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Warfare, Liquidity Crises, and Coinage Debasements in Burgundian Flanders, 1384 - 1482: Monetary or Fiscal Remedies?

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Warfare, Liquidity Crises, and Coinage Debasements in Burgundian Flanders, 1384 - 1482: Monetary or Fiscal Remedies?

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Coinage debasements were a prevalent and generally very harmful feature of most economies in late-medieval western Europe, and most certainly in Burgundian Flanders (1384-1482). Flanders also experienced several economic recessions or contractions from three related sources: warfare; the so-called 'bullion famines', with liquidity crises; and the irredeemable decline of its former mainstay, the woollen textile industries. Since many of my previous publications dealt with the Flemish cloth industry, this paper focuses on the other two major economic problems, of which warfare was the most important factor. The question posed therefore is simply this: did the Burgundian dukes undertake coinage debasements principally as a monetary or as a fiscal policy? In a recent and highly praised monograph, Sargent and Velde (*The Big Problem of Small Change,* 2002) have contended that almost all late-medieval and early-modern coinage debasements were undertaken to remedy not just coin shortages, but especially shortages of petty or *billon* coins. For the Burgundian era, one may make a strong *prima facie* case that Flanders (and all the Burgundian Low Countries) suffered from two major 'bullion famines', or certainly from severe coinage scarcities, including very severe scarcities of petty coins: from the 1390s to about 1415, and from the early 1440s to the early 1470s. In both periods, moreover, Flanders suffered from very severe deflations. In this paper, I contend that warfare was indeed, directly and indirectly, a primary cause of those monetary scarcities, especially in reducing the income velocity of money and thus in increasing hoarding – in my view, far more important than any supposed balance of payments deficits and 'bullion outflows to the East'. Nevertheless, I can find no convincing evidence that the Burgundian rulers ever undertook coinage debasements to remedy these coinage scarcities and to combat deflation (with one minor exception, in 1457, for petty coins).

Instead, the thesis of this paper is that the Burgundian rulers undertook coinage debasements primarily as aggressive fiscal policies, and primarily to finance warfare. Almost all medieval princes exacted a seigniorage tax on bullion minted. They sought to maximize these revenues both by increasing this tax rate and by enticing much larger quantities of bullion into their mints: by both the techniques of debasement and by auxiliary bullionist policies. The paper seeks to show that the Flemish coinage debasements were generally successful, by satisfying three conditions: (1) that merchants delivering bullion to the mints received in return a greater number and greater face value of coins than before (and a greater value than from any competing mints); (2) that the public continued to accept debased, or more debased, coins at nominal face value, receiving them by 'tale' rather than by weight and intrinsic value; and (3) that such merchants, also benefitting from asymmetric information, were able to spend their new coins before their gains were eroded by inflation. This paper demonstrates that the inflationary consequences from Flemish coinage debasements were always less than would be predicted from strictly mathematical formula for price changes – perhaps because the debasements did not counteract the prevailing forces of monetary contraction and deflation. At the same time, however, because so many principalities then pursued coinage debasements as veritable *guerres monétaires,* many princes undertook coinage debasements for purely defensive reasons: to protect their domestic mints from foreign competition and their realms from influxes of foreign debased and especially counterfeit imitations: i.e., to counteract Gresham's Law.

This study concludes with a striking anomaly in Spanish monetary history: Spanish monarchs, having agreed to abjure and forgo seigniorage taxes on coinage, did not engage in any debasements, of either the gold or silver coinages, from 1497 to 1686. But they had the luxury of alternative revenues from taxes on imports of vast quantities of silver from the Spanish Americas during most of this era. The Burgundian dukes had no such alternative sources of revenue to finance their wars.

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Introduction: Coinage Debasements and Economic Crises, in Burgundian Flanders

During the almost hundred-year Burgundian era (1384-1482), the five Burgundian rulers of Flanders engaged in extensive, if periodic, coinage debasements.[1] During this century-long Burgundian era, Flanders also experienced a series of economic crises that had been spawned, *inter alia*, by three related factors: first, warfare, domestic and foreign, especially those related to the Hundred Years's War (1336-1453), but also subsequent Franco-Burgundian and Anglo-Burgundian wars; second, the precipitous and ultimately irredeemable decline of their once pre-eminent woollen textiles industries, still their economic mainstay; and third, monetary scarcity – in what is now popularly known as the late-medieval 'bullion famines' – with related liquidity crises. Since I had earlier published articles and essays on the role of monetary policies in the decline of the Flemish cloth industry,[2] the focus of this study will therefore be on the role of monetary factors and monetary policies related to the other two economic problems, chiefly in Flanders: warfare and the liquidity crises (i.e., from the supposed 'bullion famines'). The question to be posed here is: to what extent did the Burgundian rulers undertakes coinage debasements as monetary or as fiscal policies designed to combat or remedy these two other major economic problems?

Medieval coinages, moneys of account, and coinage debasements.

Any answers to these questions must obviously begin with an examination of late-medieval coinage

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[1] The first duke of Burgundy, Philip the Bold (r. 1384-1404), son of King John II of France, and younger brother of King Charles VI (r. 1380-1422), had married Marguerite, daughter of Count Louis II de Male (r. 1346-1384), the last indigenous Flemish count; and thus Philip acquired Flanders on the death of his father-in-law, in 1384. Duke Philip was succeeded by his eldest son John the Fearless (r. 1404-1419), who was murdered at Montereau, near Paris. His eldest son Philip the Good ruled from 1419 to 1467, and was succeeded by his eldest son, Charles the Rash, who died in battle with the Swiss, at Nancy, in 1477. His successor, the duchess Marie, his only legitimate offspring, ruled until her death, in 1482, after which governance of the now Hapsburg Low Countries was contested by her husband Archduke Maximilian, subsequently Emperor Maximilian I (r. 1493-1519), and their son Philip the Handsome (r. 1482-1506), who also became King Philip I of Castile (in 1504). Their chief acquisitions in the Low Countries were the counties Flanders (the first), of Namur, Hainault, Holland and Zeeland, and the duchies of Brabant and, finally Guelders, aka Gelderland (from 1473 to 1492). They had also ruled the duchy of Burgundy (from 1363) in France and the Franche Comté of Burgundy, in the Empire, and some other minor principalities.

[2] John Munro, 'Gold, Guilds, and Government: The Impact of Monetary and Labour Policies on the Flemish Cloth Industry, 1390-1435', *Jaarboek voor middeleeuwse geschiedenis*, 5 (2002), 153 - 205. See also John Munro, 'Medieval Woollens: The Western European Woollen Industries and their Struggles for International Markets, c.1000 - 1500', in David Jenkins, ed., *The Cambridge History of Western Textiles*, 2 vols. (Cambridge and New York: Cambridge University Press, 2003), Vol. I, chapter 5, pp. 228-324, 378-86 (bibliography); John Munro, 'The Symbiosis of Towns and Textiles: Urban Institutions and the Changing Fortunes of Cloth Manufacturing in the Low Countries and England, 1270 - 1570', *The Journal of Early Modern History: Contacts, Comparisons, Contrasts*, 3:1 (February 1999), 1-74.; John Munro, 'Anglo-Flemish Competition in the International Cloth Trade, 1340 - 1520', *Centre européen d'études bourguignonnes*, 35 (1995), 37-60 [*Rencontres d'Oxford (septembre 1994): L'Angleterre et les pays bas bourguignonnes: relations et comparaisons, XVe - XVIe siècle*, ed. Jean- Marie Cauchies.]

debasements, which in turn requires a firm understanding of the relationship between coined money and moneys-of-account.[3] Coinage debasement was unquestionably the most significant feature of western Europe's monetary history during this entire era, and thus an important aspect of its economic history as well. Coinage debasement had also been, to be sure, an endemic feature of much of the ancient and earlier medieval worlds. Nevertheless, the abrupt and brutal silver debasement that King Philip the Fair (r. 1285 - 1314) inflicted on France in 1295 ended a century of monetary stability and inaugurated a veritable *guerre monétaire* that endured for over two centuries, throughout most of western Europe.[4]

In the simplest terms, a *physical* debasement means the reduction of the quantity of precious metal – silver or gold – contained in the currently circulating coins, of a given face value, and thus also in the related unit of money-of-account: e.g., the penny, the shilling, and the pound. Such physical reductions in the precious metal of the coin itself took place by: a reduction in the weight of the coin itself; or in its precious metal fineness: i.e., by adding proportionately more base metal — usually copper; or, most commonly by both methods combined.[5] The consequence was to increase the number of coins with a given face value – e.g., the penny, or the shilling (12d) – minted from a pound or *marc* weight of commercially fine silver. [6] That meant as well a corresponding increase in the nominal money-of-account value of that pound or *marc* of silver, as may be seen in Tables 1A and 1B, below.

Another form of coinage debasement, which normally applied only to gold coins and to more full-

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[3] For a more thorough analysis of this complex relationship on coinage and moneys-of-account, see Appendix A.

[4] See the sources cited in Appendix C3, below.

[5] The fineness of silver coins was reckoned, in France and the Low Countries, in terms of commercially fine silver, known as *argent le roy*, which was 23/24 or 95.833% pure, with 4.167% copper alloy. *Argent-le-roy* was reckoned in terms of 12 deniers, each of which contained 24 grains; and thus 288 grains in total. The fineness of gold coins was reckoned everywhere in terms of carats: so that fine gold coins had 24 carats (which, however, were probably 23.875 carats = 99.479% pure gold, with 0.53% copper: the actual fineness of Florentine florins, Venetian ducats, and English nobles). Gold coins were commonly alloyed with both silver and copper. Thus the Burgundian gold florin, from 1466, contained 19 carats of gold, 4 carats of silver, and only 1 carat of copper.

[6] The mint-weight used in France and the Low Countries was the *marc de Troyes* = one half of the French pound or *livre de Paris* = 244.7529 grams. The *marc* contained 8 *onces*, each of which contained 24 *deniers*, each of which in turn contained 24 grains, for a total of 4608 grains to the *marc*. The medieval English mint weight was the Tower Pound, with 12 ounces: each containing 20 *dwt* (penny-weight), each of which contains 32 grains, for a total of 7680 grains = 5400 Troy grains = 11.25 Troy ounces = 349.9144 grams. In 1525, it was superseded by the Troy pound, also of 12 ounces, with 20 dwt to the ounce and 24 grains to the dwt, for a total of 5760 grains = 373.242 grams. See John Munro, 'A Maze of Medieval Monetary Metrology: Determining Mint Weights in Flanders, France and England from the Economics of Counterfeiting, 1388 - 1469', *The Journal of European Economic History*, 29:1 (Spring 2000), 173-99; and John Munro, 'Money and Coinage of the Age of Erasmus: An historical and analytical glossary with particular reference to France, the Low Countries, England, the Rhineland and Italy', in Sir Roger Mynors, Douglas Thomson, and Wallace Ferguson, eds., *The Collected Works of Erasmus: The Correspondence of Erasmus*, Vol. 1: *Letters 1 to 151, A.D. 1484 - 1500* (Toronto: University of Toronto Press, 1974), pp. 311-48.

bodied, high-valued silver coins, was to increase their official exchange rates, or nominal money-of-account values. It must be clearly understood that gold values, and thus exchange rates, were always expressed in terms of the principality's silver-based money-of -account: in Flanders, the *pond groot* Flemish, with 20s to the pound, and 12d to the shilling (and thus always 240d to the pound).[7] Such increases in official coinage values were necessary to maintain the former value relationships of these high-valued coins, if they were not similarly debased in fineness and/or weight, with the debased silver penny and other fractional coins.

That can be best understood by relating the market values of gold and silver coins, when, in this era, the normal ratio of values was about 11:1 or 12:1. For a debasement of just one coinage – say, the silver coinage – increased the relative money-of-account value of silver and thus of the silver coins; and that would have altered the bimetallic mint ratio to 'favour' silver and thus to 'disfavour' gold. To some extent a small change in the bimetallic ratio may have been undertaken indeed to 'favour' one of the two metals, and thus to encourage a greater influx of that metal into the prince's mint. But too drastic an alteration of the mint-ratio in favour of silver would have led to the outflow of the other metal, gold. To prevent that exodus, the prince would have had to raise the official exchange rate or money-of-account value of the gold coins, or to debase the gold coins as well, by the physical means just discussed.

For full bodied silver coins, a good example can be seen in Table 1B, on 'Alterations of the Flemish Coinage, 1384-1482': for the Double Patard, with an initial face value of 4d *groot* Flemish, first introduced in 1467, with a fineness of 91.67 percent *argent-le-roy*, and a weight of 3.158 grams (77.5 struck to the *marc*). [8] Though subsequently debased, in 1474, in both fineness (to 83.33 percent *argent-le-roy*) and in weight (to 3.059 g. or 80 per *marc*), it was left physically untouched in the next two silver debasements of 1477 and 1482, which were limited to the single *groot* of 1d. Consequently, its official exchange value (money-of-account) was raised to 4.5d and then to 5.0 d *groot*, in proportion and full accordance with the percentage reduction in the penny *groot's* silver contents, with these debasements.

The reasons why monetary transactions were almost invariably conducted in coin, even debased coin, rather than in bullion (or ingots), is fundamental to comprehending the nature and rational for debasements in medieval and early modern Europe . First, it was, almost everywhere illegal to trade, or make transactions, in bullion. For the law in most medieval principalities stipulated that all precious metals deemed to be 'bullion' (*billon*) – excluding metals for licenced goldsmiths – had to be surrendered to the prince's mint for coinage.[9] But second, even if it had been legal to do so, doing so would not have been economically feasible, in terms of the required transaction costs: i.e., the cost of weighing the bullion, and assaying it for fineness,

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[7] For example, the traditional English gold noble, from 1352 to 1464, was worth 6s 8d, or 80 currently circulating silver pence (i.e., 80d).

[8] See nn. 5 -6 above.

[9] The modern English term 'billon' is commonly defined as a 'base' or petty coin, one in which silver constitutes less than half of the metallic content. The medieval term – *billon, billoen, billio* – meant instead 'bullion': any precious metal, including demonetized coinage, domestic and foreign, that was legally required to be surrendered to the prince's mint for coinage. It excluded precious metals in jewellery, plate, *objets d'art*, dress, and raw materials legitimately acquired by jewellers and goldsmiths, etc., for their crafts. See John Munro, 'Billon - Billoen - Billio: From Bullion to Base Coinage', *Revue belge de philologie et d'histoire/ Belgisch tijdschrift voor filologie en geschiedenis*, 52 (1974), 293-305; reprinted 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).

and determining its market or exchange value. Gold and silver coins were generally worth more than their intrinsic bullion costs simply because they were a fully recognized legal tender – with the ruler's stamp of authorization or approval.

Official, legal tender coins were thus a *cost-saving* medium of exchange: one that saved considerably on these transaction costs. That savings on transaction costs constituted an *agio* or premium that legal tender coins commanded over their bullion values; and merchants paid for that premium in their mintage fees, which were deducted from the total value of the coins produced from their bullion.[10] So long as this *agio* that coins thereby commanded over bullion was at least equal to the sum of the mintage fees, merchants would continue to deliver bullion to the mints. Conversely, whenever domestic coins lost that *agio,* bullion would cease to be delivered to the prince's mint, and would most likely be either hoarded or exported to some foreign mint.[11] Usually such coins, so exported abroad, were minted into that foreign prince's newly debased coins, when they commanded a higher exchange value than his competitors coins.

The objectives of any coinage debasement – whether undertaken by fineness, weight, or value, or some combination thereof – were two-fold. The first was to increase the number of coins, of any given coin denomination, struck from a pound weight or *marc* of fine metal delivered to the mint, and thus to increase the aggregate money-of-account value of the total coinage struck from bullion so delivered. Such increases in both the number and the money-of-account values of coins so struck can also be seen in Tables 1A and 1B. The second and closely related objective was to induce a much greater influx of precious metals into the prince's mint, from both domestic and foreign bullion, including demonetized coins (collectively known as *billon*).[12]

How successfully these goals were achieved, in the Burgundian era – in terms of both the technology and economics of medieval minting – can be understood only after determining the rational of coinage debasements in response to these late-medieval economic crises, which now demand our attention.

Late-medieval economic crises: the impact of warfare

Since, indeed both potential aspects of coinage debasements can be linked to warfare, that is the first problem that commands our attention, in examining the economic crises of this era, which also constitute the core of the larger debate about the so-called late-medieval 'Great Depression'.[13] Furthermore, the role of warfare in those late-medieval economic crises and contractions has yet to be fully explored. A typical error in the current historical literature is to commence the examination of this problem only from the outbreak of the Hundred Years' War (1337-1453), or from the Black Death (1348-49). But the historical importance of European warfare for this debate begins, in fact, at least a half century earlier. From the 1290s, after a full century of relative peace, Western Europe, and the entire Mediterranean basin, including Europe's Islamic trading partners, experienced almost continuous, disruptive, widespread, and debilitating wars, wars that then led into and indeed produced the even more destructive era of the Hundred Years' War. Those wars in fact became far more widespread and far more economically debilitating than any that Europe had

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[10] For the economics of these mintage fees – brassage and seigniorage – see below, pp. 48-51.

[11] For reasons why coins would lose that *agio*, see below, pp. 41, 47.

[12] See n. 9 above.

[13] For the more important publications in this debate see the publications listed in Appendix C1.

experienced since the late Carolingian era (ninth and tenth centuries).

One may begin by listing some of the most obvious of the deleterious consequences: the destruction of lives, property, and capital; increased taxation; and disruptions of production and of commerce, etc. Of even greater importance was the impact of such continuous war in fostering national hostilities, economic nationalism, and indeed a proto-Mercantilism, in the form of bullionism.[14] Since bullionism has direct connections with the monetary issues of this study, it will be explored later, in relation to those issues.

In my view, the most deleterious macro-economic consequence of that warfare was in promoting a shift from overland continental to maritime trade. In the past, such a shift had been viewed in a positive light: as indeed both a cause and consequence of European economic growth.[15] But more recently Herman Van der Wee has revealed its very negative consequences (without discussing specifically the issues of warfare).[16] To be sure, the major sea-port towns – those in the Italian maritime republics, Flanders, England, and the

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[14] For the more important publications on late-medieval warfare, see the publications listed in Appendix C2. For the economics of medieval bullionism, see below, pp. 27-28, and 38-41.

[15] In general, the 'contributions to growth' were reckoned in terms of supposedly much cheaper transport costs (in fact, a false argument), the shift to 'sedentary' and 'principal-agent' trade using bills of exchange etc; at the same time, the shift was also viewed as a consequence of the recent 'industrialization' of Italy, especially in textiles. See Raymond de Roover, 'The Commercial Revolution of the Thirteenth Century', *Bulletin of the Business Historical Society*, 16 (1942), 34-39; reprinted in F.C. Lane and Jelle Riemersma, eds., *Enterprise and Secular Change* (New York, 1953), pp. 80-85; Charles Verlinden, 'Markets and Fairs', in M. M. Postan, E. E. Rich, and Edward Miller, eds., *The Cambridge Economic History of Europe*, vol. III: *Economic Organization and Policies in the Middle Ages* (Cambridge, 1963), pp. 119-53; Robert-Henri Bautier, 'Les foires de Champagne: recherches sur une evolution historique', *Recueils de la Société Jean Bodin pour l'histoire comparative des institutions*, 5: *La foire* (Brussels, 1953), pp. 97-145; in English trans. as 'The Fairs of Champagne', in Rondo Cameron, ed., *Essays in French Economic History* (Homewood, Ill., 1970), pp. 42-63.

[16] Herman Van der Wee and Theo Peeters, 'Un modèle dynamique de croissance interseculaire du commerce mondiale, XIIe-XVIIIe siècles', *Annales: E.S.C.*, 25:1 (1970), 100-26. On this same theme, see John H. Munro, 'Industrial Transformations in the North-west European Textile Trades, c.1290 - c.1340: Economic Progress or Economic Crisis?', in Bruce M.S. Campbell, ed., *Before the Black Death: Studies in 'Crisis' of the Early Fourteenth Century* (Manchester and New York, Manchester University Press, 1991), pp. 110 - 48; John H. Munro, 'The 'Industrial Crisis' of the English Textile Towns, c.1290-c.1330', in *Thirteenth Century England*, VII, ed. Michael Prestwich, Richard Britnell, and Robin Frame (Woodbridge and Rochester, NY, 1999), pp. 103-42; John Munro, 'The "New Institutional Economics" and the Changing Fortunes of Fairs in Medieval and Early Modern Europe: the Textile Trades, Warfare, and Transaction Costs', *Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte*, 88:1 (2001), 1 - 47. For different perspectives, see Stephen R. Epstein, 'Regional Fairs, Institutional Innovation, and Economic Growth in Late-Medieval Europe', *Economic History Review*, 2nd ser., 47:3 (August 1994), 459 - 482; Stephen R. Epstein, *Freedom and Growth: the rise of states and markets in Europe, 1300-1750* (London: Routledge, 2000); Ian Blanchard, 'The Late Medieval European 'Integration Crisis', 1340 - 1450', in Troels Dohlerup and Per Ingesman, eds., *New Approaches to the History of Late Medieval and Early Modern Europe: Selected Proceedings of Two International Conferences at the Royal Danish Academy of Sciences and Letters in Copenhagen in 1997 and 1999*, Historisk-filosofiske Meddelelser 104 (Copenhagen: The Royal Danish Academy of Sciences and Letters, 2009), pp. 301-34.

German Baltic towns – may have experienced some *relative* gains; but even they experienced an overall absolute commercial decline, and periodic economic crises, during the fourteenth and fifteenth centuries.[17] According to the Van der Wee thesis, the far vaster hinterlands of the continental European economy, with hundreds of towns and regional fairs, experienced an even greater aggregate economic decline or contraction, and periodic depressions, with a 'reverse multiplier effect', that more than offset any collective gains that the seaport towns may have achieved. In his thesis, Van der Wee also contended that those late-medieval dislocations in international trade also contributed to a contracting monetary circulation in late-medieval western Europe. What is now popularly called a 'bullion famine' had clearly reached its dismal nadir in the mid fifteenth century.

Late-medieval economic crises: the debate about the 'bullion famines'

That late-medieval western Europe did experience periodic 'bullion famines' remains hotly contested, including the proper dating of the supposed monetary scarcities. For north-western Europe, at least, the first evidence for an economic 'crisis' involving severe bullion scarcities and consequent deflation comes in the early fourteenth century, especially in the 1320s and 1330s.[18] Not yet fully explained, it may have been related to contemporary crises and then decline in precious-metal mining, and also to disruptions from warfare, especially to bullion flows along the previously dominant overland routes.[19] Nevertheless any such contractions in precious metal supplies ceased to be a problem with the ensuing Black Death and subsequent

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[17] See, for example, Benjamin Kedar, *Merchants in Crisis: Genoese and Venetian Men of Affairs and the Fourteenth-Century Depression* (London and New Haven, 1976); and also other sources in Appendix C.

[18] Nicholas Mayhew, 'Numismatic Evidence and Falling Prices in the Fourteenth Century', *Economic History Review*, 2nd ser. 27 (1974), 1-15; Michael Prestwich, 'Currency and the Economy of Early Fourteenth-Century England', in Nicholas Mayhew, ed., *Edwardian Monetary Affairs, 1279-1344* (British Archeological Reports, BAR International Series, no. 36 (Oxford, 1977), pp. 45-58; Edward Ames, 'The Sterling Crisis of 1337-1339', *Journal of Economic History*, 25 (1965), 496-552, reprinted in Roderick Floud, ed., *Essays in Quantitative Economic History* (Oxford, 1974), pp. 36-58; Mavis Mate, 'High Prices in Early Fourteenth-Century England: Causes and Consequences', *Economic History Review*, 2nd ser. 28 (1975), 1-16; Peter Spufford, *Money and Its Use in Medieval Europe* (Cambridge, 1988), pp. 267-88; John Munro, 'Before and After the Black Death: Money, Prices, and Wages in Fourteenth-Century England', in Troels Dahlerup and Per Ingesman, eds., *New Approaches to the History of Late Medieval and Early Modern Europe: Selected Proceedings of Two International Conferences at The Royal Danish Academy of Sciences and Letters in Copenhagen in 1997 and 1999*, Historisk-filosofiske Meddelelser, no. 104 (Copenhagen: The Royal Danish Academy of Sciences and Letters, 2009), pp. 335-364.

[19] John U. Nef, 'Silver Production in Central Europe, 1450-1618', *Journal of Political Economy*, 49 (1941), 575-91; John U. Nef, 'Mining and Metallurgy in Medieval Civilization', in M.M. Postan, ed., *Cambridge Economic History of Europe*, Vol. II: *Trade and Industry in the Middle Ages* (Cambridge, 1952), pp. 456-69; revised edn. (Cambridge,1987), pp. 696-734; D. Kovacevic, 'Les mines d'or et d'argent en Serbie et en Bosnie médiévales', *Annales: E.S.C.*, 15 (1960), 248-58; Philippe Braunstein, 'Innovations in Mining and Metal Production in Europe in the Late Middle Ages', *Journal of European Economic History*, 12 (1983), 573-91; Ekkehard Westermann, 'Zur Silber- und Kupferproduktion Mitteleuropas vom 15. bis zum frühen 17. Jahrhundert: über Bedeutung und Rangfolge der Reviere von Schwaz, Mansfeld und Neusohl', *Der Anschnitt: Zeitschrift für Kunst und Kultur im Bergbau*, 38 (May-June 1986), 187 - 211; Spufford, *Money and Its Use*, pp. 267-82 . See also the previous note, and nn. 33-36, below.

demographic factors that, by the 1380s, had reduced Europe's population by perhaps 40 percent. Obviously such a demographic decline would have increased Europe's per capita stocks of precious metals; and, combined with an evident post-Plague hedonistic spending spree, drastic inflation not surprisingly did ensue in the two decades following the Black Death.[20]

By the 1370s and 1380s, western Europe, and especially north-western Europe, was again experiencing a severe reduction in its bullion stocks and mint-outputs, with consequent deflation. Those who support the concept of 'bullion famine', one of long duration and major economic importance, necessarily mean that either the stock or the circulation of precious metals had now contracted to a much greater extent than had the population and aggregate economic output (i.e., Europe's 'gross national product').

The debate about this monetary contraction remains highly contentious. The most popular explanation, apart from the ongoing depression in precious-metal mining, one expounded by such notable economic historians as Roberto Lopez, Harry Miskimin, John Day, and Peter Spufford, is a worsening balance-of-payment deficit: in particular, a supposedly increased outflow of precious metals to the 'East'.[21]

That bullion outflow was, in turn, according to many proponents of the 'bullion famine' thesis, itself a major factor that exacerbated the ongoing 'great depression'. Miskimin is particularly ingenious in arguing that, although the late-medieval 'depression' had commenced with falling population, especially after the Black Death, the economic consequences of such depopulation, with changes in relative prices, then led to a net outflow of precious metals from northern Europe to Italy, whose Mediterranean trade then led to the outflow of an even greater stock of precious metals to the Levant, and ultimately to eastern Asia. In his view,

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[20] For an analysis of the demographic and monetary factors, and for statistical evidence of that inflation, see Munro, 'Before and After the Black Death', pp. 335-64; John Munro, 'Bullion Flows and Monetary Contraction in Late-Medieval England and the Low Countries', in John F. Richards, ed., *Precious Metals in the Later Medieval and Early Modern Worlds* (Durham, North Carolina: Carolina Academic Press, 1983), pp. 97-158; reprinted 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); 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: Akten des 8th International Economic History Congress, Section C-7, Budapest 1982 (Trier: Trier University Press, 1984), pp. 31-122; John 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; 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. For English demography, see John Hatcher, *Plague, Population, and the English Economy, 1348 - 1530* (London, 1977), pp. 11- 73; Andrew Hinde, *England's Population: A History Since the Domesday Survey* (London, 2003); Mark Bailey, 'Demographic Decline in Late-Medieval England: Some Thoughts on Recent Research', *The Economic History Review*, 2nd ser., 49:1 (February 1996), 1-19.

[21] For the publications of Lopez, Miskimin, Day, Spufford and others on the late-medieval monetary problems and the 'bullion famine' debate, see Appendix C.4; and also the publications on late-medieval coinage debasements, C.4; and see also, n. 27 below.

furthermore, that net 'outflow' also involved European trade with the eastern Baltic zones and Russia. Presumably Miskimin and these other historians are referring to a *relative* increase in the outflow of precious metals, i.e., relative to a much a smaller European economy, which, at least in north-western Europe, continued to contact in aggregate size until the late fifteenth century.[22]

As a supposed monetarist who deals with these very problems, I believe that such a thesis concerning bullion outflows, in financing deficits in Europe's balance of payments with the 'East', gives 'monetarism' a bad name.   In my view, on the one hand, late-medieval Europe did experience some *periodic* scarcities of coined money — i.e. , when the circulating coined money supply was scarce relative to the transactions demand for money – especially during these three periods, which were also distinctly deflationary periods: ca. 1320 - ca.1340, ca. 1370 - ca. 1420, and ca. 1440 - ca. 1470. But, on the other hand, I can find no compelling evidence that such periodic monetary scarcities were due to any pronounced *relative* increase in Europe's long-standing, chronic balance of payments deficits with the 'East'.[23]

'Liquidity Preference' in the late-medieval economy: **hoarding and the income-velocity of money**

Instead, in my view, there were much more compelling factors to explain periodic and relative scarcities of coined money in late-medieval western Europe: periodic hoarding and either consequent or related reductions in the income velocity of money. If this is the crucial issue, its significance requires some understanding of modern Quantity Theories of money. [24] The most useful representation of the modern Quantity Theory is the Cambridge Cash Balances equation:

$$\mathbf{M} = k.\mathbf{P}.y$$

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[22] For evidence that demographic and economic recovery did not begin until the early sixteenth century, see Julian Cornwall, 'English Population in the Early Sixteenth Century', *Economic History Review*, 2nd ser. 23:1 (April 1970), 32-44; Ian Blanchard, 'Population Change, Enclosure, and the Early Tudor Economy', *Economic History Review*, 2nd ser. 23:3 (December 1970), 427-45; John Hatcher, 'Mortality in the Fifteenth Century: Some New Evidence', *Economic History Review*, 39 (Feb. 1986), 19-38; John Hatcher, 'Understanding the Population History of England, 1450 - 1750', *Past & Present*, no. 180 (August 2003), 83-130; Lawrence R. Poos, 'The Historical Demography of Northern Europe, 1400 - 1650', in Troels Dohlerup and Per Ingesman, eds., *New Approaches to the History of Late Medieval and Early Modern Europe: Selected Proceedings of Two International Conferences at the Royal Danish Academy of Sciences and Letters in Copenhagen in 1997 and 1999*, Historisk-filosofiske Meddelelser 104 (Copenhagen: The Royal Danish Academy of Sciences and Letters, 2009), pp. 365-96.

