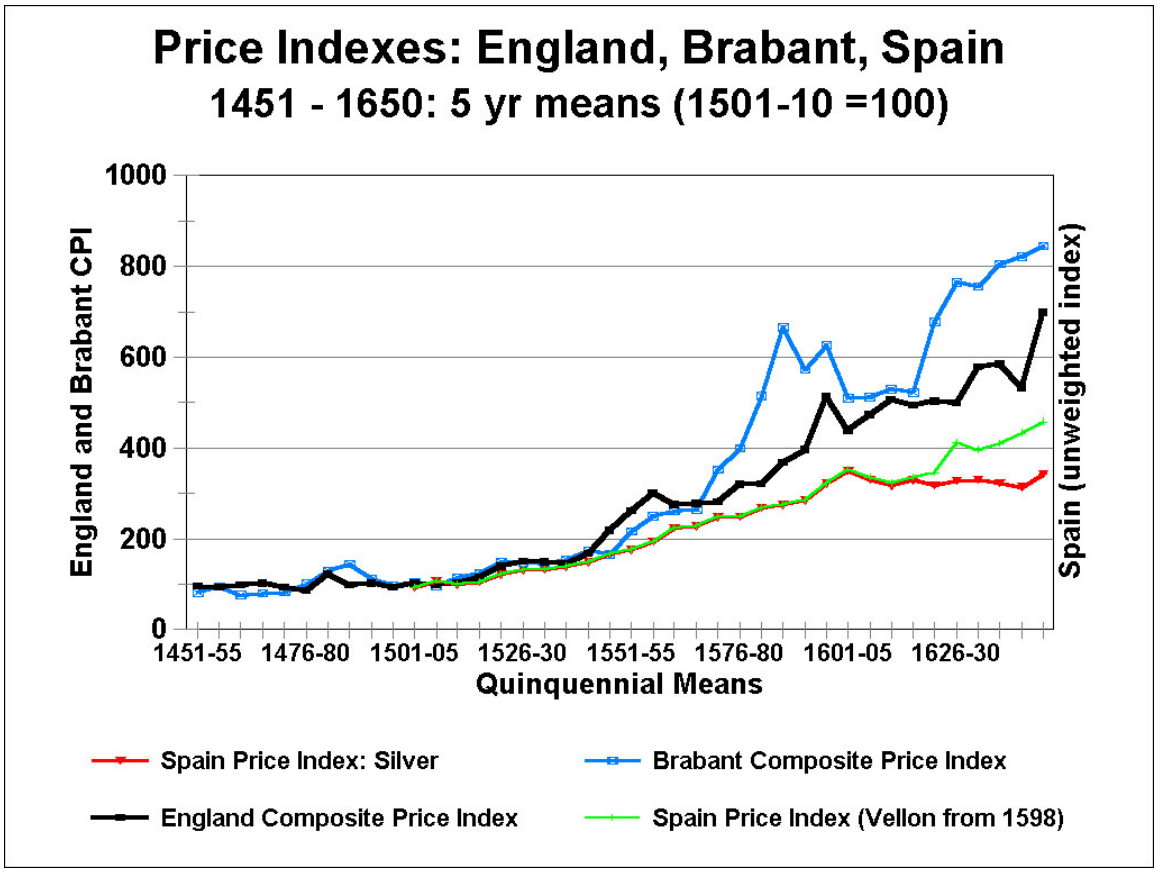


Graph A: Composite Price Indexes for Spain, Southern England, and the Southern Netherlands:

