

Working Papers No. 140/10

**Good or Bad Money? Debasement, Society
and the State in the Late
Middle Ages**

David Chilosì
and
Oliver Volckart

© David Chilosì, and
Oliver Volckart

May 2010

Department of Economic History
London School of Economics
Houghton Street
London, WC2A 2AE

Tel: +44 (0) 20 7955 7860
Fax: +44 (0) 20 7955 7730

Good or Bad Money? Debasement, Society and the State in the Late Middle Ages

David Chilosì and Oliver Volckart

Abstract

This paper revisits the question of debasement by analysing a newly compiled dataset with a novel approach, as well as employing conventional methods. It finds that mercantile influence on monetary policies favoured relative stability, and wage-payers did not typically gain from silver debasement. Excess demand for bullion was not a major cause of debasement. Yet monetary issues were important. Warfare made the debasement of silver but not of gold more likely. Regime types had an importance comparable to that of warfare: Princes debased silver more often than monetary unions and especially city-states. It is likely that fiscal debasements were more frequent in principalities, not least because princes debased for fiscal reasons also in the absence exceptional needs. The conclusion discusses the implications of the findings.

1. Introduction

As a corollary to the revival of interest in medieval trade, scholars have increasingly stressed that ‘medieval money matters’ (Wood, 2004). Under the conditions of a commodity money system with an inelastic supply of bullion, the level of monetisation and therefore commercialisation is assumed to have crucially depended on the supply of hard money as determined by mining output and the balance of trade (cf. Mayhew, 1995a; 1995b; Hatcher, 1996: 187; Munro, 2001: 25, 31 f.; Nightingale, 2007; Blanchard, 2009; Britnell, 2009: 115). Still, the focus on these exogenous factors may be misplaced. Recent developments in the quantitative analysis of late medieval markets indicate that advances in financial integration were less closely associated with the ends of the ‘bullion famines’ of ca. 1390 to 1410 and 1440 to 1460 than with debasements (Chilosì and Volckart, 2009) – a finding that raises the

question of whether the common assumption that debased coins were 'bad' coins is justified.

At present, the view that debasements were one of the 'scourges' of the late medieval economy dominates (Spufford, 1991: 289 ff.). This interpretation is based on two related claims. The first one is that debasement represented a 'hidden' and regressive form of taxation. If institutional constraints and asymmetric information on the intrinsic value of the coinage prevented nominal rents and wages from adjusting to monetary alterations as quickly as prices, debasements harmed the clergy and nobility, who lived off rents (Cipolla, 1963; Munro, 1972: 22 f.; Bordo, 1986: 341; Spufford, 1991: 308-14; Weber, 1996: 483), and labourers, who depended on wages. Employers, by contrast, made a net gain (van Werveke, 1949/64; Cipolla, 1963; Lane and Mueller, 1985: 458; Pamuk, 2000: 55-58; Kaplanis, 2003; Stahl, 2007: 196). However, to date few studies have directly addressed how debasements influenced real variables, and the results have been contradictory. Thus, Sussman (1993: 67 f.) finds that in 1419 the French nobility and wage-earners suffered from them because wages and rents adjusted only after about one year after the intervention. Pamuk (2000: 57) stresses that wage-earners had to lose most, but in the only case where he presents wage data (an Ottoman debasement in 1444), protests led to over proportional wage increases. According to Munro (2002), wage stickiness implied that in Flanders under Count Louis de Male (1346-84) debasements had a long-term effect: As the quantity of money grew while its intrinsic value declined, prices rose and real wages fell. Finally, Nicholas (1987: 6, 132 f.; 1992: 234) does initially share the view that the adjustment of nominal wages did not keep pace with Louis de Male's debasements. However, he later shows that in fourteenth-century Ghent employers regularly allowed nominal wages to adjust to inflation, and that in Flanders in the

1360s and -70s wage rearrangements more than compensated for debasements.

The second claim on which the current interpretation of debasement is based is that it was a primarily fiscal policy motivated by warfare: 'Debasement was, of course, generally a byproduct of war', as Spufford (1991: 289) puts it (cf. Munro, 1972: 20 ff.; 2009; Miskimin, 1984: ch. 3; Kindleberger, 1991; Sussman, 1993: 67 f.; Motomura, 1994; Kaplanis, 2003). Governments gained from debasements because consumers who used coins according to their face value would take their old money to the mint in order to have it re-minted into a larger nominal sum.¹ The consequence was that an increase in seigniorage revenues proportional to the activity of the mint, which could be netted until the purchasing power of the new coins adjusted to their greater quantity and lower intrinsic value. From this perspective, the recourse to debasement reflected weak fiscal and credit structures in the face of expanding needs (Cipolla, 1963; Motomura, 1994; Redish, 2000).²

While fiscal motives were doubtlessly central in at least some of the cases, there are scholars who question how dominant the desire to increase revenues actually was. The monetary perspective that they stress is associated with a more benign view of debasement than the redistributive and fiscal interpretations. Two main versions can be distinguished. First, following Keynes (cf. de Roover, 1948: 242), Cipolla (1948; 1956; 1963) argues that as the economy expanded (like in Italy

¹ Rolnick, Velde and Weber (1996) argue that debasements did not provide additional incentives to take money to the mint because consumers used money according to its intrinsic value. However, there is abundant evidence that the majority of consumers used money according to its face value (e.g. practices such as clipping that would otherwise have been pointless), cf. Volckart (2009: 105 f.).

² Government debts, where existing, were usually designated in terms of currencies that were either less exposed to debasement because they were based on gold (which rulers were reluctant to debase, cf. p. 8 f.), or removed from the government's influence because they were foreign, or both (cf. e.g. Zuiderdijjn, 2009: 73 ff.; Fuhrmann, 2007: 141; Rothmann, 2007: 187). Debasing in order to reduce the real value of debts was thus rarely an option.

during the 'commercial revolution' of the high Middle Ages), the demand for money increased whereas the supply of bullion was inelastic. Debasements helped meeting the resulting excess demand. Likewise, North (1994: 44) claims that most debasements carried out during the late-fourteenth/early fifteenth-century 'bullion famine' were monetary, with rulers trying to supply a stable quantity of coinage in the face of rising bullion prices. Gemmill and Mayhew (1995: 118 f.) imply a similar dynamic.

While these are views advanced by modern research, late medieval governments themselves clung to a second type of monetary argument: They claimed that when they debased their coinage, they were forced to do so by the need to counter Gresham's Law. The circulation of worn and defaced or foreign coins of similar nominal but lower intrinsic value than the domestic ones did, in fact, reduce the demand for domestic money. Governments reacted by aligning the bullion content of their own newly minted coins with that of the foreign money. Fluctuations of bimetallic ratios that increased the intrinsic value of coins above their face value had similar consequences and policy implications (Cipolla, 1963: 414; 1983; Prestwich, 1969; Lane and Mueller, 1985: 31; Glassman and Redish, 1988; Volckart, 1996: 213 f., 223; Redish, 2000; Fantacci, 2008: 61).³

This paper revisits the question of debasement through a comparative analysis of two particularly well-documented but rarely compared cases, i.e. Florence and Flanders, and a number of instances from Central Europe, that is, from the Holy Roman Empire and neighbouring regions. In the fourteenth and fifteenth centuries, this area

³ A similar argument has been put forward by Sargent and Velde (2002), who claim that debasement mostly addressed chronic shortages of petty coinage. As shown by Munro (1988) and Volckart (2008), however, the evidence is that petty coinage shortage was not chronic and debasement did not concentrate on petty coinage. This perspective is therefore not considered here.

was characterised by a remarkably heterogeneous institutional landscape whose importance for debasements has never before been systematically examined. The sample therefore allows us to refine our understanding of how political institutions shaped monetary policies. The analysis is based both on conventional data sources, such as constitutional history and wage and mint data, and on a new approach that finds evidence of monetary needs in the effects debasements had on gold-silver ratios (i.e. the rates at which gold and silver were exchanged in the money market). As well as casting new light on cases for which conventional data is relatively abundant, this approach allows us to examine poorly documented cases, too. It also permits a quantitative assessment of the frequency of monetary debasements. Subsequently, we test emerging hypotheses about the role of warfare, monetary and institutional factors through econometric analysis of data not only from Italy, Flanders and Central Europe, but also from France and England.

The rest of the paper is organised as follows. The next section (2) examines how status groups shaped monetary policies in Flanders, Prussia, Florence, Hamburg and Basel. We find that when monetary policy was driven by the interests of merchants and members of the nobility, rather than by those of princes, silver currencies were comparatively stable. Our evidence (section 3) does not bear out the received wisdom that wage-payers typically gained from silver debasements. On the contrary, real wages usually rose in the years of debasements so that the policy tended to have a positive impact in the long run, too. Section 4 shows that in Florence, and, to a lesser extent, Basel and Hamburg, fiscal needs were less important than in Flanders and Prussia. However, even there debasements involved more than just the desire to cope with warfare and exceptional fiscal strains. Section 5 confirms that in Florence debasements were mainly carried out for monetary reasons, even if these were unrelated to the 'bullion famines'. In

Flanders, such motives were present in some cases under the counts and in all cases after the takeover by the Dukes of Burgundy.

Section 6 compares how monetary alterations affected gold-silver ratios in the principal money markets of the time, i.e. in Bruges and Florence. Unlike in Bruges, alterations in Florence had an enduring impact, promoting convergence between the money and bullion markets gold-silver ratios. Using this yardstick to examine 30 Central European debasements (section 7) shows that monetary motives were present in almost half of these cases. Evidence of monetary motives is found significantly more often when the mint was run by an autonomous city or a monetary union. Econometric analysis (section 8) finds that the ‘bullion famines’ were not associated with particularly frequent debasements; if anything, the opposite holds. Unlike silver debasements, there is no evidence that those of gold were caused by warfare. The regime types have an importance in explaining silver debasements that is comparable to that of warfare, with princely currencies being comparatively unstable. Still, evidence that warfare was less important for autonomous cities and monetary unions than for princes is mild and inconsistent, suggesting that probably they carried out fiscal debasements also when there were no exceptional needs. The concluding section discusses the implications of the findings.

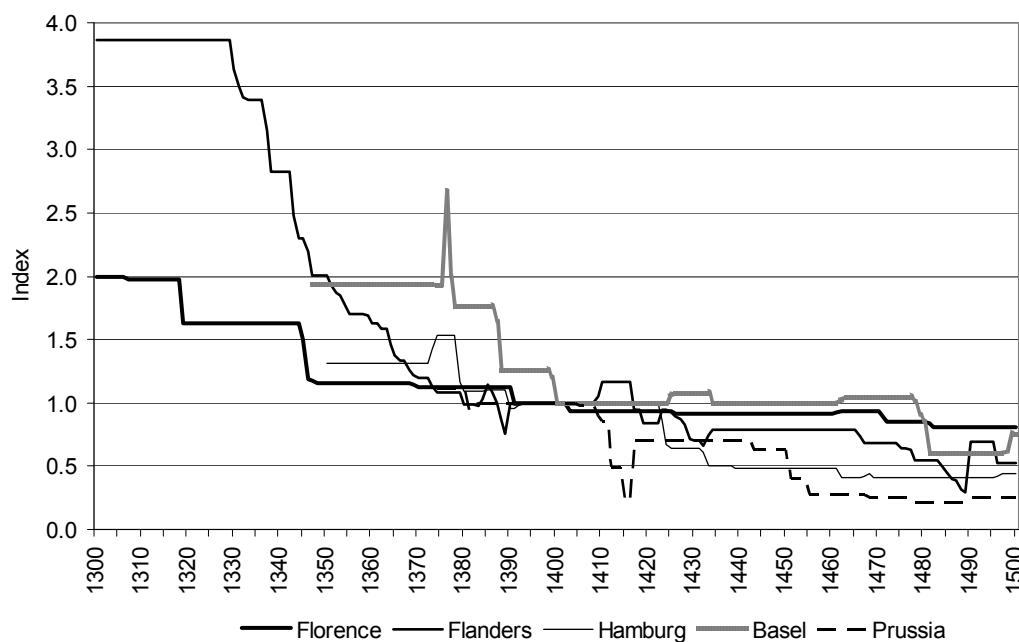
2. Status Groups

Figures 1 and 2 show changes in the standards of silver and gold currencies used in Florence, Flanders, Basel, Hamburg and Prussia between 1300 and 1500.⁴ Among the gold units, the Florentine Florin had

⁴ The curves for the silver currencies (fig. 1) chart the development of the fine silver equivalents of the units of account, the values being based on the silver content of the largest denominations. Note that in some cases there were several debasements or reinforcements per year; the curves chart the yearly means only. Lira of Florence:

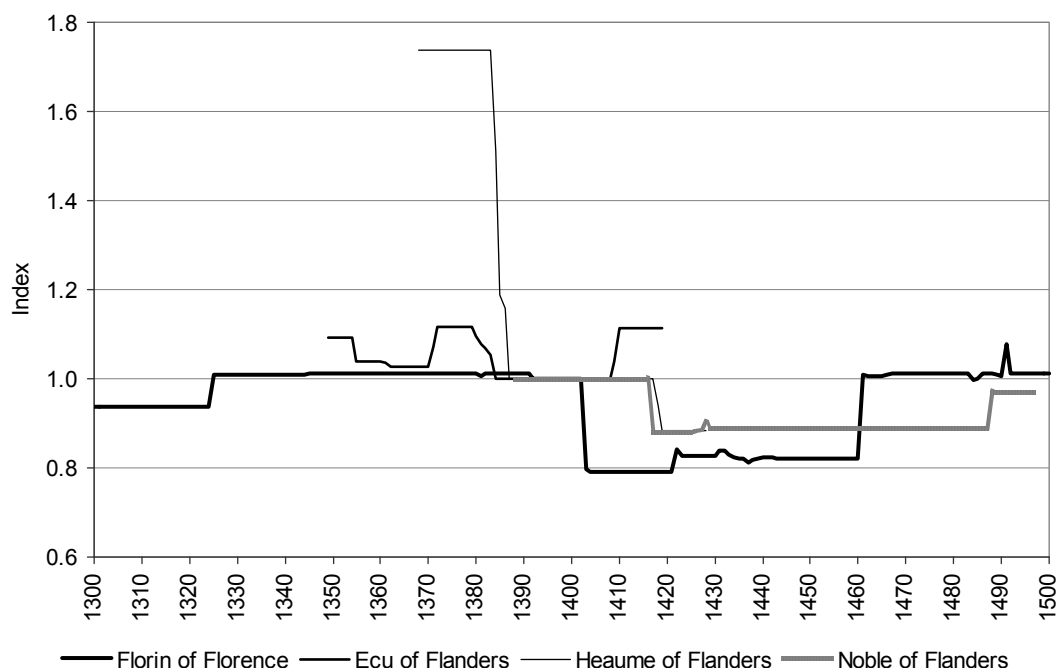
the widest currency. It originated in 1252, and was by the fourteenth century used all over Western and Central Europe (Berghaus, 1965; Giard, 1967). Flemish Écus, Heaumes and Nobles circulated mainly in Flanders and later in the Burgundian Netherlands, though the Écu and Noble occasionally appeared beyond the borders of this territory, too. In Hamburg, fifteenth-century sources (e.g. Koppmann, 1873; 1878; Bollandt, 1960) suggest that gold was practically without exception foreign. From the 1430s, the city minted its own gold coins (Stefke, 2002: 150 f.), but evidently their circulation was limited and their importance negligible.