[23] In absolute terms, we may assume that by 1400, a much smaller, contracted European economy would have had a smaller balance-of-payments deficit. See the evidence in Munro, 'Bullion Flows and Monetary Contraction', pp. 97-158, but especially pp. 112-126, Appendix, pp. 127-55, and Graphs I-III, pp. 156-58. Even if the least-squares regression trend line of the value of aggregate mint outputs in both England and the Low Countries is steeply downward (and with almost identical 'b' co-efficients), the variations from the trend line do not seem consistent with a thesis of worsening deficit in Europe's balance of payments (i.e., with the East).

[24] Since any discussion of these theories would be a needless digression for those familiar basic economic theory, and   perhaps a frustrating digression for those who are not, that discussion has been relegated to Appendix B. See below, pp. 58-61.

in which M = the aggregate stock of 'high-powered' money, in the form of readily accessible cash balances; P represents the price level in the form of a Consumer Price Index;[25] the symbol y represents 'real' net national income (deflated by that index); the sum of P.y represent the current value of the Net National Income (=Net National Product); and the final variable k represents that proportion of Net National Income that the public collectively chooses to hold in cash balances. Cambridge k thus represents the demand for money, i.e., active cash balances, in term of Keynes' concept of Liquidity Preference. Its essential components are: (1) the transactions motive, not just for current expenditures but also for debt repayments; (2) the precautionary motive ('savings for a rainy day'), and (3) the speculative motive – to take advantage of unforeseen future investment opportunities.[26] Cambridge k, it must be noted, is the mathematical reciprocal of V, the income velocity of money, in the better known Quantity Theory equation: M.V = P.y. Thus, when the income velocity of money falls, the value of Cambridge k rises, indicating a higher rate of liquidity preference and thus larger cash balances held by the public.

Both the more general question of a decline in the income velocity of coined money and the more particular problem of hoarding, were – again, in my view – chiefly in response to the economic consequences of late-medieval warfare. Warfare itself, but more often the brigandage and piracy that such warfare promoted or permitted, hindered or reduced international flows of bullion and coins by disrupting established trading patterns, on land and on sea, including disruptions from frequent bans on trading with enemies (especially the Muslim enemies).

Another monetary problem closely related these impediments to specie flows, and thus the income velocity of money, yet in some ways distinctly separate, may be expressed by a term that Spufford and others use: 'thesaurisation'. But the much simpler word is one used before: 'hoarding', as an alternative term as well for 'enhanced liquidity preference', i.e., Cambridge k. Although Peter Spufford contends that bullion outflows still remained the principal cause of the later-medieval monetary scarcities, we both agree that hoarding was another very negative consequence or response to widespread, almost continuous warfare and plagues in later medieval Europe: inflicting its ravaged society with periodic economic dislocations, depressions, and insecurity.[27] We may summarize these conditions with the one word 'fear', on whose

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[25] For the Flemish Consumer Price Index, for 1351-1500, see Table 3, below.

[26] See Appendix B, pp. 58-61, below, which emphasizes that the opportunity cost of holding cash balances is foregone investment income, and therefore that Cambridge k should vary inversely with the interest rate.

[27] Spufford, *Money and Its Use*, p. 347, stated that: 'to the [later medieval] contemporaries, it seemed that "thesaurisation" was the main cause of the bullion famines', but 'in retrospect it appears that it was itself in part a response to the famine', so that ' the export of precious metals from Europe now seems more important'. For views similar to mine, in terms of both the issues of hoarding and bullion outflows, see Nathan Sussman, 'The Late-Medieval Bullion Famine Reconsidered', *Journal of Economic History*, 58:1 (March 1998), 126-54, in which he contends that 'western Europe could not have experienced both a balance-of-payments deficit and a bullion shortage simultaneously', and that 'Excess silver stocks were likely hoarded rather than exported'. Though Sussman and I disagree on the extent of late-medieval coinage scarcities, we do agree on these two issues. Harry Miskimin, in maintaining his thesis that balance of payments deficits and consequent bullion outflows provided the predominant cause of the late-medieval monetary scarcities and consequent 'depression', totally rejects the hoarding hypothesis, in 'Money and Money Movements in France and England at the End of the Middle Ages', in John Richards, ed., *Precious Metals in the Later Medieval and Early Modern Worlds* (Durham, N.C., 1983), p. 81, on the basis of so frequent complains about coin

significance Spufford provides the most eloquent observation:[28]

> Fear of disorder made men conceal their coin. Fear of not being able to replace coin made men the keener to keep their assets liquid. With scarcity of coin went a reluctance to spend or invest what one had in hand, so that there was a sluggish circulation, which in itself was equivalent to a further reduction in the available quantity of coin..... All of these methods of hoarding, from the few petty coins put aside by poorer men in earthen vessels to the vast sums locked up in chests by the greatest of the land, removed a great deal of coin from circulation....'

Hoarding may, therefore, be viewed as a factor that affected M as much as k or its reciprocal, V (the income velocity of money), in withdrawing coins from circulation and in reducing the actual supply of coined money available to the economy.[29] Furthermore, in so far as hoarding contracted the monetary circulation, which contraction in turn led to deflation, hoarding may also be viewed as a rational suspension of unnecessary expenditures, in anticipation of continually falling prices: i.e., a classic 'self fulfilling prophecy'.

Hoarding took place in various forms. The most obvious was the physical burial of those coins – and modern discoveries of coin hoards prove that such a withdrawal was permanent. Late-medieval England, in the reign of Edward III, provides evidence of unusual increases in the number and sizes of coin hoards.[30] But another and more important form of hoarding can be found more generally in later fourteenth-century western Europe, after the post-Plague spending sprees had waned: in the greatly increased use of gold and silver ornamentation in the form of plate, jewellery, brocaded textiles, belt buckles, wall hangings, and furniture. Apart from any aesthetic satisfaction derived from displaying such rich ostentation, those who used and stored precious metals in this fashion could readily have converted them back into coinage, when so needed.[31]

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shortages, asking: what 'would simultaneously motivate vast numbers of Englishmen to bury large sums of money and then to petition the monarchy to alleviate the resulting scarcity of coin?' The answer may be that those uttered these complaints and made these petitions were not those responsible for the hoards. See also Harry Miskimin, *The Economy of Early Renaissance Europe, 1300-1460* (Cambridge, 1975), 'The Balance of Payments', pp. 138-50; and his other publications on this subject in Appendix C.4 and the bibliography; and n. 21 above.

[28] Spufford, *Money and Its Use*, pp. 345-47.

[29] On reductions in velocity in late-medieval England, see also Nicholas J. Mayhew, 'Population, Money Supply, and the Velocity of Circulation in England, 1300 - 1700', *Economic History Review,* 2nd ser., 48:2 (May 1995), 238-57.

[30] See J.D.A. Thompson, *Inventory of British Coin Hoards, A.D. 600 - 1500*, Royal Numismatic Society Publications (Oxford, 1956), pp. xxxvi -xlix and p. 163.

[31] See Harry Miskimin, *The Economy of Early Renaissance Europe, 1300-1460* (Cambridge, 1975), pp. 92-104; 134-44; Johan Huizinga, *The Waning of the Middle Ages* (London, 1926), pp. 140-52; Françoise Piponnier, *Costume et vie sociale: la cour d'Anjou, XIVe-XVe siècle* (Paris, 1970), chap. 7-10; Agnes Geijer, *A History of Textile Art* (London, 1979), pp. 141-55; Susan M. Stuard, 'Gravitas and Consumption', in Jacqueline Murray, ed., *Conflicted Identities and Multiple Masculinities: Men in the Medieval West*, Garland Medieval Casebooks vol. 25 (New York, 1999), pp. 215-42; Susan Mosher Stuard, *Gilding the Market:*

We can now readily see the historical importance of Keynesian Liquidity Preference for periods of economic crises. For most economic crises that lead to both depression and deflation involve the dual problems of leverage and liquidity. Leverage refers to a commonplace function of almost all economies from even ancient and certainly from medieval times: the acquisition of assets (goods, property, etc.) with a combination of cash down payments (equity) and debt obligations (i.e., borrowing) for the remainder. The smaller the cash down payment, and the greater is the amount of credit extended, the greater is the 'leverage' provided by that cash (or comparable liquid assets).

The related problem is one of liquidity: the need to obtain ready cash in order to meet pressing economic obligations, especially repayments of debts. Most creditors are willing to maintain or even extend credit (loans) so long as the market value of the assets so acquired maintain a value higher than the debt (loan) obligations. If their values fall, creditors demand repayment, especially if the obligations are in the form of demand loans (payable on demand), or of very short duration. In such adverse situations, debtors are forced to sell and thus liquidate other assets in order to acquire the necessary amount of ready cash. Such actions serve to depress the prices of those assets, even further. Obviously, debtors will postpone or forgo most discretionary expenditures; and if most debtors do the same during adverse economic circumstances their collective actions will lead to a contraction of aggregate demand and to a downward spiral in asset values, thus necessitating further sales of leveraged assets, together leading to a noxious combination of monetary contraction, severe deflation, and economic depression.

The evidence for periodic monetary contractions in late-medieval northern Europe.

If the concept of a 'bullion famine' remains difficult to substantiate, evidence for at least significant monetary contractions, if not necessarily genuine 'bullion famines', in north-west Europe, may be seen most clearly in the statistics of mint production of both gold and silver coins in Flanders (with the other Burgundian Low Countries from 1420) and its close neighbour and economic partner, England, from 1350 to 1500, in the graphs and in Table 3; in this current study, the table is available only for the Burgundian Low Countries.[32]

Luxury and Fashion in Fourteenth-Century Italy (Philadelphia: University of Pennsylvania Press, 2006); Robert S. Lopez, 'Hard Times and Investment in Culture', in K.H. Dannenfeldt, ed. *The Renaissance: Medieval or Modern?* (Heath Series, New York, 1959), pp. 50-63; reprinted in Anthony Molho, ed., *Social and Economic Foundations of the Italian Renaissance* (New York, 1969), pp. 95-116. In or about 1500, a Venetian visitor wrote a memoir about England, in which he stated, with some considerable wonder, that 'there is no small innkeeper, however poor and humble he may be, who does not serve with silver dishes and drinking cups; and no one, who has not in his house silver plate to the amount of at least £100 sterling, . .. is considered by the English to be a person of any consequence'. Charlotte A. Sneyd, ed., *A Relation or Rather a True Account of the Island of England with Sundry Particulars of the Customs of These People, and of the Royal Revenues Under King Henry the Seventh, about the Year 1500*, Camden Society Publications, Old Series, vol. 37 (London, 1847), pp. 28-29.

[32] For England, see the graphs and tables in: John Munro, 'Mint Policies, Ratios, and Outputs in England and the Low Countries, 1335-1420: Some Reflections on New Data', *The Numismatic Chronicle*, 141 (1981), 71-116. [formerly listed as: 8th series, Vol. I];. reprinted 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); Munro, 'Bullion Flows and Monetary Contraction', pp. 97-158; John Munro, 'Mint Outputs, Money, and Prices in Late-Medieval England and the Low Countries', in Eddy Van Cauwenberghe and Franz Irsigler, eds.,

There are, however, two sets of statistics in this table. The first set presents the total volume or weight of gold and silver struck in these two regions, in kilograms of pure metal; and that set provides one key indicator of periodic monetary scarcities. The second set presents the total value of the coinage struck, in both metals, in terms of their money-of-account values: for Flanders, in pounds (*ponden*) *groot* Flemish. Obviously, the difference in the order of magnitude of these two sets of statistics lies in the consequences of coinage debasements (to be examined later).

But even in those terms, clearly the current value of mint outputs still experienced two periods of very severe decline in the decades following the Black Death. The first was from the late 1370s to about 1415 – to the Battle of Agincourt. The ensuing period of intensive warfare, and related coinage debasements, brought about a period of resurgent mint outputs, at least in money-of-account terms, that lasted until the end of the Burgundian wars with France (1435) and England (1439). The second phase of rapidly declining mint outputs, an era of an evident 'bullion famine', then ensued until the mid-1460s, especially for silver; and it was only partly offset by a major debasement of the Burgundian gold coinage in 1454 (when and after that debasement silver outputs were virtually nil). The end of Duke Philip the Good's reign, and the ensuing reign of his successor Charles (1467-77), was marked by more warfare, coinage debasements, and increased mint outputs, whose value, however, did not come close to matching those of the 1420s and 1430s, nor those of the mid-fourteenth century (under Count Louis de Male), as is evident in the graphs for this study.

The end of the late-medieval 'bullion famines': the South-German silver mining booms, 1460-1540

To the extent that north-west Europe in general and the Burgundian Low Countries had experienced periodic monetary scarcities and possibly liquidity crises, the so-called 'bullion famines' finally came to an end in the late fifteenth century, and certainly not because of any of the ensuing Burgundian-Habsburg debasements (which ended in the 1490s). The far more important reason was the South-German Central European silver-copper mining boom, which began in the 1460s and came to an end in the 1540s, with the arrival of even cheaper supplies of silver from the Spanish Americas.

There were two fundamentally important causal factors that explain this South German mining boom, one of the very most decisive events in the transition from the late-medieval to the early-modern European economies. The first was the long-delayed revival of overland, continental trade routes that were created in newly developing and more peaceful areas of Europe, in Germany and Central Europe: beyond and to the east of the regions that had been plagued by the Hundred Years' Wars (and related wars). Indeed, the effective end of those wars, by 1453, certainly ensured the success of the new overland routes. The most important was the trans-Alpine route that ran from Venice via South Germany, and then the Rhine, to the new Brabant Fairs (Antwerp) in the Low Countries. Just as was the case in the thirteenth century, with the Champagne Fairs and the Rhone route, so these new, overland eastern routes involved only about twenty percent of the distances required for the circuitous piracy-plagued maritime routes. That much shorter and more secure route permitted international trade to be conducted far more efficiently, and more safely, and

Münzprägung, Geldumlauf und Wechselkurse/ Minting, Monetary Circulation and Exchange Rates, Trierer Historische Forschungen, vol. 7: Akten des 8th International Economic History Congress, Section C-7, Budapest 1982 (Trier: Trier University Press, 1984), pp. 31-122; Munro, 'Wage-Stickiness, Monetary Changes', pp. 185 - 297; Munro, 'Before and After the Black Death', pp. 335-364.

with more beneficial multiplier linkages.[33] Most of the major new German silver and copper mines – in Saxony, Thuringia, Schwaz, the Tyrol, and Bohemia – lay along or near this new overland route, whose commerce, and that of the Frankfurt and Brabant Fairs, was dominated by the South-German merchants, who also controlled most of these new mines.

The second factor that brought about this new South German mining boom was itself a major economic consequence of the mid-fifteenth 'bullion famine': steep deflation.[34] In so far as that deflation is measured in terms of a silver-based money-of-account, a fall in commodity prices meant a corresponding rise in the value, or purchasing power of silver, ounce per ounce. In my view, as elaborated elsewhere, that deflation increased the profit incentive and hence motivation for the crucial technological changes that made this mining boom possible. The first was in civil engineering: the invention of water-powered drainage pumps to permit deeper mine shafts to be dug in that region's mountainous ore bodies, plagued by underground steams. The second and allied innovation was in chemical engineering: the *Saigerhütten* process in smelting that permitted the low cost separation of silver from copper in the very abundant, but previously useless, supplies of argentiferous ores, and thus a rapid expansion in the outputs of both metals. In brief, from its beginnings in the 1460s to the peak in the 1540s – and just before the vast influx of silver from the Americas – that South German mining boom more than quadrupled Europe's aggregate domestic silver supplies.[35]

Initially, much or most of that German silver was exported to Venice, and re-exported to eastern Mediterranean markets; but by the 1470s, the accidental or unintended consequences of both English and Burgundian coinage debasements succeeded in attracting the greater share of that German silver to the Antwerp market. First, in 1464, Edward IV's debasement of English silver, by 20 percent, stimulated a rapid expansion of English cloth exports to its major outlet, in Antwerp, thereby attracting many more South German merchants, who sought such textiles, as an exchange commodity, for their German-Central European

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[33] See the sources cited in n. 16 above, and also: Herman Van der Wee, *Growth of the Antwerp Market and the European Economy, 14th to 16th Centuries*, 3 vols. (The Hague, 1963); Herman Van der Wee, 'Structural Changes in European Long-Distance Trade, and Particularly in the Re-export Trade from South to North, 1350-1750', in James Tracy, ed., *The Rise of Merchant Empires: Long-Distance Trade in the Early Modern World, 1350-1750* (Cambridge, 1990), pp. 14-33; John Munro, 'The Low Countries' Export Trade in Textiles with the Mediterranean Basin, 1200-1600: A Cost-Benefit Analysis of Comparative Advantages in Overland and Maritime Trade Routes', *The International Journal of Maritime History*, 11:2 (Dec. 1999), 1 - 30. As these studies confirm, the formerly prominent Italian-sponsored maritime routes to north-west Europe had largely withered away by the early sixteenth-century.

[34] For the evidence for such deflation, see Table 3 (Appendix); and see below, pp. 28-34, and nn. 36, 38, 61-72.

[35] See the sources cited in nn. 18-19 above and 36 below. At a minimum, the quantity of pure silver mined in South Germany and Central Europe rose from a quinquennial mean of 12,973.44 kg in 1471-75 to a peak of 55,703.84 kg in 1536-40. The mined output of copper (both a military and a monetary metal) rose from a mean of 1,286,656 kg in 1471-75 to one of 4,336,708 kg in 1536-40, though peaking at 5,654,047 kg in 1511-15. 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), Table 1.3, pp. 8-9, and Table 1.7, page 26; Van der Wee, *Antwerp Market*, vol. I, Appendix 44/1, pp. 522-23.

commerce. Then the Burgundian debasement of 1466 radially altered the bimetallic ratio strongly to 'favour' silver: indeed to allow the Burgundian mints, of which Antwerp was the most important, to offer a higher price for silver, in terms of both gold and goods, than was offered elsewhere.[36] The impact of both the rapidly expanding outputs of the South German silver mines and the shift in transcontinental silver trade to Antwerp can be seen in Table 2: in the rapid growth of coined silver outputs from the Burgundian mints: from virtually nothing in the 1450s and early 1460s to an annual mean of 2,071.913 kg in 1496-1500.[37]

As I have also argued elsewhere, this South German-Central European mining boom was the initial factor in explaining the origins of the subsequent Price Revolution era, by far the most inflationary era in European history, and the longest-lasting, from ca. 1515 to ca. 1650.[38] Since, in my view, the other and second origin of the monetary expansion that produced that Price Revolution was a veritable 'financial revolution' (credit institutions) from the 1520s, we must now turn to the role of credit before that era, in the late-medieval economy.[39]

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[36] See in particular, Munro, 'Monetary Origins of the Price Revolution, pp. 1-34; John Munro, 'The Central European Mining Boom, Mint Outputs, and Prices in the Low Countries and England, 1450 - 1550', in Eddy H.G. Van Cauwenberghe, ed., *Money, Coins, and Commerce: Essays in the Monetary History of Asia and Europe (From Antiquity to Modern Times)*, Studies in Social and Economic History (Leuven: Leuven University Press, 1991), pp. 119 - 83; John Munro, 'South German Silver, European Textiles, and Venetian Trade with the Levant and Ottoman Empire, c. 1370 to c. 1720: A Non-Mercantilist Approach to the Balance of Payments Problem**',** in Simonetta Cavaciocchi, ed., *Relazione economiche tra Europa e mondo islamico, seccoli XIII - XVIII*, Atti delle "Settimana di Studi" e altri convegni, no. 38, Istituto Internazionale di Storia Economica "Francesco Datini" (Florence: Le Monnier, 2007), pp. 907-62; John Munro, 'Money, Prices, Wages, and "Profit Inflation" in Spain, the Southern Netherlands, and England during the Price Revolution era: ca. 1520 - ca. 1650', *História e Economia: Revista Interdisciplinar*, 4:1 (2008), 13-71. See also n. 19, above.

[37] Some, but by no means all, of this very large increase in silver mint outputs may be attributed to Burgundian coinage debasements in the 1470s and 1480s, but certainly not in the 1490s. See Table 2.

[38] John Munro, 'Patterns of Trade, Money, and Credit', in James Tracy, Thomas Brady Jr., and Heiko Oberman, eds., *Handbook of European History in the Later Middle Ages, Renaissance and Reformation, 1400 - 1600*, 2 vols. (Leiden: E.J. Brill, 1994-95), Vol. I: *Structures and Assertions* (1994), pp. 147-95; John Munro, 'The Central European Mining Boom, Mint Outputs, and Prices in the Low Countries and England, 1450 - 1550', in Eddy H.G. Van Cauwenberghe, ed., *Money, Coins, and Commerce: Essays in the Monetary History of Asia and Europe (From Antiquity to Modern Times)*, Studies in Social and Economic History (Leuven: Leuven University Press, 1991), pp. 119 - 83; John Munro, 'The Monetary Origins of the "Price Revolution:" South German Silver Mining, Merchant-Banking, and Venetian Commerce, 1470-1540', in Dennis Flynn, Arturo Giráldez, and Richard von Glahn, eds., *Global Connections and Monetary History, 1470 - 1800* (Aldershot and Brookfield, Vt: Ashgate Publishing, 2003), pp. 1-34; John Munro, 'Money, Prices, Wages, and "Profit Inflation" in Spain, the Southern Netherlands, and England during the Price Revolution era: ca. 1520 - ca. 1650', *História e Economia: Revista Interdisciplinar*, 4:1 (2008), 13-71.

[39] John Munro, 'English "Backwardness" and Financial Innovations in Commerce with the Low Countries, 14th to 16th Centuries', in Peter Stabel, Bruno Blondé, and Anke Greve, eds., *International Trade in the Low Countries (14th - 16th Centuries): Merchants, Organisation, Infrastructure*, Studies in Urban, Social, Economic, and Political History of the Medieval and Early Modern Low Countries (Marc Boone, general editor), no. 10 (Leuven-Apeldoorn: Garant, 2000), pp. 105-67; Munro, 'New Institutional

The role of credit in the late-medieval economy: a remedy for monetary scarcity?

Obviously, even the medieval money supply did not consist just of coined moneys but also included various credit instruments. The question to be examined is two-fold: first, what was the relative importance of credit in the medieval money supply and thus in the economy as a whole; and second did credit institutions have the capacity to expand or reflate that money supply when the circulation of coined gold and silver moneys was contracting? If credit had not yet become the veritable and utterly indispensable life-blood of the economy, as it did from early modern times, credit certainly enjoyed a very important role in the later medieval economy.[40]

But we may still question whether medieval credit institutions provided an effective remedy for relative scarcities of coined moneys, in later-medieval Europe. Indeed, most people then had little if any real access to paper credit in domestic trade, and had to rely instead almost primarily on metallic coinages. According to Peter Spufford, less than ten percent of adult males had bank accounts, even in such advanced commercial centres as Venice and Bruges.[41] Outside of a limited, largely Italian-dominated network of port cities, he states, 'even ordinary international payments had to be made primarily in bullion'.[42]

Furthermore, by the later thirteenth century, all the major advances in medieval financial institutions -- deposit-and-transfer banking, bills of exchange and bills obligatory of promissory notes – had already taken place, certainly well before any such monetary scarcity became truly acute in the European economy.[43] Subsequently, as Michael Postan and others have shown, the enforcement of debt repayments had become so cumbersome and costly, especially for notarized bonds, in many parts of late-medieval Europe, that credit transactions, especially bills of exchange and bills obligatory transactions in international commerce, became more and more restricted to an ever smaller circle of merchants, especially Italians, who had established

Economics', pp. 1 -47.

[40] See in particular, Michael Postan, 'Credit in Medieval Trade', *Economic History Review*, 1st ser. 1:2 (Jan. 1928), 234-61; reprinted in Michael M. Postan, *Medieval Trade and Finance* (Cambridge: Cambridge University Press, 1973), pp. 1-27; also reprinted in Eleanora M. Carus-Wilson, ed., *Essays in Economic History*, 3 vols. (London: Longman, 1954-62), Vol. I, pp. 61-87; Michael Postan, 'Private Financial Instruments in Medieval England', *Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte*, 22 (1930); reprinted in Michael M. Postan, *Medieval Trade and Finance* (Cambridge, 1973), pp. 28-64.

[41] Peter Spufford, *Handbook of Medieval Exchange* (London: Royal Historical Society, 1986), Introduction, pp. xix - lx; Spufford, *Money and Its Use*, pp. 240-63, esp. pp. 254-63.

[42] Spufford, *Money and Its Use*, p. 255.

[43] See Herman Van der Wee, 'The Medieval and Early-Modern Origins of European Banking', in Dino Puncuh and Giuseppe Felloni, eds., *Banchi pubblici, banchi privati e monti di pietà nell'Europa preindustriale: Amministrazione, tecniche operative e ruoli economici*, Atti della società Ligure di storia patria, new series, vol. 31, 2 vols. (Genoa, 1991), vol. II, pp. 1157 - 73; Herman Van der Wee, 'European Banking in the Middle Ages and Early Modern Period (476-1789)', in Herman Van der Wee and G. Kurgan-Van Hentenrijk, eds., *A History of European Banking*, 2nd edn. (Antwerp, 2000), pp. 152-80; Munro, 'Patterns of Trade, Money, and Credit', pp. 147-95. See also the publications of Raymond de Roover below, in n. 51 below.

networks of trusted principal-agent relationships.[44]

Several historians have also recently and sharply contradicted the conventional wisdom that medieval credit instruments served to expand the effective money supply: in particular Peter Spufford, Reinhold Mueller, Pamela Nightingale, Frank Spooner, and Nicholas Mayhew. [45] They contend that the late-medieval money supply experienced periodic contractions in part because of credit crises that further diminished coinage circulation, with deflationary consequences that in turn aggravated the ongoing monetary contractions, for the various reasons already discussed. Recall, from the previous analysis of 'leverage', that most credit or debt contracts involved some initial cash payments and usually also final payments in cash – i.e., in coined money. As Spufford also commented, in his further perceptive observations about responses to warfare, insecurity, and thus fear: [46]

> ..... fear of the failure to repay [in cash] cut back on credit. This too was partially a consequence of the shortage of money and was also a cause of yet further shortage.

Conversely, Frank Spooner had emphasized the contrary phenomena, for a subsequent era, in the sixteenth century, during the Price Revolution era: that, when a far more ample supply of coined money became available, credit became far more ample, and freely available. [47] As Nicholas Mayhew also rightly observed: 'Lending does not contract in times of a glut of coin or expand in times of scarcity', so that 'credit reflected the supply of coin rather than compensated for it'.[48] In sum, credit was never an effective remedy for monetary scarcity in the late-medieval economy..

The medieval usury doctrines and credit: bills of exchange and negotiability

Finally, we cannot neglect to consider what was probably the most serious institutional impediment to the use and flow of credit in the medieval economy: the Church, especially its long-standing usury doctrine. To be more precise, that doctrine specifically meant the absolute prohibition against both lending and borrowing money at interest -- anything beyond the principal of a loan. It certainly did not mean, as is commonly and wrongly supposed, merely 'excessive' interest. What is even less well known is that Church's anti-usury campaign had undergone a momentous revival and reinvigoration in the early thirteenth century, especially with the establishment of two mendicant Preaching Orders, the Franciscans (1209) and Dominicans (1215), whose monks preached hellfire and eternal damnation for all usurers – and that meant most

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[44] See nn. 38-40, above, in particular Postan's publications (n. 40).

[45] Reinhold Mueller, ' "Chome l'ucciello di passegio": la demande saisonnière des espèces et le marché des changes à Venise au moyen âge', in John Day, ed., *Études d'histoire monétaire, XIIe-XIXe siècles* (Université de Paris VII, Lille, 1984), pp. 195-220; Nightingale, 'Monetary Contraction and Mercantile Credit', pp. 560 - 75. See also nn. 47-48, below.

[46] Spufford, *Money and Its Use*, p. 347. See also n. 28 above.

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

[48] Nicholas Mayhew, 'Money and Prices in England from Henry II to Edward III', *Agricultural History Review*, 35:2 (1987), p. 121.

merchants and certainly all bankers and financiers.[49]

To be sure, the anti-usury campaign, even in its most vigorous late-medieval forms, applied only to loans – though certainly to all the various forms of credit that involved borrowing. In no way did the usury prohibition impede the application of capital itself in other forms: e.g., equity investments in trade, finance, and industry (partnerships), nor investments in rent-yielding property. Nor, of course, did the usury ban prevent lending itself, for there were many ways, albeit illegal or sinful, of evading the usury ban. But clearly merchants and financiers who evaded the ban did so at considerable costs: confiscation, prosecutions and loss of liberty, and certainly injury to their reputations and social standing.[50] In that respect, the usury doctrine certainly did restrict the supply of credit and thus raised the cost of acquiring capital in the late-medieval economy.[51]

But the real importance of the late-medieval anti-usury campaign lies in how it prevented the establishment of full-fledged, legally-sanctioned negotiability of transferable credit instruments, in order to permit a rapid expansion in the effective money supply. Negotiability essentially came to depend on the legally enforceable right of creditors to discount credit instruments before their maturity: i.e., to sell bills to a third party for less than the stipulated redemption value. That also meant the right of those third parties, especially those holding 'bearer' bills, to collect the full amount, i.e., the redemption value, on the bill's maturity, from the original debtor. Obviously no one would have bought such bills for the full redemption value before maturity; indeed, they expected to profit from purchasing such bills 'at discount'. Simply because discounting meant a proportional deduction for forgone interest on the bill, it was clearly considered to be a usurious act, and thus illegal. That severe usury-based restriction prevented any legal transfer and final redemptions of such discounted credit instruments, in commerce, before the 'financial revolution' sixteenth century. In the 1540s, the governments of both the Habsburg Netherlands and England removed the final barriers with official ordinances that authorized interest payments on loans, up to specified limits:

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[49] See John Munro, 'The Medieval Origins of the Financial Revolution: Usury, *Rentes*, and Negotiablity', *The International History Review*, 25:3 (September 2003), 505-62; and sources cited in nn. 38-40 above.

[50] In 1398, when the renowned Francesco Datini had asked advice about opening a Florentine bank in 1398, an associate told him that he 'risked the ruin of his reputation as a merchant by entering this business, since no banker could avoid usurious contracts'. Cited in Richard Goldthwaite, 'Local Banking in Renaissance Florence', *Journal of European Economic History*, 14:1 (Spring 1985), pp. 13, 32. As Lawrence Stone commented: 'Money will never become freely or cheaply available in a society which nourishes a strong moral prejudice against the taking of any interest at all – as distinct from objection to the taking of extortionate interest. If usury on any terms, however reasonable, is thought to be a discreditable business, men will tend to shun it, and the few who practise it will demand a high return for being generally regarded as moral lepers.' Lawrence Stone, *The Crisis of the Aristocracy, 1558 - 1641* (Oxford, 1965), p. 529.

[51] See 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', 22 - 26 aprile 2007, 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; and nn. 38-40, 49, 51, above.