In Quinquennial Means, 1401-05 to 1645-50: with a semi-logarithmic scale

Base: mean of 1501-10 = 100

Sources: see the Tables

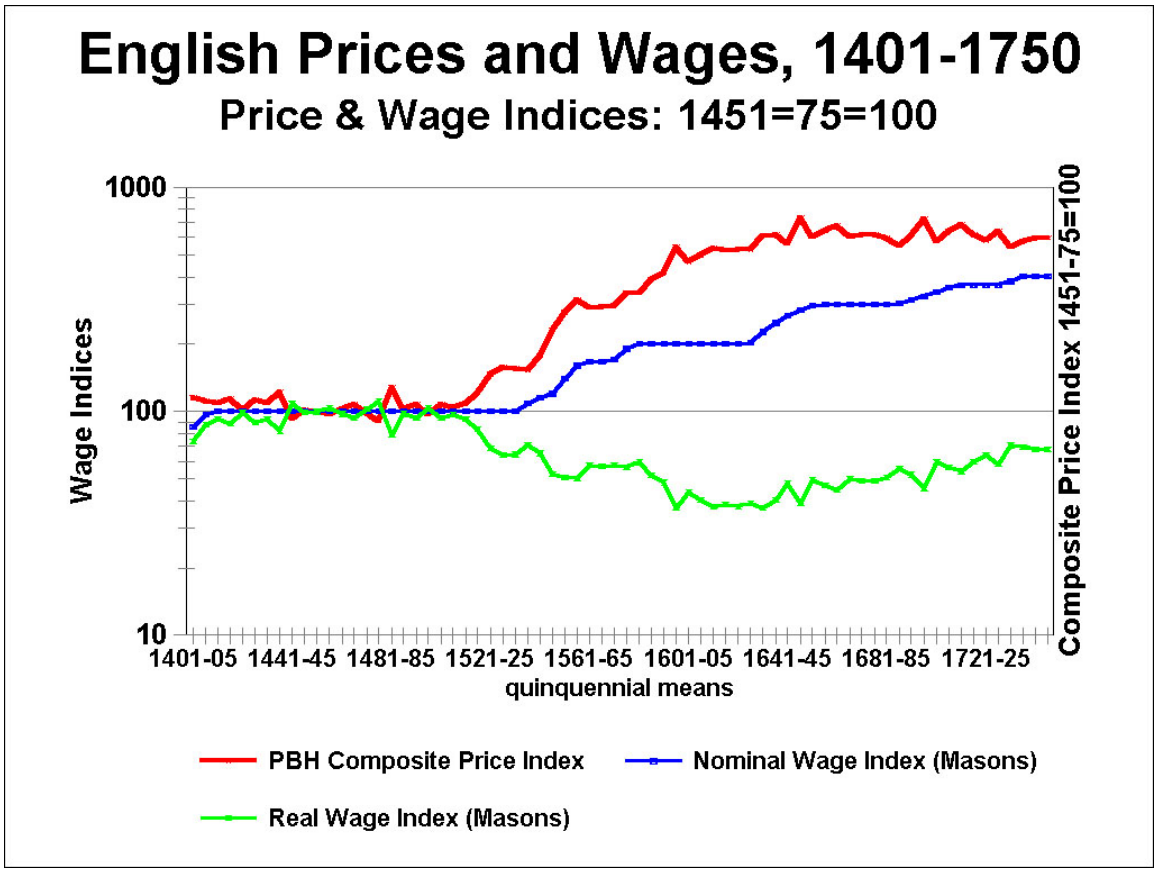


Graph B: Composite Price Indexes for Spain, southern England, and the Southern Netherlands:

Quinquennial Means, 1401-05 to 1645-50: with an arithmetic scale

Base: mean of 1501-10 = 100

Sources: see the Tables



Graph C: England, Prices and Wages, 1401 – 1750

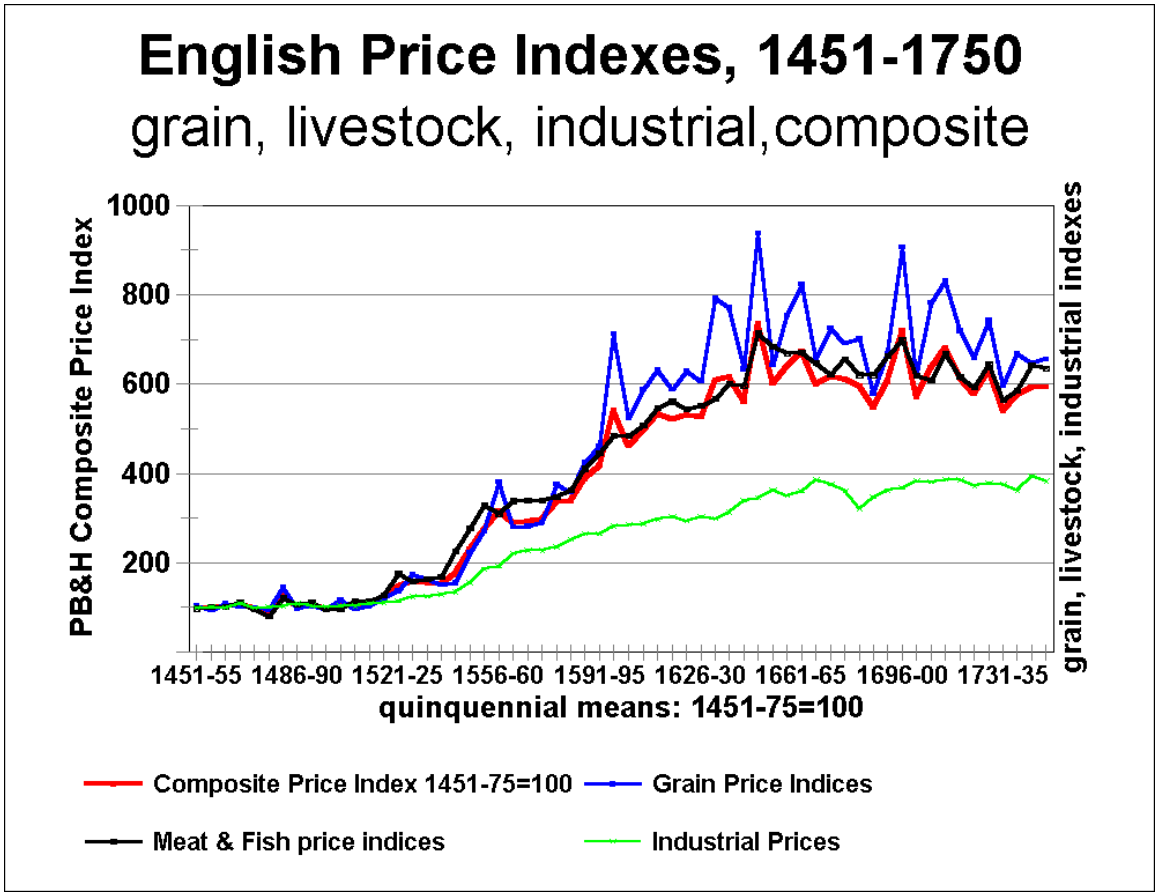
The Phelps Brown Composite Price Index ('Basket of Consumables'), the Nominal Wage Index for Master Masons, and the Real Wage Wage Index for Master Masons