Fig. 1: Silver Debasements/Reinforcements, Indices, 1400=1.0



Bernocchi (1975); Pound Grote of Flanders: Blockmans and Blockmans (1979), Munro (1972), Spufford (1970), Pusch (1932); Mark of Lübeck (used in Hamburg): Jesse (1928); Pound of Basel (since 1403 Rappenmünz Pound): Altherr (1910), Cahn (1901); Mark of Prussia: Volckart (1996). The gold curves (fig. 2) chart the development of the fine gold contents of the listed gold units. Again, in some cases there were several debasements or reinforcements per year; the graph shows yearly means only. Florin: Bernocchi (1975); Ecu, Heaume and Noble: Blockmans and Blockmans (1979), Munro (1972), Spufford (1970), Pusch (1932).

Fig. 2: Gold Debasements/Reinforcements, Indices, 1400=1.0



Comparing the two graphs shows the familiar phenomenon that gold tended to be significantly more stable than silver. This can be linked to the interest of international merchants in maintaining the stability and reputation of gold with which they were paid, at the expense of silver, which employers used to pay wages. As stressed, for instance, by a fourteenth-century Florentine chronicler, '[t]he merchants sold in florins, and the manufactures paid in soldi' (Coppo Stefani, 1940: 382). Accordingly, alterations of the Florin were rare and were shaped by the concerns of merchants. For example, the 'Fiorino Largo', introduced in 1422, imitated the Venetian Ducat (Targioni Tozzetti, 1775: 263; Orsini, 1790: xxi; Bernocchi, 1975: 63), whose increasing popularity was threatening the Florin's status as primary medium of international payments (Cipolla, 1956: 21).

It is also evident, however, that unlike in the high Middle Ages (Lopez, 1951: 221 ff.; Cipolla, 1963) commercial influence on monetary policies was associated with relatively stable silver currencies. In

Florence and Hamburg, where monetary policies were designed by merchants, silver was comparatively stable. Between 1300 and 1500 the Lira lost 0.45 percent of its silver content per year, the Mark of Lübeck (used in Hamburg) between 1350 and 1500 0.74 percent. Moreover, when Florence was dominated by the major guilds (before 1343 and 1383-1443) the Lira lost on average only 0.49 and 0.37 percent of fine silver per year, respectively. Under Medici rule (from 1443), when the major guilds remained hegemonic, the Lira also remained stable, suffering a barely perceptible loss of on average 0.21 percent per year between 1443 and 1500. By contrast, during the 'democratic' interlude (1343-1382), when the minor guilds influenced policies, the average yearly loss amounted to 0.90 percent.

Altogether, Basel's currency was less stable than that of Florence, suffering a loss of on average 0.61 percent of its fine silver content per year. The particular configuration of the social conflict meant that merchants may have played a part in accounting for this. The temporary dominance of the trade guilds may have meant that in the 1370s the local Pound was debased to erode the real value of rents. Conversely, after the nobility returned to power in 1375 and when Basel entered the 'Rappenmünz Union' (a monetary union with the Dukes of Austria and some neighbouring cities, cf. Cahn, 1901: 49; Weber, 1996: 483) in 1403, the currency was reinforced.

In Prussia, the attempt of the Teutonic Order to increase the value of its rental income by reinforcing the coinage without the consent of the mercantile upper classes failed in the 1370s. In 1380, the Mark was debased to align its silver content with that of the Bohemian Groat, the most important currency used in East Central European long distance trade. After a period of debasements in the early fifteenth century, the reinforcement of the Prussian Mark in 1416 again aligned it with the groat, mercantile influence again proving crucial (Volckart, 1996: 50 f., 86 f.). In

the second half of the fifteenth century, the government repeatedly carried out mild debasements that allowed the merchants from Königsberg to profit from the effects of Gresham's law in the neighbouring cities of Danzig, Thorn and Elbing, which had become autonomous in 1454 but preserved a currency union with the State of the Teutonic Order (Volckart, 1996: 213 f.). While working to the advantage of the merchants, the government of Prussia depended less on their and the nobility's support in managing the coinage than those of the cities discussed above. Correspondingly, overall the Mark was considerably less stable than their currencies, losing on average 1.17 percent of its fine silver content per year.

Still, even the Prussian currency was stable compared to the Flemish Pound Grote in the period before the takeover of Flanders by Burgundy in 1384. The Pound lost on average 2.32 percent of its fine silver content per year under Count Louis de Nevers (1322-46) and 1.99 percent under Louis de Male (1346-84). The Flemish towns may have been the most commercialised and industrialised in late medieval Northern Europe, but monetary policies were designed by the counts without consulting them. After 1384, the importance of the estates grew and the currency became more stable (Munro, 1972: 22 f.; Spufford, 1966; 1991: 310 ff.): Before the monetary unification of the Burgundian Netherlands in 1434, the average yearly loss was 0.63 percent. Between then and the death of Charles the Bold in 1477 it was down to 0.38 percent. This increased stability seems to have been primarily the result of the interest of the nobility and clergy in preserving their rental income, which allegedly had been harmed by the Flemish counts' debasements in the fourteenth century (de Win, 1986: 97 f.), rather than that of the influence of the mercantile elites. In the Burgundian estates general, urban power stagnated or declined, given that ducal territories such as Hainault and Brabant were much less commercialised than Flanders.

3. Real Wages

Figures 3 to 5 show how real wages related to silver monetary standards in Florence, Hamburg and Bruges.⁵ For Florence, there is little evidence of wage ‘stickiness’. Nominal wages almost always changed from year to year and seem regularly to have adjusted to silver debasements (cf. Goldthwaite, 2009: 488). Thus, in 1347 when nominal wages rose by almost 26 percent, real wages were nearly twice as high as in 1344. In 1369 and 1393 they were higher than in 1367, reflecting a more than proportional nominal wage rise in 1368, and 1389. Although they were slightly lower in 1427 than in 1424, they became considerably higher by 1428, as the 1426 debasement was also accompanied by a over-proportional increase in nominal wages.

⁵ The method used to compute real wages in Florence and Hamburg is the same as that used by Munro (2002) for Bruges, except that, given that there is little published data on prices of industrial goods, in Florence the commodity basket is more limited. Industrial goods represented a small share of the employee families’ expenses, and the bias resulting from this neglect should be limited. The Florentine data has been drawn from Goldthwaite (1980; 1995), de la Roncière (1982) and Tognetti (1995). The Hamburg data has been drawn from primary sources (Koppmann, 1869; 1873; 1878; 1880; 1883; 1892; 1894). Needless to say the estimates are subject to a number of caveats; for example, prices of goods are influenced by variations in quality, and wages by variations between seasons and building sites. For a detailed discussion of the issues involved with computing the estimates see Munro (2002).

Fig. 3: Silver Monetary Alterations and Real Wages in Florence, 1336-1450, Indices (1400=1)

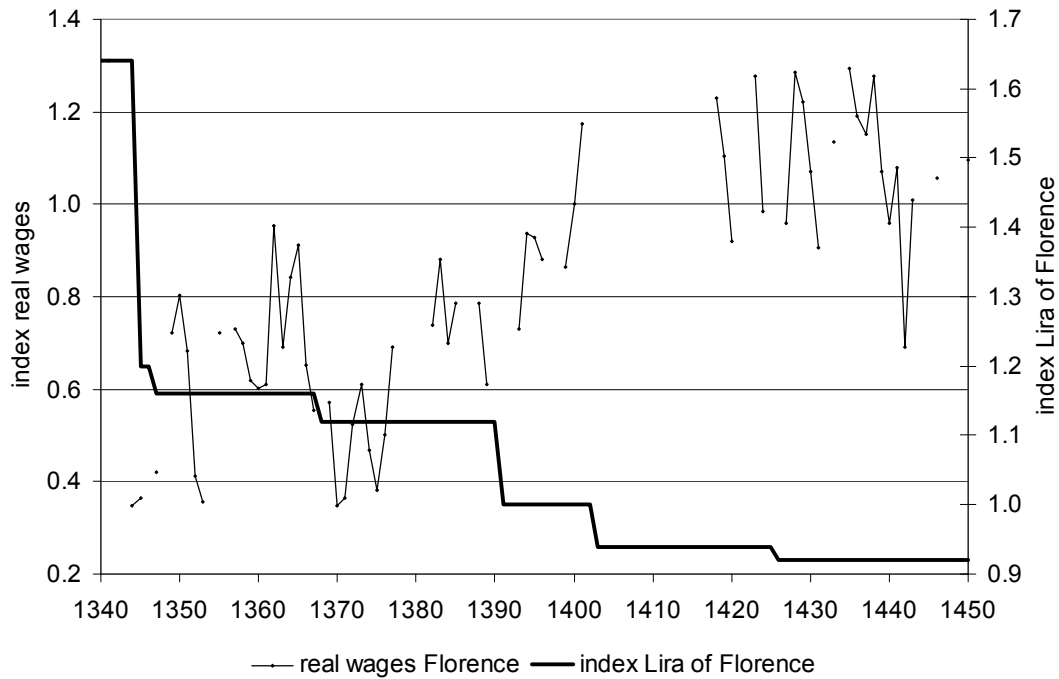


Fig. 4: Silver Monetary Alterations and Real Wages in Hamburg, 1350-1500, Indices (1475-79=1)

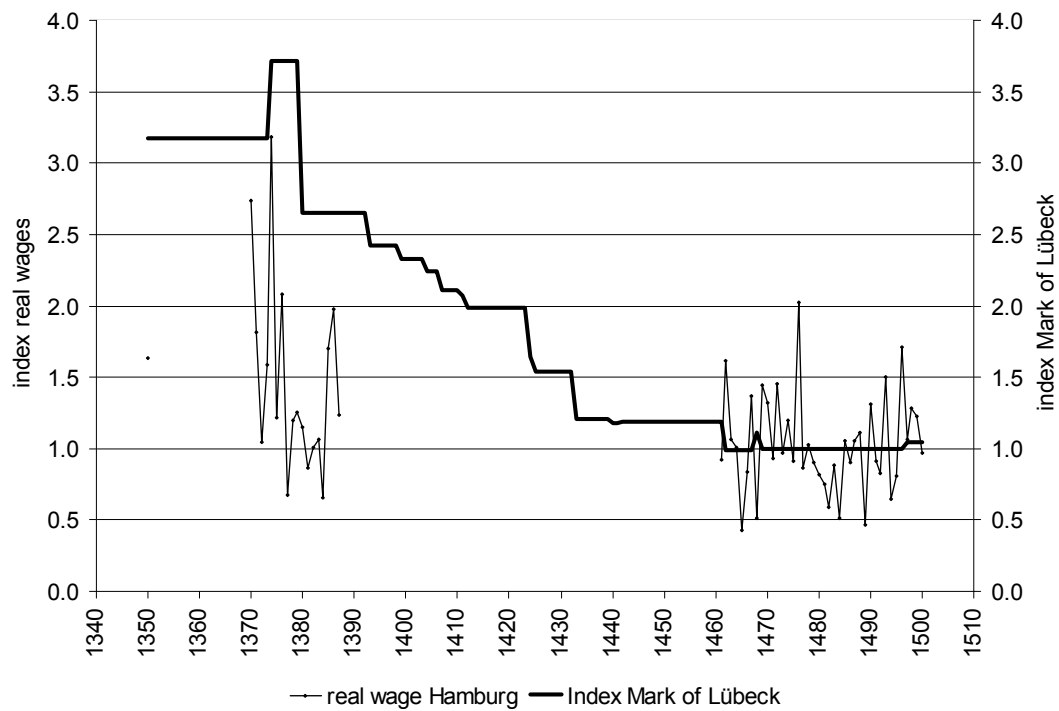
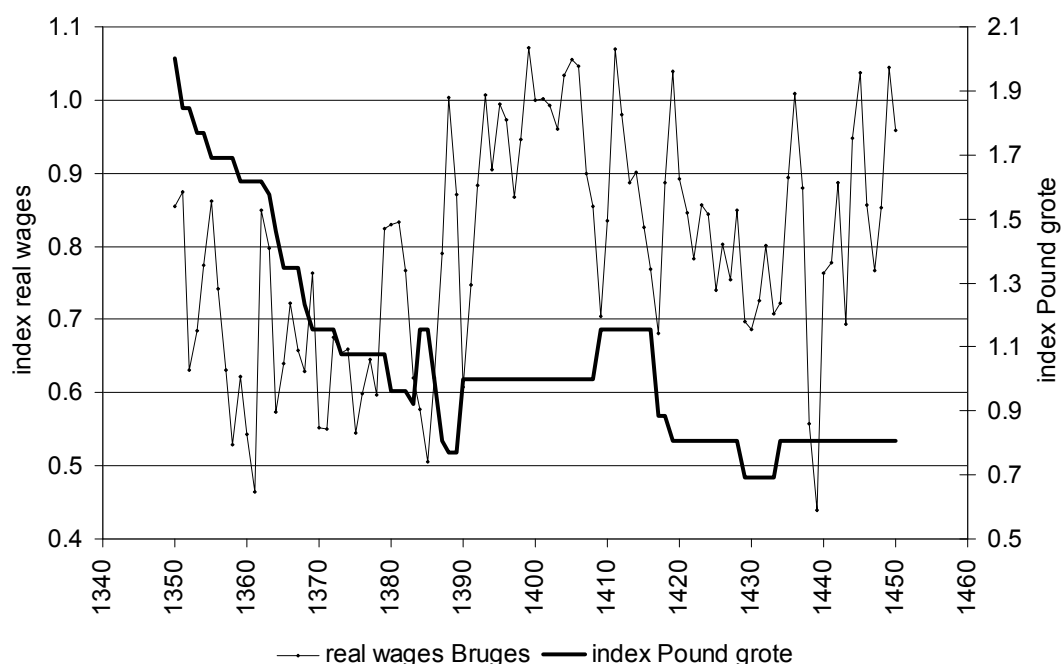