12 percent in the Netherlands and 10 percent in England.[52]   Before such legislation, the usury ban meant that non-negotiable credit instruments had not added to the money supply, but had served at best only to increase the income velocity (V) of money.[53]

Nevertheless, according to the late Raymond de Roover, who had been the foremost authority on medieval banking and finance, the usury doctrine had unwittingly (so far as ecclesiastical authorities were concerned) played a positive role in the later-medieval economy: in promoting the much greater use and more widespread diffusion of bills of exchange. Few will contest the view that such bills were the single most important European financial innovation of the medieval era (from the thirteenth century); and one that was distinctly European in its origins.

In essence, de Roover contended that merchants used the bill of exchange as the most effective means of circumventing the usury ban by 'disguising' the implicit interest on the loan contract within the exchange rate between the two currencies in the contract: i.e., first , in the local currency of the city in which the loan was contracted (e.g., Florence); and then, in the currency of the other, foreign city, in which the repayment was made (e.g., Bruges) by the *recambium* or 'return bill' .[54]

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[52] In the Habsburg Netherlands, still nominally Catholic, but already strongly influenced by Calvinists and Lutherans, Emperor Charles V issued two ordinances to legalize interest-bearing loans: in 1540 and 1543, the latter setting the 12 percent limit.). See Herman Van der Wee, 'Anvers et les innovations de la technique financière aux XVIe et XVIIe siècles', *Annales: E.S.C.*, 22 (1967), 1067-89, republished as 'Antwerp and the New Financial Methods of the 16th and 17th Centuries', in Herman Van der Wee, *The Low Countries in the Early Modern World* , trans. by Lizabeth Fackelman, Variorum Series (Aldershot, 1993), pp. 145-66, esp. p. 163; Herman Van der Wee, 'Monetary, Credit, and Banking Systems', in E.E. Rich and Charles Wilson, eds., *The Cambridge Economic History of Europe*, Vol. V: *The Economic Organization of Early Modern Europe* (Cambridge, 1975), p. 325; Van der Wee, Wee, *Growth of the Antwerp Market,* vol. II, pp . 352-53. The Imperial ordinance of 1540 (unpublished) is in Stadsachief Antwerpen, Pk. 2763 (Van der Wee); and that of 1543, with the 12 percent limit, is recorded in Charles Laurent, J. Lameere, H. Simont, C. Terlinden, and C. Bolsee, eds., *Recueil des ordonnances des Pays Bas: Seconde série*, 7 vols. (Brussels, 1893-1960), vol. IV, pp. 232-38.   In now Protestant England, Henry VIII followed suit in his 1545 Parliament, but his statute was revoked in 1552; and Parliament did not restore it until 1571, at the behest of Queen Elizabeth I. See Statutes 37 Henrici VIII, c. 9 (1545) and Statute 5-6 Edwardi VI c. 20, and 13 Elizabeth I, c. 8 (1571): in Great Britain, Record Commission (T. E. Tomlins, J. Raithby, et al.), eds., *Statutes of the Realm*, 6 vols. (London, 1810-22), vol. III, p. 996; vol. IV:1, p. 155, 542. Usury thus came to be defined as interest in excess of the legal limits. Equally important was legislation to protect the right of third parties or 'bearers', to whom bills had been transferred in payment, to redeem these bills on maturity, ending with the Imperial ordinance of 31 October 1541. See sources Van der Wee, *Antwerp Market*, vol. II, pp. 343-44; Van der Wee, 'New Financial Methods', pp. 149-63; Van der Wee, 'Monetary, Credit, Banking Systems', pp. 324-32. See also nn. 38- 40, 49, 51 above.

[53] See nn. 38-43, 49, 51 above.

[54] Raymond de Roover, *L'evolution de la lettre de change, XIVe-XVIIIe siècles* (Paris, S.E.V.P.E.N., 1953); De Roover, 'New Interpretations of the History of Banking', *Journal of World History*, 2 (1954), 38-76; De Roover, 'Scholastic Economics: Survival and Lasting Influence from the Sixteenth Century to Adam Smith', *Quarterly Journal of Economics*, 69 (1955), 161-90; both reprinted in Julius Kirshner, ed., *Business, Banking, and Economic Thought in late Medieval and Early Modern Europe: Selected Studies of Raymond de Roover* (University of Chicago Press, 1974), pp. 200 - 38; De Roover, 'Early Banking Before 1500 and

De Roover, however, is not entirely fair to the Church; for ecclesiastical authorities deemed the bill of exchange or *cambium* to be a fully legitimate investment contract, involving a merchant's purchase of funds from a foreign banker, or his financial agent abroad. Such ecclesiastical approval was conditional, however, on how the exchange rates were set. If the exchange rate on the return bill, or *recambium*, was fixed in advance, and not according to market forces at the time of the subsequent transaction, the Church condemned such bills as *cambio secco* ('dry exchange'), and thus as usurious.

Furthermore, I have also contended that, since the bill of exchange was not just a loan contract but an equally important financial transfer instrument, other factors, other major impediments, were responsible for its diffusion and growing mercantile popularity in the later Middle Ages. [55] The first, of course, were the growing burdens of warfare, from the 1290s, on international trade: from not just military battles, but even more from the consequently increased brigandage on land routes, and piracy on maritime routes, and the reluctance or failure of many states involved in the wars to protect foreign merchants in their jurisdictions. Under these adverse circumstances, many merchants were reluctant to conduct their trade in precious metals – fearing theft, confiscations, and losses from shipwrecks and piracy. Instead, more and more, they preferred to transact international trade with bills of exchange, which, as noted obviated any recourse to bullion shipments. But that in turn depended upon their access to an established network of resident factors, usually with their own ethnic and family ties, always fundamental for risky principal-agent relationships. [56]

Bullionism and the bill of exchange

Another and fully related factor was late-medieval 'bullionism': i.e., those late-medieval monetary policies that arose from both late-medieval warfare and from coinage debasement itself. In sum, 'bullionist' policies were those designed to ban and prevent the export of bullion and also to encourage or entice its import, and in particular the influx of bullion into the domestic prince's mint. A financial counsellor for Elizabeth I indeed attributed the origins of the European bill of exchange to such export bans, stating that: 'marchauntes naturall exchaunge was first divised and used by the trewe dealing marchauntes immediately after that princes did inhibit the cariadge of gould and silver out of their Realmes'. [57] As I have also contended, elsewhere, precisely because bills of exchange and related credit instruments were designed either

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the Development of Capitalism', *Review of the History of Banking*, 4 (1971), 1-16.

[55] See also Markus A. Denzel, 'The European Bill of Exchange: Its Development from the Middle Ages to 1914', in Sushil Chaudhuri and Markus Denzel, eds., *Cashless Payments and Transactions from the Antiquity to 1914*, Beiträge zur Wirtschafts- und Sozialgeschichte n. 114 (Stuttgart: Franz Steiner Verlag, 2008), pp. 153-94; Spufford, *Handbook of Medieval Exchange*, Introduction, pp. xix - lx; and the following note.

[56] Munro, 'The New Institutional Economics', pp. 1 - 47; John Munro, 'Bullionism and the Bill of Exchange in England, 1272-1663: A Study in Monetary Management and Popular Prejudice', in Center for Medieval and Renaissance Studies, University of California (Fredi Chiappelli, director), ed., *The Dawn of Modern Banking* (New Haven and London: Yale University Press, 1979), pp. 169-239; reprinted 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). See also de Roover, 'Commercial Revolution', pp. 34-39.

[57] An official identified only as Taverner: to Elizabeth I, in 1570: in Richard Tawney and Eileen Power, eds., *Tudor Economic Documents*, 3 vols. (London 1924), III, no. iii.5, p. 362.

to economize on or to circumvent the use of direct bullion payments, many later-medieval princes and governments sought to forbid or restrict their use. [58]

Indeed, most late-medieval princes who pursued bullionist monetary policies came to view credit instruments and institutions (banks) as a threat to the conduct of those monetary policies, and in particular to the prince's monopoly of the money supply. The classic case for the Burgundian Netherlands was the series of bans that Duke Philip the Good and his successors imposed on money-changers and their deposit-and-transfer credit banks, from the monetary unification of the Burgundian Low Countries in 1433 to the late 1480s (1467, 1480, 1489).[59] Both Raymond de Roover and Herman Van der Wee have contended that these bans were so effective that deposit-banking re-emerged only slowly in the Low Countries, in late-sixteenth century Antwerp and in seventeenth-century Amsterdam.[60]

The monetary and price effects of coinage debasements: inflations and deflations, 1384 - 1482

If, therefore, credit institutions did not play any positive role in relieving monetary scarcities in the late-medieval economy, we must now ask if the numerous coinage debasements succeeded in that task. While we cannot effectively measure the Flemish money supply, and its year to year changes, we can use the mint-output statistics (Table 2 and the graphs) as an indirect measure of monetary changes; and then we can use the aforementioned Flemish Consumer Price to measure both the deflationary consequences of the periodic 'bullion famines' or liquidity crises, and then the inflationary consequences of the periodic coinage debasements during the entire century of the Burgundian era. We will also look at the contemporary English evidence, for comparison.

First, the evidence portrayed in the graphs and tables is overwhelming, that periodic coinage debasements did increase the money supply and also that such increases did lead to some periodic inflations, though more so in the Low Countries than in England. In England, between 1384 and 1482, the silver content of the sterling penny declined from 1.079 grams to 0.719 grams = a loss of 0.360 grams or 33.36 percent of its earlier contents. Over this century, the English price level or Consumer Price Index (with a base of 1451-75 = 100) rose only marginally: from 119.92 in 1384 to 128.417 in 1482: a rise of only 8.496 = 7.08

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[58] Munro, 'Bullionism and the Bill of Exchange in England', pp. 169-239; and other studies cited in nn. 38-43, 49, 51 above.

[59] Raymond de Roover, *Money, Banking and Credit in Mediaeval Bruges: Italian Merchant-Bankers, Lombards, and Money Changers: A Study in the Origins of Banking* (Cambridge, Mass., 1948), pp. 236-46, 331-57, esp. pp. 339-42. See also Van der Wee, *Growth of the Antwerp Market*, vol. II: pp. 85-86, 333-40, 355-58; Van der Wee, 'Monetary, Credit, and Banking Systems', pp. 302, 312, 323-24 (noting similar problems in 15th-century Italy), 361-62; Van der Wee, 'Medieval and Early-Modern Origins of Banking', pp. 1157 - 73; Van der Wee, 'European Banking in the Middle Ages', pp. 152-80. Note, from these sources (and my own publications) that deposit-banking arose everywhere only from money-changing

[60] Furthermore, various Burgundian ordinances, both ducal and municipal, also sought to restrict pawnbroking (1442, 1451, 1457, 1473, 1477). See Van der Wee, 'Monetary, Credit, and Banking Systems', pp. 302, 312, 323-24 (noting similar problems in 15th-century Italy), 361-62; Van der Wee, *Antwerp Market*, vol. II, pp. 85-86, 333-40, 355-58; de Roover, *Money, Banking and Credit*, pp. 130, 236-46, 331-57, esp. pp. 339-42, 341, 351.

percent.[61] The related monetary and price changes in Flanders seem to have been more commensurate. The silver content of the Flemish penny *groot* fell from 1.173 grams in 1384 to one of just 0.522 grams in 1482: a loss of 0.651 grams = 55.49 percent of its 1384 contents. During this same era, the Flemish Consumer Price Index (base 1451-75 = 100) rose from 122.185 to 193.932 = 71.747, or a rise of 58.72 per cent.[62]

But these statistics are misleading in several ways. In the first place, to compares diminutions in metal contents with rises in prices, in this fashion, is statistically false, since we are dealing with reciprocals. The following is the formula needed to compare the consequence of a reduction of the coin's silver contents with the expected rise in the money-of-account value of a *marc* weight of commercially fine silver (244.753 g): a value known as the *traite* of the *marc*.[63]

$$\Delta T \text{ (traite)} = [1/(1 - x)] - 1$$

in which *x* represents the percentage reduction of the fine silver content of the penny and the corresponding pence in the money of account; and **ΔT** represents the consequent change in the money-of-account value of a *marc* of fine silver (*argent-le-roy* = 95.833 percent pure) after the coinage debasement. By this formula, a 10-percent reduction in the fine silver contents of the penny would have produced a 11.11 percent rise in the nominal value of the new coined *marc* of silver, i.e., a potential increase of 11.11 percent in the coined money supply. By the crude, simplistic Quantity of Theory of Money, that should also have been the expected rate of inflation.

In the two cases cited here – for price changes in England and Flanders, from 1384 to 1482 – we now find that, for England, in this era, the expected rate of inflation, resulting from a 33.36 percent reduction in the penny's silver content, should have been 50.06 percent – instead of the 7.08 percent rise that did occur. Similarly, for Flanders, over this same century, the expected rate of inflation, resulting from a 55.47 percent reduction in the penny's silver content, should have been 124.57 percent – instead of the far more modest 58.72 percent rise in prices that did occur. [64] While these two snapshots are useful for purely heuristic purposes, the real statistical tests would have to be measured in one or two year lagged changes in the two domestic price indexes, following each coinage debasement. Those results will be found in the Table 4, in the Appendix – results that do not contradict the essence of the snapshots presented here.

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[61] For the English data, see Sir Albert Feavearyear, *The Pound Sterling: A History of English Money,* 2nd rev. edn. by E. V. Morgan (Oxford: Clarendon Press, London, 1963), Appendix III.ii, p. 439; Munro, 'Wage-Stickiness', pp. 185 - 297, esp. Tables 1, 3-5, pp. 231-42; Table 5, pp. 240-42; Munro, 'Builders' Wages', pp. 1013-76, esp. Tables 1- 2, pp. 1050-52; and Munro, 'Before and After the Black Death', pp. 335-64.

[62] For the construction of the Flemish Consumer Price Index, see Munro, 'Wage-Stickiness, Monetary Changes, and Real Incomes',Table 1, p. 231; and Munro, 'Builders' Wages', pp. 1018-28, and Table 1, pp. 1048-49. See also Tables 1, 3, and 7 in the Appendix.

[63] For definitions of fineness and weight, in terms of the *marc de Troyes*, see nn. 5-6 above. The computation of the *traite* or money-of-account value of a *marc* of commercially fine silver simply involves the calculation of the number of coins, of a given denomination, struck from the *alloye*d *marc* (i.e., with the copper added) – a number known as the *taille per marc* – and then a multiplication of that number by the official value of the coin itself. Thus **T = (taille * face value)/percentage fineness.**

[64] See Table 1A, and n. 62 above.

The historical lesson is clear: coinage debasements, and consequent increases in money supplies, did not produce and never produced correspondingly proportional inflations. There are five possible reasons why they did not. First, coinage debasements rarely succeeded in reminting the entire domestic coined money supply, even if the financial terms seemed compelling for merchants to surrender their own current coins to the mint. But many others would have chosen to retain them, knowing that their higher bullion contents would later fetch a higher market value. Second, even if a silver debasement was also designed to attract other sources of bullion, as well, especially from neighbouring lands, the expected cost or monetary loss would have been some outflow of the other metal, gold, for reasons noted earlier. Third, since, as also noted earlier, coins did not account for the entire money supply, we must, therefore take account of credit changes. Apart from the considerations already discussed, we should also note that coinage debasements often proved to be injurious to foreign merchants (in Burgundian Flanders, to the German Hanse, in particular); and commercial disruptions often had an adverse effect on supplies of credit. Fourth, as may be seen in the modernized Quantity Theory of Money, the inflationary consequences of increasing the money supply (M) may have been offset by a decrease in the income velocity of money (V – or in a corresponding increase in Cambridge k) and/or by increases in y (i.e., net national product and income).[65]

Fifth, perhaps the most important factor was simply the failure of coinage debasements to counter-act or fully offset the prevailing deflationary consequences of long-term, widespread monetary scarcities – i.e., the prevalent 'bullion famines'. Indeed, one obvious reason why they failed to do so is that coinage debasements were almost always periodic or episodic and thus relatively short-term, as well as being merely regional in their impacts. Furthermore, in Burgundian Flanders, three episodes of coinage debasement were followed by the exact monetary opposite: a coinage *renforcement* or a restoration and strengthening of the coinage (with more silver), which, in contracting the money supply – i.e., in reminting debased coins into necessarily a fewer number of stronger coins – had deflationary consequences.[66]

Thus, as may be seen in Tables 1A and 1B, Duke Philip the Bold of Burgundy had commenced his rule in Flanders with a *renforcement*, in September 1384, that restored the silver contents of the penny *groot* to those that Count Louis de Male of Flanders had set in September 1369 (1.173 grams). But that coinage alteration of 1369 had, in fact, been a debasement; and Count Louis had inflicted three more debasements, before his death in 1384. Duke Philip's 1384 *renforcement* was then followed by four consecutive debasements of his own, in the years 1386 to 1388. Finally, in 1389-90, he once more engaged in a *renforcement*, one that lasted for the rest of his reign (indeed, to 1416) ; but, in doing so, Philip restored the *groot*'s silver contents to only 86.80 percent of those in his first coinage, of 1384 (Table 1.A).[67] That *renforcement* in turn was followed by a sharp drop in Flemish mint outputs, and another apparent 'bullion famine' and deflation that lasted for 27 years, until 1416. During that period, the quinquennial mean CPI or

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[65] See Appendix B, below.

[66] See Tables 1A and 1B.

[67] That *1384 renforcement* was accompanied by a pro-silver shift in the bimetallic ratio: from 10.412:1 to 9.5853:1. But to offset any potential losses of gold, Philip the Good issued counterfeit imitations of the English gold noble, which succeeded in attracting and minting a considerable amount of gold, in the early 1390s. See John Munro, *Wool, Cloth and Gold: The Struggle for Bullion in Anglo-Burgundian Trade, 1340-1478*, Centre d'Histoire Économique et Sociale (Brussels: Editions de l'Université de Bruxelles; and Toronto: University of Toronto Press, 1973), pp. 43-63; Munro, 'Mint Policies, Ratios, and Outputs', 71-116; Munro, 'A Maze of Medieval Monetary Metrology', pp. 173-99.

price level, with a base of 1451-75 =100, fell from a high of 124.72 in 1386-90 to a low of 88.53 in 1401-05: a drop of 29.01 percent; and on the eve of the next round of debasements, in 1411-15, the Flemish mean CPI was only 95.31.

The next set of coinage debasements, under dukes John the Fearless and Philip the Good, from 1416 to 1433, were followed and then accompanied by a rise in the Flemish CPI: from a mean of 95.31 in 1411-15 to a high of 140.167 in 1436-40. Those debasements were again followed by both a *renforcement* and the monetary unification of the Burgundian Low Countries, based on the reformed Flemish coinage.[68] As with the previous *renforcement*, mint outputs fell sharply, once the recoinage was complete; and the Low Countries then experienced the worst phased of the late-medieval 'bullion famines', for the next three decades, when it experienced a fully stable silver coinage, though receiving a new, and higher valued gold coinage in 1454.[69] During these three decades, until the mid 1460s, the Low Countries also experienced the most severe deflation of the late-medieval era, when the Flemish CPI fell from the aforementioned peak of 140.167 in 1436-50 to a nadir of 88.71 in 1461-65: a precipitous fall of 36.71 percent.

A principal reason for these coinage *renforcements* was to restore not just the coinages, but also public confidence in the economy – and indeed to restore the honour, dignity, and reputation of the Burgundian dukes. It cannot be emphasized too strongly that coinage debasements were widely and deeply resented, and encountered serious political opposition in the Burgundian Low Countries. After two of his debasements, the assembly of Flemish towns (the Estates) forced Philip the Good not to undertake any further coinage alterations for specified periods: in 1418-19, for fifteen years;[70] and in 1433, for twenty years.[71] Philip, however, broke his first promise, chiefly by engaging in debasements in his recently acquired and neighbouring provinces of Namur, Holland-Zeeland, and Brabant, but also once, within Flanders itself, at Ghent, in November 1428. Yet he did indeed keep his second promise (at least for silver), and for more than

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[68] With the monetary unification of Flanders, Holland, Zeeland, Hainaut, Brabant, and Namur. See Peter Spufford, 'Coinage, Taxation, and the Estates General of the Burgundian Netherlands', *Anciens pays et assemblées d'états (Standen en Landen)*, 40 (1966), 63-88; Peter Spufford, *Monetary Problems and Policies in the Burgundian Netherlands, 1433 - 1496* (Leiden, 1970), pp. 1-46; Munro, *Wool, Cloth and Gold,* pp. 93 - 126.

[69] Munro, *Wool, Cloth and Gold,* pp. 65-179; Munro, 'Bullion Flows and Monetary Contraction', pp. 97-158; Munro, 'Mint Outputs, Money, and Prices', pp. 31-122; Munro, 'Patterns of Trade, Money, and Credit', pp. 147-95; Munro, 'Wage-Stickiness, Monetary Changes, and Real Incomes', pp. 185 - 297.

[70] See Munro, *Wool, Cloth and Gold*, pp. 74-76, and n. 34 in particular. The most important study on this issue is Spufford, 'Coinage, Taxation, and the Estates General', pp. 63-88. In March 1418, the Flemish towns or the Four Members (vier *leden*) had in fact requested no changes for the next 40 years: that 'dese munte sal ghedeurch zijn zonder angheven ofte veranderen xl jaer'; but that period was reduced to 15 years in the final ordinance, in: Algemeen Rijksarchief, Rekenkamer, reg. no. 1158, fo. 7vo. When Philip became count in his own name, in 1419, after his father's murder, the Four Members required him to repeat this promise. Louis Gilliodts-van Severen, ed., *Cartulaire de l'ancienne estaple de Bruges*, 2 vols. (Bruges: Société d'Emulation de Bruges, 1906-08), I, no. 630, p. 526.

[71] Munro, *Wool, Cloth and Gold*, pp. 101-103; Spufford, 'Coinage, Taxation, and the Estates General', pp. 143-53; Prudent Van Dusye and Edmond De Busscher, eds., *Inventaire analytique des chartes et documents appartenan aux archives de la ville de Gand* (Ghent: Annoot-Braeckman, 1867), no. 552, p. 192: charter of 18 January 1434.

thirty years, up to the final year of his reign, in 1466-67.

We may now summarize the remaining coinage debasements of the Burgundian era and the beginning of the ensuring Habsburg era. They resumed, at first gently, in 1466-67, as noted, in the final year of Philip's reign, and then with ever more drastic and negative alterations under his son, Charles the Rash (1467-77), and his Habsburg successors: Charles' son-in-law Archduke Maximilian (d.1519) and his son Philip the Fair (d. 1506), from 1482 to 1499, with one intervening, short-lived, *renforcement*, in 1490.[72] These latter debasements were also much more inflationary than their predecessors, chiefly because they occurred during periods of intense and costly civil wars. After the final coinage alteration of 1499, the Low Countries experienced almost twenty years of monetary and price stability, before the onset of the aforementioned Price Revolution era (ca. 1515 - ca. 1650).[73] But this very complex phase of Burgundian-Habsburg monetary history lies beyond the scope of this study.

Motivations for the Burgundian coinage debasements: a monetary remedy?

In view of the fact that almost the entire Burgundian era experienced periodic and often very severe monetary scarcities – the afore-mentioned 'bullion famines' – with very deflationary consequences, a *prima facie* case may be made that coinage debasements were indeed undertaken primarily to expand the money supply and thus to combat deflation. Our concern here is with motivation, not with economic consequences. Indeed, one of the world's most renowned economists, Thomas Sargent, has recently co-authored a highly-praised monograph whose prime thesis is that the primary motivation for almost all medieval and early-modern coinage debasements was to remedy such coinage scarcities: but above all, the often severe shortages of petty coins, 'small change', the coins that were most required in day to day transactions, by the vast majority of the populace: those that were used to purchase bread, beer, and similar daily necessities. [74]

In Flanders, these coins were known as 'mites', of which 24 = 1d or penny *groot*. They were also known also as *monnaies noires*, because of their very high copper contents, which made the coins, despite having some silver content, appear black. There is some seeming merit to Sargent's argument, for indisputably the proportion of the total bullion minted that was struck into these petty coins was always very low: an average of about one percent in Flanders and then all of the Burgundian Low Countries, according to my own calculations, from the 1330s to 1480s.[75]

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[72] See Louis Deschamps de Pas, 'Histoire monétaire des comtes de la Flandre de la maison d'Autriche et classement de leurs monnaies (1482-1556): Philippe-le-Beau (1482-1506)', *Revue numismatique*, nouvelle série, 14 (1869-70), 86-114; 243-266; 319-334; 419-440; 15 (1874-77), 80-104, 151-63; and Louis Deschamps de Pas, 'Histoire monétaire des comtes de la Flandre de la maison d'Autriche et classement de leurs monnaies (1482-1556): Charles-Quint (1506-1556)', *Revue belge de numismatique*, 32 (1876), 49-122.

[73] See p. 20 and nn. 36-39, above.

[74] Thomas Sargent and François Velde, *The Big Problem of Small Change* (Princeton and Oxford: Princeton University Press, 2002), especially chapters 1-3, pp. 3-41; chapters 20-24, pp. 335-74.

[75] John H. 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: in particular Table 3, p. 396, reprinted 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).

The standard view is that mint-masters had found the minting of such petty coins unprofitable, and thus sought to strike most of their bullion into higher denomination silver coins. That argument might have been valid for medieval England, in which all silver coins normally maintained sterling silver fineness (92.5 percent pure silver), so that striking farthings, worth one-quarter pence, meant striking four times as many such coins as pennies from the Tower Pound.[76] But in France and the Low Countries the number of petty coins to be struck from the alloyed marc was proportionally smaller because such coins were given a far higher copper content: hence, indeed, the term *monnaies noires*; and the mint-master charged a far higher brassage fee to compensate for his extra labour and the copper alloys. There is no evidence that striking such coins was necessarily unprofitable; and the prince exacted the same proportional seigniorage fee, per *marc* of fine silver.

In my own view (published in 1988), there was generally no need to use a larger share of the mint's bullion supplies for the petty coinage, because there was generally a much lesser need to replenish stocks of these petty coins than to replenish the stocks of high denomination silver coins. The reason for that difference lies in the fact that high denomination silver coins were frequently exported, for commercial or financial reasons, while the very high copper contents of the *monnaies noires* made the task of melting them to extract the silver too costly: i.e., their high brassage fees protected from export.[77]

In sum, I find no merit to Sargent's argument that coinage debasements in medieval and early modern Europe were undertaken principally to remedy shortages of 'small change'; and certainly not in the Low Countries. Had the Flemish and then Burgundian mints undertaken debasements for this specific purpose, they would have had to debase the petty coins to a much greater extent than those for higher denomination coins: i.e., to reduce the silver contents proportionally more than the reductions undertaken for the silver double and single *groot,* or even its other subdivisions: half and quarter *groten*. In fact, the Burgundian Flemish debasements of the silver coinages, from the *double groot* (2d) to the single mite, were almost always generally proportional for each denomination: i.e., in maintaining virtually the same ratio of silver contents between denominations.[78] To be sure, the silver contents of these petty coins, these *monnaies noires*, almost entirely copper, appear to be 'minimal', even token. Thus in the Burgundian coinage reform and unification of October 1433, the new double-mite or *courte* had a commercial silver fineness (*argent le roy*) of just 4.17 percent: compared to the 50 percent commercial silver fineness of both the double *groot* (Table 5) and the single *groot*. But in terms of the relative values of the *courte* and the groot (1 *groot* = 12 double mites), the double mite had two-thirds = 66.67 percent of the relative silver content of the *groot*; and despite the several debasements that ensued from 1466 to 1482, that same silver ratio was maintained, varying only from 64.16 to 69.31 percent. Clearly, therefore, the silver contents were not just 'nominal', and these *monnaies noires* were not just token coin. The relative reduction in their silver contents (i.e., the difference from 100 percent)

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[76] See in particular, Philip Grierson, 'Medieval Numismatics', in J. Powell, ed., *Medieval Studies: An Introduction* (Syracuse, 1976), p. 113, reprinted in Philip Grierson, *Later Medieval Numismatics (11th - 16th Centuries): Selected Studies* (London: Variorum Reprints, 1979), no. 1, commenting that medieval 'moneyers preferred to strike high denominations to low ones... and were apt to leave the public desperately short of small change'. See also Munro, 'Deflation and the Petty Coinage', p. 387.

[77] See nn. 74- 75 above. Sargent and Velde (n. 74) acknowledge my publication (and others), in several places, but they do not acknowledge my arguments.

[78] The original version of Table 1 on Flemish coinage had contained all the coin denominations: the double *groot* or *patard* (2d), the *groot* (1d), the demi-*groot*, the quarter-*groot*, the double mite (= 1/12 *groot*), and the single mite (= 1/24 *groot*); and those mint data confirmed this point. For reasons of space constraints, however, only a condensed version of this table, with the first two denominations, has been presented.

was necessary to allow the mint-master to charge a higher production fee (known as *brassage*) to cover his relatively higher costs, and also to permit him to earn his own profit.[79] The utility of these coins in effecting day to day payments for most of the population justified their higher *agio* over their bullion contents.

The one and only exception that I have found that might justify the Sargent-Velde thesis — and one that had escaped their attention – is a Bruges mint indenture for 31 August 1457, during indeed the worst phase of the mid-century 'bullion famine'. It required the mint-master to strike a greater number of *courtes* or double-mites from the alloyed marc: 240 per marc instead of the previously stipulated number (or *taille*), 216. The results were not impressive: in the quinquennium 1456-60, only 51.302 kg of fine silver were minted – compared to 112 times as much in 1426-30: 5,724.645 kg. On the other hand, 11.4 percent of the fine silver struck the Flemish mints in the later 1450s (none from Oct 1458 to June 1466) was coined into *mites* – and that percentage may be compared to the previously mentioned 'typical' percentage of about one percent, during the rest of the Burgundian era.[80] The stated purpose of the mint ordinance should also be noted: 'que pour subvenir au menu peuple de monnoye noire'.[81] Yet that is most notable for being such a singular exception.

Furthermore, my intensive studies of English, Flemish, and then Burgundian mint accounts, monetary ordinances, and financial records for the fourteenth and fifteenth centuries permit us to reject the hypothesis that coinage debasements were undertaken in order to benefit the public and the economy as anti-deflationary monetary policies, i.e., those designed to replenish and expand the money supply.[82] In England, after Edward III's very minor, defensive debasement in 1351, the 1352 Parliament, by its Statute of Purveyors, decreed that the coinage 'shall never be worsened, neither in weight nor in fineness (*aloi*)', without its consent. The crown did observe that parliamentary statute for over a century – until Edward IV's debasement of 1464.[83] Similarly, in Flanders, the 'Estates' or town assemblies evidently regarded debasements as a 'cure' worse than any supposed coin shortages. Twice, as noted earlier, they had similarly demanded that Duke Philip to Good not alter the coinage, and at least he observed the second request for over thirty years. When he again resorted

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[79] See the previous note. From the 1384 *renforcement* to the final, pre-unification debasement of 1428, the ratio varied more widely: from a high of 72.86 in 1384 to 62.95 in the 1390 *renforcement* to 58.03 percent in the final pre-unification debasement of Nov. 1428.

[80] Munro, 'Deflation and the Petty Coinage', 387-423: in particular Table 3, p. 396.