In quinquennial means, 1401-05 to 1746-50

Base = mean of 1451-75 = 100

Real Wage Index (RWI) = Nominal Wage Index (NWI)/ Consumer Price Index (CPI)

Sources: see the Tables

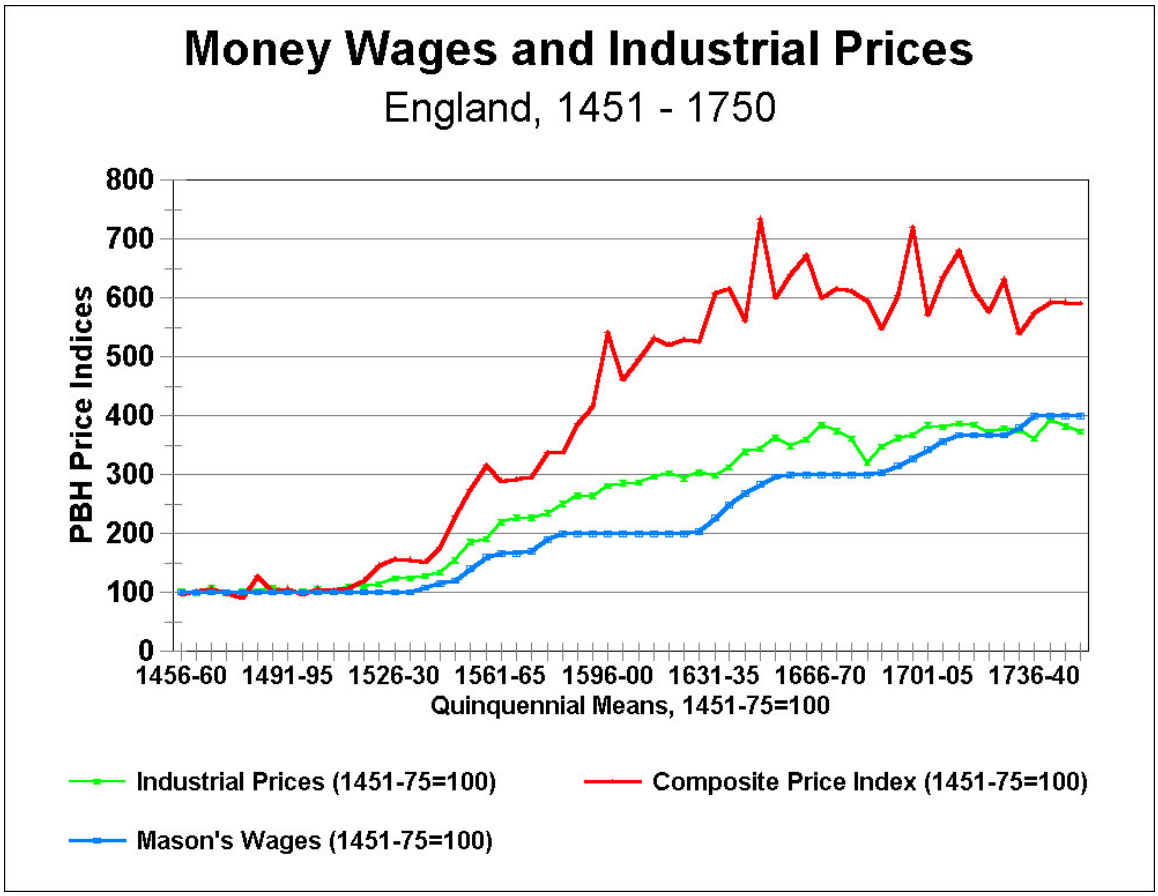


Graph D: Prices in England, 1451 – 1750

The Phelps Brown and Hopkins Composite Price Index, and the Indexes for Grain Prices, Meat-Dairy-Fish Prices, and Industrial Prices