Fig. 5: Silver Monetary Alterations and Real Wages in Bruges, 1350-1450, Indices (1400=1)



Unlike in Florence, industry played a minor role in the economy of Hamburg and two of its partners with whom it had formed a currency union (the Wendish Monetary League), i.e. Wismar and Lübeck. Wages were much more important in the third partner city, Lüneburg, which had important salt works and joined the League in 1384 (Witthöft, 1976; Kahle, 1987). If we compare the thirty years before that year with the thirty years after, we find that the Mark did indeed become less stable: Before, it lost on average 0.60 percent of its silver content per year; after 1384, the yearly loss increased to 0.94 percent. However, the most serious reduction in the fine silver content of the Mark had taken place in 1379, five years before Lüneburg joined the union. This debasement had been preceded by a fall in real wages, which actually rose in the year of the debasement and after 1384. A sharp price rise occurred two years after the debasement and was matched by a more than proportional increase in nominal wages. By the 1460s the silver content of the coinage

had declined by about 50 percent, but real wages were about the same as in the 1370s. The relatively mild alterations of the 1460s do not seem to have affected them at all.

In Flanders, where the towns monitored monetary policies, the evidence – i.e. yearly data on master building craftsmen in Bruges compiled by Munro (2002: 252 f.) – runs against the claim that de Male's debasements systematically depressed real wages (van Werveke, 1949/64). Nominal wages were considerably more 'sticky' than in Florence, but in most cases (7 out of 12: 1351, 1353, 1355, 1359, 1365, 1369 and 1380) they actually grew in the year of the debasement. In five of these instances this was due to falling prices, suggesting that in Flanders, like in Hamburg, they often took a while to adjust. In the remaining two cases, the proportional price rise was below the nominal wage rise, as this exceeded the debasement. All nominal wage adjustments taking place in these years occurred either during the year before or after a debasement. Only in 1363 was the proportional change in nominal wages slightly less than that in the intrinsic value of the coinage, and often the former was significantly higher than the latter. Debasement coincided with a decline in real wages greater than 1 percent only in 1364 and 1383. In the first case this was countered by a rise in 1365 and 1366.

Reinforcements in 1384, 1390 and 1409 were tied to over proportional reductions in nominal wages, understandably leading to social unrest (de Roover, 1942: 230; Spufford, 1991: 290). However, debasements did not typically cause real wages to fall in the Burgundian years either. On the contrary, between 1386 and 1388 they rose substantially because the monetary interventions were accompanied by over proportional wage increases. Even if real wages were lower in 1416 than in 1417, they rose in 1418 and -19. In 1429, they were only slightly lower than in 1428.

Table 1: Trends in Real Wages in Bruges, Florence and Hamburg, 1350-1450 (Yearly Data)

	Period	Years covered	Percentage change
Bruges	1350-1389	41	0.23
	1390-1450	61	-4.21**
Florence	1350-1389	31	0.12
	1393-1450	29	0.39*
Hamburg	1350-1387	19	-2.34

Key: *=significant at 10%, **=significant at 5%

Munro's own data do not support his view that Louis de Male's debasements implied long-term real wage reductions between 1350 and the late 1380s (Munro, 2002: 211 ff.). Comparing Flemish conditions with the behaviour of wages in Florence and Hamburg leads to the same conclusion (cf. table 1). After the Black Death, real wages appear to have risen more rapidly in Bruges, where debasements were much more frequent and substantial, than in Hamburg, where they seem to have fallen significantly between 1350 and 1387, and Florence, which experienced a famine in the mid-1370s and a more consistent rise in real wages in the first half of the fifteenth century. In Bruges, like in Florence, deflation probably contributed to their late fourteenth-century rise. However, this was a short-term effect: From the beginning of the fifteenth century, real wages ceased to grow. These patterns as well as the lack of similar dynamics around 1409 suggest that the 'bullion famine' – an exogenous shock unforeseen by political decision makers – had a stronger influence on the behaviour of real wages in Bruges than the Dukes' of Burgundy stable-currency policy. When the Flemish cloth industry declined in the first half of the fifteenth century, real wages fell despite the fact that debasements were much rarer than under Louis de

Male. Hence, the data justify stressing the importance of monetary factors and the limitations of Malthusianism for modelling medieval wages. Still, on the whole debasements seem to have had beneficial effects for wage-earners both in the short and the long run, being often accompanied by over proportional rises in real wages that anticipated price rises.

4. Fiscal Motives

In Florence, there was hardly any link between debasements and fiscal needs and warfare (cf. Cipolla, 1983: 88). With about 0.6 percent of the nominal output, seigniorage and brassage rates on gold remained constant throughout.⁶ Their contribution to the city's expenditure was negligible, remaining well below 1 percent and decreasing over time. Silver mint revenues in periods of intense activity were more substantial, reaching about 5000 Florins per year. However, in the later fourteenth century this was less than 1 percent of the yearly expenditures (cf. Becker, 1965: 433 f.); the contribution shrank considerably in the first half of the fifteenth century, when mint output was comparatively low. The actual contribution to the state finances was even lower, as probably about half of the revenue was retained by the mint. The proportion of silver withheld there rose considerably in 1347: From c. 1.2 percent to more than 4.5 percent, when fiscal needs played a part (Bernocchi, 1975: 196; Cipolla, 1983: 44 f.). However, in 1369 it declined, as in 1372, when the small silver coins were debased. Similarly, in 1427 the rate was lower than in 1423, suggesting that the 1426 debasement was not fiscally motivated. If the rates applying to the minting of petty coins are anything to go by, the 1391 and 1403 debasements were not accompanied by a

⁶ The Florentine mint data presented here and in the next section has been extrapolated from Bernocchi (1975). The brassage was a fee that covered the production costs of the coinage apart from the cost of bullion (Schrötter, 1930: 83 f.).

rise either: Around 1426 these were the same as between 1371 and 1374.

Florence was not an isolated case. In Basel, for instance, neither wars nor disasters correlate strongly with debasements. Out of eight cases of silver debasements only those of 1377 (decided about two weeks after a major fire) and of 1425 and 1433 (carried out during the preparation and the hosting of the General Council) may have been linked to fiscal strains. There was, however, no debasement when fires destroyed large parts of the city in 1354 and 1357 or when Basel participated in military campaigns in 1374, 1409, 1441-49 and 1475-77. In 76 out of the 174 years which the records cover (1361 to 1534), Basel's revenue office did not register any payments out of the mint (Harms, 1909; 1910). In the rest of the years, the share of the income derived from the mint was on average c. 1.3 percent, with a peak of almost 11 percent in 1387. Debasements did cause a rise in mint revenues; for example in 1387 (when the Pound lost c. 7 percent of its fine silver content), in 1388 (-23 percent) and in 1400 (-16 percent). However, in 1377 and 1378, when the Pound was debased by 25 and 11 percent, respectively, and in 1481, when it lost more than 28 percent of its silver content, seigniorage did not amount to more than 1 percent of Basel's total revenues.

Hamburg presents a similar picture. Despite the fact that the fight against Denmark in the 1360s and against England in the 1470s involved both Hamburg and its partners in its monetary union, neither of them seems to have caused debasements. In addition, Hamburg repeatedly took part in smaller conflicts with neighbouring princes or lords and with pirates in the North Sea, as in 1398, 1400 to 1401 and 1433 to 1435. The latter war may actually have been linked to a debasement, but this was relatively mild, with the Mark losing only about 3 percent of its fine silver content. Hamburg's revenue office registered an income from the mint in only 48 of the 129 years for which the city's revenues are recorded

(between 1350 and 1562) (Koppmann, 1869; 1873; 1878; 1880; 1883; 1892; 1894). The average seigniorage share in those years when there were mint revenues amounted to just over 2 percent. In 1379, when the Mark was debased by over 28 percent, Hamburg received a substantial contribution (4.8 percent of its revenues) from the mint, but in 1469, when the Mark lost 9.7 percent of its fine silver, the corresponding value was 1.9 percent. Other debasements in 1392 and 1461 (by 8.5 and 17 percent, respectively) correspond to an even lower share of the mint in total recorded revenues, 0.5 and 0.2 percent respectively.

The evidence that war and fiscal needs influenced monetary policies is stronger for Flanders (van Werveke, 1931/64; Blockmans and Blockmans, 1979; Munro, 2009), particularly in the pre-Burgundian years.⁷ The Flemish mints, unlike those in Florence, Hamburg and Basel, provided a substantial if declining contribution to the budget. The counts of Flanders increased the seigniorage rate regularly when they debased their gold. In at least five cases, this applied to debasements of silver, too (though here, there are cases when the seigniorage rate fell in connection with debasements: 1343, 1354 and 1359). After the 1337 debasement, the contribution of the seigniorage to Louis de Nevers' revenues grew from just over 4 to 12.7 percent. Louis de Male may have drawn an average of more than 10 percent of his yearly budget from seigniorage. The Burgundian dukes enjoyed comparatively sound finances. Until the mid-1420s, they relied on seigniorage to meet an average of perhaps c. 4 percent of the Flemish yearly expenditure. After 1432, however, debasements ceased. In consequence, the seigniorage's contribution to

⁷ The Flemish mint data presented here and in the next section has been drawn from Munro (1972; 1981), Spufford (1970) and Blockmans and Blockmans (1979). In contrast to them, however, we broke down the data listed in the sources (which cover unequal spans of time) to daily rather than to monthly averages, before aggregating the yearly values. This led to a few discrepancies with their aggregates, but yields more precise results. The figures on the Flemish budget are drawn from Vaughan (1962: 227, 230; 1966: 106-118; 1970: 259, 262), Blockmans and Blockmans (1979: 75) and Elsen (1995: 162).

total revenues shrank rapidly to become negligible (cf. Spufford, 1970: 133).

Altogether, in Flanders/Burgundy debasements and exceptional fiscal needs were less closely associated than often claimed (Blockmans and Blockmans, 1979; Munro, 2009). First, under Louis de Male, more often than not the coinage was debased when there was no major military conflict, as in 1346, 1351, 1353, 1355, 1362, 1363, 1364, 1365, 1368, 1369 and 1373. Taken together with the comparatively large role of the seigniorage, frequent debasements that were carried out in relatively peaceful times, too, suggest that the count relied on them as a regular source of finance (like the Ottoman Empire, cf. Pamuk, 2000: 50-55). Second, the tendency to debase in the absence of military conflict continued in the Burgundian period (1386, 1387, 1388, 1429, 1430, 1432, 1433 and 1434), when, in addition, exceptional needs were met through alternative sources. Neither the disastrous crusade (1394-1397) nor the costly French campaigns in 1405, 1410 and 1411 and the annexation of Luxembourg (1443) were financed through debasement.

Again, we can find a parallel in Central Europe: Prussia. Since the creation of the Polish-Lithuanian union in 1386, the Teutonic Order came under increasing pressure. The period of crisis into which it entered turned out to be practically permanent (Dralle, 1975; Burleigh, 1984). The Order fought (and lost) major wars against Poland-Lithuania not only in 1409/10, but also in 1422, 1454 to 1466, 1478 and 1520/21 – the last conflict leading to the replacement of its rule by a secular duchy. The Mark of Prussia was frequently debased: Mostly either in the run-up to wars (1408, 1409, 1410, 1451), during wars (1455, 1478), or immediately after (1412, 1415). The Teutonic Order's fiscal difficulties were particularly severe after its defeat in 1410. To collect the ransom for the knights captured by the Polish (100,000 Bohemian Groats), the Order reduced the silver content of the Mark by almost 75 percent, hoping to be able to

exploit the time lag between the debasement and the appreciation of the Groat (Volckart, 1996: 66 ff.). Still, as mentioned above, here as in Flanders debasements did occur outside the context of wars, with some of them either certainly (1380 and mild debasements in the later fifteenth century) or probably (1399 and 1442) reflecting mercantile interests.