[81] To Georges le Caboete, *maitre-partiulier* of the Bruges mint, cited in Louis Deschamps de Pas, 'Essai sur l'histoire monétaire des comtes de Flandre de la Maison de Bourgogne et description de leurs monnaies d'or et d'argent: Philippe le Bon (1419-1467): Suite', *Revue numismatique*, nouvelle série, 7 (1862), 123-24. The only other example that I know was an ordinance for a disproportionate minting of courtes – 235 to be struck to the alloyed *marc*, instead of 226, issued in July 1489, also for 'les pauvre et commun peuple'. Text in Deschamps de Pas, 'Histoire monétaire des comtes de la Flandre: Philippe-le-Beau', p. 252. Only 263.100 kg of fine silver were coined in all of 1489, and only 222.358 kg. in all of 1490. See the mint account sources cited in John Munro, 'Deflation and the Petty Coinage Problem', pp. 387-423; Munro, 'Wage-Stickiness, Monetary Changes, and Real Incomes', pp. 185 - 297: Table 3, pp. 235-36.

[82] See my publications on monetary history in Appendix C and in the bibliography for this study.

[83] *Statutes of the Realm*, vol. I, p. 322: Stat. 25 Edwardi III, stat. 5, c. 13. See Munro, *Wool, Cloth, and Gold*, pp. 35, 159-63; Feavearyear, pp. 15-45.

to a debasement, a relatively mild one, in May 1466, he still acknowledged the public's will for a stable coinage, stating, in the ordinance's preamble:[84]

> Que ung des principaulx poins de toutes bonnes pollicies sur quoy le bien publique, tant de nous comme de peuple, est fondé est de avoir et entretenir bonne monnoye, ferme et durable, tant d'or comme d'argent.

Medieval bullionism, coinage debasements, and monetary scarcities: **how they were interrelated**

While it is tempting to dismiss such noble statements as elegant hypocrisy, we are not entitled to dispute the notion that for, many late-medieval princes, their monetary policies were still based on their desire to protect their principalities' mints, their coinages, and their money supplies. In part, as argued earlier, late-medieval bullionist policies may be attributed to the growing conviction that the wealth, prosperity, and power of a realm depended upon its stock of precious metals. But clearly also those bullionist policies also became an integral feature of that era's mint policies, and especially those designed both to protect the realm against foreign debasements and to permit the prince to engage in 'defensive' coinage debasements. For the combination of 'bullionist' and debasement policies, undertaken for whatever reason, almost invariably invited retaliation from neighbouring princes.

In pursuing bullionist monetary policies, most medieval princes banned not only the export of precious metals but also the influx of foreign coins, especially silver coins, except for those declared to be bullion (*billon*) and thus to be surrendered as such to the prince's mints.[85] What these rulers clearly perceived, correctly, was the operation of what is commonly called Gresham's Law: in essence, that cheap money – i.e., debased or counterfeit and thus 'bad' money – drives out dearer coins: i.e., better-quality, higher-silver or higher-gold content coins.[86]

In England, the first recorded ban of this nature was the *Statute of Westminster* (3 Edwardi I, c 15) in April 1275, which stipulated that all imported coins suspected to be counterfeits or otherwise defective be confiscated and turned over to the London Tower mint. From the *Statutum de Moneta Magnum* in 1282, and especially from the *Statutum de Falsa Moneta* ('Statute of Stepney'), in May 1299, Parliament prohibited the importation of all foreign coins, whatever their condition, for domestic circulation. These statutes cited in particular the problems resulting from the circulation of counterfeit, clipped, or otherwise fraudulent coins.

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[84] Algemeen Rijksarchief, Rekenkamer, reg. no. 133, fo. 174 vo., cited in Munro, *Wool, Cloth and Gold*, p. 179.

[85] See n. 9, above.

[86] See John Munro, 'Gresham's Law', in Joel Mokyr, et al, eds., *The Oxford Encyclopedia of Economic History*, 5 vols. (Oxford and New York: Oxford University Press, 2003), vol. II, pp. 480-81; Munro, *Wool, Cloth and Gold*, esp. pp. 11-41; and nn. 63, 70 below. This 'law's is attributed to Sir Thomas Gresham (1519-1579), a merchant-banker and royal agent in Antwerp, and financial advisor to Queen Elizabeth I; he was also the founder of the Royal Exchange, in London (1565; on 23 January 1571, Elizabeth bestowed its royal title). But he did not formulate the law as such, and it was well known centuries before. It can be found in the writings of the Sunni Muslim scholar (born in Haran, Anatolia) Taqi ad-Din Ahmad ibn Taymiyyah (1263 – 1328), and the famed Polish scholar Nicholas Copernicus (1473-1543), who wrote a treatise in the debasement of the Prussian silver coinage: in *Monetae cudendae ratio*, 1528. Appendix C presents 15th-century Burgundian texts of 'Gresham's Law'.

Parliament also banned the export of all silver bullion (including all foreign silver coin) and plate from December 1278, then the export of gold bullion from January 1307, and finally, from January 1364, the export of all coins, gold and silver, explicitly including all legal tender English coins (without export licences). That total ban remained in force until 1663.[87] In this latter respect, England seems to have been unique. For other medieval West European states did permit the export of legal-tender coins.[88] Certainly, however, the late-medieval Low Countries and most other principalities soon did insist on prohibiting the export of 'bullion' per se, i.e. *billon* or *billoen*: specifically defined, as noted earlier, as demonetized coins and uncoined metals, except those permitted for explicit industrial purposes (e.g., goldsmiths, etc).[89]

Peter Spufford himself had also contended that periodic coinage debasements, instead of alleviating coin scarcities, acted only to exacerbate hoarding, with the attendant negative consequences for the European medieval economy.[90] Recall that the famous Gresham's Law assumes that the 'good coin' that is driven out by the influx of foreign debased coins or by the circulation of domestic debased coins is either buried, converted into plate, or exported. [91] Indeed, with continuous competitive medieval debasements, much coin and bullion were exported to gain a higher value from foreign mints engaged in aggressive debasements.

Defensive motives for late-medieval coinage debasements

Clearly, therefore, a very common motive for late-medieval debasements was purely defensive: to protect a prince's realm, and his own mints, obviously, from the economic as well as purely monetary damages inflicted by an influx of foreign debased coins. That was all the more serious a problem when those foreign

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[87]   Royal proclamation of Dec. 1278, in Thomas Rymer, ed., *Foedera, conventiones, literae, et acta publica*, 12 vols. (London, 1709-12), vol. I:ii, p. 564; Statute of Westminster (1275) and *Statutum de Falsa Moneta* (1299), in Great Britain, Record Commission (T.E. Tomlins, J. Raithby, et. al) eds., *The Statutes of the Realm*, 6 vols. (London, 1810-22), I, 131-35, 219; royal proclamation of Jan. 1307, in Rymer, *Foedera*, vol. I:ii, p. 1007 (repeated in Feb. 1326, in *Ibid.*, vol. II.1, p. 619); Statute 38 Edwardi III stat 1 c. 2 (Jan. 1364), in *Statutes of the Realm*, vol. I, p. 383, and Rymer, *Foedera*, vol. III.ii, p. 728; Statute 15 Carolus II c. 7 (May 1663), in *Statutes of the Realm,* vol. V, p. 452, sec. 9. See also Munro, 'Bullionism and the Bill of Exchange', pp. 187-205, 216-39; and Appendix A, pp. 216-19.

[88]   On this see Munro, *Wool, Cloth, and Gold*, pp. 11-64, 181-86; Munro, 'Billon - Billoen - Billio', pp. 293-305. Exempted from this bullion-export ban were also unbroken plate and jewellery. That difference in attitudes can be seen in the stern, almost contemptuous, rebuke that Burgundian-Habsburg ambassadors delivered to the English delegates during the 1499 trade-treaty negotiations : They [the Archduke's councillors] thynk that theye do very moche for your subjectes to graunt them to conveigh oute of the archdukis landis all money current in thoos parties and also all manere of plate wrought and brought to eny man certen forme and fasshion [unbroken]. For the archdukis subjectes may not have like pryvylage to convey money nether plate oute of your realme of England into the archdukis parties, nor all manere of cune [coins]... Full text in Georg Schanz, ed., *Englische Handelspolitik gegen Ende des Mittelalters*, II: *Zoll-und Handelsstatistik, Urkunden, Beilagen* (Leipzig, 1881), doc. no. 8, p. 196.

[89]   See nn. 9, 85, 88 above.

[90]   Spufford, *Money and Its Use*, p. 347: ' Fear of debasements, and the instability of money, made men happier to keep their silver in the form of plate, in addition to the desire for ostentation.'

[91]   See n. 86 above.

influxes contained fraudulent or counterfeit imitation of that prince's own coins, and thus containing of course a smaller precious metal content. An allied problem was the circulation of coins, domestic and foreign, that had been fraudulently clipped or otherwise denuded of their precious metal contents. But the same consequences could also have been honestly produced by simple wear and tear of the coins over time. When such clipping or 'wear and tear', or other diminutions in the precious-metal contents of so many coins in current circulation had led to the market's elimination of the *agio* or premium that coins commanded over bullion, then, as noted earlier, bullion ceased to flow to the prince's mints[92]. That would have forced the prince to engage in a debasement that reduced the silver contents of the penny and related coins to the level of the silver found in the currently circulating coinage. Such a debasement would have restored the *agio* of coinage over bullion, and thereby would also have renewed an influx of bullion into the prince's mints. [93]

Aggressive motives for late-medieval coinage debasements: seigniorage revenues to finance warfare

Almost all late-medieval mint ordinances – certainly those in France and the Low Countries – include virtual renditions of Gresham Law, and citations of these very adverse circumstances, in order to justify the prince's coinage debasements.[94] Obviously it was always better to appear to be the victim than the victimizer. Only in England, however, and there, only in 1351 and 1411, can coinage debasements be judged to have been purely defensive; the next one, Edward IV's debasement of 1464, was only partly defensive and certainly much more so aggressive.[95] Virtually all debasements in late-medieval France and the Low Countries – where the evidence can be weighed carefully – even when retaliatory in nature, were essentially aggressive in nature.

The motive for all of these was profit-seeking: the augmentation of the prince's seigniorage revenues, principally in order to finance both defence and warfare. One must understand that a prince's feudal revenues could rarely be increased in the short run, and that securing additional incomes from taxes, *aides*, loans, or grants from town assemblies, 'estates', or other legislative assemblies was difficult and usually involved unwelcome concessions. The mint and the coinage, however, were the prince's exclusive prerogative, though as already noted, even that prerogative was sometimes challenged.[96] Often late-medieval mints did produce very large seigniorage revenues, as Hans Van Werveke has demonstrated, for example, for the reign of Flanders' Count Louis de Male (1346-84). [97] Few would doubt that such fiscal motives had a strong priority

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[92] For the concept of coinage *agio*, or its premium in value over bullion, see above, pp. 5, 41.

[93] On this see Feavearyear, *Pound Sterling,* pp. 1-45. He contends that before Henry VIII"s 'GreatDebasement' of 1542-1551 (thus continuing under Edward VI), the chief reason for the relatively few English debasements were such purely defensive motives (except possibly for Edward IV's 1464 debasement).

[94] See Munro, *Wool, Cloth and Gold*, pp. 28, 33, 35 n. 24, 40, 44 n.6, 49, 58 n. 54, 60, 74 n. 33, 87 n. 58, 101 n. 20, 150 n. 76, 161 n. 19, 169; and the texts of various examples in Appendix D.

[95] Feavearyear, *Pound Sterling*, pp. 15-45; Munro, *Wool, Cloth and Gold*, chapters 1-6.

[96] See above, for Flanders, in 1418 and 1433, pp. 32-33; Spufford, 'Coinage, Taxation, and the Estates', pp. 63-88.

[97] Hans Van Werveke, 'De economische en sociale gevolgen van de muntpolitiek der graven van Vlaanderen (1337 - 1433)', *Annales de la Société d'Emulation de Bruges*, 74 (1931), 1 - 15; reprinted in his *Miscellanea Mediaevalia: verspreide opstellen over economische en sociale geschiedenis van de*

in the coinage debasements of Philip IV and all of his royal successors in fourteenth- and fifteenth-century France. Certainly the French philosopher and political theorist Nicholas Oresme had no such doubts, in stating in his treatise *De Moneta*, ca. 1355, that: 'I am of the opinion that the main and final cause why the prince pretends to the power of altering the coinage is the profit or gain that he can get from it; [for] it would otherwise be vain to make so many and so great changes.'[98]

Both the mechanics and economics of debasement as a fiscal policy can be seen clearly in Table 5. It compares the coinage of the Flemish double *groot* coin, as struck from June 1418 to October 1428, with the new, debased coinage of November 1428. The official exchange value of this coin remained 2d *groot*, but its pure silver content had been reduced from 1.725 grams to 1.522 grams, for a loss of 0.203 g. or 11.768 percent of its former (1418) fine silver contents. This was achieved by reducing both the fineness and the weight of the double *groot*: the former, from 47.92 percent purity (6 deniers *argent le roy*) to 42.59 percent purity (5 deniers 8 grains); the latter, from weight of 1.800 grams (68 cut to the *marc de Troyes*) to 1.588 gr (68.5 to the *marc)*. The number of double *groot* coins cut from a *marc de Troyes* of commercially fine silver (*argent-le-roy*) rose from 136 double *groot* coins to 154.125 coins; and thus the change in *traite* or money-of-account value of that *marc* rose from 22s 8d (i.e., 136 * 2d) to 25s 8d 6 mites. According to the previously-given formula for such coinage debasements, [99] the reduction in the coin's silver content, by 11.77 percent, resulted in a 13.33 percent increase in the value of the *traite per marc de Troyes* of commercially fine silver. As can also be readily calculated, the number of double *groot* coins struck from that *marc* in November 1428, namely 154.125, is 13.33 per cent greater than the 136 double *groot* coins struck from the same marc from June 1418 to October 1428: i.e., a difference of 18.125 double *groot coins* = 36.25d or 3s 0d 6 mites. That is the difference between the two *traite* for the fine silver *marc*: a sum of 25s 8d 6 mites by the November 1428 mint indenture, compared to a sum of 22s 8d, for the previous coinage, of June 1418.[100]

The merchants' gains from late-medieval coinage debasements

For any debasement to succeed, and to induce a much larger influx of bullion into the prince's mints, the mint had to offer merchants who delivered bullion a 'real' gain, or a better 'price' than that offered by any competing mints, for their bullion (including previous and demonetized domestic coin issues). The merchants' realization of 'real' gains depended on the fulfillment of three conditions. The first was that the merchants had to receive a greater number of coins, with the same face value, than they had previously received, and a higher value, in terms of goods and gold, than they would have received from any other mint. The second was that the public, including other merchants, had to accept the newly debased coins at nominal or 'face value'.

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middeleewuen (Ghent: E. Story-Scientia, 1968), pp. 243-55; 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* (Ghent, 1968), pp. 255-67.

[98] Charles Johnson, ed., *The 'De Moneta' of Nicholas Oresme and English Mint Documents* (London: Thomas Nelson and Sons, 1956), p. 24: 'Videtur michi quod principalis et finalis causa propter quam princeps sibi vult assumere potestatem mutandi monetas, est emolumentum vel lucrum quod inde potest habere; aliter enim frustra faceret tot mutanciones et tantas.' On Oresme, see also Spufford, *Money and Its Use*, pp. 295-304; and Émile Bridrey, *La Théorie de la monnaie au XIVe siècle: Nicole Oresme: étude d'histoire des doctrines et des faits économiques* (Paris, Girard et Brière, 1906).

[99] ΔT (traite) = $[1/(1 - x)] - 1$

[100] For definitions of the monetary terms, see nn. 5-6, above.

The third was that these new coins had to retain their purchasing power, at least in terms of good and services within the domestic economy, within the 'short run' – in time for the merchants to spend their new coins.

If, in Table 5, we now compare the number and the money-of-account values of the double *groot* coins that merchants received for their bullion in June 1418 with those received after the debasement of November 1428, we find that merchants received, per *marc* of commercially fine silver, the following: in June 1418, 127 double *groot* coins worth 21s 2d *groot* (93.38 percent of the bullion delivered); and in November 1428, 144 double *groot* coins, now worth 24s 0d *groot* (93.43 percent of the bullion delivered). Their purely *nominal* gain of the extra 17 coins or 2s 10d *groot* was thus 13.38 percent. Thus the mint ordinance fulfilled the first of our conditions.

The second condition is the most complex of the three: why did the public accept these newly debased coins at face value, when they contained less fine silver than before? This is a very important question because several economists have recently put forward two contrary propositions, to prove, in effect, that medieval debasements could not have worked – despite the evidence that debasements were so commonly practised, and for several centuries. The critics's first argument is that the general populace would not have accepted such newly debased coins at face value, but only at a proportionally lesser or discounted value: i.e., discounted from the amount of silver contained in the immediately preceding coin issue. Such discounting would have thus denied those merchants who converted bullion into debased coins any real gains. In effect, these critics are contending that Gresham's Law did not apply to medieval coinages, and it is therefore a modern fallacy.[101] In part that view can be rejected on the various grounds cited earlier to explain why domestic commerce was always transacted in legal tender coins rather than in bullion.[102]

The mechanics of medieval 'hammered' coinages of detection methods

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[101] See Arthur J. Rolnick and Warren E. Weber, 'Gresham's Law or Gresham's Fallacy', *Journal of Political Economy*, 94:1 (Feb. 1986), 185-99; and 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; and Thomas Sargent and Bruce D. Smith, 'Coinage Debasements and Gresham's Laws', *Economic Theory*, 10:2 (1997), 197 - 226; and also François R. Velde, Warren E. Weber, and Randall Wright, 'A Model of Commodity Money, with Applications to Gresham's Law and the Debasement Puzzle', *Review of Economic Dynamics*, 2:1 (1999), 291-333. A much more nuanced, highly modified view appears in Thomas J. Sargent and François R. Velde, 'The Big Problem of Small Change', *Journal of Money, Credit, and Banking*, 31:2 (1999), 137-61; and especially in the more recent Sargent and Velde, *Big Problem of Small Change* (2002). See an attack on their earlier views in George Selgin, 'Salvaging Gresham's Law: The Good, the Bad, and the Illegal', *Journal of Money, Credit, and Banking*, 28:4, Part I (November 1996), 637-49. For even earlier views, influencing Rolnick and Weber, see Harry Miskimin, 'The Enforcement of Gresham's Law', *Credito, banche e investimenti, secoli XIII-XX: Atti della quarta Settimana di Studio (Prato, 14-21 aprile 1972)*, Istituto Internazionale di Storia Economica 'Francesco Datini' (Florence, 1985), pp. 147-61; and Harry Miskimin 'Money, the Law, and Legal Tender', in Georges Depeyrot and Tony Haeckens, eds., *Rythmes de la production monétaire, de l'Antiquité à nos jours: Actes du Colloque international Paris, 10-12 janvier 1986*, Numismatica Lovaniensia 7 (Louvain-la-Neuve, 1987), pp. 697-705. Both have been republished in Harry Miskimin, Harry Miskimin, *Cash, Credit, and Crisis in Europe, 1300 - 1600* (London: Variorum Reprints, 1989). For my own views, see Munro, 'Gresham's Law' (n. 86 above).

[102] See above, pp. 4-5.

But for many, an even more compelling argument for the general acceptance of even debased legal tender coins, at 'face value', can be in the technology of medieval mints: for what is known as 'hammered' coinages. In striking silver coins, from thin alloyed sheets of metal, with the required proportions of silver and copper, the mint-master's employees first cut out circular disks, known as 'blanks'. The mint-master himself (or trained deputy) then placed each of these blanks on the anvil-like lower coin dye. He then used the upper coin dye as a hammer to strike the blank, thereby implanting the obverse and reverse stamps, with appropriate symbols or emblems of the prince, on each side of the coin. The employees then used shears to trim the disks, which had been flattened and extended by this hammering, into approximately round disks. As a consequence, coins so struck were never exactly the same in size and weight. Indeed coin weights were never specified by any measure than the *taille*: i.e., the number cut from the alloyed *marc*, with a tolerance or *remède* permitted for each *marc* so struck.

Thus most individuals handling separate and individual coins were never able to tell whether not any differences between the weights of coins of a given denomination were purely the accidental results of these techniques or the result of fraud, including counterfeiting. Note, from a comparison of the two mint indentures, that the very minute changes in weight would have been very difficult to detect, even for those very few money specialists, usually just money-changers and bankers, who were equipped with accurate scales. They in turn might have required sets of perhaps fifty or one hundred coins to detect differences on these scales. Needless to say, most retail merchants, let alone individual customers, would not have been so equipped to undertake such tests.

Detecting changes in the coin's fineness was even more difficult, especially when the changes were as small as those indicated in Table 5, for the November 1428 Flemish debasement. Again, only money-changers and bankers would likely have been equipped with the required device for such testing, known as 'touchstones': instruments on which coins were rubbed to produce colour comparisons, as a gauge of the fineness, or the mixture of silver and copper alloy. Under the best of circumstances they were very crude measuring devices that were rarely accurate within five or even ten percent. [103] The only certain way to detect and measure changes in silver contents after a debasement was by melting them, in order to separate the silver from the copper. No merchant, of course, could have afforded to take such drastic measures, though mint officials sometimes did so. Even differences in the stamp on the obverse and reverse sides, if observed, would not have been an indication of the actual changes in value, since such changes took place with changes in princes and mint-masters, without debasements.

Indeed, contrary to some erroneous views in the economic history literature, most people – whether merchants, tradesmen, artisans, labourers, peasant farms, etc. – usually always accepted coins by 'tale' – i.e., by number, at face-value, without ever weighing, assaying, or otherwise testing them. [104] Indeed, as contended earlier, coins, with the prince's official stamp, certifying its value, circulated with a premium value or *agio* over the comparable value of the bullion contents precisely because their ability to do so provided significant savings on transactions costs, vital for all trades. To be sure, in foreign trade transactions, some wealthy

[103] Philip Grierson, *Numismatics* (Oxford, 1975), pp. 100-11, 150-5; Philip Grierson, *Les monnaies de moyen âge* (Paris, 1976); Philip Grierson, *Later Medieval Numismatics (11th - 16th Centuries): Selected Studies* (London: Variorum Reprints, 1979); Albert Girard,'La guerre des monnaies', 19 (1940-45), *Revue de synthèse* [also: 60 (1940-45) *Synthèse historique*], 83-101.

[104] See n. 101 above. But subsequently, Sargent and Velde, *Big Problem of Small Change*, did conclude that commercial transactions using coin were generally conducted by tale, rather than by weight: pp. 16-19, 22, 75.

merchants – Italian or Hanseatic in particular – might have tested gold coins in large-value transactions, because the relative savings on transaction costs were lower and the costs of fraud were higher. But very few, if any, would have done so for low value silver coins circulating in domestic trade.

Even if some had done so, and discovered deficiencies in the silver content, how would they have discounted the value of, say, a penny coin? Would it have been accepted for, say, nine-tenths of a penny, a value that would have, in any event, lacked exactitude?[105] The question answers itself. But if confidence in the coinage in general did wane, especially with increased supplies of counterfeit coins, merchants and tradesmen would indeed have finally resorted to discounting the entire coinage: simply by raising their prices, and thus eliminating, as suggested earlier, the *agio* on coinage. Since the prince's mints would no longer be receiving bullion, that situation might then have induced yet another round of debasements.

Did inflation eliminate the potential gains from debasements?

The second and seemingly compelling objection or counter-argument from the critics is that the consequent and quickly ensuing inflation would have eliminated any possible gains from the debasement. We have already seen, however, considerable evidence to contradict that view. First, the inflationary consequences of debasements were generally less than those predicted by the mathematical formula. Second, when price changes did occur, they occurred relatively slowly and without any uniform pattern amongst goods and services. Third, that the extent of the rise in prices was far from being uniform, and depended on both the supply and demand elasticities for the various commodities on which the new moneys were spent.[106] Provided, therefore, that the merchants had spent those double *groot* coins quickly enough, after the receiving their newly debased coins, and spent them on the right selection of goods and services, they would certainly have profited – i.e., realized a genuine net gain.

We should also observe that inflation could not have occurred immediately, since some time would be have been necessary for the increased quantity of coin to enter and become part of the general coinage circulation. That observation applies also to the previously enunciated proposition: that wholesalers and retailers would have ultimately reacted to a debasement only by raising their prices. Their success in doing so, however, depended nevertheless upon the increased circulation of the new coins.

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[105] If the debasement reduced the silver contents by exactly ten percent, then by the previously mentioned formula for changes in the *traite* values [ΔT (traite) = $[1/(1 - x)]$ - 1], the requisite 'discount', by this approach, would have been 11.11%. How would such a discount have been achieved?

[106] See above, pp. 30-31; and Table 4 and Appendix B (on the Quantity Theory of Money) below. See also, in support of these views, John H. Munro, 'Monetary Contraction and Industrial Change in the Late-medieval Low Countries, 1335 - 1500', in Nicholas J. Mayhew, ed., *Coinage in the Low Countries (800 - 1500): The Third Oxford Symposium on Coinage and Monetary History*, British Archeological Reports, BAR International Series 54 (Oxford, 1979), pp. 95 - 162; 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: Akten des 8th International Economic History Congress, Section C-7, Budapest 1982 (Trier: Trier University Press, 1984), pp. 31-122; Munro, 'Deflation and the Petty Coinage Problem', pp. 387-423; Munro, 'Wage-Stickiness, Monetary Changes, and Real Incomes', pp. 185 - 297; Munro, 'Money, Prices, Wages, and Profit Inflation', pp. 13-71; Munro, 'Monetary Origins of the Price Revolution', pp. 1-34; Munro, 'Before and After the Black Death', pp. 335-364.

We may further observe that merchants who gained from delivering bullion to the mints and quickly spending their increased number of coins benefited from what is now known in economics as asymmetric information: that they were privy to the knowledge of the mint changes that remained unknown, for some time, to the general public.[107] But inevitably such information would have been finally disseminated to the general public. That information, combined with the increased number of coins in circulation, would have led to some inflation, and thus to some loss, though rarely a total loss, of the gains from a debasement.

The mintage fees: brassage and seigniorage

As noted earlier, the mint retained, from the bullion supplied, a small proportion – usually under ten percent (see Table 1B) – for the stipulated mintage fees, which comprised two items: the brassage, for the mint-master; and the seigniorage, for the prince.

The brassage fee can be readily understood: that it cost money to make money. Obviously, as already noted for the *monnaies noires*, the mint-master had to be compensated for his production costs: the copper alloy added, the labour costs of production, the capital costs of his tools (hammers, dyes, furnaces, forges, melting pots, shears, etc.), and the administrative costs of operating the mint.[108] Those costs were normally modest, except for the petty coinage. In accordance with the Flemish mint indenture of June 1418, the mint-master retained 7 of the 136 double *groot* coins struck; that amounted to 1s 2d *groot* or 5.15 percent of the bullion delivered. But, in accordance with the next mint indenture, for the debasement of November 1428, the mint master received only a minuscule increase of just 1/8 double *groot* = a quarter-*groot*, or just 6 mites. In fact, his share of the total bullion received fell from 5.15 percent to 4.62 percent – an amount that likely was insufficient to cover his increased costs for labour and alloy (copper). So much for the view that mint-masters had instigated debasements for their own profit.

The other mintage fee was seigniorage: the tax that the prince imposed on minting coins, i.e., as a fixed percentage of the bullion delivered to his mint, by virtue of the his official monopoly on coinage within his realm. Counterfeiting was, of course, a very serious violation of the prince's monopoly on coinage, and indeed of his sovereignty; and it was usually treated, therefore, as a capital crime.[109] The term 'seigniorage' is still used to this day, for the same purpose: as an important source of government revenue. [110]

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[107] Neil Gandal and Nathan Sussman, 'Asymmetric Information and Commodity Money: Tickling the Tolerance in Medieval France*', Journal of Money Credit and Banking*, 29:4 (November 1997), 440-457. Note that in 2001, George Akerlof, Michael Spence, and Joseph Stiglitz won the Nobel Prize in Economics for their 'analyses of markets with asymmetric information'.

[108] Since the mint was the property of the prince, the prince was responsible for the capital and maintenance costs of the mint buildings, but not of the mint-master's equipment.

[109] See John Munro, 'An Aspect of Medieval Public Finance: The Profits of Counterfeiting in the Fifteenth-Century Low Countries', *Revue belge de numismatique et de sigillographie*, 118 (1972), 127-48; reprinted 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); Munro, 'A Maze of Medieval Monetary Metrology', pp. 173-99.

[110] From *Investopedia,* via Answers.com: 'Seigniorage may be counted as revenue for a government when the money that is created is worth more than it costs to produce it. This revenue is often used by governments to finance a portion of their expenditures without having to collect taxes. If, for example, it costs

Clearly, at least in proportional terms, the agent who realized the greatest gain was the prince; i.e., Duke Philip the Good. For, in his 1428 Flemish debasement, his seigniorage tax increased from 2 double *groot* coins (4d) to 3 such coins (6d), a 50-percent increase, increasing his share of the bullion delivered to the mint from 1.47 percent to 1.95 percent. His increased mint profits were thus based on two factors: the increase in the seigniorage rate itself, and the success of the debasement in increasing the Flemish mint output. As Table 6 demonstrates, Duke Philip's 1428 debasement was very successful indeed : from 1428 to 1429, it increased the quantity of silver bullion struck by 1475.68 percent (from 1,078.65 kg to 16,996.01 kg); the current value coinage output, in pound *groot* Flemish, by 1666.02 per cent (from £5,267.28 to £93,021.38 *groot*); and the seigniorage revenues, by 1554.47 percent (from £123 to £2,035 *groot* Flemish). As this table also indicates, coinage debasements were subject to rapidly diminishing returns, a condition that often forced prince, as just noted, to engage in subsequent debasements. In this case, however, as noted earlier, Duke Philip the Good instead chose – if in response to pressure from the Flemish towns – to reform the Flemish coinage and impose a monetary unification on his recently acquired Burgundian Low Countries.[111]

The role of copper in medieval coinages

A penultimate observation about coinage debasements may be made. The term 'debasement' literally refers to the adulteration of coinage by adding proportionately more base metal, i.e., copper. We must also realize that all coins, even the very best coins, gold and silver, always contained some copper as a necessary hardening agent, for otherwise the two precious metals would have been too soft and malleable, too much subject to wear and tear, to be durable and reliable mediums of exchange.

Consider therefore the temptation, for medieval princes, to add just a bit more copper with subsequent coinage issues. Consider as well these two historical comparisons: in 1300, the Flemish silver *groot*, worth 1d (there was then no double *groot*), had a commercial fineness of 95.667 percent silver = 91.67 percent pure silver and 8.33 percent copper; and it contained 3.794 grams pure silver. The Flemish silver *groot* of November 1428, also worth 1d, had a commercial fineness of only 37.50 percent = 35.94 per cent pure silver and 64.06 copper, with just 0.7486 g. pure silver in the coin (Table 1A) – a loss of 80.27 percent, since 1300.[112] By 1482, at the end of the Burgundian era and of this study, the commercial fineness of the Flemish penny *groot* had fallen to 26.04 percent = 24.96 percent pure silver and 75.04 percent copper, with just 0.4663 grams of pure silver in the content. That was only 12.29 percent of the silver in the original 1300 Flemish *groot*. How the once mighty penny had fallen!