In quinquennial means: 1451-55 to 1749-50

Base: Mean of 1451-75 = 100



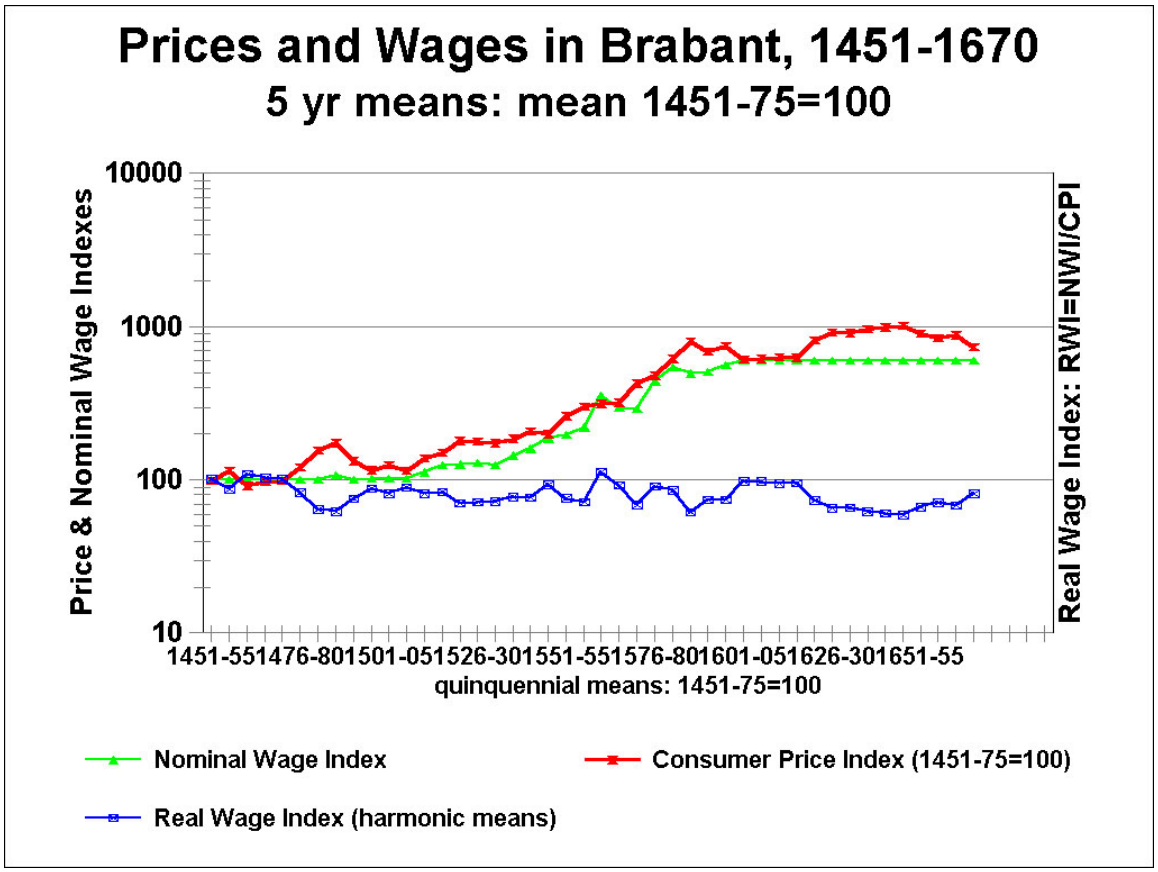
Graph E: England, Prices and Wages, 1451 – 1750

The Phelps Brown and Hopkins Composite Price Index, an Index of Industrial Prices, and Masons' Wages, 1451-55 to l746-50, in quinquennial means

Base: mean of 1451-75 = 100

Real Wage Index (RWI) = Nominal Wage Index (NWI)/ Consumer Price Index (CPI)

Sources: see the Tables



Graph F: Prices and Wages in the Duchy of Brabant (southern Netherlands), 1451-1670