5. The Supply of Money

The link between commercial influence and relatively stable silver currencies that we identified earlier is not the only evidence against the argument that an excess demand for bullion was a major cause of debasement. Debasements were particularly frequent in Flanders after the Black Death, when the demand for money fell. With the partial exceptions of late-fourteenth-century Basel and mid-fifteenth century Prussia, silver debasements did not become more frequent during a late medieval 'bullion famines'. The 1402 debasement of the Florin is the only instance of substantial debasement of gold during the heights of bullion scarcity.

Post-1350 Florentine and late medieval Flemish debasements have been interpreted as a means to counter the effects of wear and tear (Goldthwaite and Mandich, 1994: 15; Goldthwaite, 2009: 488; Fantacci, 2008: 61). In a number of cases, particularly in Florence, they were mild enough (below 3 percent) to suggest that this motive may have played a role. Still, on the whole they were neither as small nor as regular as we would expect if they had been aimed solely at addressing this issue: Its actual relevance seems to have been overstated (cf. figures 1 and 2).

This is not to deny that in Florence debasements were mainly monetary (cf. Cipolla, 1983; Goldthwaite and Mandich, 1994; Goldthwaite, 2009: 48): In all cases where mint data is available, monetary needs appear to have been genuine. Thus, the output of Florins was below

average in the decade before the mild debasement of 1391 and moved towards normal levels in the year of the alteration. Between 1380 and 1390 a yearly average of 96 kg of gold was minted, as compared to an overall yearly average of 183 kg until 1435. In 1391, 151 kg of gold were minted. We lack data from the 1402 debasement, when according to Targioni Tozzetti (1775: 261 f.) the city was 'forced to reduce the weight of the Florin ... because it was customary for all the other powers continuously to worsen their coinage, ... with the consequence ... that the city was being emptied of good gold and was filled with bad coins'. We know, however, that with just 32 kg output was very low when another debasement was carried out in 1423; then it grew significantly. In 1424 the gold output reached 138 kg.

Turning to silver, in 1345, when the Grosso was debased, its output was exceptionally low: 299 kg. This was because following a rise in the price of silver relative to gold in the 1330s and early 1340s, which probably resulted from an inflow of gold from the East, the Grosso's face value had fallen below its intrinsic value. The coins were therefore melted rather than minted. Since the gold-silver ratio continued to fall, another debasement was needed in 1347, carried out by minting new Grossi whose higher face value was not compensated by a proportional increase in their intrinsic value (Pagnini del Ventura, 1775: 393 ff.; Villani, 1845; Coppo Stefani, 1940: 147; Bernocchi, 1975: 190, 260 ff.; Cipolla, 1983: 42). From then until 1351, their output rose substantially (from 1,124 to 4,565 kg).

When 'bad' Pisan coins flooded Florence between 1353 and 1367, its output of silver was very low (yearly average 328 kg). The mint reacted by reintroducing a medium-sized coin in 1368 and by debasing the Grosso and Quattrino in 1369 and 1371, respectively (Bernocchi, 1975: 200-204; Cipolla, 1983: 69-74). The last intervention put an end to the Pisan 'invasion' and triggered a sudden rise in the minting of silver that

reached over 8,000 kg in 1372 and 1373. It is likely that in 1392 similar circumstances led to the debasement of the Grosso. In 1391, its output was only 246 kg, to go up to 818 kg in the following year. During the 'bullion famine', however, silver ceased to be minted (1392 to 1402: Day, 1980/87: 26). Finally, it seems that the mild debasement of the Grosso in 1426 was also preceded by a relatively low mint output. In 1423, the figure was 179 kg; by 1427 the output was 826 kg. Yet, output seems to have begun to rise before the debasement.

Flemish data suggest that the May 1337 debasement was purely fiscal. Blockmans and Blockmans (1979: 72) see the 1337 intervention as partly reacting to the French debasement of January 1337. The 1337 pre-debasement data, however, signal no slow mint activity. On the contrary, output was in line with the average level of the period and rising (average monthly output 1334-1338: 662 kg; 1336: 559 kg; and 1337, before May: 678 kg), as the seigniorage rate had been reduced in January 1337. The ordinance of May 1337 sharply increased the seigniorage rate; this explains a temporary fall of the output in the month of the debasement. However, both output and seigniorage remained particularly high for the following twelve months (average monthly output 914 kg). The claim that the April 1343 debasement was defensive against a French debasement in June 1342, as the towns were driving the monetary policy (Blockmans and Blockmans, 1979: 73), is more convincing. In April 1343, output was actually less than a fifth of what it had been four months before the debasement (105 as compared to 558 kg), and this despite the fact that the debasement was linked to a reduction in the seigniorage rate.

Louis de Male's interventions were less unambiguously aggressive than often assumed (van Werveke, 1949/64: 261; Blockmans and Blockmans, 1979: 81; Murray, 2005: 126-30). As stressed by Laurent (1933: 40), he did face a genuine scarcity of bullion, and Day's (1980/87: 14) interpretation that his motives were mixed seems correct. The output

of gold was high before the debasements of the Mouton between 1359 and 1364 (the yearly output had been above 2000 kg since 1355 and reached more than 4000 kg in 1357; 1364, when just 529 kg of gold were minted, was exceptional). Although this suggests purely fiscal motives, there is evidence of monetary needs for the debasements of the Écu in 1355, which was preceded by a rapid decline (from 1140 kg in 1352 to 82 kg in 1354), and between 1381 and 1384: In 1377 and at the beginning of 1380s, output was well below 500 kg, falling to 192 kg in 1384. Silver presents a similar picture. There is strong evidence of purely fiscal motives in May 1351, October 1353 and October 1383: Mint output in the months before the debasements was high (except in September 1353) and alterations were linked to a rise in the seigniorage rate. However, in the months before December 1354, November 1359, December 1361, February 1368 and October 1369 output declined or was low, and (with the exception of February 1368) the seigniorage rate was reduced in connection with the debasements.

All debasements for which we have mint data in the Burgundian years were preceded by either low or declining outputs, indicating that the presence of genuine monetary issues became a precondition of debasements. Thus, the gold output was exceptionally low in 1415 (less than 2 kg) before the Noble was debased in 1417. Despite a sudden rise it remained low (less than 12 kg) before the 1419 debasement of the Heaume. Between 1427 and 1428 there was sudden fall from 1419 to 365 kg, before the Noble was debased again in 1429. The 1434 debasement of the Peter, the 1470 debasement of the Philippus and the 1478 debasement of the Andreas were all preceded by declining outputs. Before silver debasements were carried out in November 1386, April 1387 and February 1388, output had been falling rapidly, owing to the combined effects of debasements in France and the Low Countries and the 1385 reinforcement. Where in 1385, 1747 kg were minted, in the

following year the figure was as low as 310 kg. Between the 1390 reinforcement and a mild debasement in 1392 output declined, too. We lack data from the year of the December 1416 debasement, but we know that in the aftermath of the 1410 reinforcement there was a sharp fall in mint activity, probably exacerbated by a French debasement in 1415. Between 1412 and 1413 mint output fell from 6957 kg to 700 kg; by 1415, it was 446 kg. Likewise, debasements in 1426, 1427 and 1429 were preceded by rapidly declining outputs. In the year before the 1423 reinforcement, 16,481 kg of silver were minted, in contrast to 427 kg in 1427. It is only after the substantial debasement of 1429 that minting went back to the pre-reinforcement level. The effect was, however, short-lived. By the time the coinage was debased again in 1432, output had fallen to 676 kg. In view of these figures, Munro's (2009: 24-27) rejection of monetary motives in favour of purely fiscal ones during the Burgundian period is unconvincing.

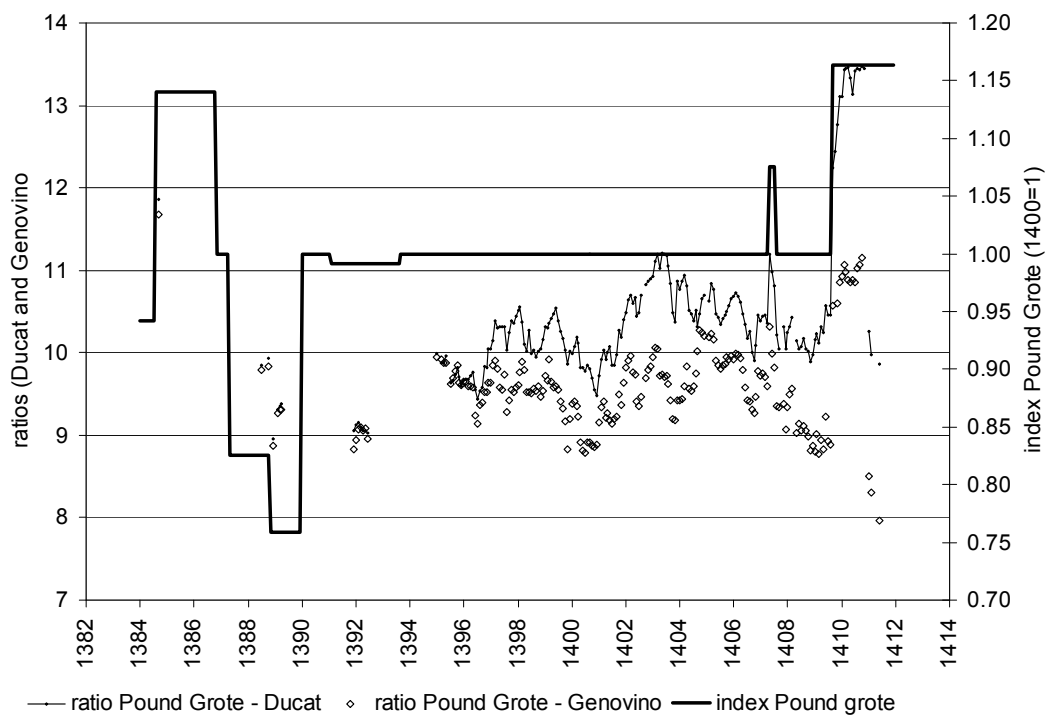
6. Gold-Silver Ratios in Bruges and Florence

Bruges and Florence are ideal starting points for an analysis of how monetary alterations affected gold-silver ratios because data on exchange rates from these places are exceptionally well-preserved.⁸ As mentioned earlier, debasements had a temporary effect on the purchasing power of coins, which lasted until prices adjusted to their growing quantity and their falling intrinsic value. One would expect the

⁸ To compute the gold-silver ratios used here and in the subsequent analysis, the following assumptions have been made: first, unless specified otherwise, transactions were carried out manually; second, if not explicitly stated otherwise, the sources presupposed *argent le roi* and gold of corresponding purity as raw materials; third, people used the largest silver denominations available to pay for high-purchasing-power gold coins; fourth, after debasements, within the home territory, new money replaced old coins within one year, whereas abroad, adjustment entailed a time lag of one year; and, fifth, gold and silver coins suffered alike from wear and tear. For a detailed discussion of the rationale behind and the implications of these assumptions see Chilosi and Volckart (2009).

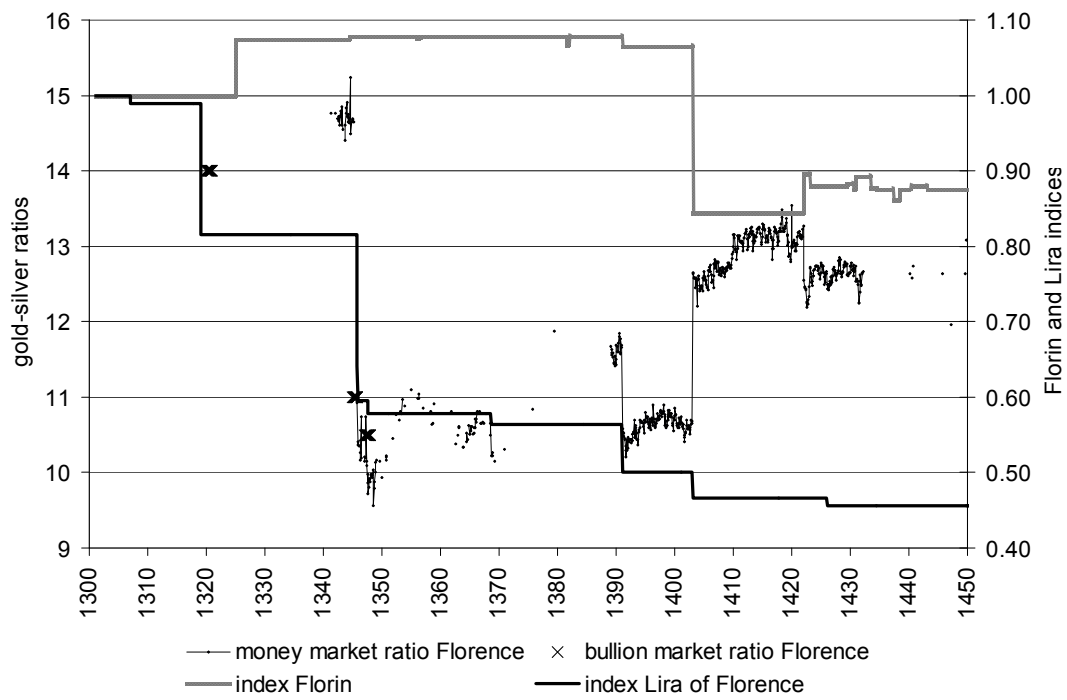
exchange rates between gold and silver to follow analogous dynamics; if anything, the money market should adjust more rapidly than other markets. Indeed, according to Spufford (1991: 293), late medieval exchange rates reacted to significant debasements in a matter of weeks or even days. Munro (1972: 31), by contrast, emphasises that financial markets lacked flexibility. Recent studies estimate the typical speed of adjustment after a shock to be in the order of months (Volckart and Wolf, 2006; Kugler, 2008; Chilosì and Volckart, 2009).