Debasements and warfare in the Burgundian Low Countries

Of course, it would now be an enormous and ultimately also a tedious task to demonstrate that each and every one of the so numerous Flemish coinage debasements had been undertaken primarily for such fiscal motives: specifically to finance warfare and defence. But one clear evidence of that can be found in Table 1B,

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the U.S. government $0.05 to produce a $1 bill, the seigniorage is $0.95, or the difference between the two amounts.'

[111] See p. 32-33 and nn. 70-71 above.

[112] Note that the double *groot* in the 1428 ordinance had a commercial fineness of 50.00 percent = 47.92 percent pure silver and 52.08 percent copper, with, as noted, 1.522 grams pure silver in the coin. See Tables 1A and 1B.

detailing all the silver coinage changes from 1384 to 1482. Note the increase in the seigniorage rates with all the major debasements, and their reductions with a return to stronger and stable coinages. If the motives had been purely altruistic, and designed to benefit depressed economies by expanding the money supply, there would have been no reason and no excuse for increasing the seigniorage rates in this fashion.

As for the wars that the Burgundian dukes were obligated to finance, by any means at their disposal, we need cite only the major ones. [113] First, under Duke Philip the Bold (1384-1404): the Second Artevelde or Ghent rebellion (aided by English intervention), from 1382-85; and the Guelders war of 1388. Under Duke John the Fearless (1404-1419): the Burgundian-Armagnac civil wars, 1411-19, culminating in Duke John's murder at Montereau. His son and successor Philip the Good (1419-67) immediately defied the French Dauphin Charles (later Charles VII), by contracting a military alliance with England, whose king, Henry V, had achieved such a major victory over the French at Agincourt (1415). During his wars with Charles, Philip also became involved in the civil war in Holland-Zeeland (Hoeks vs. Kabiljauws), which also embroiled him in conflict with England, in 1424 - 1428, ending with Burgundian acquisition of these Imperial counties. Duke Philip subsequently complained to his subjects how costly were these wars:[114]

> You also well know how, during a lull in the war in France, I had to wage a burdensome and murderous war against the English [Humphrey, Duke of Gloucester] in my lands of Holland, Zeeland and Friesland in order to protect Flanders ... This war...had cost me, besides all the heavy expenses that I incurred throughout this period in the French war, over a million gold *saluts*, which at first I was extremely ill-prepared to find.

The troubled Anglo-Burgundian military alliance finally ended, in 1435, with Duke Philip's *volte-face*, in making peace with Charles VII, by the Treaty of Arras, which then led to the Anglo-Burgundian war of 1436-1439 (complicated by the Dutch-Wendish wars of 1438-1441). Then, relative peace — and an absence from coinage debasements – ensued over the next two decades, until Philip's son Charles the Rash (1467-1477) renewed the Burgundian conflicts with Louis XI's France. That conflict began with the rebel League of the Common Weal, 1465-66 (i.e., before Charles became duke). That in turn led to Charles' suppression of the French-sponsored revolt of Liège, in 1468; his abortive invasion of Normandy, in 1471; and then his wars with Imperial Alsace, Lorraine, and the Swiss, all allies of Louis XI, culminating in the Burgundian defeat and Charles' death, at the hands of the Swiss, at Nancy (Lorraine), in 1477. The marriage of his daughter Marie (r. 1477-1482) to the Habsburg Archduke Maximilian (d. 1519) led to protracted civil wars in Flanders, and to even more horrendous coinage debasements, ending only in the 1490s, which is beyond the scope of this study.

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[113] See Richard Vaughan, *Philip the Bold: the Formation of the Burgundian State* (London: Longmans Green, 1962); Richard Vaughan, *John the Fearless: the Growth of Burgundian Power* (London: Longmans Green, 1966); Richard Vaughan, *Philip the Good: the Apogee of Burgundy* (London: Longmans Green, 1970): Richard Vaughan, Richard Vaughan, *Charles the Bold: the last Valois Duke of Burgundy* (London: Longmans Green, 1973); Joseph Calmette, *Les grands ducs de Bourgogne* (Paris: Albin Michel, 1949); trans. as Joseph Calmette, *The Golden Age of Burgundy: the Magnificent Duke and their Courts* (New York: Norton, 1963); David Nicholas, *Medieval Flanders* (Longman: London and New York, 1992) , pp. 317-99.

[114] In a speech before the deans of Ghent's craft guilds, in January 1447. Cited (and translated) by Vaughan, *Philip the Good*, pp. 307-08, quoting from the Flemish texts in Victor Fris, ed., *Dagboek van Gent van 1447 to 1470* (Ghent, 1904), vol. I, pp. 57-68.

The Spanish Exception: coinage stability after a renunciation of seigniorage

Certainly many historical studies of France and other principalities in late-medieval western Europe provide the same links between warfare, coinage debasements, and seigniorage profits. [115]   One final proof of the connection between seigniorage, fiscal motives, and coinage debasement may be found in the anomalous monetary history of Spain, from 1471. In that year, King Henry IV of Castile issued an ordinance known as the *Pragmatica*, which renounced the exaction of any seigniorage taxes on the gold and silver coinages. That renunciation was deemed to be a necessary component of the crown's monetary reform policy to suppress all competing baronial mints (about 150) in Castile. But this policy may not have been fully implemented until 1474, when Ferdinand of Aragon and his wife Isabella confirmed this *Pragmatica,* as joint rulers of Castile; and the right to exact seigniorage was again formally revoked with their new coinage of 1497.[116] 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, that is, without any debasements or any other coinage alterations – an experience unique in early-modern European monetary history. [117] One might observe, however, that, from the 1520s, the Spanish monarchs had the luxury of forgoing seigniorage revenues, because by they were receiving ample compensation from the duties imposed on the importation of precious metals from the Americas.[118]

The Spanish crown's renunciation of its seigniorage privileges and coinage debasements did not apply, however, to its petty *vellon* (i.e., *billon)* coinages. Having issued only small amounts of these petty coins up to the late 1590s, the Spanish government (then under Philip III: 1598-1621) then began minting increasingly large and more and more debased issues of *vellon*, until the mid-seventeenth century; and indeed, during this very period, Spain's imports of precious metals from the Americas were experiencing a sharp decline. So large were these *vellon* issues in the first half of the seventeenth century that they became the single most powerful

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[115] See note 4 and Appendix C.2. For an excellent summary, see Spufford, *Money and Its Use*, chapter 13, 'The Scourge of Debasement', pp. 289-318.

[116] 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.

[117] For the Spanish silver coinages, see Earl Hamilton, *American Treasure and the Price Revolution in Spain, 1501-1650* (Cambridge, Mass., 1934; reissued 1965), pp. 46-72; Hamilton, Earl J., *War and Prices in Spain, 1651-1800* (Cambridge, Mass: Harvard University Press, 1947), pp.9-35; Modesto Ulloa, 'Castilian Seignorage and Coinage in the Reign of Philip II', *Journal of European Economic History*, 4:2 (Fall 1975), 459-79; 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.

[118] 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.

factor in the inflation that Spain endured during this final era of the Price Revolution.[119]

One may make some similar observations about the medieval English crown's remarkable forbearance in eschewing major, continental-style coinage debasements, up to the final years of Henry VIII's reign (1509-1547). For, up until to his reign, the English crown had received ample revenues from export taxes on the lucrative wool trade, especially after the large increases in the tax rates from the 1330s, on the eve of the Hundred Years' War. But well before Henry VIII's Great Debasement (1542-1547), the wool export tax revenues had virtually disappeared . By the 1520s, the cloth export trade had almost totally displaced the wool trade, but cloth exports still remained very lightly taxed before 1558. [120] Possibly that major increase in the cloth export taxes trade permitted Elizabeth I to restore the English coinage, or partly restore it, in 1561 and allowed subsequent English rulers thereafter to eschew coinage debasements, apart from one minor weight reduction, in 1601, until 1817.[121]

If the Henrician Great Debasement seems to be an anomaly in English monetary history, we may also contend that the monetary histories of medieval England and of early-modern Spain are themselves anomalies in European history, and that the debasement-ridden monetary histories of Flanders and the Low Countries, France, Italy, Germany, etc., represent the historic norm. Certainly, the Burgundian rulers of the Low Countries had no such alternative sources of commercial revenues – non akin to English wool exports or Spanish silver imports – to permit them to forgo the seigniorage revenues from coinage debasements.

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[119] From at least 1471, the Castilian and then Spanish kings had issued a largely copper fractional *vellon* 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'. 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 of 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. See the sources cited in n. 117 above; and also Munro, 'The Monetary Origins of the Price Revolution', pp. 1-34; Munro, 'Profit Inflation', pp. 13-71.

[120] See: Munro, 'Medieval Woollens', pp. 228-324.

[121] In 1601, the number of pence cut to the Troy pound was changed from 720d to 744d, reducing the penny's weight from 0.5184 g to 0.5017 grams. Otherwise, from the Elizabethan recoinage of 1560 to 1817, the English silver coinage retained its traditional sterling fineness: 11 oz 2 dwt silver and 18 dwt copper = 92.50 percent pure silver. Feavearyear, *Pound Sterling*, Appendix I, p. 435; Appendix III.ii, p. 439.

APPENDICES:

A. Medieval coinages, moneys-of-account, and bimetallism

First to be considered is the issue of bimetallism. In 1252, both Florence and Genoa resumed the coinage of gold in the West, after four centuries, adopting the old Roman bimetallic ratio of 12:1. France followed suit in 1266; Venice, from 1284; Flanders, from 1334; England, from 1344 (effectively); the Imperial Rhineland, from 1354; and other European principalities, at various times in the fourteenth century.[122] A monetary system that uses both gold and silver coinages is called bimetallic. But bimetallism does not mean that the two coins are, everywhere, mutually interchangeable and exchangeable. In general, at least within the greater European economy, gold coins, because of their very high value, were reserved for international trade, or high volume-high value wholesales trades, banking and finance, diplomacy, and warfare. Silver coins were thus generally reserved for local, domestic retail trades, and payments of wages. In general, therefore, most silver coins generally had only a local circulation – within the jurisdiction of the prince that struck them.[123] Because gold coins were so important for international trade, diplomacy, and warfare, and also because they better symbolized the sovereignty and power of the prince, they were usually – but not always – much less frequently subjected to debasement than were silver coins, whose impact, therefore, seemed to most princes to be purely local (though not in terms of economic consequences), and thus less damaging to their reputations.

For most of western Europe, during the millennium from the monetary reforms of Charlemagne (790-802) to the French Revolution, silver was also the determinant of the money-of-account in most principalities: for recording prices, wages, rents, etc., and all related domestic economic transactions.[124] In that respect, silver and not gold largely determined the domestic price level, except when particular factors determined whether more gold or more silver was being used in foreign trade. For such principalities, the silver penny (*denier*) itself provided the direct link between the actual coinage and the local money-of-account: e.g., the English pound sterling, the French *livre tournois*, the Flemish *pond groot*. Over this millennium, the predominant

[122] See Spufford, *Money and Its Use*, pp., 267-88. Also: Marc Bloch, 'Le problème de l'or au moyen âge', *Annales d'histoire sociale*, 5:19 (Jan. 1933), 1-34; reissued in English translation as: Marc Bloch, 'The Problem of Gold in the Middle Ages', in *Land and Work in Medieval Europe: Selected Papers by Marc Bloch*, trans. by J. E. Anderson (New York: Harper and Row, 1697), pp. 186-229; Roberto Lopez, 'Settecento anni fa: il ritorno all'oro nell'occidente duecentesco', *Rivista storica italiana*, 65 (1953), 19-55, 161-98; and the revised and shorter English version, but with some additional notes: Robert Lopez, 'Back to Gold, 1252', *Economic History Review*, 2nd ser., 9:2 (1956), 219-40.

[123] English sterling silver coins were a major exception during the thirteenth and early fourteenth century, serving as an international medium of exchange, in a period in which: (a) there were no gold coins, other than the French *écu* (from August 1266), to serve that role; and (b) the English sterling coins were unchanged in fineness (sterling fineness = 92.5% fine) and weight. See Spufford, *Money and Its Use*, pp. 160-62; Feavearyear, *The Pound Sterling*, pp. 1-21; Nicholas J. Mayhew, 'The Circulation and Imitation of Sterlings in the Low Countries', in N. J. Mayhew, ed., *Coinage in the Low Countries (800 - 1500): The Third Oxford Symposium on Coinage and Monetary History*, British Archeological Reports, BAR International Series 54 (Oxford, 1979), pp. 54 - 68.

[124] The principal major exceptions were Florence and Venice, which had bimetallic systems with independent gold-based (florins, ducats) and silver-based moneys-of-account. See Spufford, *Money and Its Use*, pp. 267-88; Spufford, *Handbook of Medieval Exchange*, Introduction, pp. xix - lx, pp. 1-138.

money-of-account was in fact the pound, which, in Carolingian times had originally equalled in value the pound weight of fine silver.[125] The pound (*livre*) always contained, for accounting purposes, 20 shillings, each of which was also always worth 12 currently circulating silver pennies; and 240 pence = £1 pound. Thus, irrespective of any changes in the silver content of the penny, following centuries of coinage debasements, a pound, *pond*, or *livre* was always worth 240 currently circulating pennies (or pence, in money-of-account). Contrary to much erroneous economic-history literature, money as coinage and money in moneys-of-account were almost never divorced from each other.[126]

B. The Quantity Theories of Money: in a medieval context

The relationship between the money supply and the domestic price level is, according to the Classical Quantity Theory of Money, a very simple one: monetary expansions produce inflations and conversely monetary contractions produce deflation.   But the original, crude assumptions of the Quantity Theory – namely, that prices change almost automatically and proportionally in response to changes in the money – must be amended by subsequent and more sophisticated versions of this . This concept was first introduced by the Yale Economist, Irving Fisher, in 1911.[127] Known also as the Equation of Exchange, it has four variables: $M.V = P.T$. Here, M stands for the quantity of 'high-powered' money, strictly viewed as a medium of exchange; V stands for the transactions Velocity of that money: the average number of times that a unit of money circulates in the economy effecting all transactions in a given year; P stands for the price level, usually measured by a Consumer Price Index; and T stands for the total volume of transactions effected each year in the economy.

The most glaring weakness of this model is the inability to measure T. For a substitute, we may resort to Milton Friedman's National Income approach: to replace T with *y*, i.e., the value of the 'real' Net National

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[125] The weight of the Carolinian pound was 489.6 grams: according to Edouard Fournial, *Histoire monétaire de l'Occident médiéval* (Paris, 1970), whose arguments justifying this weight are quite complex. But this weight has been challenged by other numismatists (by even more complex arguments), who variously offer alternative weights: 408.0 g., 411.36, 459.36, and 483.33. The last is based on the supposition that the Roman pound in fact weighed 322.2 , and that the Carolingian pound was 1.5 times heavier. For the other weights, see Willem Blockmans, 'Le poids des deniers carolingiens', *Revue belge de numismatique et de sigillographie*, 119 (1973), 179-81. None of these critics, however, explains the origin or evolution of the Parisian pound of 489.506 grams; nor explain why its weight, readily verifiable from the surviving official metallic weights, was virtually identical to that ascribed to the Carolingian pound by Fournial.

[126] In defence of this view, see in particular Hans Van Werveke, 'Monnaie de compte et monnaie réelle', *Revue belge de philologie et d'histoire*, 13 (1943), 123-52; reprinted in his *Miscellanea Mediaevalia* (Ghent, 1968), pp. 133-58; Peter Spufford, 'Coinage and Currency', in M. M. Postan et al., eds., *Cambridge Economic History of Europe*, Vol. III: *Economic Organization and Policies in the Middle Ages* (Cambridge, 1963), 576-602; Peter Spufford, *Monetary Problems and Policies in the Burgundian Netherlands, 1433-1496* (Leiden, 1970), Chapter I: 'Money of Account', pp. 13-28; Spufford, *Money and Its Use,* Appendix II, pp. 411-414; Van der Wee, *Growth of the Antwerp Market,* I: *Statistics*. Part I, chapter 3: 'Money and the History of Prices', pp. 107-36; Van der Wee, 'Monetary Policy in the Duchy of Brabant', pp. 167-82; Ernst Jeurg Weber, ''Imaginery' or 'Real' Moneys of Account in Medieval Europe? An Econometric Analysis of the Basle Pound, 1365 - 1429', *Explorations in Economic History*, 33:4 (October 1996), 479-95.

[127] Irving Fisher, *The Purchasing Power of Money : its Determination and Relation to Credit, Interest and Crises*, New and rev. edn., assisted by Harry Brown (New York : Macmillan, 1911, 1926).

Product = Net National Income, as currently measured in constant 'dollars' or in other monetary units. If we multiply P by y, we obtain the value of the Net National Products measured in current or nominal dollars (or some other monetary unit). In this version, V is changed from the Transactions Velocity to the Income Velocity of Money.

We may observe, from abundant historical evidence, that increases in M do not automatically produce exactly proportional inflations; nor do decreases in M produce automatic and exactly proportional deflations. The extent of the consequent price changes – which usually occur rather slowly – may be modified considerably by changes in both V and y. Thus, the inflationary consequences of expanding the money supply, M, may be offset first, by a reduction in the income velocity of money, V, as a much more plentiful supply and increased circulation of M reduces the need to economize on its use. The predicted inflationary consequences may also be offset, second, by an increase in Net National Product, y, especially in so far as an increased M stimulates increased investment, production, and consumption. The converse is of course generally true for monetary contractions and deflation.

A better and much more sophisticated variant, to explain those changes, is supplied by the Cambridge 'cash balance' approach, in which k replaces V; and in fact, k is mathematically the reciprocal of V (i.e., V = 1/k; k = 1/V). This equation is expressed as: $M = kPy$. This value or variable k represents that share of the value of the Net National Product (P.y) that the public collectively chooses to hold in cash balances, i.e., in M. The variable k also represents or constitutes what is known as 'Liquidity Preference'. It expresses the major reasons why the public, collectively, chooses to hold liquid cash balances, for present and future economic concerns: (1) the transactions motive: for current expenditures, including debt repayments; (2) the precautionary motive: to prepare for future adverse circumstances (i.e., 'saving for a rainy day'); (3) the speculative motive: to take advantage of future investment opportunities. The 'opportunity cost' of maintaining cash balances is to forgo the likely returns (rent, interest, profits) from current investment opportunities – i.e., from investments in illiquid assets, such as land, long-term bonds, or a business enterprise.

Hence the value of k should reflect and vary inversely with changes in real interest rates: when those rates rise, k should fall; and conversely, when interest rates fall, k should rise. That is, rising interest rates increase the opportunity cost of holding idle cash balances, while falling interest rates lowers such costs, permitting larger cash balances.

In the view of Keynes and other Cambridge economists, the behaviour of changes in V and k should be comparable, in that, as suggested earlier, changes in V should reflect the extent to which the public economizes on the use of money. At the same time, if the Liquidity Preference schedule remains constant, real interest rates should vary inversely with changes in the money supply: thus if M increases, V should fall, as noted earlier, and inversely k should rise, with the consequent fall in interest rates; and if M decreases, V should rise – to economize on scarcer coin – and inversely k should fall with the consequent rise in interest rates. The important factor to observe here is the effect of changes in the interest rate: in either expanding or contacting investment, production, trade, and consumption. Hence, in sum, another reason to contend that a growth in the money supply should lead to economic expansion, while a reduction in the money supply to economic contraction.

Those economic consequences of monetary changes can be better understood by examining particular consequences of the related changes in prices: i.e., in terms of deflation and inflation. The crude Classical Quantity Theory had paid scant attention to these problems, on the basis of two assumptions: (1) that the transaction or income velocity of money was fixed, at least in the short run; and (2) that the economy was always at full employment, incapable of further expansion – i.e., that y was fixed – so that increased aggregate

demand from an increase in M, with a perfectly inelastic aggregate supply, would thus lead to a proportional increase in prices. These views cannot be substantiated either in theory or in historical fact. From this historic evidence of the past millennium, we may we may expect, by both the Fisher and Cambridge equations, that the inflationary impact of an increase in M would have been offset by an anticipated increase in y and by a decrease in V = an increase in Cambridge k.

But whether the deflationary impact of a decrease in M is offset in a similar fashion is far less clear, historically. Certainly, however, there is no historical support from the Classical assumption that all prices would immediately and automatically fall with monetary contraction, and adjust together, thus leaving 'real' economic relationships unchanged. Historically, in fact, individual or *relative* prices have never behaved in such a predictable fashion, with either monetary contraction or expansion, and show varying amplitudes of changes under these monetary circumstances. In particular, wages, interest rates (nominal interest), and land rents normally and generally do not fall with the otherwise general fall in prices; instead they tend to be very 'sticky'. [128]

Therefore, the *real* costs of these factors of production – labour, land, and capital – rise, thus increasing these real burdens for producers and merchants. Such rising real costs, along with reduced consumer demand, therefore should lead to postponed investments and curtailed production and trade, which further reduces the incomes and hence purchasing power of those dependent on such various forms of production and trade. Furthermore, the fall in prices became a self-justifying phenomenon - then and now – as many postponed purchases of all but necessities in the expectation that they could be effected later, at lower price: i.e, as the purchasing power of the coins, those maintained in cash balances, increased. Conversely, monetary inflation can reduce factor costs, in that wages and especially land rents and interest rates do not normally rise, with other prices, and thus benefit producers and merchants in a corresponding fashion. At the same, time, inflation can also be a self-justifying process if both producers and consumers, anticipating further price increases, increase their current rates of consumption, thus increasing the income velocity of money.

C. Publications on the late-medieval 'depression', warfare, coinage debasements, and monetary problems (the 'bullion famines')

1. Publications on the Late-Medieval 'Great Depression'

For the more important publications in this debate see: Michael M. Postan, 'The Trade of Medieval Europe: the North', and Robert S. Lopez, 'The Trade of Medieval Europe: the South', in Michael Postan et al., eds., *The Cambridge Economic History of Europe*:Vol. II: *Trade and Industry in the Middle Ages*, 1st edn. (1952); 2nd edn. (Cambridge, 1987), pp. 240-304, 379-401; Robert Lopez and Harry Miskimin, 'The Economic Depression of the Renaissance', *Economic History Review*, 2nd ser. 14 (1962), 408-26; Carlo Cipolla, Robert Lopez, and Harry Miskimin, 'Economic Depression of the Renaissance: Rejoinder and Reply', *Economic History Review*, 2nd ser. 16 (1964), 519-29; Robert Lopez, 'Hard Times and Investment in Culture', in K.H. Dannenfeldt, ed. *The Renaissance: Medieval or Modern?* (Heath Series, New York, 1959), pp. 50-63; reprinted in Anthony Molho, ed., *Social and Economic Foundations of the Italian Renaissance* (New York, 1969), pp. 95-116; Edouard Perroy, 'At The Origin of a Contracted Economy: The Crises of the 14th Century', in Rondo Cameron, ed., *Essays in French Economic History* (Homewood, Ill. 1970), pp. 91-105; Harry A. Miskimin, *The Economy of Early Renaissance Europe, 1300-1460* (Cambridge, 1975), pp. 86-111; 129-50; John Day, 'Crises and Trends in the Late Middle Ages', in John Day, *The Medieval Market Economy*

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[128] Munro, 'Wage-Stickiness', pp. 185-297.

(Oxford: Blackwell, 1987), pp. 185-224; John Munro, 'Economic Depression and the Arts in the Fifteenth-Century Low Countries', _Renaissance and Reformation_, 19 (1983), 235-50; reprinted in John Munro, *Textiles, Towns, and Trade: Essays in the Economic History of Late-Medieval England and the Low Countries* (London, 1994); John Hatcher, 'The Great Slump of the Mid-Fifteenth Century', in Richard Britnell and John Hatcher, eds., *Progress and Problems in Medieval England: Essays in Honour of Edward Miller* (Cambridge and New York: Cambridge University Press, 1996), pp. 237-72; Pamela Nightingale, 'Monetary Contraction and Mercantile Credit in Later Medieval England', *Economic History Review*, 2nd ser. 43 (Nov. 1990), 560 - 75. Pamela Nightingale, 'England and the European Depression of the Mid-Fifteenth Century', *The Journal of European Economic History*, 26:3 (Winter 1997), 631-56.

2. Publications on warfare in later medieval Europe

The best current survey is Philippe Contamine, *War in the Middle Ages* (London, 1984); see also B.P. McGuire, *War and Peace in the Middle Ages* (Copenhagen, 1987). For recent contributions, many of them devoted to the pre-Hundred Years' War era, see Michael Mallet, *Mercenaries and Their Masters: Warfare in Renaissance Italy* (Totawa, New Jersey, 1974); J.R. Maddicott, *The English Peasantry and the Demands of the Crown, 1294-1341, Past and Present* Supplement no. 1 (Oxford: 1975), 75 pp, reprinted in T.H. Aston, ed., *Landlords, Peasants, and Politics in Medieval England*, *Past and Present* Publications (Cambridge: Cambridge University Press, 1987), pp. 285-359; Edward Miller, 'War, Taxation, and the English Economy in the Late Thirteenth and Early Fourteenth Centuries', in J.M. Winter, ed., *War and Economic Development: Essays in Memory of David Joslin* (Cambridge, 1975), pp. 11-32; Michael Prestwich, *The Three Edwards: War and State in England, 1272-1377* (London, 1980); Mavis Mate, 'The Impact of War on the Economy of Canterbury Cathedral Priory, 1294-1340', *Speculum,* 58 (1982), 761-78; A. Tuck, 'War and Society in the Medieval North', *Northern History*, 21 (1985), 33-52; John Day, 'Crisis and Trends in the Later Middle Ages', in his *The Medieval Market Economy* (Oxford: Basil Blackwell, 1987), pp. 185-224; John Pryor, *Geography, Technology, and War: Studies in the Maritime History of the Mediterranean, 649 - 1571, Past and Present* Publications (Cambridge University Press, 1988); Irene Katele, 'Piracy and the Venetian State: The Dilemma of Maritime Defense in the Fourteenth Century', *Speculum*, 63 (Oct. 1988), 865 - 89; W. M. Ormrod, 'The Crown and the English Economy, 1290 - 1348', in Bruce M.S. Campbell, ed., *Before the Black Death: Studies in the 'Crisis' of the Early Fourteenth Century* (Manchester and New York, Manchester University Press, 1991), pp. 149 - 83; William Caferro, 'Mercenaries and Military Expenditure: The Costs of Undeclared Warfare in XIVth Century Siena', *Journal of European Economic History*, 23:2 (Fall 1994), 219-47; Guy Bois, *La grande dépression médiévale: XIVe - XVe siècles: le précédent d'une crise systémique*, Actuel Marx Confrontation (Paris: Presses Universitaires de France, 2000); Michael E. Mallett, 'The Art of War', in Thomas A. Brady, jr., Heiko O. Oberman, and James D. Tracy, eds., *Handbook of European History, 1400-1600: Late Middle Ages, Renaissance and Reformation*, Vol. I: *Structures and Assertions* (Leiden/New York/Cologne: E.J. Brill, 1994), pp. 535-62; Michael Prestwich, *Armies and Warfare in the Middle Ages: the English Experience* (New Haven and London: Yale University Press, 1996); Philippe Contamine, ed., *War and Competition Between States: The Origins of the Modern State in Europe, 14th - 18th Centuries* (New York: Clarendon Press, 2000); Sergio Boffa, *Warfare in Medieval Brabant, 1356-1406*, Warfare in History series (Woodbridge and Rochester, NY: Boydell and Brewer, 2004); Chris Briggs, 'Taxation, Warfare, and the Early Fourteenth Century "Crisis" in the North: Cumberland Lay Subsidies, 1332-1348', *The Economic History Review*, 2nd ser., 58:4 (November 2005), 639-72; William P. Caferro, 'Warfare and Economy in Renaissance Italy, 1350 - 1450', *Journal of Interdisciplinary History*, 39:2 (Autumn 2008), 167-209 (the most recent and exceptionally important study).

3. Publications on late-medieval coinage debasements and 'guerres monétaires'

Borrelli de Serres, *Les variations monétaires sous Philippe le Bel* (Chalon-sur-Saône, 1902); Adolphe Landry, *Essai économique sur les mutations des monnaies dans l'ancienne France de Philippe le Bel à Charles VII* (Paris, 1910); Georges Bigwood, *Le régime juridique et économique du commerce de l'argent dans la Belgique du moyen âge*, 2 vols. (Brussels, 1921-22); Henri Laurent, 'Crise monétaire et difficultés économiques en Flandre aux XIVe et XVe siècles', *Annales d'histoire économique et sociale*, 5 (1933), 156-60; Albert Girard,'La guerre des monnaies', 19 (1940-45), *Revue de synthèse* [also: 60 (1940-45) *Synthèse historique*], 83-101; F. Graus, 'La crise monétaire du XIVe siècles', *Revue belge de philologie et d'histoire*, 29 (1951), 445-54; A. Grunzweig, 'Les incidences internationales des mutations monétaires de Philippe le Bel', *Le moyen âge*, 59 (1953), 117-72; Carlo M. Cipolla, 'Currency Depreciation in Medieval Europe', *Economic History Review*, 2nd ser. 15 (1963), 413-33; reprinted with a few changes in Sylvia Thrupp, ed., *Change in Medieval Society: Europe North of the Alps, 1050-1500* (New York: Appleton-Century-Crofts, 1964; reissued University of Toronto Press, 1988), pp. 227-36; Harry Miskimin, 'Le problème de l'argent au Moyen Âge', *Annales: Économies, sociétés, civilisiations*, 17:6 (1962), 1125-1130, reprinted in Harry A. Miskimin, *Cash, Credit and Crisis in Europe, 1300-1600* (London: Variorum Reprints, 1989), no. IV; R. Cazelles, 'Quelques reflexions à propos des mutations monétaires de la monnaie royale française (1295-1360)', *Le moyen âge*, 72 (1966), 83-105, and 251-78; Reinhold Mueller, 'Guerra monetaria tra Venezia e Milano nel quattrocento', *La zecca di Milano: Atti del Convegno internazionale di studio Milano, 9-14 maggio 1983* (Milan, 1984), pp. 341-55; Harry Miskimin, 'L'or, l'argent, et la guerre dans la France médiévale', *Annales: E.S.C.*, 40 (1985), 171 - 84; reprinted in Harry A. Miskimin, *Cash, Credit and Crisis in Europe, 1300-1600* (London: Variorum Reprints, 1989), no. XII; Michael Bordo, 'Money, Deflation, and Seigniorage in the Fifteenth Century', *Journal of Monetary Economics*, 18 (1986), 337 - 46; John Day and Huguette Bertand, 'Les frappes de monnaies en France et en Europe aux XIVe - XVe siècles', in Georges Depeyrot, Tony Hackens, and Ghislaine Moucharte, eds., *Rythmes de la production monétaire, de l'antiquité à nos jours* (Louvain-la-Neuve, 1987), pp. 537-77; Herman Van der Wee, 'Monetary Policy in the Duchy of Brabant, Late Middle Ages to Early Modern Times', in H. Van den Eerenbeemt, ed., *Het geld zoekt zien weg: the Van Lanshot Lectures on Banking in Brabant* (Tilberg: Katholieke Universitet Leuven, 1987); special issue of *Bijdgragen tot de geschiedenis van het Zuiden van Nederland*, pp. 37-58; republished in Herman Van der Wee, *The Low Countries in the Early Modern World* (Variorum: Cambridge University Press, 1993), pp. 167-82; John H. Munro, 'An Aspect of Medieval Public Finance: The Profits of Counterfeiting in the Fifteenth-Century Low Countries', *Revue belge de numismatique et de sigillographie*, 118 (1972), 127-48; reprinted 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); John H. Munro, *Wool, Cloth and Gold: The Struggle for Bullion in Anglo-Burgundian Trade, 1340-1478*, Centre d'Histoire Économique et Sociale (Brussels: Editions de l'Université de Bruxelles; and Toronto: University of Toronto Press, 1973); John H. 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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: Akten des 8th International Economic History Congress, Section C-7, Budapest 1982 (Trier: Trier University Press, 1984), pp. 31-122; John H. Munro, 'Monnayage, monnaies de compte, et mutations monétaires au Brabant à la fin du moyen

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Appendix D.   Texts employing 'Gresham's Law' to Justify Debasements or Bullionist Legislation

1.   **Complaints of the English Crown about imported Flemish coins: March 1364**

coment les monoies dor et dargent, que sont molt meilleurs dautre paiis, sont de jour en jour en autre treet et porte de nostre roialme, par cause de gayn des marchantz, et, si null billoun dor et dargent ne soit porte a nos nostre dit roialme serra destitut deinz breve des monnoies

The English crown did not, however, impose a debasement, but instead an ordinance that forbade credit sales at the Calais wool Staple and required full payment in bullion or English coin.