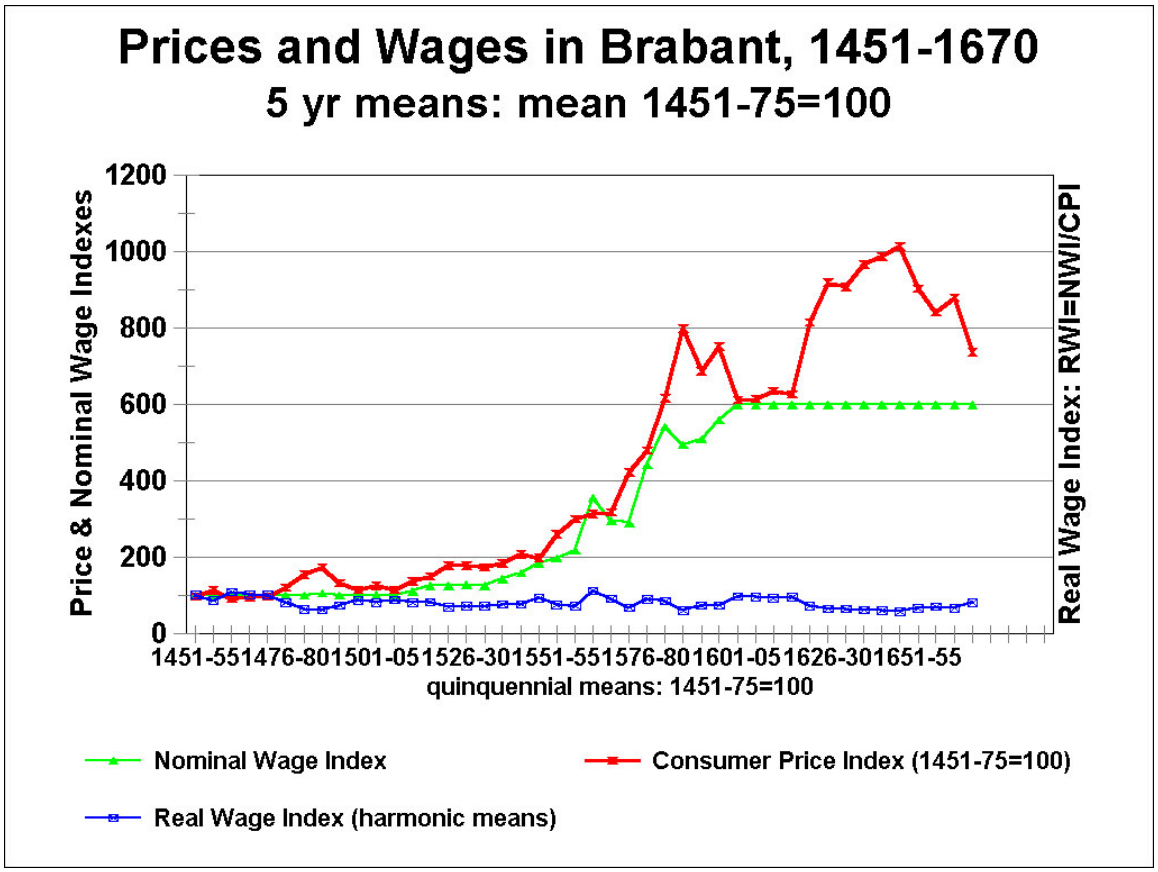
The Van der Wee Composite or Consumer Price Index, the Nominal Wage Index for Master Masons, and the Real Wage Index for Master Masons: in semi-logarithmic scale

In quinquennial means 1451-55 to 1666-70

Base: mean of 1451-75 =100

Real Wage Index (RWI) = Nominal Wage Index (NWI)/ Consumer Price Index (CPI)

Sources: see the Tables



Graph G: Prices and Wages in the Duchy of Brabant (southern Netherlands), 1451-1670