Fig. 6: Monetary Alterations and Monthly Gold-Silver Ratios in Bruges, 1389-1411⁹



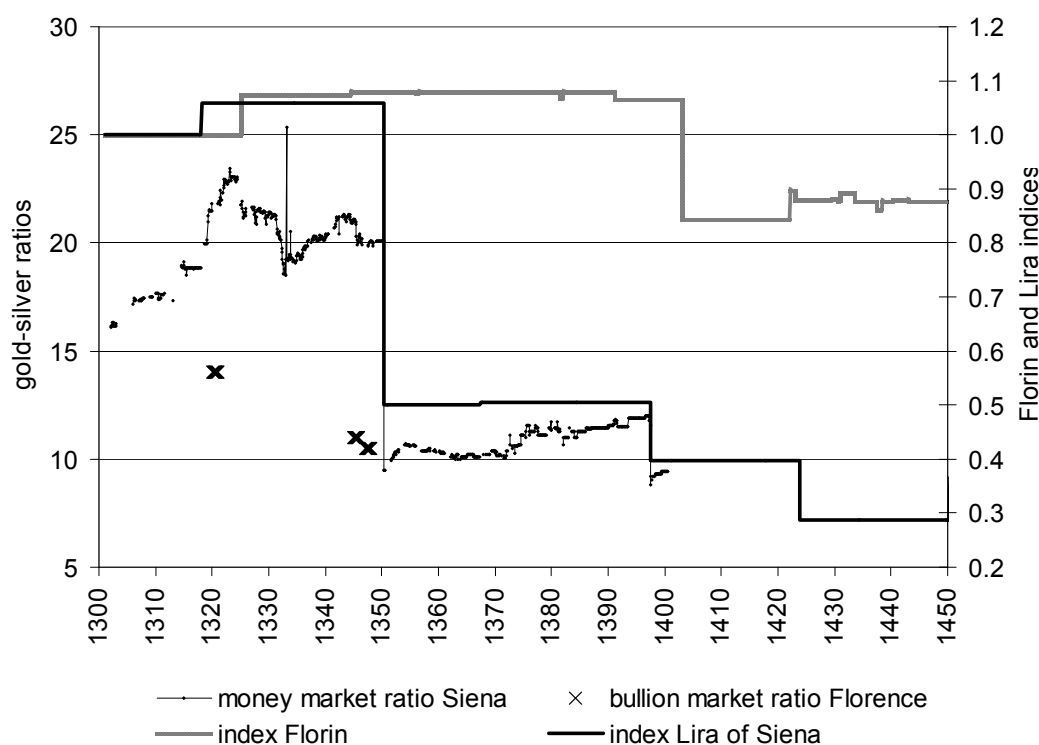
⁹ Index Pound grote: 1400 = 1. Indices for the Ducat and the Genovino are not shown as these coins remained stable over the period here considered. Exchange rates: de Roover (1968: 106 ff.)

Fig. 7: Monetary Alterations and Monthly Gold-Silver Ratios in Florence, 1300-1450¹⁰



¹⁰ Exchange rates: Spufford (1986: 3 ff.); bullion content Bernocchi (1975).

Fig. 8: Monetary Alterations and Monthly Gold-Silver Ratios in Siena, 1300-1450¹¹



In Bruges, exchange rates between gold and silver coins adjusted to monetary alterations in a matter of months (fig. 6). Data from April 1389 and December 1391 show that after the January 1390 reinforcement, the gold-silver ratios were only slightly lower than before, indicating that the intervention had no enduring effect. This is confirmed by the September 1409 reinforcement: It did lead to a sudden upward shift of the gold silver ratio, but this lasted just over a year. By January 1411 the ratio had returned to its pre-reinforcement value.¹²

¹¹ Exchange rates: Bernocchi (1976: 92 ff.); bullion content: Bernocchi (1975) and Toderi (1992).

¹² The spread between the ratios calculated on the basis of the Ducat and the Genovino that developed since the middle of the 1390s mirrors the emergence of the Ducat as the more important medium of international transactions, for which merchants were prepared to pay a premium.

This is not, however, what happened in Florence and Siena (figs. 6 and 7).¹³ There, monetary alterations were not followed by adjustments of the exchange rates, with the consequence that debasements caused enduring shifts in the gold-silver ratios. The dynamic was described by the late eighteenth century Florentine scholar Pagnini del Ventura (1775: 411) as ‘one of the many not easily perceivable combinations, of which the matter of money is capable ... In effect, the quantity of fine silver, which was received in barter [for the Florin], came to be reduced’. To understand this pattern, we concentrate on the 1345 and the 1391 debasements. We do this for a number of reasons: First, these years are relatively well-covered by the gold-silver ratios; second, at least the debasement of 1345 has been amply studied so that the discussion is grounded; third, both debasements were substantial alterations, making their effects particularly marked; fourth, they involved silver only so that the analysis is comparatively simple; and finally, as argued in the previous section, they represent two distinct ‘ideal types’ of monetary debasements.

Just before the debasement of the Florentine Grosso in October 1345, gold was less (and silver more) expensive on the bullion than on the money market. The gold-silver ratio calculated on the basis of the price of silver ingots in Florins for 1345 is 1:11 (Cipolla, 1983: 17 f.). At the same time, the ratio based on the exchange rate between Florin and Grosso was 1:14.7. The spread seems to have developed as a result of a fall in the bullion market ratio that in 1320 had been about 1:14, too. Sieneese data suggest that the two ratios began to diverge in 1333. In Siena between 1323 and 1333, the money market ratio had moved into the same direction as the Florentine bullion market ratio: It had fallen, indicating that gold became cheaper and silver more expensive. From

¹³ Given the proximity of Florence and Siena, we can use Sieneese data to illuminate patterns during periods not covered by the Florentine series.

1333 to 1343, however, the Sienese money market ratio went up again, whereas the bullion market ratio continued to fall. The timing of the divergence suggests that from about 1333, with silver becoming more expensive, the intrinsic value of the Grosso climbed above its face value. In consequence, consumers ceased demanding Grossi to use them as money, relying instead on substitutes like the Florin. As the demand for Grossi declined and that for Florins grew, Grossi depreciated with respect to Florins at the same time as silver was appreciating with respect to gold on the bullion market.¹⁴ In consequence of the 1345 debasement in Florence, not only did the intrinsic value of the Grosso fall below its face value; the gold-silver ratio on the money market also converged with the bullion market ratio: By 1347, both ratios had stabilised at between above 1:10 and 1:10.5. The Sienese debasement of 1350 had the same result.

As for the Florentine debasement of 1390, both Sienese and Florentine data indicate that it was preceded by a rise in the money-market gold-silver ratio. The Florentine bullion market gold-silver ratio is supposed to have remained stable at this time (Goldthwaite, 2009: 488). Owing to more than twenty years without a debasement, by the late 1380s the money market was very likely 'dirty', i.e. local demand was met with 'bad' foreign silver coins. The expected quantity of silver that could be obtained in exchange for the Florin accordingly decreased, causing a depreciation of silver with respect to gold in the money market, but not in that for bullion. By aligning the bullion contents of the Florin and the Grosso with those of the 'bad' foreign coins, however, uncertainty was reduced. Consequently, once again the money market ratio stabilised at around 1:10.5 (the same level as after the previous debasement).

¹⁴ Although the divergence could have been exploited by speculators in a way that stimulated the demand for the Grossi, this adjusting mechanism does not seem to have operated: perhaps their scarcity implied high transaction costs.

7. Central European Gold-Silver Ratios

We can apply the two ideal types identified in the previous section – i.e. adjustment of the gold-silver ratio in the absence and non-adjustment in the presence of monetary motives – to Central European debasements, too. When there was no adjustment, the effect of a debasement on the gold-silver ratio resembles a level shift. Hence, we can use the Chow test (Chow, 1960) to examine if there is evidence of monetary needs behind Central European debasements. The test is relatively undemanding in terms of data availability and thus suited to investigate the possibility of multiple breaks occurring in a relatively short span of time. Its main drawback is that, unlike structural time series models (Harvey, 1989), it assumes stationarity of the level before and after each structural break. However, the available data are insufficient to take this approach. Moreover, the violations of the assumption are so limited that they hardly affect the results. An alternative non-standard approach that does not assume stationarity and directly tested lack of adjustment produced almost identical results. Before carrying out the test, we examine if the gold-silver ratio moved in the direction predicted by a monetary intervention: Silver debasements should lead to a sudden decrease of the gold-silver ratio, and gold debasements to an increase. As shown by the previous analysis, not all debasements in a monetary area need to have been motivated by the same reason. We therefore carry out the Chow test individually on each debasement. Specifically, the test examines if the intervention led to a level shift of the series comprised between the previous and the subsequent debasement.

In this way we examine 30 cases of debasement from the perspective of 13 cities.¹⁵ The results of the tests are summarised in

¹⁵ Debasement data sources: Florin: Bernocchi (1975); Rhinegulden and Albus of Trier: Weisenstein (1995); Pound of Basel, Pound Rappenmünze: Altherr (1910), Cahn (1895); Mark and Albus of Cologne: Metz (1990); Mark of Prussia (1996); Pound Grote: Blockmans and Blockmans (1979), Munro (1972); Pusch (1932); Tyrolean Kreuzer:

table 2. The first three columns show the city and the gold and silver coins on which the calculation of the gold-silver ratios is based. The fourth column gives the year of the intervention and the metal debased. The two next columns present the size of the sample of the gold-silver ratio series used for the Chow test, the value of the F-statistic and its level of significance. When the test is not performed, we do not provide the sample size, and write 'opposite' in the sixth column. The last column shows if the results provide evidence of monetary motives. Whenever the level of significance is higher than 1 percent, the decision is based on whether the graph conforms to the expected pattern.

Nagl (1906), Koch (1994); Ducat: Lane and Mueller (1985); Pound of Nuremberg: Scholler (1916); Schock Groates (Bohemia): Castelin (1973). The exchange rates used in calculating the gold-silver ratios will be documented in the forthcoming 'Handbook of Late Medieval Exchange'.

Table 2: Results of Tests for the Presence of Monetary Motivations
behind Debasements in Central Europe

	Gold coin	Silver coin	Debasement	N	F statistic	M
Basel	Florin	Pound of Basel	1373 (S)		Opposite	No
			1377 (S)	13	0.27	No
Basel	Rhinegulden	Pound Rappenmünze	1425 (S)		4.32**	No
				30		
			1433 (S)	36	46.21***	Yes
			1463 (S)	46	47.02***	Yes
			1481 (S)	69	7.36***	Yes
Cologne	Florin	Mark of Cologne	1372 (S)	12	218.44***	Yes
Cologne	Rhinegulden	Albus of Cologne	1420 (S)	15	2.18	No
			1438 (S)		Opposite	No
			1455 (S)	30	139.04***	Yes
			1481 (S)	44	43.70***	Yes
			1510 (S)	38	0.76	No
			1520 (S)	39	1.44	No
Danzig	Hungarian Florin	Mark of Prussia	1442 (S)		Opposite	No
Düren	Rhinegulden	Albus of Cologne	1481 (S)	20	67.51***	Yes
			1510 (S)	36	23.77***	Yes
			1520 (S)	38	13.22***	Yes
Ghent	Florin	Pound Grote	1354 (S)		Opposite	No
			1368 (S)		Opposite	No
Hall i.T.	Rhinegulden	Tyrolean Kreuzer	1461 (S)	24	40.58***	Yes
Hamburg	Rhinegulden	Mark of Lübeck	1461 (S)	20	6.10**	Yes
Koblenz	Rhinegulden	Albus of Cologne	1481 (S)	52	22.93***	Yes
			1510 (S)	37	21.98***	Yes
			1520 (S)	37	7.87***	Yes
Marienburg	Hungarian Florin	Mark of Prussia	1408 (S)	12	2.37	No
Nuremberg	Rhinegulden	Pound of Nuremberg	1510 (S)	26	144.64***	Yes
Prague	Rhinegulden	Schock groates	1539 (S)	16	43.28***	Yes
Trier	Rhinegulden	Albus of Trier	1419 (G)	21	29.01***	Yes
			1438 (S)	30	9.91***	Yes
			1464 (G)	24	7.24**	No
			1482 (S)	20	1.85	No
			1488 (G)		Opposite	No
			1504 (S)	20	0.41	No
			1510 (S)	25	0.61	No
Vienna	Hungarian Florin	Pound of Vienna	1436 (S)	28	0.29	No
			1460(S)	31	0.01	No

Key: N=sample size, *=significant at the 10 percent level, **=significant at the 5 percent level, ***=significant at the 1 percent level, M=evidence of monetary motivations, G=gold and S=silver.