Thomas Rymer, ed., *Foedera, conventiones, literae et cujuscunque generalis acta publica, inter reges Angliae et alios quosvis imperatores, reges, pontifices, principes, vel communitates, ab ineunte saeculo duodecimo, viz. ab anno 1101. ad nostra usque tempora, habita aut tractata,* 12 vols. (London, 1709-12), vol. III:2, pp. 725-26.

2.   **English Parliamentary Petition to protect the realm from foreign debased coins in order to augment Tower Mint Outputs: 1381**

qe en la Tour de Londres n'est fai monnoye d'or ne d'argent... Et les causes sont, pur ceo qe les Monnoiez d'or et d'argent par dela la meer sont pluis febles qe les Monoiez d'Engleterre pur qoi les

Merchantz ne purront aporter la bullion en Engleterre a lour profit, ne au profit du Roialme...
Item, par cause q l'or d'Engleterre est si bon et fort, et le Money par dela le meer est feble, les Nobles qi venant a Caleys s'en vont en Flandres, et les autres Nobles qi sont en Engleterre s'en vont par dela le meer, a graunt profit a ceux qi les amenent par dela le meer, et damage au Roi

Great Britain, Parliament, *Rotuli Parliamentorum ut et petitiones et placita in Parliamento*, 6 vols (London, 1767-77), III, 126: no. 1.[129]

Parliament, having forbidden the crown to alter the coinage without its consent, by the Statute of Purveyors of 1352, again refused to consider coinage debasements, and instead recommended a variety of bullionist measures imposed on both the import and export trades.[130]

3.   **Duke Philip the Bold's complaint against Brabantine coins: September 1399**

that foreign coins, especially gold, 'de mauvais aloy se moultiplient si fort — que les marchands envoient de jour en jour dehors a autres monnoies que a la nostre grant quantite de billon d'or et d'argent.

Archives départementales du Nord [France], Ser. B. 630/14.138

No Flemish debasement ensured, principally because duchesse Jeanne of Brabant returned to strong

coinage that same year.**[131]**

4.   **Duke John the Fearless: Flemish Monetary Ordinance of 6 December 1416:**

l'ouvrage desquelles monnoyes ... ait convenu cesser et n'y ait ou peu ouvrer ne forgier ja longtemps ... comme pour les diminutions et empirances des monnoyes de monseigneur le Roy [de France] faite depuis nos dites ordonnances, et aussi pour les diminutions des monnoyes de plusiers seigneurs voisins de nos dits pays, lesquelles estranges monnoyes ... ont cours en nostre dit pays, et par ce la plus grand partie de nostre dite monnoye, qui estoit de plus fort aloy, a estre vuidee et portee fondre esdites monnoyes voisins.

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[129] This six volume set is now available online, with the page numbers indicated: as Eighteenth Century Collections Online. Gale Group: http://galenet.galegroup.com/servlet/ECCO. Gale Document Number: CW3325589105

[130] *Statutes of the Realm*, vol. I, p. 322: Stat. 25 Edwardi III, stat. 5, c. 13. See Munro, *Wool, Cloth, and Gold*, p. 35. See Munro, *Wool, Cloth, and Gold*, pp. 34-35, 44-45; Munro, 'Bullionism and the Bill of Exchange', pp. 190-98, Appendix A, pp. 216-20, Appendix C, pp. 226-27.

[131] Munro, *Wool, Cloth, and Gold*, p. 58; John Munro, 'Monnayage, monnaies de compte, et mutations monétaires au Brabant à la fin du moyen âge', in John Day, ed., *Études d'histoire monétaire, XIIe - XIXe siècles*, Études de l'Université de Paris VII et du Centre National des Lettres (Lille: Presses Universitaires de Lille, 1984), pp. 263-94; reprinted 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).

Louis Deschamps de Pas, 'L'histoire monétaire des comtes de Flandre de la maison de Bourgogne et descriptions d e leurs monnaies de l'or et d'argent', *Revue numismatique*, 2nd ser. 6 (1861), 223-24.

5. **Duke Philip de St. Pol, of Brabant: monetary ordinance of September 1429, implementing a debasement.**

> ... overmits alre hande vremde munten, die in onse voirscreven lande zeer hoege boven hoere werde gegaen hebben, metten welcken tgout ende tselver uten selven onsen lande zeer getogen.

Alemeen Rijksarchief [België], Rekenkamer, reg. 18, 065.

6. **Duke Philip the Good, duke of Burgundy, count of Hainaut: monetary ordinance to debase the coinage, 20 May 1433**

> pour obvier aux cours de plusieurs estranges monnoies d'or et d'argent de divers seigneurs d'Alemaigne et autres forgees a Tournay [Charles VII], en fortresses et ailleurs, lesquelles ont eu cours et este de petite valeur et non suffisant, apportees, mises et haulces a plus grant pris que ne valent en nos dits pais; et encore sont les dictz monnaies estranges journellement empirees, et soubs umbre de ce que les pluisieurs d'icelles sont faictes et forgees a la facon des nostres si pres, que la difference ne s'en peut bonnement congnoistre, si non par les gens qui se meslent de fait de monnoies, elles sont journelement princes et receues en nos dits pais, dont plusieurs fraudes et inconveniens sur le fait de la marchandise se commettent de jour en jour.

Renier Chalon, *Recherches sur les monnaies des comtes de Hainaut* (Brussels, 1818), pp. 208-11, doc. no. 15.

7. **Duke Philip the Good: monetary ordinance of 18 January 1454: debasing the gold coinage**

Contending that the gold *postulaat* of Utrecht and florins of Liège and Guelders had been debased from 16 carats and a *taille* of 72 per marc to 12 carats and a taille of 78 per marc (a loss of 30 percent of their gold contents), so that

> onse gulden penningen Philippus geheten [gold rijders] ende andere goede penningen van goude wy cours gelaten hadden in onsen voirscr. landen daer uut worden getogen ende gedragen in anderen vremde landen ende munten ten groten achterdiele ende schade van ons.

Algemeen Rijksarchief [België], Rekenkamer, carton 65:1.

8. **Duke Philip the Good of Burgundy**: **coinage ordinance and debasement of May 1466**

> pour ce que en aucunes villes, fortresses, et monnoyes estranges ont este cy-devant

faiz et forgiez deniers dor et dargent ala facon, emprainte, et forme de noz deniers ou assez semblables et iceulx allouez au pris et a valeur de noz deniers, lequelx toutesfoyes estoyent et sont d'autre et moindre poix et aloy que lesdis nostres;

les dis deniers dor et dargent de foible poix et aloy dequoy nosdis pays sont fort remplis tellement que en briefs temps nul bon or ne aussi blance monnoye ne y seront trouve.

Algemeen Rijksarchief, Rekenkamer, reg. no. 133, fo. 174–76r.; Deschamps de Pas, 'Histoire monétaire', *Revue numismatic,* 2nd ser., 7 (1862), 126-29.

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Table 1A. **The Flemish Silver Groot: silver contents and values**
1300 - 1482

Date	Fineness in Argent-le-Roy in deniers	Fineness in Argent-le-Roy in grains	Fineness as a Percent-age	Taille to Marc de Troyes	Grams Pure Silver in the Groot	Traite of Marc de Troyes in Shillings	Value of 1 kg Pure Silver in £ groot	Index 1351 = 100.00
	1 d groot	1 d groot	1 d groot	1 d groot	1 d groot	1 d groot	1 d groot	1 d groot
1300-4-2	11	11.50	95.660%	59.133	3.7944	5.1513	1.0981	50.73
	10	12.00	87.500%	57.000	3.6006	5.4286	1.1572	53.46
1331-8-8								
	10	6.00	85.417%	57.500	3.4843	5.6098	1.1958	55.25
1332-3-13								
	10	6.00	85.417%	57.500	3.4843	5.6098	1.1958	55.25
1335-5								
	9	0.00	75.000%	60.500	2.9077	6.7222	1.4330	66.20
1337-5-25								
	8	0.00	66.667%	66.000	2.3692	8.2500	1.7587	81.25
1343-4-16								
	8	0.00	66.667%	66.000	2.3692	8.2500	1.7587	81.25
1344-1								
	8	0.00	66.667%	66.000	2.3692	8.2500	1.7587	81.25
1344-8								
	8	0.00	66.667%	66.000	2.3692	8.2500	1.7587	81.25
1345-9								
	7	16.00	63.889%	66.000	2.2705	8.6087	1.8351	84.78
1346-1-20								
	7	16.00	63.889%	66.000	2.2705	8.6087	1.8351	84.78
1346-8								
	6	23.50	58.160%	66.000	2.0669	9.4567	2.0159	93.13
1346-11-24								
	6	12.00	54.167%	66.000	1.9250	10.1538	2.1645	100.00
1351-5-28								
	6	12.00	54.167%	66.000	1.9250	10.1538	2.1645	100.00

Date	Fineness in Argent-le-Roy in deniers	Fineness in Argent-le-Roy in grains	Fineness as a Percent-age	Taille to Marc de Troyes	Grams Pure Silver in the Groot	Traite of Marc de Troyes in Shillings	Value of 1 kg Pure Silver in £ groot	Index 1351 = 100.00
	1 d groot	1 d groot	1 d groot	1 d groot	1 d groot	1 d groot	1 d groot	1 d groot
1351-7								
	6	8.00	52.778%	67.500	1.8340	10.6579	2.2719	104.96
1353-9-7								
	6	4.00	51.389%	69.000	1.7469	11.1892	2.3852	110.20
1354-12-20								
	6	0.00	50.000%	70.000	1.6754	11.6667	2.4870	114.90
1359-10-22								
	6	0.00	50.000%	72.000	1.6289	12.0000	2.5580	118.18
1361-12-4								
	6	0.00	50.000%	78.000	1.5036	13.0000	2.7712	128.03
1363-12-1								
	8	0.00	66.667%	114.000	1.3717	14.2500	3.0377	140.34
1365-4-12								
	7	12.00	62.500%	114.000	1.2859	15.2000	3.2402	149.70
1368-1-21								
	7	4.00	59.722%	114.000	1.2288	15.9070	3.3909	156.66
1369-4-21								
	6	0.00	50.000%	100.000	1.1728	16.6667	3.5528	164.14
1369-9-22								
	6	12.00	54.167%	114.000	1.1145	17.5385	3.7387	172.73
1373-6-18								
	6	0.00	50.000%	116.000	1.0110	19.3333	4.1213	190.40
1380-1-30								
	5	18.00	47.917%	116.000	0.9689	20.1739	4.3005	198.68
1383-9-12								
	6	0.00	50.000%	100.000	1.1728	16.6667	3.5528	164.14
1384-9-10								
	5	8.00	44.444%	102.000	1.0220	19.1250	4.0769	188.35
1386-10-29								
	5	4.00	43.056%	119.000	0.8486	23.0323	4.9098	226.83

Date	Fineness in Argent-le-Roy in deniers 1 d groot	Fineness in Argent-le-Roy in grains 1 d groot	Fineness as a Percent-age 1 d groot	Taille to Marc de Troyes 1 d groot	Grams Pure Silver in the Groot 1 d groot	Traite of Marc de Troyes in Shillings 1 d groot	Value of 1 kg Pure Silver in £ groot 1 d groot	Index 1351 = 100.00 1 d groot
1387-4-3	4	20.00	40.278%	121.000	0.7808	25.0345	5.3366	246.55
1388-10-1	5	0.00	41.667%	96.000	1.0180	19.2000	4.0929	189.09
1389-12-20	5	0.00	41.667%	82.667	1.1822	16.5333	3.5244	162.83
1409-8-17	4	4.00	34.722%	85.000	0.9581	20.4000	4.3487	200.91
1416-12-6	5	0.00	41.667%	115.000	0.8498	23.0000	4.9029	226.52
1418-6-12	4	12.00	37.500%	117.500	0.7486	26.1111	5.5661	257.15
1428-11-7	6	0.00	50.000%	144.000	0.8144	24.0000	5.1161	236.36
1433-10-12	5	0.00	41.667%	139.000	0.7031	27.8000	5.9261	273.79
1466-5-23	4	12.00	37.500%	130.000	0.6766	28.8889	6.1582	284.51
1467-10-13	4	0.00	33.333%	131.000	0.5968	32.7500	6.9813	322.54
1474-12-10	3	12.00	29.167%	131.000	0.5222	37.4286	7.9786	368.61
1477-9-20	3	3.00	26.042%	131.000	0.4663	41.9200	8.9361	412.85
1482-7								

Table 1 B.   **Alterations of the Flemish Silver Coinages: 1384 - 1482**

Date and names of the silver coins Double Groot Single Groot	Value in d. groot	Fineness Percent Argent-le-Roy	Percent Purity	Weight Taille	Weight in Grams	Grams Pure Silver	Traite of marc AR £ gr	Bullion Price £ gr	Seign-iorage £ gr	Brassage £ gr
1384 - 07 - 16										
Double Groot	2.000	50.00%	0.4792	50.00	4.8951	2.3455	0.8333	0.7167	0.05000	0.06667
Groot	1.000	50.00%	0.4792	100.00	2.4475	1.1728	0.8333	0.7167	0.05000	0.06667
1386-10-29										
Double Groot	2.000	50.00%	0.4792	57.00	4.2939	2.0575	0.9500	0.8833	0.01042	0.05625
Groot	1.000	44.44%	0.4259	102.00	2.3995	1.0220	0.9563	0.8833	0.01667	0.05625
1387-04-03										
Double Groot	2.000	43.06%	0.4126	59.50	4.1135	1.6973	1.1517	1.0375	0.03507	0.07917
Groot	1.000	43.06%	0.4126	119.00	2.0567	0.8486	1.1517	1.0375	0.03507	0.07917
1388-10-01										
Double Groot	2.000	40.28%	0.3860	60.50	4.0455	1.5615	1.2566	1.1000	0.03333	0.12326
Groot	1.000	40.28%	0.3860	121.00	2.0228	0.7808	1.2566	1.1000	0.03333	0.12326
1389 - 12 - 20										
Double Groot	2.000	50.00%	0.4792	57.00	4.2939	2.0575	0.9500	0.8500	0.01667	0.08333
Groot	1.000	41.67%	0.3993	96.00	2.5495	1.0180	0.9600	0.8500	0.01667	0.09332
1391 - 01 - 24										

Date and names of the silver coins Double Groot Single Groot	Value in d. groot	Fineness Percent Argent-le-Roy	Percent Purity	Weight Taille	Weight in Grams	Grams Pure Silver	Traite of marc AR £ gr	Bullion Price £ gr	Seign-iorage £ gr	Brassage £ gr
Double Groot	2.000	50.00%	0.4792	57.50	4.2566	2.0396	0.9583	0.8583	0.01667	0.08333
1393 - 08 - 24										
Double Groot	2.000	50.00%	0.4792	57.00	4.2939	2.0575	0.9500	0.8750	0.01667	0.05833
Groot	1.000	41.67%	0.3993	96.00	2.5495	1.0180	0.9600	0.8750	0.01667	0.06832
1409 - 08 - 17										
Double Groot	2.000	50.00%	0.4792	49.00	4.9950	2.3934	0.8167	0.7583	0.00833	0.05000
Groot	1.000	41.67%	0.3993	82.67	2.9607	1.1822	0.8266	0.7583	0.00833	0.05998
1416 - 12 - 06										
Double Groot	2.000	41.67%	0.3993	50.00	4.8951	1.9546	1.0000	0.8625	0.06667	0.07083
Groot	1.000	34.72%	0.3328	85.00	2.8794	0.9581	1.0208	0.8625	0.06667	0.09167
1418 - 06 - 12										
Double Groot	2.000	50.00%	0.4792	68.00	3.5993	1.7247	1.1333	1.0583	0.01667	0.05833
Groot	1.000	41.67%	0.3993	115.00	2.1283	0.8498	1.1500	1.0583	0.01667	0.07500
1428 - 11 - 07										
Double Groot	2.000	44.44%	0.4259	68.50	3.5730	1.5218	1.2840	1.2000	0.02500	0.05903
Groot	1.000	37.50%	0.3594	117.50	2.0830	0.7486	1.3056	1.2000	0.02917	0.07639
1433 - 10 - 12										
Double Groot	2.000	50.00%	0.4792	72.00	3.3993	1.6289	1.2000	1.1375	0.00833	0.05417

Date and names of the silver coins Double Groot Single Groot	Value in d. groot	Fineness Percent Argent-le-Roy	Percent Purity	Weight Taille	Weight in Grams	Grams Pure Silver	Traite of marc AR £ gr	Bullion Price £ gr	Seign-iorage £ gr	Brassage £ gr
Groot	1.000	50.00%	0.4792	144.00	1.6997	0.8144	1.2000	1.1375	0.00833	0.05417
1466 - 05 - 23										
Double Patard	4.000	95.83%	0.9184	79.50	3.0787	2.8274	1.3826	1.3375	0.00625	0.03885
Double Groot or Patard	2.000	50.00%	0.4792	82.50	2.9667	1.4215	1.3750	1.3167	0.00625	0.05208
Groot	1.000	41.67%	0.3993	139.00	1.7608	0.7031	1.3893	1.3167	0.00625	0.06641
1467 - 10 - 13										
Double Patard	4.000	91.67%	0.8785	77.50	3.1581	2.7743	1.4091	1.3667	0.00625	0.03617
Double Groot or Patard	2.000	50.00%	0.4792	84.50	2.8965	1.3879	1.4083	1.3500	0.00625	0.05208
Groot	1.000	37.50%	0.3594	130.00	1.8827	0.6766	1.4444	1.3458	0.00625	0.09236
1474 - 10 - 27										
Double Patard	4.000	83.33%	0.7986	80.00	3.0594	2.4433	1.6000	1.5333	0.02500	0.04167
Double Groot or Patard	2.000	41.67%	0.3993	80.00	3.0594	1.2216	1.6000	1.5167	0.02500	0.05833
Groot	1.000	33.33%	0.3194	131.00	1.8683	0.5968	1.6375	1.5167	0.02500	0.09583
1477 - 12 - 20										
Double Patard	4.500	83.33%	0.7986	80.00	3.0594	2.4433	1.8000	1.7333	0.02500	0.04167
Double Groot or Patard	2.250	41.67%	0.3993	80.00	3.0594	1.2216	1.8000	1.7167	0.02500	0.05833
Groot	1.000	29.17%	0.2795	131.00	1.8683	0.5222	1.8714	1.7167	0.02500	0.12969
1482 - 07 - 18										
Double Patard	5.000	83.33%	0.7986	80.00	3.0594	2.4433	2.0000	1.9406	0.01354	0.04583
Double Groot or Patard	2.500	41.67%	0.3993	80.00	3.0594	1.2216	2.0000	1.9198	0.01354	0.06667

Date and names of the silver coins Double Groot Single Groot	Value in d. groot	Fineness Percent Argent-le- Roy	Percent Purity	Weight Taille	Weight in Grams	Grams Pure Silver	Traite of marc AR £ gr	Bullion Price £ gr	Seign- iorage £ gr	Brassage £ gr
Groot	1.000	26.04%	0.2496	131.00	1.8683	0.4663	2.0958	1.9198	0.01354	0.16250

Date and names of the silver coins	Total Mint Charges £ gr	SUM BP+MC = Traite £ gr	Seign- iorage as % of Traite	Brassage as % of Traite	Bullion Price as % of Traite	Percent Change in Silver Content	Percent Change in the Traite
1384 - 07 - 16							
Double Groot	0.1167	0.8333	6.00%	8.00%	86.00%		
Groot	0.1167	0.8333	6.00%	8.00%	86.00%		
1386-10-29							
Double Groot	0.0667	0.9500	1.10%	5.92%	92.98%	-12.28%	14.00%
Groot	0.0729	0.9563	1.74%	5.88%	92.37%	-12.85%	14.75%
1387-04-03							
Double Groot	0.1142	1.1517	3.04%	6.87%	90.08%	-17.51%	21.24%
Groot	0.1142	1.1517	3.04%	6.87%	90.08%	-16.96%	20.44%
1388-10-01							
Double Groot	0.1566	1.2566	2.65%	9.81%	87.54%	-8.00%	9.10%
Groot	0.1566	1.2566	2.65%	9.81%	87.54%	-8.00%	9.10%

Date and names of the silver coins	Total Mint Charges £ gr	SUM BP+MC = Traite £ gr	Seign- iorage as % of Traite	Brassage as % of Traite	Bullion Price as % of Traite	Percent Change in Silver Content	Percent Change in the Traite
1389 - 12 - 20							
Double Groot	0.1000	0.9500	1.75%	8.77%	89.47%	31.76%	-24.40%
Groot	0.1100	0.9600	1.74%	9.72%	88.54%	30.39%	-23.60%
1391 - 01 - 24							
Double Groot	0.1000	0.9583	1.74%	8.70%	89.57%	-0.87%	0.88%
Groot	0.1100	0.9600	1.74%	9.72%	88.54%	0.00%	0.00%
1393 - 08 - 24							
Double Groot	0.0750	0.9500	1.75%	6.14%	92.11%	0.88%	-0.87%
Groot	0.0850	0.9600	1.74%	7.12%	91.15%	0.00%	0.00%
1409 - 08 - 17							
Double Groot	0.0583	0.8167	1.02%	6.12%	92.86%	16.33%	-14.04%
Groot	0.0683	0.8266	1.01%	7.26%	91.74%	16.13%	-13.89%
1416 - 12 - 06							
Double Groot	0.1375	1.0000	6.67%	7.08%	86.25%	-18.33%	22.45%
Groot	0.1583	1.0208	6.53%	8.98%	84.49%	-18.95%	23.49%
1418 - 06 - 12							
Double Groot	0.0750	1.1333	1.47%	5.15%	93.38%	-11.76%	13.33%
Groot	0.0917	1.1500	1.45%	6.52%	92.03%	-11.30%	12.65%

Date and names of the silver coins	Total Mint Charges £ gr	SUM BP+MC = Traite £ gr	Seign-iorage as % of Traite	Brassage as % of Traite	Bullion Price as % of Traite	Percent Change in Silver Content	Percent Change in the Traite
1428 - 11 - 07							
Double Groot	0.0840	1.2840	1.95%	4.60%	93.46%	-11.76%	13.30%
Groot	0.1056	1.3056	2.23%	5.85%	91.91%	-11.91%	13.53%
1433 - 10 - 12							
Double Groot	0.0625	1.2000	0.69%	4.51%	94.79%	7.03%	-6.54%
Groot	0.0625	1.2000	0.69%	4.51%	94.79%	8.80%	-8.09%
1466 - 05 - 23							
Double Patard	0.0451	1.3826	0.45%	2.81%	96.74%		
Double Groot or Patard	0.0583	1.3750	0.45%	3.79%	95.76%	-12.73%	14.58%
Groot	0.0727	1.3893	0.45%	4.78%	94.77%	-13.67%	15.78%
1467 - 10 - 13							
Double Patard	0.0424	1.4091	0.44%	2.57%	96.99%	-1.88%	1.92%
Double Groot or Patard	0.0583	1.4083	0.44%	3.70%	95.86%	-2.37%	2.42%
Groot	0.0986	1.4444	0.43%	6.39%	93.17%	-3.77%	3.97%
1474 - 10 - 27							
Double Patard	0.0667	1.6000	1.56%	2.60%	95.83%	-11.93%	13.55%
Double Groot or Patard	0.0833	1.6000	1.56%	3.65%	94.79%	-11.98%	13.61%
Groot	0.1208	1.6375	1.53%	5.85%	92.62%	-11.79%	13.37%

Date and names of the silver coins	Total Mint Charges £ gr	SUM BP+MC = Traite £ gr	Seign-iorage as % of Traite	Brassage as % of Traite	Bullion Price as % of Traite	Percent Change in Silver Content	Percent Change in the Traite
1477 - 12 - 20							
Double Patard	0.0667	1.8000	1.39%	2.31%	96.30%	0.00%	12.50%
Double Groot or Patard	0.0833	1.8000	1.39%	3.24%	95.37%	0.00%	12.50%
Groot	0.1547	1.8714	1.34%	6.93%	91.73%	-12.50%	14.28%
1482 - 07 - 18							
Double Patard	0.0594	2.0000	0.68%	2.29%	97.03%	0.00%	11.11%
Double Groot or Patard	0.0802	2.0000	0.68%	3.33%	95.99%	0.00%	11.11%
Groot	0.1760	2.0958	0.65%	7.75%	91.60%	-10.71%	12.00%

Table 2. **Outputs of the Mints in Flanders and the Burgundian Low Countries**

in Kilograms of Fine Metal, Silver and Gold, and in Flemish Pounds Groot

in quinquennial means, 1351-55 to 1496-1500

Year	SILVER Flanders kg.	SILVER Flanders £ groot	SILVER Total LC kg	SILVER Total LC £ groot	GOLD Flanders kg	GOLD Flanders £ groot	GOLD Total LC kg	GOLD Total LC £ groot	Low Countries £ groot	Per Cent silver	Per Cent gold
1351-55	5,178.951	11,397.252	5,178.951	11,397.252	1,096.661	24,811.554	1,096.661	24,811.554	36,208.806	31.48%	68.52%
1356-60	8,820.730	21,251.516	8,820.730	21,251.516	3,191.827	80,870.028	3,191.827	80,870.028	102,121.544	20.81%	79.19%
1361-65	3,992.165	11,141.966	3,992.165	11,141.966	2,629.891	77,350.494	2,629.891	77,350.494	88,492.460	12.59%	87.41%
1366-70	10,347.518	33,290.674	10,347.518	33,290.674	1,636.694	51,788.717	1,636.694	51,788.717	85,079.391	39.13%	60.87%
1371-75	4,852.022	18,208.349	4,852.022	18,208.349	1,807.028	72,090.390	1,807.028	72,090.390	90,298.739	20.16%	79.84%
1376-80	1,898.960	7,567.387	1,898.960	7,567.387	541.721	21,890.920	541.721	21,890.920	29,458.308	25.69%	74.31%
1381-85	2,816.883	11,467.496	2,816.883	11,467.496	529.809	22,941.630	529.809	22,941.630	34,409.126	33.33%	66.67%
1386-90	2,013.492	8,723.712	2,013.492	8,723.712	465.426	22,891.085	465.426	22,891.085	31,614.797	27.59%	72.41%
1391-95	3,676.062	14,958.400	3,676.062	14,958.400	368.614	14,458.242	368.614	14,458.242	29,416.642	50.85%	49.15%
1396-1400	5,791.306	23,507.520	5,791.306	23,507.520	324.589	12,731.424	324.589	12,731.424	36,238.944	64.87%	35.13%
1401-05	691.661	2,826.540	691.661	2,826.540	31.535	1,236.902	31.535	1,236.902	4,063.442	69.56%	30.44%
1406-10	1,113.700	3,887.994	1,113.700	3,887.994	19.025	636.250	19.025	636.250	4,524.244	85.94%	14.06%
1411-15	2,484.269	8,665.846	2,484.269	8,665.846	5.884	196.762	5.884	196.762	8,862.608	97.78%	2.22%

Year	SILVER Flanders kg.	SILVER Flanders £ groot	SILVER Total LC kg	SILVER Total LC £ groot	GOLD Flanders kg	GOLD Flanders £ groot	GOLD Total LC kg	GOLD Total LC £ groot	Low Countries £ groot	Per Cent silver	Per Cent gold
1416-20	2,828.980	13,624.106	3,124.468	15,052.698	2.278	85.550	4.308	181.634	15,234.332	98.81%	1.19%
1421-25	11,427.611	55,349.868	12,143.547	57,614.792	36.533	1,949.216	41.056	2,195.696	59,810.488	96.33%	3.67%
1426-30	5,724.635	30,932.966	7,999.913	43,326.036	372.372	22,373.694	1,105.072	69,470.308	112,796.344	38.41%	61.59%
1431-35	4,568.739	23,495.926	6,609.816	34,252.100	313.963	17,491.002	1,774.868	115,363.244	149,615.344	22.89%	77.11%
1436-40	3,505.132	17,981.664	5,015.219	25,788.306	241.904	13,483.328	511.935	28,534.390	54,322.696	47.47%	52.53%
1441-45	102.683	527.552	102.683	527.552	111.931	6,466.290	111.931	6,466.290	6,993.842	7.54%	92.46%
1446-50	5.911	40.786	5.911	40.786	2.550	148.084	2.550	148.084	188.870	21.59%	78.41%
1451-55	53.164	283.980	164.611	880.316	322.409	19,759.234	827.293	50,701.692	51,582.008	1.71%	98.29%
1456-60	51.302	336.654	64.066	408.310	160.791	9,854.308	253.139	15,513.918	15,922.228	2.56%	97.44%
1461-65	0.000	0.000	0.000	0.000	6.596	404.224	6.596	404.224	404.224	0.00%	100.00%
1466-70	2,975.690	17,957.102	4,628.964	27,867.694	186.880	12,116.676	253.594	16,400.726	44,268.420	62.95%	37.05%
1471-75	4,619.347	28,258.168	7,313.984	45,191.724	140.215	10,042.534	261.202	18,927.514	64,119.238	70.48%	29.52%
1476-80	4,078.520	28,866.250	9,341.495	67,636.248	186.598	14,335.372	380.051	29,208.498	96,844.746	69.84%	30.16%
1481-85	1,997.516	16,669.166	6,534.304	56,337.178	27.255	2,470.546	58.536	5,216.392	61,553.570	91.53%	8.47%
1486-90	940.931	9,235.614	6,803.602	78,323.898	0.000	0.000	144.641	24,136.964	102,460.862	76.44%	23.56%
1491-95	1,039.270	7,332.372	2,780.071	19,521.098	9.272	623.804	20.320	1,336.340	20,857.438	93.59%	6.41%