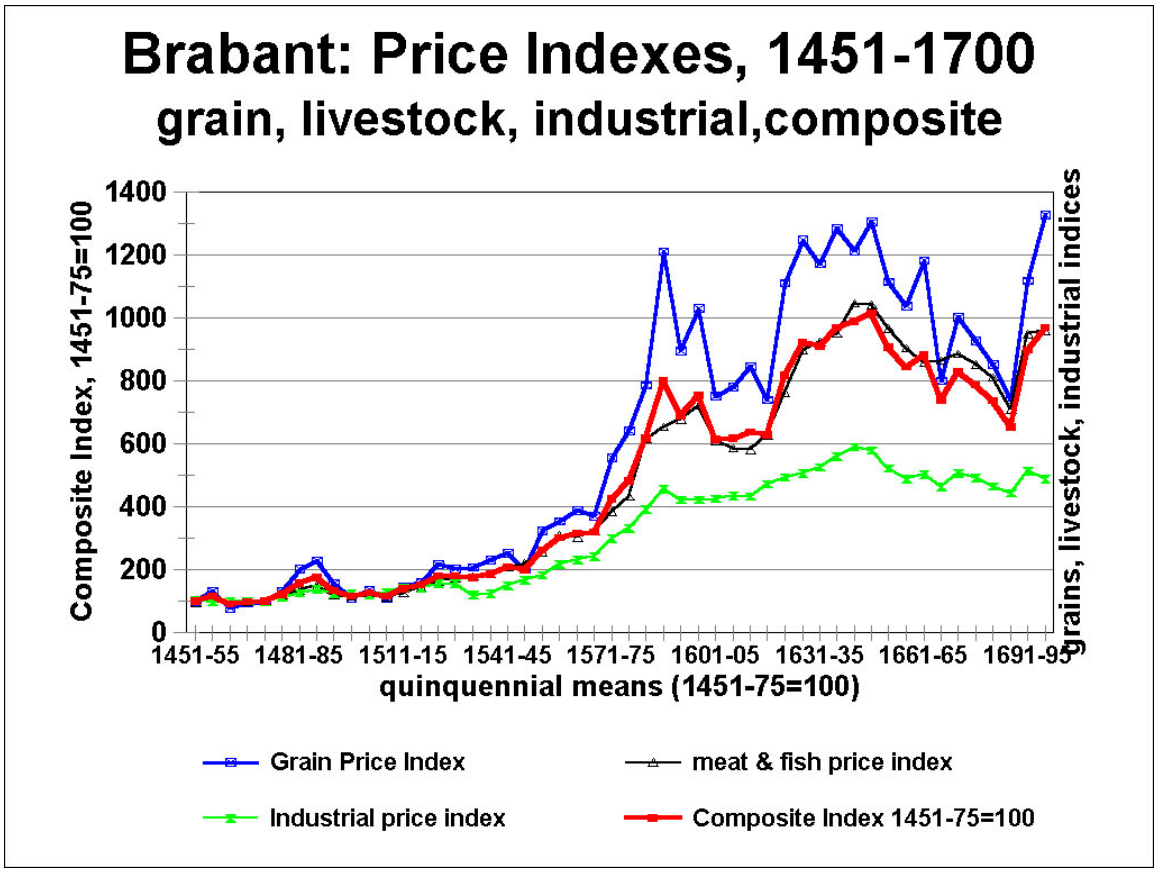
The Van der Wee Composite or Consumer Price Index, the Nominal Wage Index for Master Masons, and the Real Wage Index for Master Masons: in arithmetic scale

In quinquennial means 1451-55 to 1666-70

Base: mean of 1451-75 =100

Real Wage Index (RWI) = Nominal Wage Index (NWI)/ Consumer Price Index (CPI)

Sources: see the Tables



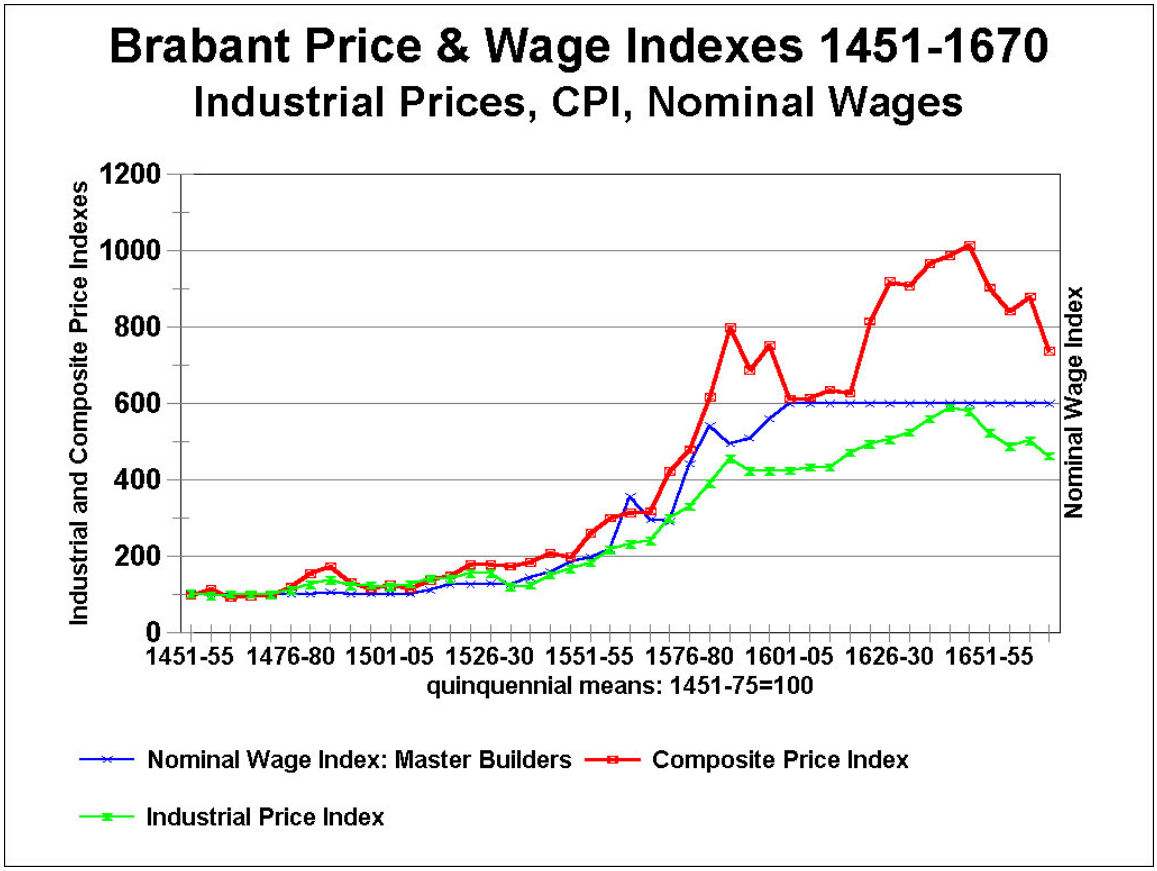
Graph H: Prices in the Duchy of Brabant (southern Netherlands), 1451-1670