In the case of the debasements of the Albus of Cologne in 1481, 1510 and 1520 it is possible to examine the effect of the debasement from the point of view of three cities. While evidence of monetary motivations is consistent for the first debasement, this is not the case for the last two, which produced evidence of monetary motivations in Düren and Koblenz, but not in Cologne. This can be expected, given that monetary conditions could vary within a currency area, with the implication that not all cases where monetary motivations were present are captured by our analysis. The data shows that while the 1510 debasement can be classified as at least in part monetary, this is not the case for the 1520 debasement, for which the results are distorted by non-stationarity. Other significant results, however, do not appear to have been influenced by this. Another issue that needs to be highlighted is that when the magnitude of the intervention was small, shifts are less apparent; therefore the power of the Chow test is low. This caveat applies to the following debasements whose magnitude was below 5 percent: The Pound of Basel in 1373, the Pound Grote in 1354 and 1368, the Pound of Nuremberg in 1510, the Albus of Trier in 1504 and 1510, and the Rhinegulden in 1419 and 1488.

The analysis finds evidence of monetary motives in 13 cases out of 30, i.e. in 44 percent of the cases, thereby confirming that both non-monetary and monetary issues played an important role in the area. Consistent with Weber's (1996: 483) argument that the debasements of Pound of Basel in the 1370s were redistributive in nature, and with the results of Kugler's (2008) econometric analysis, the Basel gold-silver ratios adjusted in the aftermath of the 1373 and 1377 debasements; the latter may have also been linked to fiscal issues. However, in line with the results of the previous analysis (cf. section 3), in the following period there is evidence of monetary issues in three cases out of four in Basel and in the one case from Hamburg. The exception from Basel (1425)

occurred at time when fiscal issues may have been present, whereas we know that there in 1481 and in Hamburg in 1461 the fiscal contribution of seigniorage was negligible despite the magnitude of the interventions. Conversely, there is no evidence of monetary needs in the Flemish (Ghent) and Prussian cases (Marienburg and Danzig). This is despite slow minting before the 1354 and 1368 debasements of the Pound Grote, suggesting that the pattern was due to cities other than Ghent, and that the 1442 debasement of the Mark of Prussia may have been linked to commercial interests. The 1409 debasement of the Mark, however, was carried out in the run-up to a war. In just one case (Cologne 1438), a debasement was carried out during a military conflict. In contrast to the wider tendency of the coinage, there is no evidence of monetary motives in this instance. Consistent with previous results, monetary motives were present significantly more often – in 60 as compared to 27 percent of cases – when the mint was not run by a prince. Despite the small sample size, this difference is sufficient for the chi-square test to reject the hypothesis of no association between political institutions and presence of monetary motives at the 10 percent level.

8. Bullion Famines, War and Regime Types

We examine the effects of bullion famines, warfare and regime types on debasement through a regression analysis of data from England and France as well as from Italy, Flanders and Central Europe.

Debasement is measured in three ways: First, as a dummy variable (DEBASE). Second, as the ten years rolling standard deviation of the index of its bullion content (INSTABILITY), which is set to 1 in the first year for which data on the bullion content of the currency is available; the higher the standard deviation, the greater the currency instability. This measure has the advantage of taking into account not only how frequent

but also how significant changes were. Still, using the standard deviation as a measure of stability does not allow to distinguish between variations induced by debasement and reinforcement. This issue, which is particularly serious for gold currencies, is addressed by the third measure: The slope of the trend of the index (TREND). Only negative values are considered. To make the comparison with the others measures more straightforward, its value is multiplied by -1, so that it becomes greater the more rapidly the fine bullion content decreased. Obviously, in most years there was no debasement. Hence, these dependent variables imply that a Probit method should be used with the first measure and a Tobit method with the other two. As we expect that gold and silver currencies may follow different dynamics, the two metals are examined separately.

Given that we are working with a sample of debasements and that all variables are strictly exogenous, we control for unobservable currency-specific factors with random-effects. Unaccounted for time effects are captured by decade dummies.¹⁶ Time dummies are also used to investigate the effect of the bullion famines (FAMINE).¹⁷ We use two measures of war. The first one is a dummy variable signalling that at least one place in the currency area was involved in a military conflict (WAR). The second one takes into account the facts that fiscal debasement may occur also in the run-up of follow-up of wars, and that longer conflicts produce more severe fiscal strains. It measures the variable as the ten years moving average of the number of wars involving at least one place in the currency area (WAR_10). The effect of regime types is investigated in two ways. First, we compare princely currencies with those minted by

¹⁶ In the case of the Probit analysis of gold these were not included as given, that a small minority of values of the dependent variable are one, it was difficult to achieve convergence.

¹⁷ Examining the effects of the famines separately did not produce new results.

monetary unions (UNION) and city-states (CITYSTATE).¹⁸ Since only one gold currency was minted by a union between princes, in the case of gold we only compare princely currencies with those minted by city-states. Second, we investigate the interaction between political institutions and war.¹⁹ Table 3 shows the results. The first six columns refer to gold and the following six ones to silver. The effect of each of the three independent variables is examined first without the interaction coefficient, and then with it (therefore there are six columns for each metal). The chi-square statistics and the associated P-values indicate how well the model fits the data by testing the hypothesis that all coefficients are equal to 0.

¹⁸ CITYSTATE covers Italian city states as well as free Imperial cities and territorial cities that were autonomous with regard to monetary policies.

¹⁹ Following Aiken and West (1991), war was centred (i.e. it was divided by the sample standard deviation, after the sample mean was subtracted) before carrying out the interaction analysis.

Table 3: The Causes of Debasement: Econometric Analysis

	Gold						Silver					
	DEBASE	DEBASE	INSTABILITY	INSTABILITY	TREND	TREND	DEBASE	DEBASE	INSTABILITY	INSTABILITY	TREND	TREND
FAMINE	-0.0420	-0.0422	0.0327	0.0329	0.0044	0.0043	-0.1847	-0.1841	-0.0190***	-0.0177***	0.0059***	0.0059***
WAR	0.1147	0.1079					0.2087**	0.1994				
WAR_10			0.0018	-0.0066	-0.0064	-0.0209			0.0071***	0.0087***	0.0007*	0.0001
UNION							-0.1213	-0.1318	-0.1427*	-0.136*	-0.0026	-0.0029
CITYSTATE	0.0120	0.0079	0.0240	0.0241	0.0028		-0.1970	-0.1963	-0.0171**	-0.0175**	-0.0030*	-0.0033*
WAR*UNION								0.0717				
WAR*CITYSTATE		0.0165						-0.0168				
WAR_10*UNION										0.0013		0.0033***
WAR_10*CITYSTATE				0.0030		0.0044**				-0.0063*		0.0004
Decade dummies	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Random effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Probability > χ^2	0.8992	0.9641	0.0000	0.0000	0.0000	0.0000	0.0112	0.0222	0.0000	0.0000	0.0000	0.0000
Model Wald χ^2	0.59	0.59	75.40	75.68	78.68	80.52	35.81	35.93	195.74	200.71	159.71	167.10
N	2050	2050	1843	1843	1843	1843	3719	3719	3441	3441	3441	3441

Key: *=significant at the 10 percent level, **=significant at the 5 percent level, ***=significant at the 1 percent level, N=sample size.

The low frequency of debasements implies that the Tobit models perform better than the Probit models. For gold when Probit is used, we are not even able to reject the null hypothesis of no association between debasement and the independent variables. The results highlight that bullion famines, warfare and political institutions have limited or no explanatory power for alterations of the gold coinage. The coefficients of FAMINE, WAR and WAR_10 all have inconsistent signs across specifications and are never significant. Although it appears that in city-states, gold tended to be debased more often, and that war caused greater fine bullion reductions than in princely territories, the interaction coefficient is significant at the 5 percent level only in one case. Moreover, the magnitude of the coefficients tends to be considerably smaller than for silver. The lack of association between gold debasement and warfare is consistent with Sussman's (1993: 67 f.) and Volckart's (2009) observation that the demand for gold was more elastic with respect to its intrinsic value. As a consequence, the incentives to debase for fiscal purposes were weaker for gold than for silver. The findings suggest that in both principalities and city-states the gold was debased mainly for other reasons, such as e.g. countering Gresham's Law.

The story changes with silver, which in the Tobit models produces a number of statistically significant results. Though highly significant in four cases out of six, the sign of FAMINE is negative, rather than positive. This indicates that instead of causing debasements, the bullion famines restricted the scope for interventions because there was less money that could be dishoarded and brought to the mints. Even if debasements Central Europe were particularly frequent in 1400-10 and 1440-60 (cf. (Chilosi and Volckart, 2009), these were part of wider cyclical dynamics which are captured by the decade rather than the famine dummies, suggesting that the pattern reflected periodical 'cleanings' of the money market. Across specifications, war has the expected sign, and in four

cases out of six it is significant, showing that even if debasement was carried out during a conflict in fewer than 20 percent of the cases, war made it significantly more likely. The same holds for principalities. Monetary unions and especially city-states debased significantly less frequently and had more stable currencies than princes. In fact, marginal effect analysis based on the Probit model without interaction shows that the importance of political institutions was comparable to that of warfare. Other things being equal, any new observation has a probability of being a debasement of 6.33 percent. The likelihood of debasing the currency increased by 2.91 percentage points in the presence of war, and by 2.34 percentage points when the currency provider was a prince rather than a city-state. Still, the evidence that war was more important for princes than for other polities is mild and inconsistent. This does not necessarily imply that regime types were not important in motivating debasement. This perspective sits uneasily with the higher frequency of debasements in princely territories, as well as with the previous analysis. Rather, the result suggests first that Louis de Male was not exceptional. Princes often debased their currency as a regular source of revenue, i.e. even when there was no war. Second, it suggests that Florence was too extreme a case to be typical, with other polities occasionally also debasing for fiscal reasons, particularly if war caused a sudden need.

9. Conclusion

In conclusion, was debased money good or bad? It was not bad in the sense that it embodied regressive taxation. In the late Middle Ages, the influence of merchants and members of the nobility on monetary policies was associated with the supply of silver currencies that were stable in comparison to those produced by princes. Correspondingly, against conventional wisdom, in Florence, Hamburg and Bruges there is

no evidence that real wages suffered systematically as a result of silver debasements; on the contrary, nominal wages usually adjusted more than proportionally to silver debasements before prices rose, so that real wages increased in the short run and may have increased as a consequence of the policy also in the long term. Two implications follow: First, with wage-earners typically being poorly informed about monetary alterations, the dynamic suggests political interventions that aimed at compensating them and preventing social unrest. In so far, the institutional background to late medieval debasements may efficiently have addressed issues of asymmetric information. Future research should further explore the nature of the underlying institutional setting. Second, if institutional constraints on the negotiation of other regular payments such as rents imply that clergy and aristocracy were the main losers, 'hidden' debasement was not a particularly regressive form of taxation. Indeed, the opposite holds.

Both conventional and novel approaches show that monetary motives were important. Indeed, debasements of gold appear to have been almost exclusively monetary. Monetary motivations, however, do not make debasement an unmitigated blessing. Excess demand of bullion and the bullion famines were not a major cause of debasement in the late Middle Ages. On the contrary, the evidence is that they restricted the scope for it. Insofar as monetary debasements were reacting to debasements carried out by other authorities, the game had a negative sum. Munro's (1972) image of 'bullion wars' aptly describes the dynamics in this respect. Yet, the trope is also misleading. Firstly, even if debasements were not primarily aimed at addressing bullion shortages and wear and tear, they could be used to 'cure' other chronic ailments of the commodity money system such as those resulting from a rise of a coin's intrinsic above its face value. Secondly, the circulation of debased foreign coins was only one of several sources of uncertainty concerning

the intrinsic value of coins. Allowing an increase in the supply of coins of uniform quality, debasements would then contribute to a fall in transaction costs. The assessment of late medieval debasements therefore remains crucially dependent on how important monetary motivations were. One contribution of this paper is to show in which way advances in the quantification of the relevance of these motives can be made.

Warfare was a major cause of silver debasement, and regime types were almost as important. Princes debased silver more often, and probably did so for fiscal reasons more frequently than monetary unions and particularly city-states. This was true also if there were no exceptional fiscal needs. This implies that either late medieval princes did not enjoy comparatively better developed systems of taxation than city-states, or that fiscal debasements did not reflect weak taxation structures. The alternative interpretation sees fiscal debasements as a consequence of princely autonomy in monetary matters. Princes were unable to commit credibly to a stable currency (cf. Volckart, 2009) and to debase only for monetary reasons when the subjects lacked institutional means effectively to influence monetary and fiscal policies. This explains why in pre-1384 Flanders fiscal debasements were particularly frequent, notwithstanding a comparatively well-developed credit market, and why even though the Prussian government was probably the best organised in Central Europe, it continued to rely on fiscal debasements. The likely prevalence of fiscal debasements in princely territories was not necessarily a 'scourge'. They allowed princes to increase their revenues at short notice, and were, according to our results on real wages, also for the subjects preferable to loans and indirect taxation. Our perspective can therefore cast a new light on the decline of autonomous cities and the rise of territorial states in the fifteenth century: This may owe less to the superior taxing ability of the state than to the ability to carry out fiscal debasements more easily than cities.