Year	SILVER Flanders kg.	SILVER Flanders £ groot	SILVER Total LC kg	SILVER Total LC £ groot	GOLD Flanders kg	GOLD Flanders £ groot	GOLD Total LC kg	GOLD Total LC £ groot	Low Countries £ groot	Per Cent silver	Per Cent gold
1496-1500	2,071.913	17,066.911	5,345.911	44,764.905	293.421	27,548.326	474.633	44,464.280	89,229.185	50.17%	49.83%

Table 3   **Basket of Consumables Price Index for Flanders (Bruges and Ghent)**
In quinquennial means: 1351-55 to 1496-1500

Mean of 1451-75 = 100 = 126.295 d groot Flemish
values in d. groot Flemish

Year	Basket Consumables Total Value in d groot Flemish	Commodity Basket Index 1451-75= 100 126.295 gr Flemish	Grains Group Index 1451-75= 100 56.354 gr Flemish	Dairy Group Index 1451-75= 100 44.665 gr Flemish	Textiles Group Index 1451-75= 100 25.276 gr Flemish	Grains as per cent of total basket by value	Dairy as per cent of total basket by value	Textiles as per cent of total basket by value
1351-55	76.593	60.646	68.466	63.048	38.968	50.37%	36.77%	12.86%
1356-60	110.558	87.540	102.100	93.151	45.160	52.04%	37.63%	10.32%
1361-65	119.255	94.425	108.636	98.228	56.023	51.34%	36.79%	11.87%
1366-70	135.641	107.401	126.994	101.825	73.568	52.76%	33.53%	13.71%
1371-75	145.519	115.222	121.901	112.359	105.388	47.21%	34.49%	18.31%
1376-80	141.024	111.662	105.597	121.366	108.038	42.20%	38.44%	19.36%
1381-85	150.534	119.193	110.799	135.714	108.711	41.48%	40.27%	18.25%
1386-90	157.514	124.719	132.745	122.655	110.470	47.49%	34.78%	17.73%
1391-95	111.784	88.510	82.803	99.235	82.282	41.74%	39.65%	18.60%
1396-00	113.407	89.796	92.733	92.132	79.118	46.08%	36.29%	17.63%
1401-05	111.810	88.531	95.190	80.675	87.565	47.98%	32.23%	19.79%

Year	Basket Consumables Total Value in d groot Flemish	Commodity Basket Index 1451-75= 100 126.295 gr Flemish	Grains Group Index 1451-75= 100 56.354 gr Flemish	Dairy Group Index 1451-75= 100 44.665 gr Flemish	Textiles Group Index 1451-75= 100 25.276 gr Flemish	Grains as per cent of total basket by value	Dairy as per cent of total basket by value	Textiles as per cent of total basket by value
1406-10	132.939	105.261	115.682	91.056	107.127	49.04%	30.59%	20.37%
1411-15	120.370	95.309	93.652	92.417	104.114	43.84%	34.29%	21.86%
1416-20	135.616	107.381	110.755	104.677	104.636	46.02%	34.48%	19.50%
1421-25	141.680	112.182	112.756	114.392	106.998	44.85%	36.06%	19.09%
1426-30	148.741	117.773	122.830	114.511	112.262	46.54%	34.39%	19.08%
1431-35	155.989	123.512	132.917	115.130	117.353	48.02%	32.97%	19.02%
1436-40	177.022	140.166	172.289	109.153	123.350	54.85%	27.54%	17.61%
1441-45	143.350	113.504	111.205	113.067	119.403	43.72%	35.23%	21.05%
1446-50	138.904	109.984	107.703	110.051	114.952	43.70%	35.39%	20.92%
1451-55	127.434	100.902	95.302	102.660	110.282	42.14%	35.98%	21.87%
1456-60	148.845	117.855	131.873	107.281	105.288	49.93%	32.19%	17.88%
1461-65	112.030	88.705	83.052	90.737	97.721	41.78%	36.18%	22.05%
1466-70	121.900	96.520	93.351	101.206	95.304	43.16%	37.08%	19.76%
1471-75	121.264	96.017	96.422	98.116	91.406	44.81%	36.14%	19.05%
1476-80	148.034	117.213	125.644	118.347	96.410	47.83%	35.71%	16.46%

Year	Basket Consumables Total Value in d groot Flemish	Commodity Basket Index 1451-75= 100 126.295 gr Flemish	Grains Group Index 1451-75= 100 56.354 gr Flemish	Dairy Group Index 1451-75= 100 44.665 gr Flemish	Textiles Group Index 1451-75= 100 25.276 gr Flemish	Grains as per cent of total basket by value	Dairy as per cent of total basket by value	Textiles as per cent of total basket by value
1481-85	198.097	156.853	198.728	131.927	107.537	56.53%	29.75%	13.72%
1486-90	233.028	184.511	190.773	187.098	165.979	46.14%	35.86%	18.00%
1491-95	183.104	144.981	156.841	122.174	158.841	48.27%	29.80%	21.93%
1496-00	126.617	100.255	82.119	93.309	152.966	36.55%	32.92%	30.54%

BASKET OF CONSUMABLES COMMODITY PRICE INDEXES

Commodity	FLANDERS			
	Amount	**Unit**	**Value in in d gr. Flemish**	**Percent**
Farinaceous				
Wheat	45.461	l.	13.279	10.51%
Rye	36.369	l.	7.062	5.59%
Barley	18.184	l.	2.867	2.27%
Peas	24.243	l.	7.341	5.81%
Sub-total	**124.257**	**l.**	**30.549**	**24.19%**

Commodity	FLANDERS			
	Amount	**Unit**	**Value in in d gr. Flemish**	**Percent**
Farinaceous				
Drink				
barley (or malt)	**163.659**	**l.**	**25.805**	**20.43%**
Total Farinaceous	**287.917**	**l.**	**56.354**	**44.62%**
Meat, Fish, Dairy				
Butter	13.610	kg	36.087	28.57%
Cheese	13.610	kg	8.578	6.79%
Sub-total	**27.220**		**44.665**	**35.37%**
Industrial				
Coarse Woollens	1.225	m.	25.276	20.01%
Sub-total			**25.276**	**20.01%**
TOTAL			**126.295**	**100.00%**

Table 4 Flemish Silver Coinage Changes and Price Changes, 1380-1482

Relationship between coinage debasement and the money of account value of a kilogram of pure silver, in coin

Δ T (traite) = [1/(1 - x)] - 1   x = percentage change in silver contents of 1d groot

Flemish Price Index: Mean of 1451-1475 = 100 = 126.295 d groot Flemish

Date of coinage change	Year 1 Jan - 31 Dec	Silver grams in 1d groot	% change in silver	Traite of Silver Marc AR in shillings groot	Value of 1 kg Pure Silver in £ groot 1 d groot	% change in value	Value of Flemish Basket in d groot Flemish	Flemish Price Index from 1350	% change
1380-1-30	1380	1.0110	-9.28%	19.333	4.121	10.23%	134.373	106.396	-0.46%
	1381	1.0110	0.00%	19.333	4.121	0.00%	133.718	105.878	-0.49%
	1382	1.0110	0.00%	19.333	4.121	0.00%	145.040	114.843	8.47%
1383-9-12	1383	0.9689	-4.17%	20.174	4.300	4.35%	143.218	113.400	-1.26%
1384-9-10	1384	1.1728	21.04%	16.667	3.553	-17.39%	154.314	122.185	7.75%
	1385	1.1728	0.00%	16.667	3.553	0.00%	176.381	139.658	14.30%
1386-4-18	1386	1.0220	-12.85%	19.125	4.077	14.75%	167.336	132.496	-5.13%
1386-10-29	1386	1.0061	-1.56%	19.429	4.142	1.59%	167.336	132.496	0.00%
1387-4-3	1387	0.8486	-15.65%	23.032	4.910	18.55%	169.142	133.926	1.08%
1388-10-1	1388	0.7808	-8.00%	25.035	5.337	8.69%	132.960	105.278	-21.39%
1389-12-20	1389	1.0180	30.39%	19.200	4.093	-23.31%	153.323	121.401	15.32%
	1390	1.0180	0.00%	19.200	4.093	0.00%	164.806	130.493	7.49%
1391-1-24	1391	1.0075	-1.03%	19.400	4.135	1.04%	134.037	106.130	-18.67%
	1392	1.0075	0.00%	19.400	4.135	0.00%	113.614	89.959	-15.24%
1393-6-20	1393	1.0180	1.04%	19.200	4.093	-1.03%	99.657	78.908	-12.28%
	1394	1.0180	0.00%	19.200	4.093	0.00%	110.844	87.766	11.23%

Date of coinage change	Year 1 Jan - 31 Dec	Silver grams in 1d groot	% change in silver	Traite of Silver Marc AR in shillings groot	Value of 1 kg Pure Silver in £ groot 1 d groot	% change in value	Value of Flemish Basket in d groot Flemish	Flemish Price Index from 1350	% change
	1395	1.0180	0.00%	19.200	4.093	0.00%	100.768	**79.788**	-9.09%
	1396	1.0180	0.00%	19.200	4.093	0.00%	105.820	**83.788**	5.01%
	1397	1.0180	0.00%	19.200	4.093	0.00%	128.543	**101.780**	21.47%
	1398	1.0180	0.00%	19.200	4.093	0.00%	117.823	**93.292**	-8.34%
	1399	1.0180	0.00%	19.200	4.093	0.00%	104.026	**82.368**	-11.71%
	1400	1.0180	0.00%	19.200	4.093	0.00%	110.824	**87.751**	6.54%
	1401	1.0180	0.00%	19.200	4.093	0.00%	113.341	**89.743**	2.27%
	1402	1.0180	0.00%	19.200	4.093	0.00%	116.456	**92.209**	2.75%
	1403	1.0180	0.00%	19.200	4.093	0.00%	122.507	**97.001**	5.20%
	1404	1.0180	0.00%	19.200	4.093	0.00%	102.946	**81.512**	-15.97%
	1405	1.0180	0.00%	19.200	4.093	0.00%	103.799	**82.188**	0.83%
	1406	1.0180	0.00%	19.200	4.093	0.00%	105.226	**83.318**	1.37%
1407-4-30	1407	1.1043	**8.47%**	19.200	4.093	0.00%	124.277	**98.402**	18.10%
1407-7-7	1407	1.0180	**-7.81%**	19.200	4.093	0.00%	124.277	**98.402**	0.00%
1409-8-17	1408	1.1822	**16.13%**	16.533	3.524	**-13.89%**	133.170	**105.444**	7.16%
	1409	1.1822	0.00%	16.533	3.524	0.00%	166.534	**131.861**	25.05%
	1410	1.1822	0.00%	16.533	3.524	0.00%	135.488	**107.279**	-18.64%
	1411	1.1822	0.00%	16.533	3.524	0.00%	100.492	**79.569**	-25.83%
	1412	1.1822	0.00%	16.533	3.524	0.00%	114.743	**90.853**	14.18%
	1413	1.1822	0.00%	16.533	3.524	0.00%	126.848	**100.438**	10.55%
	1414	1.1822	0.00%	16.533	3.524	0.00%	124.889	**98.887**	-1.54%
	1415	1.1822	0.00%	16.533	3.524	0.00%	134.880	**106.798**	8.00%
1416-12-6	1416	0.9581	**-18.95%**	20.400	4.349	**23.39%**	150.185	**118.916**	11.35%
	1417	0.9581	0.00%	20.400	4.349	0.00%	168.555	**133.461**	12.23%
1418-6-12	1418	0.8498	**-11.30%**	23.000	4.903	**12.75%**	116.493	**92.239**	-30.89%
	1419	0.8498	0.00%	23.000	4.903	0.00%	118.932	**94.170**	2.09%
	1420	0.8498	0.00%	23.000	4.903	0.00%	123.917	**98.118**	4.19%
	1421	0.8498	0.00%	23.000	4.903	0.00%	135.816	**107.538**	9.60%
	1422	0.8498	0.00%	23.000	4.903	0.00%	141.966	**112.408**	4.53%

Date of coinage change	Year 1 Jan - 31 Dec	Silver grams in 1d groot	% change in silver	Traite of Silver Marc AR in shillings groot	Value of 1 kg Pure Silver in £ groot 1 d groot	% change in value	Value of Flemish Basket in d groot Flemish	Flemish Price Index from 1350	% change
	1423	0.8498	0.00%	23.000	4.903	0.00%	130.379	**103.234**	-8.16%
	1424	0.8498	0.00%	23.000	4.903	0.00%	149.826	**118.632**	14.92%
	1425	0.8498	0.00%	23.000	4.903	0.00%	150.416	**119.099**	0.39%
	1426	0.8498	0.00%	23.000	4.903	0.00%	135.544	**107.323**	-9.89%
	1427	0.8498	0.00%	23.000	4.903	0.00%	146.895	**116.311**	8.37%
1428-11-7	1428	0.7486	**-11.91%**	26.111	5.566	**13.53%**	141.851	**112.317**	-3.43%
	1429	0.7486	0.00%	26.111	5.566	0.00%	160.475	**127.064**	13.13%
	1430	0.7486	0.00%	26.111	5.566	0.00%	158.941	**125.849**	-0.96%
	1431	0.7486	0.00%	26.111	5.566	0.00%	155.796	**123.359**	-1.98%
	1432	0.7486	0.00%	26.111	5.566	0.00%	147.576	**116.851**	-5.28%
1433-10-12	1433	0.8144	8.80%	24.000	5.116	**-8.09%**	175.816	**139.210**	19.14%
	1434	0.8144	0.00%	24.000	5.116	0.00%	164.300	**130.092**	-6.55%
	1435	0.8144	0.00%	24.000	5.116	0.00%	136.456	**108.046**	-16.95%
	1436	0.8144	0.00%	24.000	5.116	0.00%	122.225	**96.777**	-10.43%
	1437	0.8144	0.00%	24.000	5.116	0.00%	140.259	**111.057**	14.76%
	1438	0.8144	0.00%	24.000	5.116	0.00%	234.974	**186.052**	67.53%
	1439	0.8144	0.00%	24.000	5.116	0.00%	241.337	**191.090**	2.71%
	1440	0.8144	0.00%	24.000	5.116	0.00%	146.317	**115.854**	-39.37%
	1441	0.8144	0.00%	24.000	5.116	0.00%	156.040	**123.552**	6.65%
	1442	0.8144	0.00%	24.000	5.116	0.00%	136.240	**107.875**	-12.69%
	1443	0.8144	0.00%	24.000	5.116	0.00%	178.214	**141.109**	30.81%
	1444	0.8144	0.00%	24.000	5.116	0.00%	126.467	**100.136**	-29.04%
	1445	0.8144	0.00%	24.000	5.116	0.00%	119.790	**94.850**	-5.28%
	1446	0.8144	0.00%	24.000	5.116	0.00%	144.775	**114.632**	20.86%
	1447	0.8144	0.00%	24.000	5.116	0.00%	160.241	**126.879**	10.68%
	1448	0.8144	0.00%	24.000	5.116	0.00%	142.056	**112.479**	-11.35%
	1449	0.8144	0.00%	24.000	5.116	0.00%	118.072	**93.490**	-16.88%
	1450	0.8144	0.00%	24.000	5.116	0.00%	129.378	**102.441**	9.57%
	1451	0.8144	0.00%	24.000	5.116	0.00%	124.475	**98.559**	-3.79%

Date of coinage change	Year 1 Jan - 31 Dec	Silver grams in 1d groot	% change in silver	Traite of Silver Marc AR in shillings groot	Value of 1 kg Pure Silver in £ groot 1 d groot	% change in value	Value of Flemish Basket in d groot Flemish	Flemish Price Index from 1350	% change
	1452	0.8144	0.00%	24.000	5.116	0.00%	121.500	96.203	-2.39%
	1453	0.8144	0.00%	24.000	5.116	0.00%	136.156	107.808	12.06%
	1454	0.8144	0.00%	24.000	5.116	0.00%	133.161	105.437	-2.20%
	1455	0.8144	0.00%	24.000	5.116	0.00%	121.880	96.505	-8.47%
	1456	0.8144	0.00%	24.000	5.116	0.00%	149.444	118.330	22.62%
	1457	0.8144	0.00%	24.000	5.116	0.00%	164.206	130.018	9.88%
	1458	0.8144	0.00%	24.000	5.116	0.00%	150.723	119.342	-8.21%
	1459	0.8144	0.00%	24.000	5.116	0.00%	132.542	104.947	-12.06%
	1460	0.8144	0.00%	24.000	5.116	0.00%	147.310	116.640	11.14%
	1461	0.8144	0.00%	24.000	5.116	0.00%	125.656	99.494	-14.70%
	1462	0.8144	0.00%	24.000	5.116	0.00%	121.121	95.903	-3.61%
	1463	0.8144	0.00%	24.000	5.116	0.00%	103.168	81.688	-14.82%
	1464	0.8144	0.00%	24.000	5.116	0.00%	98.413	77.923	-4.61%
1466-5-23	1465	0.7031	-13.67%	27.800	5.926	15.83%	111.793	88.518	13.60%
	1466	0.7031	0.00%	27.800	5.926	0.00%	121.154	95.930	8.37%
1467-10-13	1467	0.6766	-3.77%	32.750	6.158	3.92%	129.006	102.146	6.48%
	1468	0.6766	0.00%	37.429	6.158	0.00%	121.436	96.153	-5.87%
	1469	0.6766	0.00%	37.429	6.158	0.00%	121.243	96.000	-0.16%
	1470	0.6766	0.00%	37.429	6.158	0.00%	116.661	92.372	-3.78%
	1471	0.6766	0.00%	37.429	6.158	0.00%	125.794	99.604	7.83%
	1472	0.6766	0.00%	37.429	6.158	0.00%	120.760	95.617	-4.00%
	1473	0.6766	0.00%	37.429	6.158	0.00%	104.770	82.957	-13.24%
	1474	0.6766	0.00%	37.429	6.158	0.00%	136.661	108.208	30.44%
1474-12-10	1475	0.5968	-11.79%	32.750	6.981	13.37%	118.337	93.699	-13.41%
	1476	0.5968	0.00%	32.750	6.981	0.00%	116.659	92.370	-1.42%
1477-9-20	1477	0.5222	-12.50%	37.429	7.979	14.29%	124.747	98.775	6.93%
	1478	0.5222	0.00%	37.429	7.979	0.00%	164.072	129.911	31.52%
	1479	0.5222	0.00%	37.429	7.979	0.00%	188.593	149.327	14.95%
	1480	0.5222	0.00%	37.429	7.979	0.00%	146.097	115.679	-22.53%

Date of coinage change	Year 1 Jan - 31 Dec	Silver grams in 1d groot	% change in silver	Traite of Silver Marc AR in shillings groot	Value of 1 kg Pure Silver in £ groot 1 d groot	% change in value	Value of Flemish Basket in d groot Flemish	Flemish Price Index from 1350	% change
	1481	0.5222	0.00%	37.429	7.979	0.00%	174.173	**137.910**	19.22%
1482-7	**1482**	0.4663	**-10.71%**	41.920	8.936	**12.00%**	244.926	**193.932**	40.62%

Table 5.   **Flemish Coinage Debasement: The Flemish Mint Ordinances of June 1418 and November 1428**

Double Groot (Gros)	**June 1418**			**November 1428**		
Value in money-of-account [a]	2d *groot* [or *gros* Flemish]			2d *groot* [or *gros* Flemish]		
Fineness [b] in *argent-le-roy* (AR)	6 deniers AR = =		50.0% fine 47.92% pure	5 deniers 8 grains AR = =		44.44% fine 42.59% pure

Weight (Taille) [c] in grams
   Fine silver content AR in g.
   Pure silver content in g.
	68 cut to the marc		3.599 grams
			 1.800 g.
			 1.725 g.
				68.5 cut to the marc =		3.573 grams
						 1.588 g.
						 1.522 g.

Traite per *marc* [d] *argent-le-roy*	$\frac{68.0 \times 2d. = 136d}{6/12 \quad\quad 0.5}$ =		22s 8d 5.333/12 0.444	$\frac{68.5 \times 2d. = 137d}{5.333/12 \quad 0.444}$ =		25s 8d 6 mites

....

Division of the Traite Value per marc argent-le-roy	**Value in groot Flemish**	**Number of coins**	**Percentage of the traite**	**Value in groot Flemish**	**Number of coins**	**Percentage of the traite**
Brassage	1s 2d	7	5.15%	1s 2d 6m	7 1/8	4.62%
Seigniorage	4d	2	1.47%	6d 0m	3	1.95%
Total Mint Charges (of the above)	1s 6d	9	6.62%	1s 8d 6m	10 1/8	6.57%
Mint Price: for merchants' bullion	21s 2d	127	93.38%	24s 0d 0m	144	93.43%
Traite per Marc argent-le-roy	**22s 8d**	**136**	**100.00%**	**25s 8d 6m**	**154 1/8**	**100.00%**

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[a] **Values in money-of-account:**   1 penny or 1d groot = 24 mites = 12d or 1s parisis
                                         12d groot = 1s (sou, sol, schelling); 1 livre or pond (£1 pound) = 20 shillings = 240d (pence)

[b] **Fineness:**   reckoned out of 12 **deniers argent-le-roy**, with 24 **grains** per **denier**: 23/24 or 95.833% pure

[c] **Weight:**   reckoned in terms of the **taille** or number cut from the **marc de Troyes** of 8 **onces**: 244.753 g.

[d] **Traite per marc:**   official value of coinage struck per **marc argent le roy**: T = taille * face value/fineness
                             fineness: (Fineness/12 deniers Argent-le-Roy)

Table 6.   **The Flemish Silver Coinage Debasement of Nov 1428 and its Aftermath**

Year	Mint Outputs in Marcs argent le roy *	Mint Outputs Kilograms of pure silver	Percentage Change	Output in £ groot Flemish	Percentage Change	Seigniorage in £ groot Flemish	Percentage Change
1428	4,598.700	1,078.647		5,267.280		123	
1429	72,460.700	16,996.010	1475.68%	93,021.380	1666.02%	2,035	1554.47%
1430	34,992.400	8,207.638	-51.71%	45,065.400	-51.55%	1,316	-35.33%
1431	5,595.200	1,312.381	-84.01%	7,240.240	-83.93%	283	-78.50%
1432	104.300	24.464	-98.14%	135.140	-98.13%	55	-80.57%

* *Marc argent-le-roy* = 244.7529 grams commercially fine silver, at 23/24 or 95.833% purity, with 4.167% copper.

Sources for the Tables:

A. **Mint Accounts and monetary ordinances: 1350 - 1500: Archival sources**

I: County of FLANDERS

a) Ghent:

Algemeen Rijksarchief (België), Rolrekeningen (Comptes en Rouleaux), nos. 580, 788, 790 - 831, 2138-39, 2877-880.

Algemeen Rijksarchief (België), Acquits de Lille, Liasses nos. 936: 1 - 7, 937: 1-26.

Algemeen Rijksarchief (België), Rekenkamer (Chambre de Comptes), registers nos. 18,195 - 200

Archives Départementales du Nord (at Lille), Chambre de Comptes: Série B. 612/7751, 7796, 7822, 7834, 20932; Série B. 613/8736, 8806, 8862, 8964, 18366-70; Série B. 621/18968; B. 1606; B. 6121.

b) Bruges:

Algemeen Rijksarchief (België), Rolrekeningen (Comptes en Rouleaux), nos. 771-787, 794.

Algemeen Rijksarchief (België), Rekenkamer (Chambre de Comptes), registers nos. 18, 103 - 18,123.

Archives Départementales du Nord (at Lille), Chambre de Comptes: Série B. 612/775, B. 644/15, B. 19,960.

c) Mechelen (Malines):

Algemeen Rijksarchief (België), Rolrekeningen (Comptes en Rouleaux), nos. 803, 2135-41, 2143, 2145-46.

Algemeen Rijksarchief (België), Acquits de Lille, Liasses nos. 1512: 2, 3, 5.

Algemeen Rijksarchief (België), Rekenkamer (Chambre de Comptes), register no. 18,242: 1 - 3.

d) Valkenberg (Fauquemont):

Algemeen Rijksarchief (België), Rolrekeningen (Comptes en Rouleaux), no. 2586 (1396-98 only: for the Count of Flanders)

II: Duchy of BRABANT

a) Brussels

Algemeen Rijksarchief (België), Rekenkamer (Chambre de Comptes), register no. 17,985 - 989

b) Leuven (Louvain)

Algemeen Rijksarchief (België), Rolrekeningen (Comptes en Rouleaux), nos. 2588 - 2592.

Algemeen Rijksarchief (België), Rekenkamer (Chambre de Comptes), register nos. 18,064 - 072

c) Vilvoorde

Algemeen Rijksarchief (België), Rolrekeningen (Comptes en Rouleaux), nos. 2590, 2592

Algemeen Rijksarchief (België), Rekenkamer (Chambre de Comptes), register no. 18,094; no. 48,967

d) Antwerp

Algemeen Rijksarchief (België), Rolrekeningen (Comptes en Rouleaux), no. 2504.

Algemeen Rijksarchief (België), Rekenkamer (Chambre de Comptes), register nos. 17,880 - 882

e) Maastricht

Algemeen Rijksarchief (België), Rekenkamer (Chambre de Comptes), register nos. 18,701, 18703.

III: County of Namur

Algemeen Rijksarchief (België), Rekenkamer (Chambre de Comptes), register no. 18,203: nos 1 - 21,

IV: County of Hainaut: Valenciennes

Algemeen Rijksarchief (België), Acquits de Lille, Liasses nos. 937, 1512.

Archives Départementales du Nord (at Lille), Chambre de Comptes: Série B. 31, B. 17,651, B. 19/975/402

V: County of Holland-Zealand: **Dordrecht**

Algemeen Rijksarchief Nederland, Grafelijkheidsrekenkamer, Rekeningen no. 4937 - 38.

VI: Duchy of Gelderland (Guelders): **Nijmegen, Arnhem, Zaltbommel**

Algemeen Rijksarchief (België), Rekenkamer (Chambre de Comptes), register no. 18,100-101, no. 48,969

B. Mint Accounts and Monetary Ordinances: published documents in:

Victor Gaillard, ed., *Recherches sur les monnaies des comtes de Flandre*, Vol. II: *Sous les règnes de Louis de Crécy et de Louis de Male* (Ghent: H. Hoste, 1856). The two reigns cover the years 1322-1346, and 1346-1384.

Louis Deschamps de Pas, 'Essai sur l'histoire monétaire des comtes de Flandre de la Maison de Bourgogne et description de leurs monnaies d'or et d'argent: Philippe le Hardi (13 84-1404)', *Revue numismatique*, nouvelle série, 6 (1861), 106-39.

Louis Deschamps de Pas, 'Essai sur l'histoire monétaire des comtes de Flandre de la Maison de Bourgogne et description de leurs monnaies d'or et d'argent: Jean Sans-Peur (1405-1419)', *Revue numismatique*, nouvelle série, 6 (1861), 211-37.

Louis Deschamps de Pas, 'Essai sur l'histoire monétaire des comtes de Flandre de la Maison de Bourgogne et description de leurs monnaies d'or et d'argent: Philippe le Bon (1419-1467): première partie', *Revue numismatique*, nouvelle série, 6 (1861), 458-78.

Louis Deschamps de Pas, 'Essai sur l'histoire monétaire des comtes de Flandre de la Maison de Bourgogne et description de leurs monnaies d'or et d'argent: Philippe le Bon (1419-1467): Suite', *Revue numismatique*, nouvelle série, 7 (1862), 117-43.

Louis Deschamps de Pas, 'Essai sur l'histoire monétaire des comtes de Flandre de la Maison de Bourgogne et description de leurs monnaies d'or et d'argent: Charles le Téméraire (1467-1477)', *Revue numismatique*, nouvelle série, 7 (1862), 351-65.

Louis Deschamps de Pas, 'Essai sur l'histoire monétaire des comtes de Flandre de la Maison de Bourgogne et description de leurs monnaies d'or et d'argent: Marie (1477-14 81)', *Revue numismatique*, nouvelle série, 7 (1862), 460-80.

Louis Deschamps de Pas, 'Supplement à l'essai sur l'histoire monétaire des comtes de Flandre de la Maison de Bourgogne', *Revue numismatique*, nouvelle série, 11 (1866), 172-219.

C. Prices and the Flemish Price Index (Table 3.

Stadsarchief Gent, Stadsrekeningen, 1350-51 to 1499-1500: cloth prices from the Ghent town accounts.

Charles Verlinden, E. Scholliers, et al, eds., *Documents pour l'histoire des prix et des salaires en Flandre et en Brabant/Dokumenten voor de geschiedenis van prijzen en lonen in Vlaanderen en Brabant*, 4 vols. (Bruges, 1959 - 65)

John 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.

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.