The Van der Wee Composite or Consumer Price Index, and the Price Indexes for Grains, Meat and Fish Products, and Industrial Products (arithmetic scale)

In quinquennial means 1451-55 to 1666-70

Base: mean of 1451-75 =100

Sources: see the Tables



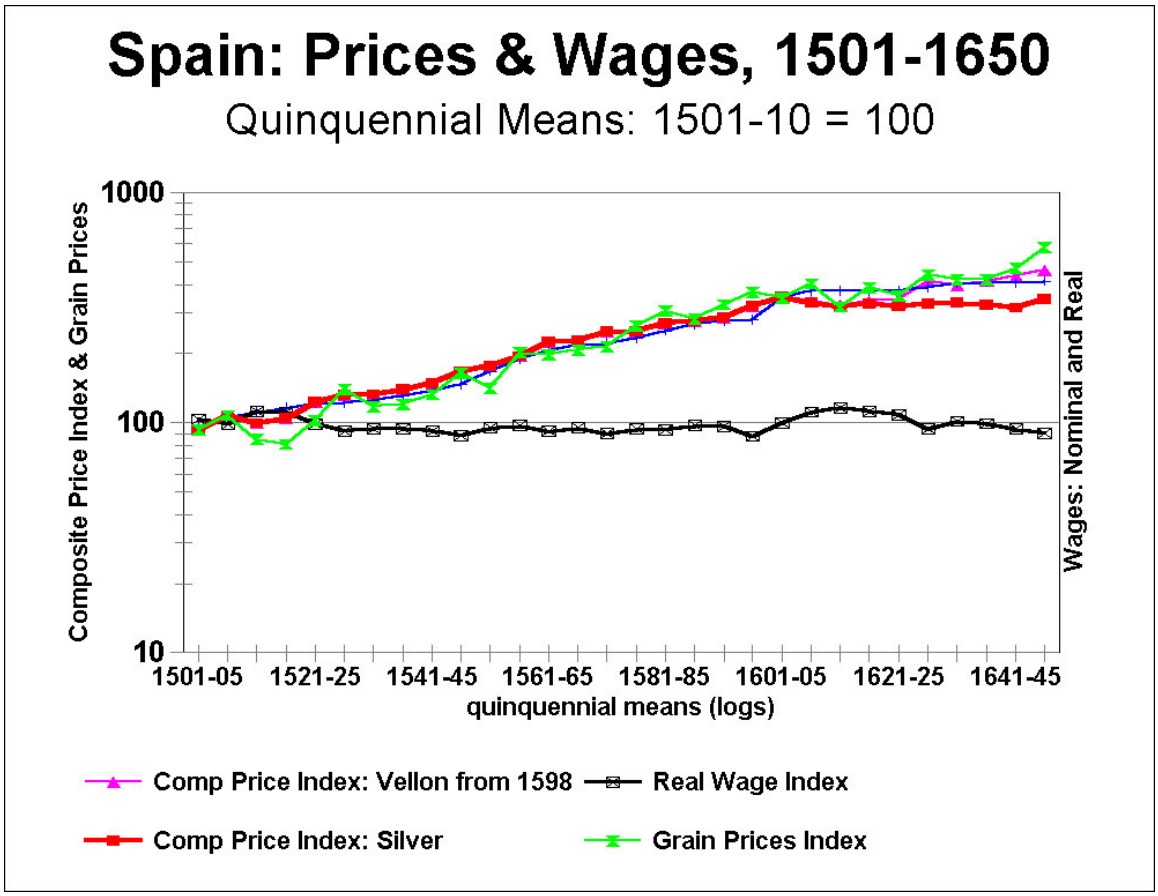
Graph I: Prices and Wages in the Duchy of Brabant (southern Netherlands), 1451-1670