References:

- Aiken, L. S. and West, S. G. (1991). *Multiple Regression: Testing and Interpreting Interactions*. Newbury Park: Sage.
- Altherr, H. (1910). *Das Münzwesen der Schweiz bis zum Jahre 1798 auf Grundlage der eidg. Verhandlungen und Vereinbarungen*. Bern: Stämpfli & Cie.
- Becker, M. (1965). Problemi della finanza pubblica fiorentina della seconda metà del Trecento e dei primi del Quattrocento. *Archivio Storico Italiano* IV, 433-466.
- Berghaus, P. (1965). Umlauf und Nachprägung des Florentiner Guldens nördlich der Alpen. In *Congresso Internazionale di Numismatica, Roma 11–16 settembre 1961*, vol. 2: Atti. Rome: Commission Internationale de Numismatique, 595-607.
- Bernocchi, M. (1975). *Le monete della Repubblica Fiorentina*, vol. 2: Corpus Nummorum Florentinorum. Firenze: Leo S. Olschki.
- Bernocchi, M. (1976). *Le monete della Repubblica Fiorentina*, vol. 3: Documentazione. Firenze: Leo S. Olschki.
- Blanchard, I. (2009). The Late Medieval European 'Integration Crisis' 1340-1540. In *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* (eds. Dahlerup, T. and Inqesman, P.). Copenhagen: The Royal Danish Academy of Sciences and Letters, 301-334.
- Blockmans, F. and Blockmans, W. P. (1979). Devaluation, Coinage and Seignorage under Louis de Nevers and Louis de Male, Counts of Flanders, 1330-84. In *Coinage in the Low Countries (880-1500): The Third Oxford Symposium on Coinage and Monetary History* (ed. Mayhew, N. J.). Oxford: B.A.R., 69-94.

- Bollandt, J. (ed.) (1960). *Hamburgische Burspraken 1346 bis 1594 mit Nachträgen bis 1699*, vol. 2: Bursprakentexte. Hamburg: Hans Christians Druckerei und Verlag.
- Bordo, M. M. (1986). Money, Deflation and Seignorage in the Fifteenth Century: A Review Essay. *Journal of Monetary Economics* 18, 337-346.
- Britnell, R. (2009). Agriculture, Marketing and Rural Change. In *A Common Agricultural Heritage? Revising French and British Rural Divergence* (ed. Broad, J.). Exeter, 107-120.
- Burleigh, M. (1984). *Prussian Society and the German Order: An aristocratic corporation in crisis c. 1410-1466*. Cambridge, London, New York, New Rochelle, Melbourne, Sydney: Cambridge University Press.
- Cahn, J. (1895). *Münz- und Geldgeschichte der Stadt Strassburg im Mittelalter*. Strassburg: Trübner.
- Cahn, J. (1901). *Der Rappenmünzbund: Eine Studie zur Münz- und Geldgeschichte des oberen Rheinthaales*. Heidelberg: Carl Winter's Universitätsbuchhandlung.
- Castelin, K. (1973). *Grossus Pragensis: Der Prager Groschen und seine Teilstücke; 1300 - 1547*. Braunschweig: Klinkhardt & Biermann.
- Chilosi, D. and Volckart, O. (2009). Money, States and Empire: Financial Integration Cycles and Institutional Change in Central Europe, 1400-1520. London: London School of Economics, Economic History Department, WP 132/09.
- Chow, G. C. (1960). Tests of Equality Between Sets of Coefficients in Two Linear Regressions. *Econometrica* 28, 591-605.
- Cipolla, C. M. (1948). *Studi di storia della moneta*, vol. 1: I movimenti dei cambi in Italia dal secolo XIII at XV. Pavia.
- Cipolla, C. M. (1956). *Money, Prices and Civilization in the Mediterranean World, Fifth to Seventeenth Century*. New York: Gordian Press.

- Cipolla, C. M. (1963). Currency Depreciation in Medieval Europe. *Economic History Review* XV, 413-422.
- Cipolla, C. M. (1983). *The Monetary Policy of Fourteenth-Century Florence*. Berkeley, Los Angeles, London: University of California Press.
- Coppo Stefani, M. (1940). *Cronica Fiorentina*, vol. 2. Bologna: Zanichelli.
- Day, J. (1980/87). The Great Bullion Famine of the Fifteenth Century. In *The Medieval Market Economy* (ed. Day, J.). Oxford: Basil Blackwell, 1-54.
- de la Roncière, C.-M. (1982). *Prix et salaires à Florence au XIV^e siècle*. Rome: École Française de Rome.
- de Roover, R. (1942). Money, Banking, and Credit in Medieval Bruges. *Journal of Economic History* 2: supplement, 52-65.
- de Roover, R. (1948). *Money, Banking and Credit in Medieval Bruges: Italian Merchant-Bankers Lombards and Money-Changers. A Study in the Origins of Banking*. Cambridge/MA: The Medieval Academy of America.
- de Roover, R. (1968). *The Bruges Money Market Around 1400*. Brussel: Paleis der Academien.
- de Win, P. (1986). The Lesser Nobility of the Burgundian Netherlands. In *Gentry and Lesser Nobility in Late Medieval Europe* (ed. Jones, M.). Gloucester: Sutton, 95-118.
- Dralle, L. (1975). *Der Staat des Deutschen Ordens in Preußen nach dem II. Thorner Frieden: Untersuchungen zur ökonomischen und ständepolitischen Geschichte Altpreußens zwischen 1466 und 1497*. Steiner: Wiesbaden.
- Elsen, O. (1995). La monnaie des comtes de Flandre Louis de Nevers (1322-1346) et Louis de Male (1346-1384) d'après les comptes et les ordonnances monétaires. *Revue Belge de Numismatique et de Sigillographie* 141, 37-183.

- Fantacci, L. (2008). The dual currency system of Renaissance Europe. *Financial History Review* 15, 55-72.
- Fuhrmann, B. (2007). Der Rat aber war zu mer ewigs gelts zu verkauffen - Das kommunale Kreditwesen Nürnbergs im 15. Jahrhundert. In *Städtische Finanzwirtschaft am Übergang vom Mittelalter zur Frühen Neuzeit* (eds. Seggern, H. v., Fouquet, G. and Gilomen, H.-J.). Frankfurt, Berlin, Bern: Peter Lang, 139-167.
- Gemmill, E. and Mayhew, N. J. (1995). *Changing Values in Medieval Scotland: A Study of Prices, Money, and Weights and Measures*. Cambridge: Cambridge University Press.
- Giard, J. B. (1967). Le Florin d'or au Baptiste et ses imitations en France au XIV^e siècle. *Bibliothèque de l'École des Chartes* 125, 94-141.
- Glassman, D. and Redish, A. (1988). Currency Depreciation in Early Modern England and France. *Explorations in Economic History* 25, 75-97.
- Goldthwaite, R. A. (1980). *The Building of Renaissance Florence: An Economic and Social History*. Baltimore, London: John Hopkins University Press.
- Goldthwaite, R. A. (1995). I prezzi del grano a Firenze dal XIV al XVI secolo. In *Banks, Palaces and Entrepreneurs in Renaissance Florence* (ed. Goldthwaite, R. A.). Aldershot: Variorum Reprints, VI, 5-37.
- Goldthwaite, R. A. (2009). *The Economy of Renaissance Florence*. Baltimore: John Hopkins University Press.
- Goldthwaite, R. A. and Mandich, G. (1994). *Studi sulla Moneta Fiorentina*. Firenze: Olschki.
- Harms, B. (ed.) (1909). *Der Stadthaushalt Basels im ausgehenden Mittelalter*, vol. 1: Die Einnahmen. Tübingen: Kommissionsverlag der H. Laupp'schen Buchhandlung.

- Harms, B. (ed.) (1910). *Der Stadthaushalt Basels im ausgehenden Mittelalter*, vol. 2: Die Ausgaben 1360-1490. Tübingen: Kommissionsverlag der H. Laupp'schen Buchhandlung.
- Harvey, A. S. (1989). *Forecasting, Structural Time Series Models and the Kalman Filter*. Cambridge: Cambridge University Press.
- Hatcher, J. (1996). The Great Slump of the Mid-Fifteenth Century. In *Progress and Problems in Medieval England: Essays in Honour of Edward Miller* (eds. Britnell, R. and Hatcher, J.). Cambridge, New York: Cambridge University Press, 237-272.
- Jesse, W. (1928). *Der Wendische Münzverein*. Lübeck: Hansischer Geschichtsverein.
- Kahle, E. (1987). Die Organisation der Saline in Lüneburg vom Mittelalter bis ins 19. Jahrhundert. 1-22.
- Kaplanis, C. (2003). The Debasement of the 'Dollar of the Middle Ages'. *Journal of Economic History* 63, 768-801.
- Kindleberger, C. P. (1991). The Economic Crises of 1619 to 1623. *Journal of Economic History* 51, 149-175.
- Koch, B. (1994). *Corpus Nummorum Austriacorum (CNA)*, vol. 1: Mittelalter. Wien: Kunsthistorisches Museum.
- Koppmann, K. (ed.) (1869). *Kämmereirechnungen der Stadt Hamburg: 1350-1400*. Hamburg: Hermann Grüning.
- Koppmann, K. (ed.) (1873). *Kämmereirechnungen der Stadt Hamburg: 1401-1470*. Hamburg: Hermann Grüning.
- Koppmann, K. (ed.) (1878). *Kämmereirechnungen der Stadt Hamburg: 1471-1500*. Hamburg: Hermann Grüning.
- Koppmann, K. (ed.) (1880). *Kämmereirechnungen der Stadt Hamburg von 1482-1500*. Hamburg: Hermann Grüning.
- Koppmann, K. (ed.) (1883). *Kämmereirechnungen der Stadt Hamburg: 1501-1540*, vol. 5. Hamburg: Hermann Grüning.

- Koppmann, K. (ed.) (1892). *Kämmereirechnungen der Stadt Hamburg 1541-1554*. Hamburg: Gräfe & Sillem.
- Koppmann, K. (ed.) (1894). *Kämmereirechnungen der Stadt Hamburg 1555-1562*, vol. 7. Hamburg: Gräfe & Sillem.
- Kugler, P. (2008). Financial Market Integration in Late Medieval Europe: Results from a Threshold Error Correction Model for the Rhinegulden and Basle Pound 1365-1429. Basel: Universität Basel.
- Lane, F. C. and Mueller, R. C. (1985). *Money and Banking in Medieval and Renaissance Venice*, vol. 1: Coins and Moneys of Account. Baltimore, London: John Hopkins University Press.
- Laurent, H. (1933). *La loi de Gresham au moyen age: Essai sur la circulation monétaire entre la Flandre et le Brabant a la fin du XIV^e siècle*. Paris: Libraire du Recueil Sirey.
- Lopez, R. S. (1951). The Dollar of the Middle Ages. *Journal of Economic History* 11, 209-234.
- Mayhew, N. J. (1995a). Modelling Medieval Monetisation. In *A Commercialising Economy: England 1086 to c. 1130* (eds. Britnell, R. H. and Campbell, B. M. S.). Manchester, New York: Manchester University Press, 55-77.
- Mayhew, N. J. (1995b). Population, Money Supply, and the Velocity of Circulation in England, 1300-1700. *The Economic History Review* 48, 238-257.
- Metz, R. (1990). *Geld, Währung und Preisentwicklung: Der Niederrheinraum im europäischen Vergleich 1350-1800*. Frankfurt: Fritz Knapp.
- Miskimin, H. A. (1984). *Money and Power in Fifteenth-Century France*. New Haven, London: Yale University Press.
- Motomura, A. (1994). The Best and Worst of Currencies: Seignorage and Currency Policy in Spain, 1597-1650. *Journal of Economic History* 54, 104-127.

- Munro, J. H. (1972). *Wool, Cloth, and Gold: The Struggle for Bullion in Anglo-Burgundian Trade, 1340-1478*. Brussels, Toronto: University of Toronto Press.
- Munro, J. H. (1981). Mint Policies, Ratios, and Outputs in England and the Low Countries, 1335-1420: Some Reflections on New Data. *Numismatic Chronicle* 141, 71-116.
- Munro, J. H. (1988). Deflation and the Petty Coinage Problem in the Late-Medieval Economy: The Case of Flanders, 1334-1484. *Explorations in Economic History* 25, 387-423.
- Munro, J. H. (2001). The "New Institutional Economics" and the Changing Fortune of Fairs in Medieval and Early Modern Europe: the Textile Trades, Warfare and Transaction Costs. *Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte* 88, 1-47.
- Munro, J. H. (2002). 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, 185–297.
- Munro, J. H. (2009). Warfare, Liquidity Crises, and Coinage Debasements in Burgundian Flanders, 1384 - 1482: Monetary or Fiscal Remedies? Toronto.
- Murray, J. M. (2005). *Bruges, Cradle of Capitalism, 1280-1390*. Cambridge: Cambridge University Press.
- Nagl, A. (1906). Das Tiroler Geldwesen unter Erzherzog Sigismund und die Entstehung des Silberguldens. *Numismatische Zeitschrift* 38, 45-168.
- Nicholas, D. (1987). *The Metamorphosis of a Medieval City: Ghent in the Age of the Artevelde, 1302-1390*. Lincoln, London: University of Nebraska Press.
- Nicholas, D. (1992). *Medieval Flanders*. London, New York: Longman.