D. Prices and the English Price Index (graphs)

E. H. Phelps Brown and Sheila V. Hopkins, 'Seven Centuries of the Prices of Consumables, Compared with Builders' Wage Rates', *Economica*, 23:92 (November 1956), 296-314: reprinted in E.M. Carus-Wilson, ed., *Essays in Economic History*, 3 vols. (London, 1954-62), II, 168-78, 179-96, and in E.H. Phelps Brown and Sheila V. Hopkins, *A Perspective of Wages and Prices* (London, 1981), pp. 13-39 (with price indexes not in the original).
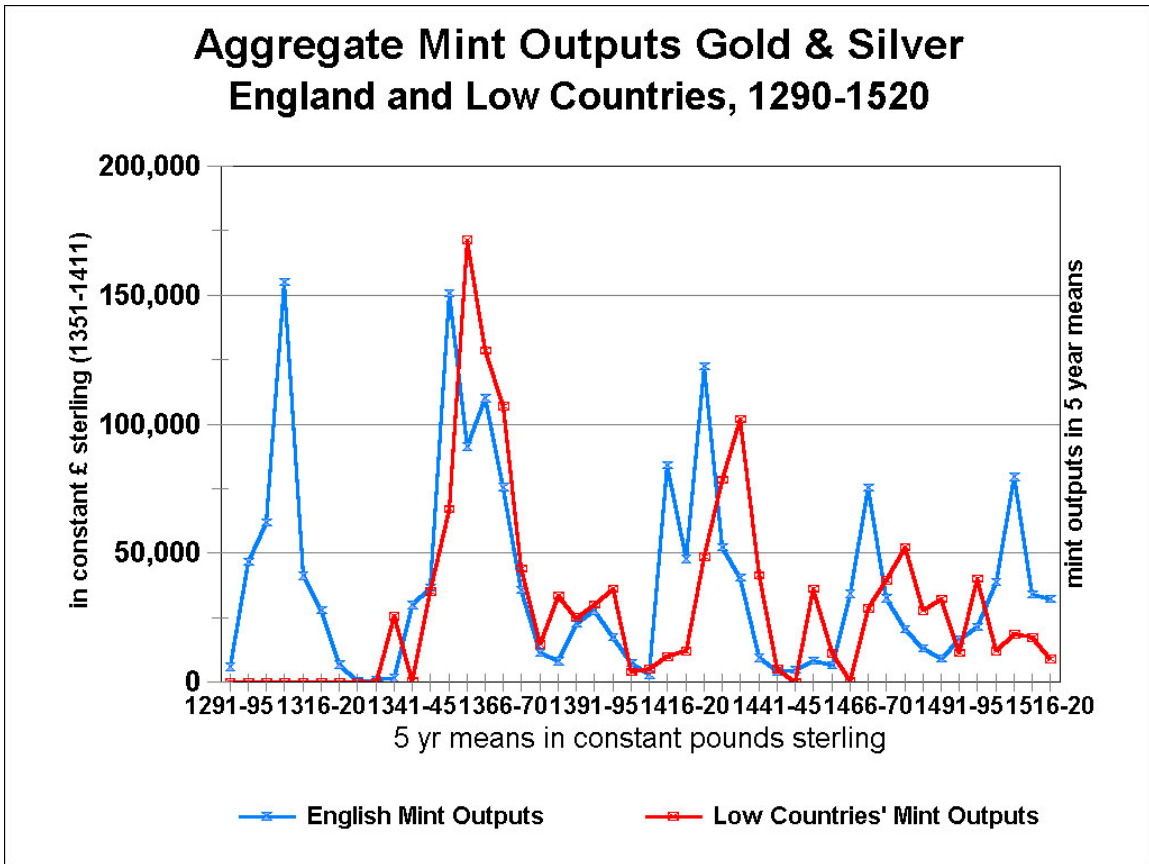
Graph 1:

Aggregate Mint Outputs of Gold and Silver, in England and the Low Countries, from 1290 to 1520, in terms of constant pounds sterling, with values per kilogram of pure silver and of pure gold (fixed value of 1351 to 1411).

From 1290 to 1520: in quinquennial means
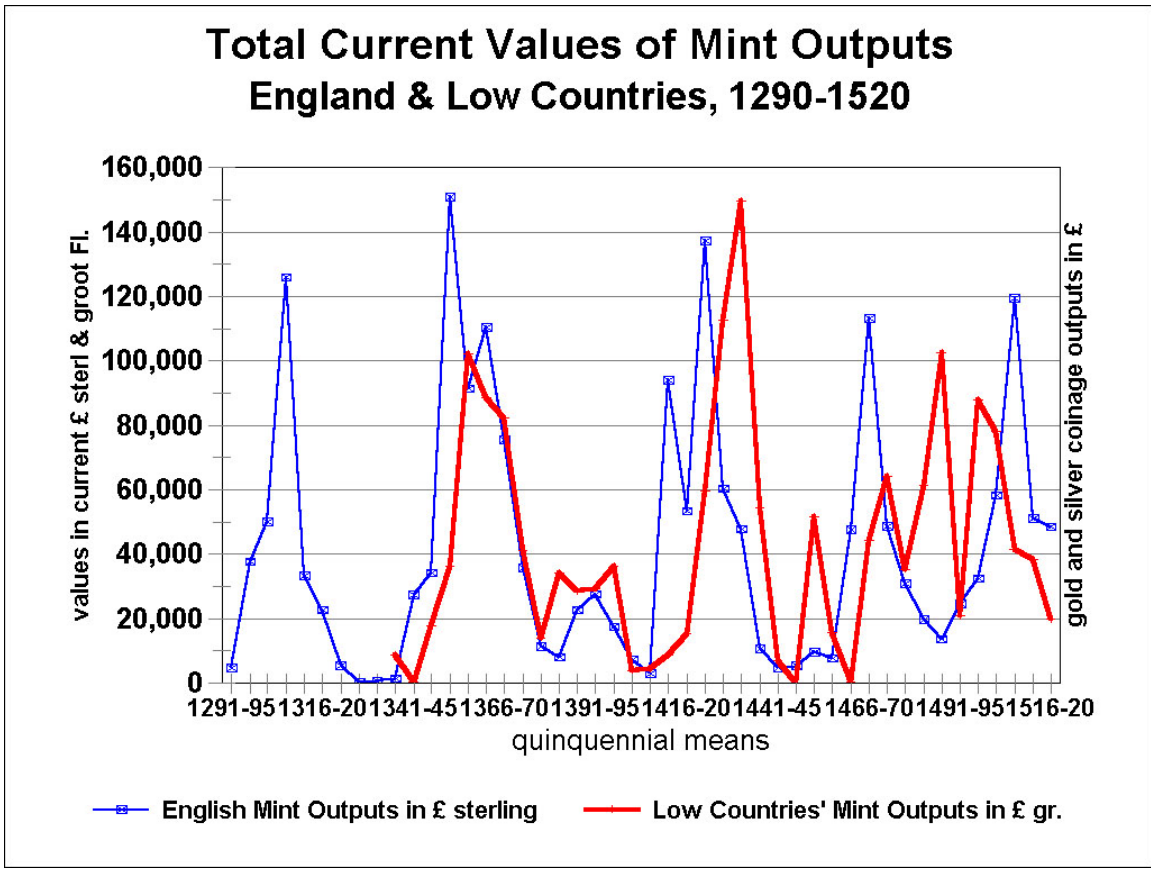
Mint Outputs of England & Flanders/LC
1346 - 1500 in constant £ sterling:

Graph legend:
- English Mint Ouputs: constant £
- English Trend Line
- Flanders/LC mint outputs: constant £
- Flanders/LC Trend Line
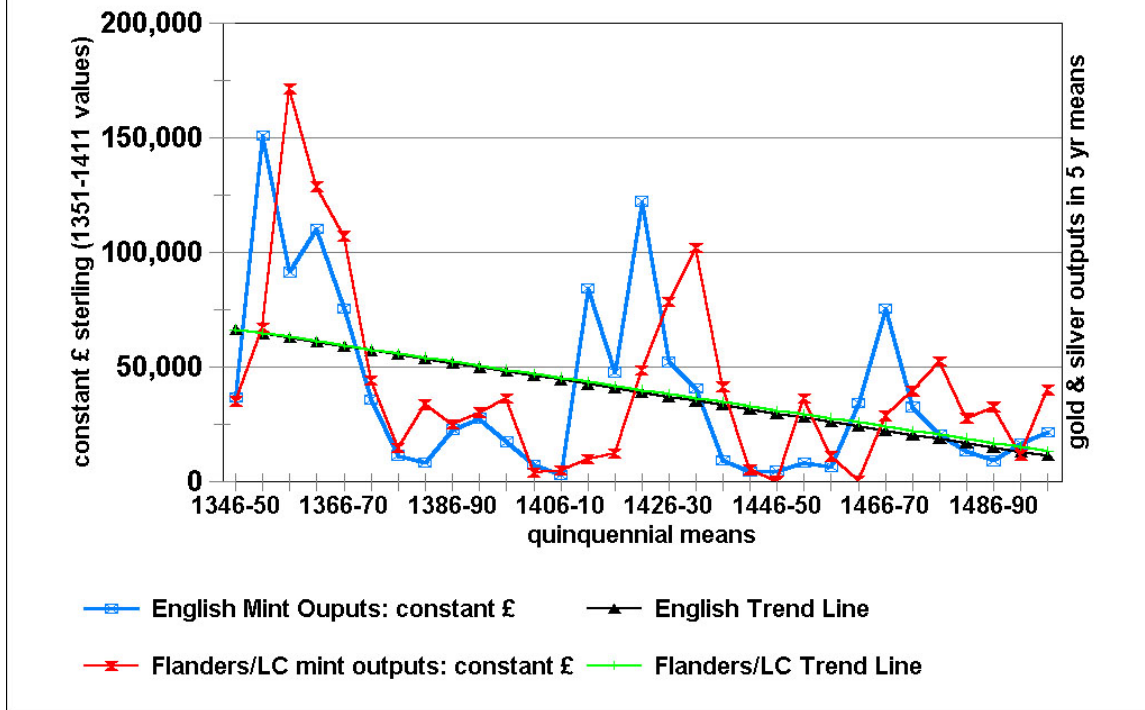
Graph 2:

Aggregate Mint Outputs of Gold and Silver, in England and the Low Countries, from 1290 to 1520, in terms of constant pounds sterling, with values per kilogram of pure silver and of pure gold, from 1351 to 1411, with least-squares (linear regression) trend lines for mint outputs in England and the Low Countries

From 1346 to 1500: in quinquennial means

Graph 3:

Total values of the mint outputs of England and the Low Countries in current money-of-account values: English pounds sterling and Flemish pounds groot.

From 1290 to 1520, in quinquennial means.

Coinage and Prices in England
Mint Outputs and CPI, 1264-1520
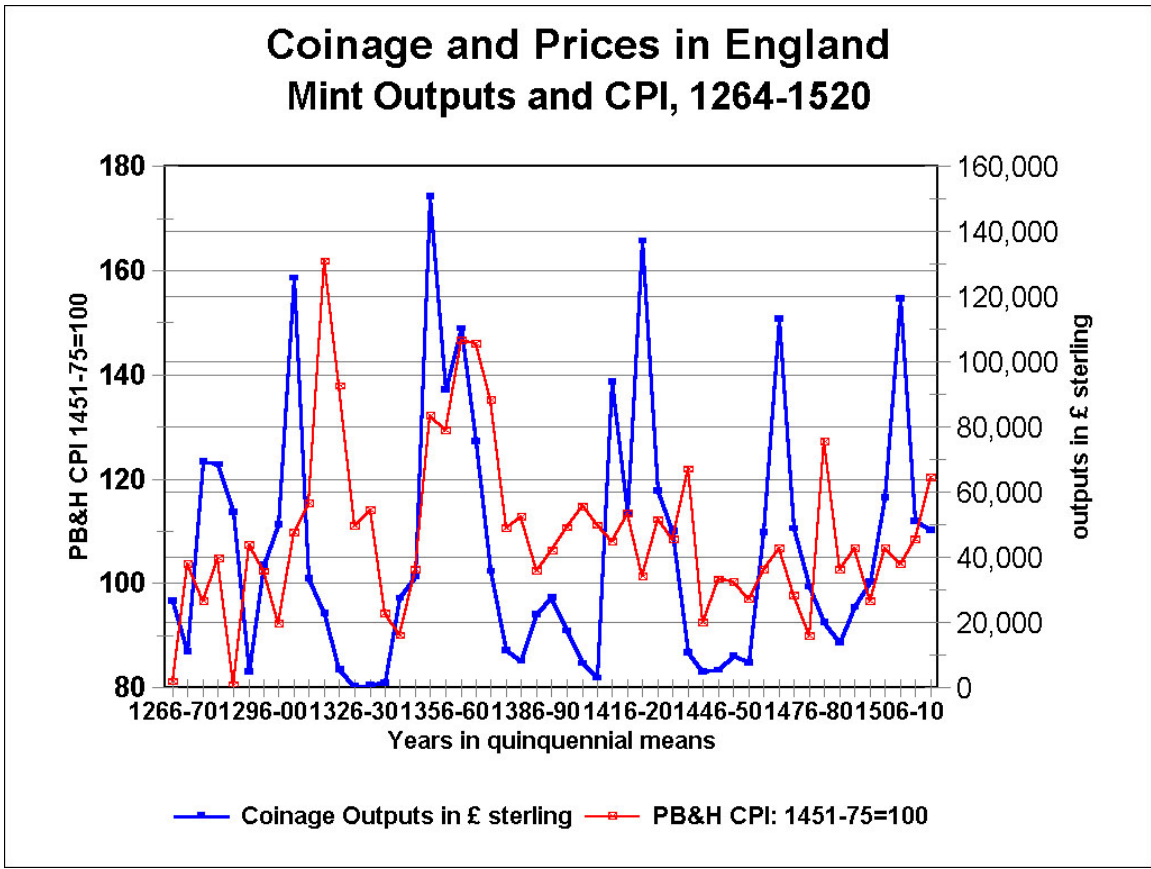
Graph 4:

Outputs of the English coinages, in current pounds sterling and the Phelps Brown and Hopkins 'basket of consumable' price index (mean of 1451-75 = 100)
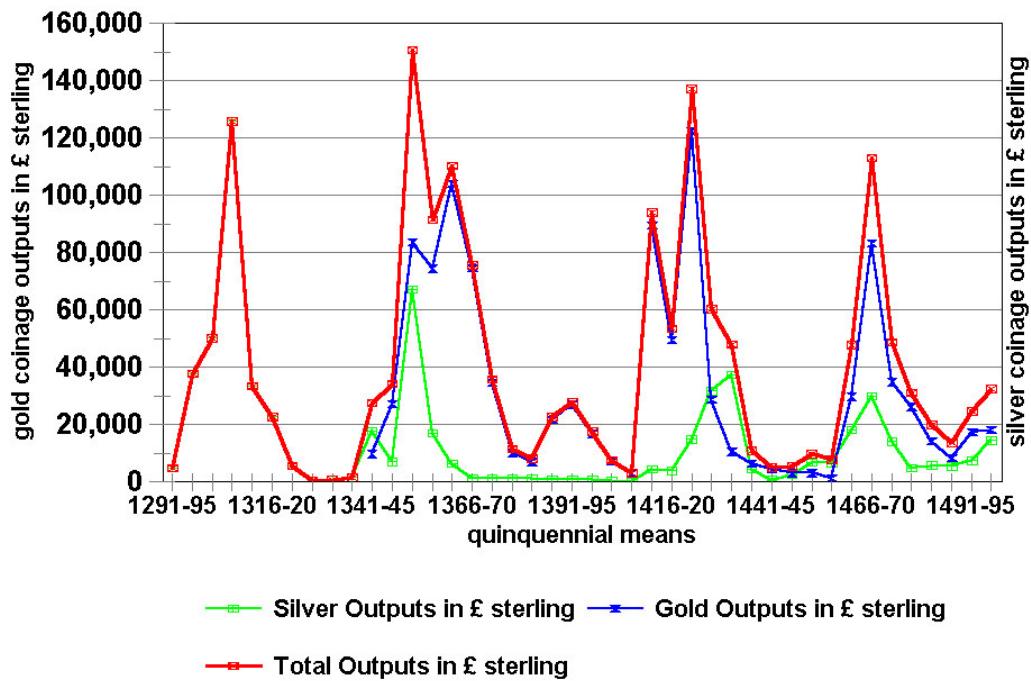
From 1264 to 1520: in quinquennial means.
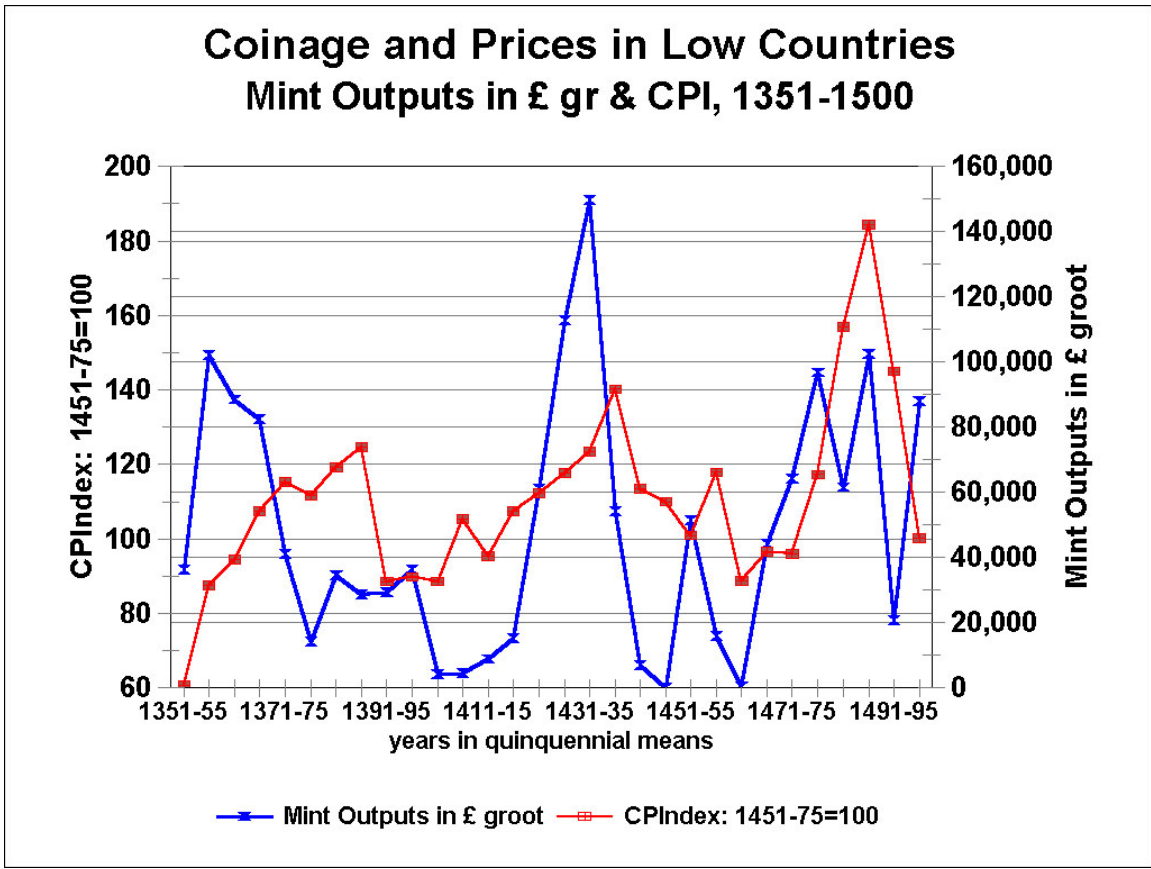
Graph 5:

Outputs of the Flemish and Low Countries' Mints in current pounds groot Flemish and the Flemish Consumer Price Index (mean of 1451-75 = 100)

From 1351 to 1500: in quinquennial means

Graph 6:

Outputs of the English mints, in gold and silver coinages, and combined values of the coinages, in current pounds sterling, from 1291-95 to 1496-1500: in quinquennial means
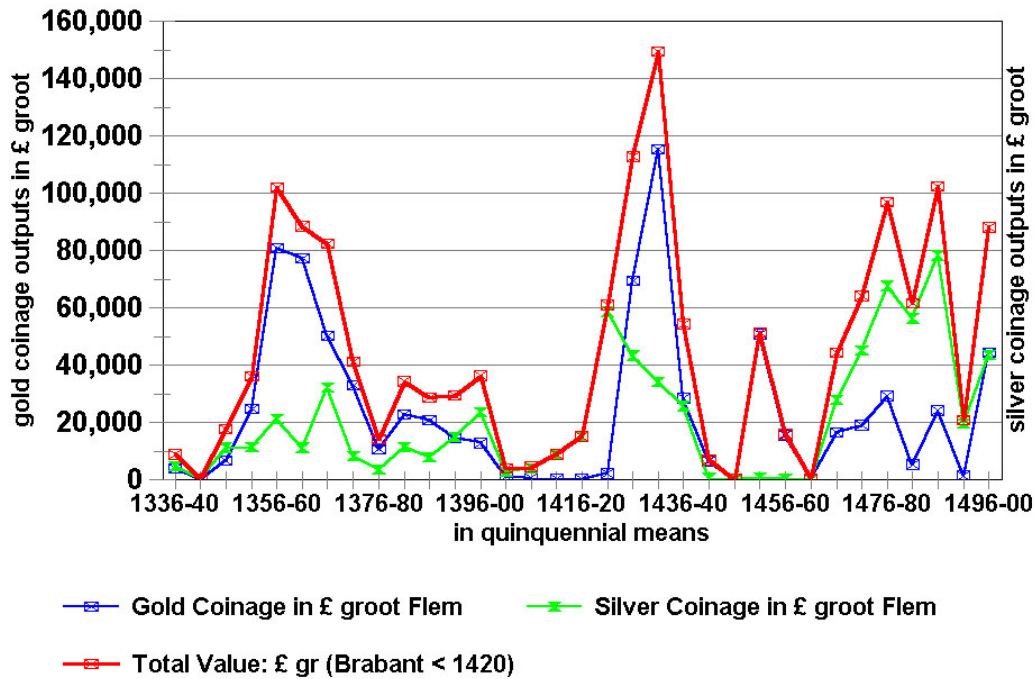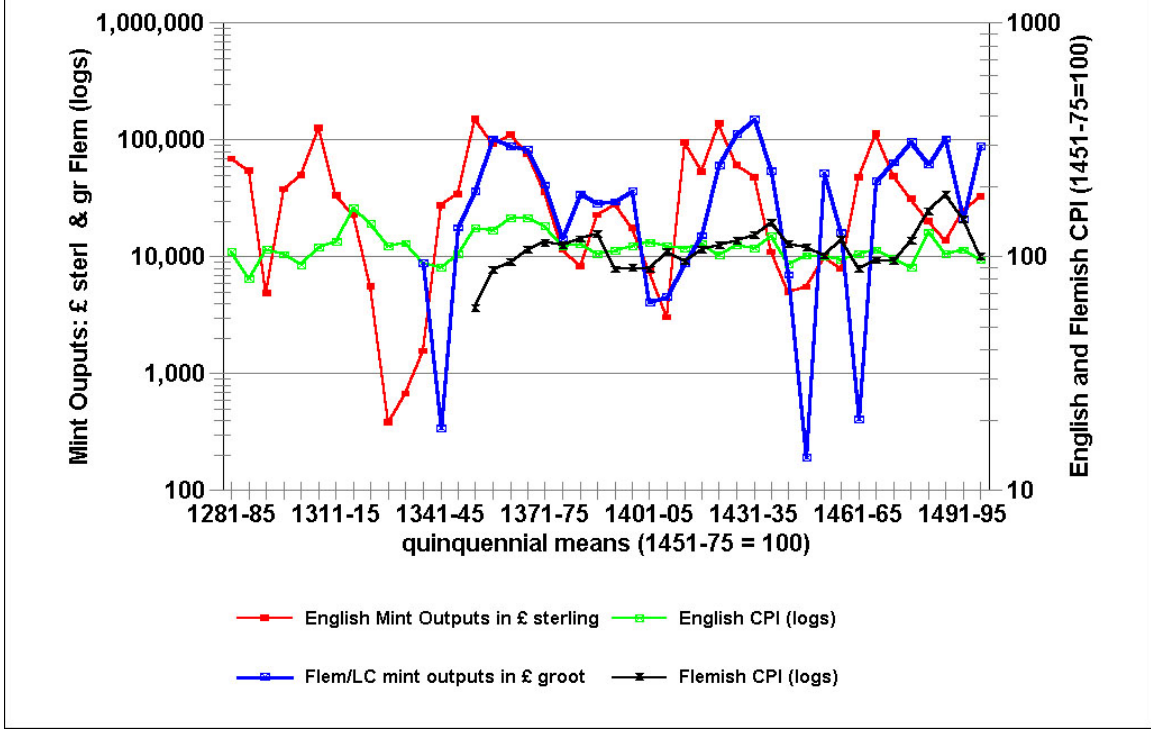
Graph 7:

Outputs of the Flemish and Low Countries' mints, in gold and silver coinages, and combined values of the coinages, in current pounds groot Flemish, from 1291-95 to 1496-1500: in quinquennial means
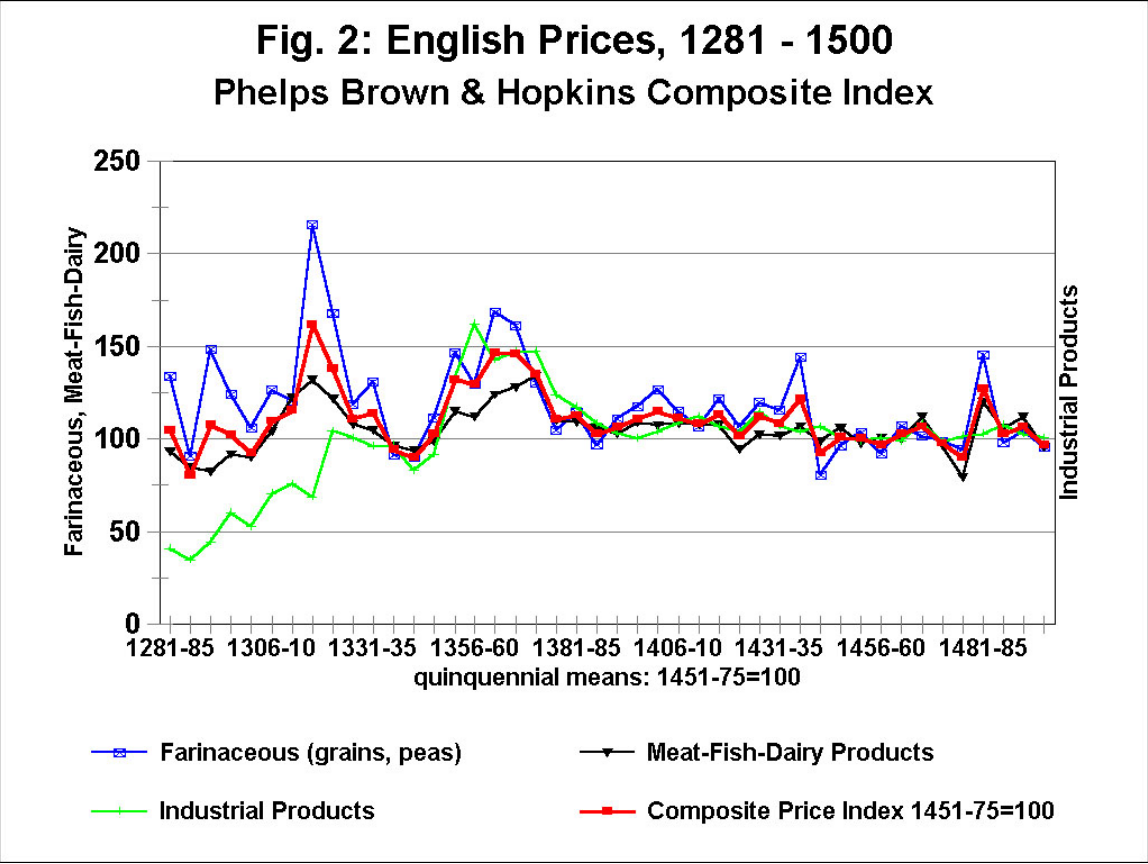
Graph 8 (Figure 1):

Outputs of the mints of England and the Low Countries, in current pounds sterling and pounds groot Flemish, and the Consumer Price Indexes for England and Flanders
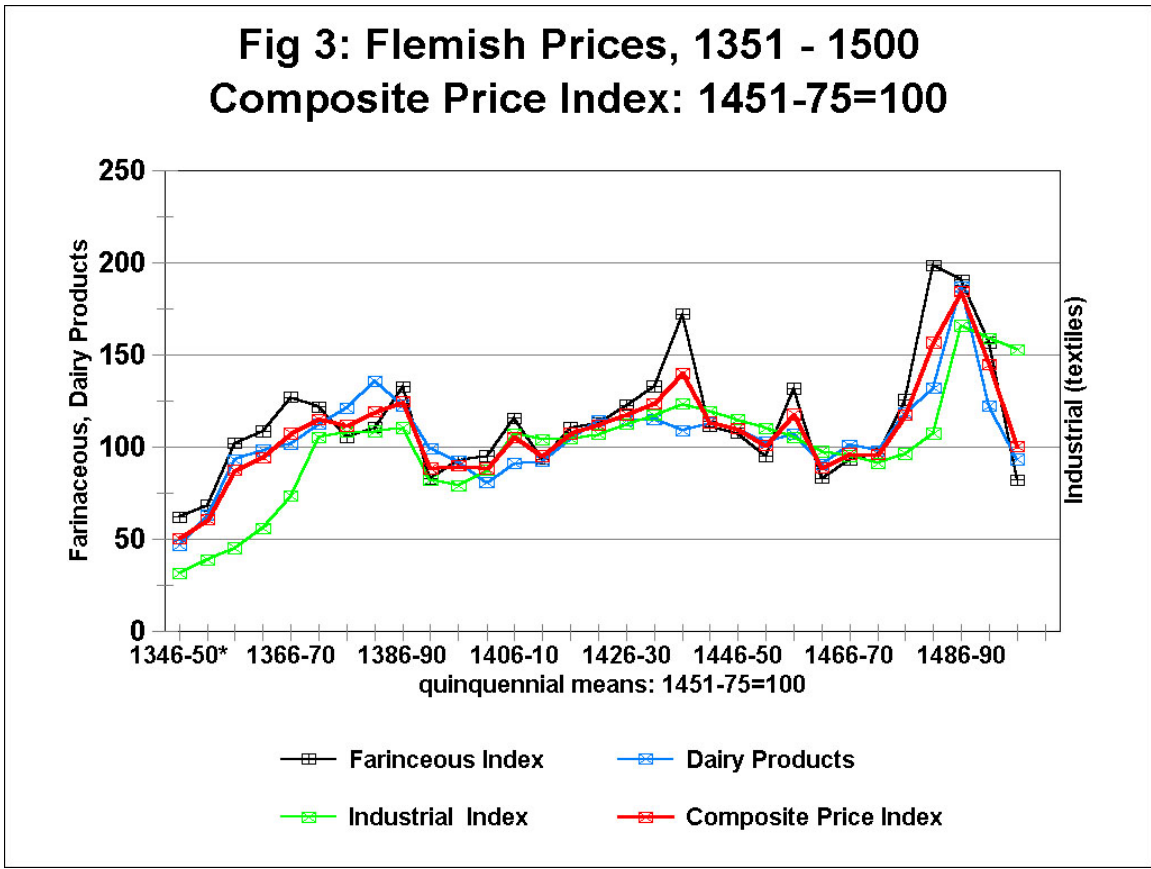
From 1281 to 1500: in quinquennial means

Fig. 2: English Prices, 1281 - 1500
Phelps Brown & Hopkins Composite Index

Graph 9 (Figure 2):

The Phelps Brown and Hopkins 'Basket of Consumables' Price Index for England, from 1281 to 1500 (1451 – 75 = 100): in quinquennial means

Price Indexes for farinaceous, meat-fish-dairy, and industrial products and the aggregate Consumer Price Index.

Fig 3: Flemish Prices, 1351 - 1500
Composite Price Index: 1451-75=100

Graph 10 (Figure 3):

The Consumer Price Index for Flanders (1451 – 75 = 100), from 1351 to 1500: in quinquennial means

Price Indexes for farinaceous (grains), dairy, and industrial products and the Composite Price Index