The Van der Wee Composite or Consumer Price Index, the Composite Industrial Price Index, and the Nominal Wage Index for Master Masons

In quinquennial means 1451-55 to 1666-70

Base: mean of 1451-75 =100

Sources: see the Tables



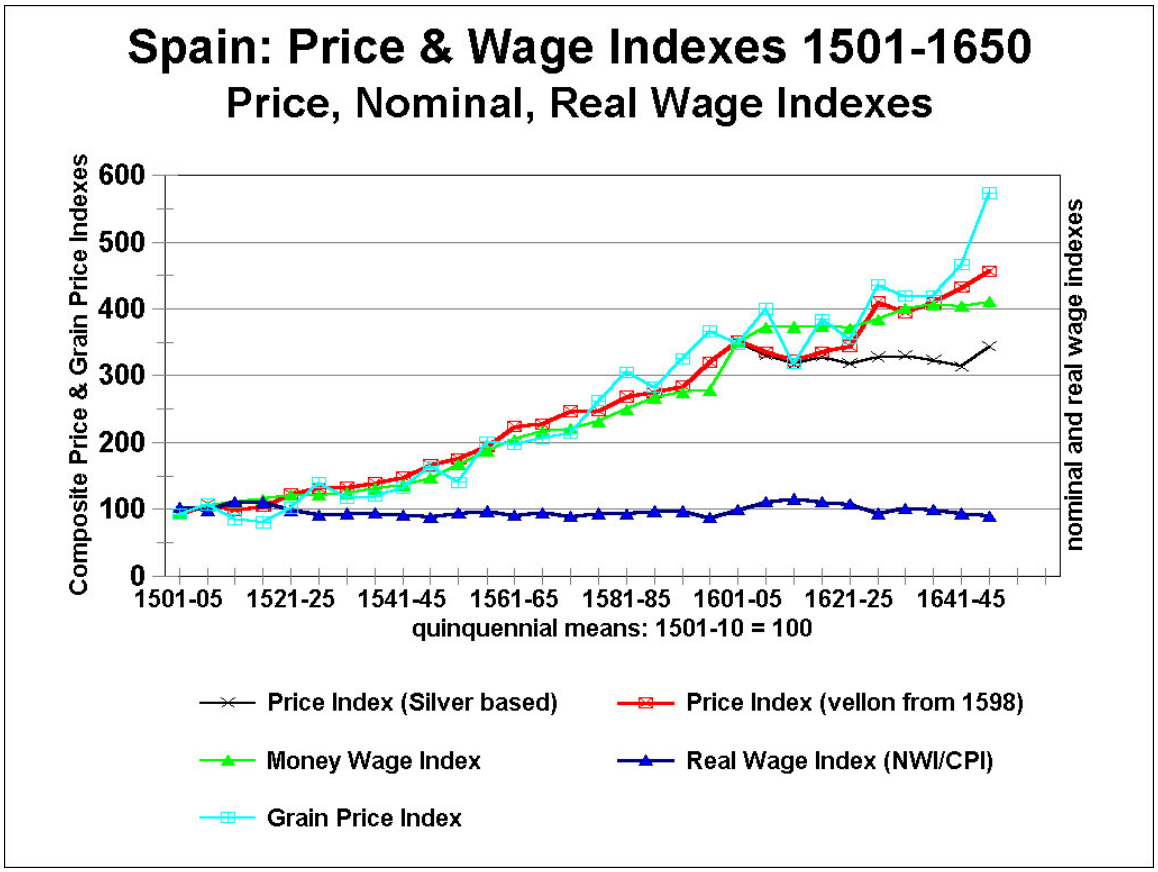
Graph J: Prices and Wages in Spain, 1501 – 1650

Hamilton's Composite Price Index for Spain (both silver and vellon based), the Grain Price Index, and the Real Wage Index for Craftsmen: semi-logarithmic scale

Base: mean of 1501-10 = 100

Real Wage Index (RWI) = Nominal Wage Index (NWI)/ Consumer Price Index (CPI)

Sources: see the text and the Tables



Graph K: Prices and Wages in Spain, 1501 – 1650

Hamilton's Composite Price Index for Spain (both silver and vellon based), the Grain Price Index, and the Real Wage Index for Craftsmen: arithmetic scale

Base: mean of 1501-10 = 100

Sources: see the text and the Tables