- Nightingale, P. (2007). *Trade, Money, and Power in Medieval England*. Aldershot: Ashgate.
- North, M. (1994). *Das Geld und seine Geschichte: Vom Mittelalter bis zur Gegenwart*. München: Beck.
- Orsini, I. (1790). *Storia delle Monete della Repubblica Fiorentina*. Firenze: Stampatrice di Pietro Gaetano Viviani.
- Pagnini del Ventura, G. F. (1775). Della moneta de' fiorentini. In *Delle Monete d'Italia: Nuova Raccolta che Può Servire di Parte Settima in Continuazione alla Raccolta dell' Argelati*, vol. 1 (ed. Zanetti, G. A.). Bologna: Lelio della Volpe Impressore dell' Istituto di Scienze.
- Pamuk, Ş. (2000). *A Monetary History of the Ottoman Empire*. Cambridge: Cambridge University Press.
- Prestwich, M. (1969). Edward I's Monetary Policies and their Consequences. *Economic History Review* 22, 406-416.
- Pusch, G. (1932). *Staatliche Münz- und Geldpolitik in den Niederlanden unter den burgundischen und habsburgischen Herrschern besonders unter Kaiser Karl V*. München: Val. Höfling.
- Redish, A. (2000). *Bimetallism: An Economic and Historical Analysis*. Cambridge, New York: Cambridge University Press.
- Rolnick, A. J., Velde, F. R. and Weber, W. E. (1996). The Debasement Puzzle: An Essay on Medieval Monetary History. *Journal of Economic History* 56, 789-808.
- Rothmann, M. (2007). Gemeiner Nutzen auf Kredit: Der Frankfurter Rentenmarkt und sein Einzugsbereich im Spätmittelalter. In *Städtische Finanzwirtschaft am Übergang vom Mittelalter zur Frühen Neuzeit* (eds. von Seggern, H., Fouquet, G. and Gilomen, H.-J.). Frankfurt, Berlin, Bern: Peter Lang, 183-238.
- Sargent, T. J. and Velde, F. R. (2002). *The Big Problem of Small Change*. Princeton, Oxford: Princeton University Press.

- Scholler, E. (1916). *Der Reichsstadt Nürnberg Geld- und Münzwesen in älterer und neuerer Zeit (Ein Beitrag zur reichsstädtischen Wirtschaftsgeschichte.)*. Nürnberg.
- Schrötter, F. F. v. (1930). *Wörterbuch der Münzkunde*. Berlin, Leipzig: de Gruyter.
- Spufford, P. (1966). Coinage, Taxation and the "Estates General" of the Burgundian Netherlands. *Standen en Landen* 40, 61-87.
- Spufford, P. (1970). *Monetary Problems and Politics in the Burgundian Netherlands 1433-1496*. Leiden: Brill.
- Spufford, P. (1986). *Handbook of Medieval Exchange*. London: Offices of the Royal Historical Society.
- Spufford, P. (1991). *Money and its Use in Medieval Europe*. Cambridge, New York, Port Chester, Melbourne, Sydney: Cambridge University Press.
- Stahl, A. M. (2007). Coins for Trade and for Wages: The Development of Coinage Systems in Medieval Venice. In *Wages and Currency: Global Comparisons from Antiquity to the Twentieth Century* (ed. Lucassen, J.). Bern, Berlin, Bruxelles et al.: Peter Lang, 193-209.
- Stefke, G. (2002). Der "Wendische Münzverein" als spätmittelalterliche Währungsunion und andere norddeutsche Münzkonventionen des 13./14.-16. Jahrhunderts. In *Währungsunionen: Beiträge zur Geschichte überregionaler Münz- und Geldpolitik* (ed. Cunz, R.). Hamburg: Museum für Hamburgische Geschichte, 145-195.
- Sussman, N. (1993). Debasements, Royal Revenues, and Inflation in France during the Hundred Years' War, 1415-1422. *Journal of Economic History* 53, 44-70.
- Targioni Tozzetti, G. (1775). Del fiorino d'oro di sigillo, e delle riflessioni sulle cause dell'accrescimento di valuta del fiorino d'oro della Repubblica Fiorentina. In *Delle Monete d'Italia: Nuova Raccolta che Puo' Servire di Parte Settima in Continuazione alla Raccolta*

- dell'Argelati*, vol. 1 (ed. Zanetti, G. A.). Bologna: Per Lelio della Volpe Editore dell'Istituto delle Scienze.
- Toderi, G. (1992). Le monete della repubblica di Siena. In *Le monete della repubblica senese* (eds. Paolozzi Strozzi, B., Toderi, G. and Vannel Toderi, F.). Siena: Monte dei Paschi di Siena, 283-403.
- Tognetti, S. (1995). Prezzi e salari nella Firenze tardomedievale: un profilo. *ASI* 153, 263-333.
- van Werveke, H. (1931/64). De economische en sociale gevolgen van de muntpolitiek der graven van Vlaanderen (1337-1433). In *Miscellanea Mediaevalia: Verspreide opstellen over economische en sociale geschiedenis van de middeleeuwen* (ed. van Werveke, H.). Gent: Wetenschappelijke Uitgeverij, 243-254.
- van Werveke, H. (1949/64). Currency Manipulation in the Middle Ages: The Case of Louis de Male, Count of Flanders. In *Miscellanea Mediaevalia: Verspreide opstellen over economische en sociale geschiedenis van de middeleeuwen* (ed. van Werveke, H.). Gent: Wetenschappelijke Uitgeverij, 255-267.
- Vaughan, R. (1962). *Philip the Bold: The Formation of the Burgundian State*. London: Longmans.
- Vaughan, R. (1966). *John the Fearless: The Growth of Burgundian Power*. London: Longmans.
- Vaughan, R. (1970). *Philip the Good: The Apogee of Burgundy*. Harlow: Longmans.
- Villani, G. (1845). *Cronica di Giovanni Villani*. Firenze: Sansone.
- Volckart, O. (1996). *Die Münzpolitik im Deutschordensland und Herzogtum Preußen von 1370 bis 1550*. Wiesbaden: Harrassowitz.
- Volckart, O. (2008). 'The Big Problem of the Petty Coins', and How it Could be Solved in the Late Middle Ages. London: London School of Economics and Political Science, Economic History Department, Working Papers No. 107/08.

- Volckart, O. (2009). Regeln, Willkür und der gute Ruf: Geldpolitik und Finanzmarkteffizienz in Deutschland, 14. bis 16. Jahrhundert. *Jahrbuch für Wirtschaftsgeschichte* 2, 101-129.
- Volckart, O. and Wolf, N. (2006). Estimating Financial Integration in the Middle Ages: What can we learn from a TAR-model? *Journal of Economic History* 66, 122-139.
- Weber, E. J. (1996). "Imaginary" or "Real" Moneys of Account in Medieval Europe? An Econometric Analysis of the Basle Pound, 1365-1429. *Explorations in Economic History* 33, 479-495.
- Weisenstein, K. (1995). *Das Kurtriersche Münz- und Geldwesen vom Beginn des 14. bis zum Ende des 16. Jahrhunderts: Auch ein Beitrag zur Geschichte des Rheinischen Münzvereins*. Koblenz: Numismatischer Verlag.
- Witthöft, H. (1976). Struktur und Kapazität der Lüneburger Saline seit dem 12. Jahrhundert. *Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte* 63, 1-117.
- Wood, D. (ed.) (2004). *Medieval Money Matters*. Oxford: Oxbow Books.
- Zuiderduijn, J. (2009). *Medieval Capital Markets: Markets for Renten, State Formation and Private Investment in Holland (1300-1550)*. Leiden, Boston: Brill.

LONDON SCHOOL OF ECONOMICS
ECONOMIC HISTORY DEPARTMENT WORKING PAPERS
(from 2006 onwards) For a full list of titles visit our webpage at
<http://www.lse.ac.uk/>

2007

- WP97 An Historical Analysis of the Expansion of Compulsory
Schooling in Europe after the Second World War
Martina Viarengo
- WP98 Universal Banking Failure? An Analysis of the Contrasting
Responses of the Amsterdamsche Bank and the
Rotterdamsche Bankvereeniging to the Dutch Financial Crisis of
the 1920s
Christopher Louis Colvin
- WP99 The Triumph and Denouement of the British Fiscal State:
Taxation for the Wars against Revolutionary and Napoleonic
France, 1793-1815.
Patrick Karl O'Brien
- WP100 Origins of Catch-up Failure: Comparative Productivity Growth in
the Hapsburg Empire, 1870-1910
Max-Stephan Schulze
- WP101 Was Dick Whittington Taller Than Those He Left Behind?
Anthropometric Measures, Migration and the Quality of life in
Early Nineteenth Century London
Jane Humphries and Tim Leunig
- WP102 The Evolution of Entertainment Consumption and the
Emergence of Cinema, 1890-1940
Gerben Bakker
- WP103 Is Social Capital Persistent? Comparative Measurement in the
Nineteenth and Twentieth Centuries
Marta Felis Rota
- WP104 Structural Change and the Growth Contribution of Services:
How Motion Pictures Industrialized US Spectator Entertainment
Gerben Bakker

WP105 The Jesuits as Knowledge Brokers Between Europe and China (1582-1773): Shaping European Views of the Middle Kingdom
Ashley E. Millar

WP106 Regional Income Dispersion and Market Potential in the Late Nineteenth Century Habsburg Empire
Max-Stephan Schulze

2008

WP107 'The Big Problem of the Petty Coins', and how it could be solved in the late Middle Ages
Oliver Volckart

WP108 The Anglo-German Industrial Productivity Puzzle, 1895-1935: A Restatement and a Possible Resolution
Albrecht Ritschl

WP109 The History, Nature and Economic Significance of an Exceptional Fiscal State for the Growth of the British Economy, 1453-1815
Patrick O'Brien

WP110 The Economic History of Sovereignty: Communal Responsibility, the Extended Family, and the Firm
Lars Boerner and Albrecht Ritschl

WP111 A Stakeholder Empire: The Political Economy of Spanish Imperial Rule in America
Regina Grafe and Alejandra Irigoin

WP112 The U.S. Business Cycle, 1867-1995: Dynamic Factor Analysis vs. Reconstructed National Accounts
Albrecht Ritschl, Samad Sarferaz and Martin Uebele

WP113 Understanding West German Economic Growth in the 1950s
Barry Eichengreen and Albrecht Ritschl

2009

- WP114 War and Wealth: Economic Opportunity Before and After the Civil War, 1850-1870
Taylor Jaworski
- WP115 Business Cycles and Economic Policy, 1914-1945: A Survey
Albrecht Ritschl and Tobias Straumann
- WP116 The Impact of School Provision on Pupil Attendance: Evidence From the Early 20th Century
Mary MacKinnon and Chris Minns
- WP117 Why Easter Island Collapsed: An Answer for an Enduring Question
Barzin Pakandam
- WP118 Rules and Reality: Quantifying the Practice of Apprenticeship in Early Modern Europe
Chris Minns and Patrick Wallis
- WP119 Time and Productivity Growth in Services: How Motion Pictures Industrialized Entertainment
Gerben Bakker
- WP120 The Pattern of Trade in Seventeenth-Century Mughal India: Towards An Economic Explanation
Jagjeet Lally
- WP121 Bairoch Revisited. Tariff Structure and Growth in the Late 19th Century
Antonio Tena-Junguito
- WP122 Evolution of Living Standards and Human Capital in China in 18-20th Centuries: Evidences from Real Wage and Anthropometrics
Joerg Baten, Debin Ma, Stephen Morgan and Qing Wang
- WP123 Wages, Prices, and Living Standards in China, 1738-1925: in Comparison with Europe, Japan, and India
Robert C. Allen, Jean-Pascal Bassino, Debin Ma, Christine Moll-Murata, Jan Luiten van Zanden

- WP124 Law and Economic Change in Traditional China: A Comparative Perspective
Debin Ma
- WP125 Leaving Home and Entering Service: The Age of Apprenticeship in Early Modern London
Patrick Wallis, Cliff Webb and Chris Minns
- WP126 After the Great Debasement, 1544-51: Did Gresham's Law Apply?
Ling-Fan Li
- WP127 Did Globalization Aid Industrial Development in Colonial India? A Study of Knowledge Transfer in the Iron Industry
Tirthankar Roy
- WP128 The Education and Training of Gentry Sons in Early-Modern England
Patrick Wallis and Cliff Webb
- WP129 Does Trade Explain Europe's Rise? Geography, Market Size and Economic Development
Roman Studer
- WP130 Depression Econometrics: A FAVAR Model of Monetary Policy During the Great Depression
Pooyan Amir Ahmadi and Albrecht Ritschl
- WP131 The Economic Legacies of the 'Thin White Line': Indirect Rule and the Comparative Development of Sub-Saharan Africa
Peter Richens
- WP132 Money, States and Empire: Financial Integration Cycles and Institutional Change in Central Europe, 1400-1520
David Chilosì and Oliver Volckart
- WP133 Regional Market Integration in Italy During the Unification (1832-1882)
Anna Missiàia

2010

- WP134 Total Factor Productivity for the Royal Navy from Victory at Texal (1653) to Triumph at Trafalgar (1805)
Patrick Karl O'Brien FBA and Xavier Duran
- WP135 From Sickness to Death: The Financial Viability of the English Friendly Societies and Coming of the Old Age Pensions Act, 1875-1908
Nicholas Broten
- WP136 Pirates, Politics and Companies: Global Politics on the Konkan Littoral, c. 1690-1756
Derek L. Elliott
- WP137 Were British Railway Companies Well-Managed in the Early Twentieth Century?
Nicholas Crafts, Timothy Leunig and Abay Mulatu
- WP138 Merchant Networks, the Baltic and the Expansion of European Long-Distance Trade: Re-evaluating the Role of Voluntary Organisations
Esther Sahle
- WP139 The Amazing Synchronicity of the Global Development (the 1300s-1450s). An Institutional Approach to the Globalization of the Late Middle Ages
Lucy Badalian and Victor Krivorotov
- WP140 Good or Bad Money? Debasement, Society and the State in the Late Middle Ages
David Chilosì and Oliver Volckart