

3. When Small Change was not a Big Problem*

▼ **ABSTRACT** In a proportional coinage system with several denominations, there is a risk of shortage of small change. The main reason is the higher production costs of small coins. This was a major problem in large parts of Europe in the late Middle Ages and Early Modern period. Cipolla has suggested a standard formula to this problem: issue small coins as credit coins, mint them on government account, and make them convertible, for example, by accepting them as payment of taxes. In this paper we show that other solutions were put into effect in Antiquity and the Middle Ages. In the early and High Middle Ages, small change was created by simply cutting the main denomination in halves or quarters. In the late Middle Ages, minting authorities in central and northern Europe coined small change as uni-faced 'hohlpfennigs' by using a cheaper minting technology. We show that there was no shortage of hohlpfennigs, and explain why this technology was cheaper and why it was abandoned in the early sixteenth century.

▼ **KEYWORDS** small change, production costs, minting technology, hohlpfennigs

Shortage of Small Change and the Standard Formula

When monetization increases and the amount in monetary transactions is more dispersed in a society,

there will be a demand for more monetary denominations. It is obvious that large-scale international trade, wholesale transactions, and daily transactions on local markets need different denominations. Sometimes, different denominations have been minted with the same precious metal, but often the denominations have had different metals. In the latter case, gold has often been used in high denomination coins for international trade, silver coins for intermediate transactions, and copper or bronze coins for small change for daily transactions.

* The authors would like to thank the participants at the XVI International Numismatic Conference in Warsaw for insightful comments. Roger Svensson gratefully acknowledges financial support from the Sven Svensson Foundation for Numismatics and the Gunnar Ekström Foundation. The opinions expressed in this paper are the sole responsibility of the authors and should not be interpreted as reflecting the views of Sveriges Riksbank.

Roger Svensson The Research Institute of Industrial Economics (IFN), Sweden, roger.svensson@ifn.se
Andreas Westermark Research Department, Sveriges Riksbank, Sweden; andreas.westermark@riksbank.se

Proceedings of the XVI International Numismatic Congress, 11–16.09.2022, Warsaw, Vol. III: Medieval Numismatics, ed. by Jarosław Bodzek, Aleksander Bursche, and Anna Zapolska, WSA, 12 (Turnhout, 2025), pp. 31–34.

This is an open access chapter made available under a CC BY-NC 4.0 International Licence.

BREPOLS  PUBLISHERS

DOI 10.1484/M.WSA-EB.5.145261

When different denominations have used the same precious metal, the silver content has normally been proportional to the face values. The big problem with small change in a commodity monetary system in history is that small denominations have considerably higher production costs than large ones as a share of the nominal value. This has caused mints to be reluctant to produce small change. If coins were fully divisible into smaller fractions, then a lack of small change could easily be alleviated by dividing large coins into parts (see Wallace 2003).

Sargent and Velde (2002) argue in their book *The Big Problem of Small Change* that a proportional coinage system — where denominations have proportional intrinsic value — will cause shortage of small change when there is free minting and the exchange rate between different coins is market determined. There are two explanations to this phenomenon, partly from the supply side and partly from the demand side. The supply side argument derives from the fact that the cost to produce a coin is approximately the same, irrespective of denomination (excluding the cost of the intrinsic metal content). Since the cost as a share of face value is then larger for small coins, there is a tendency to focus on minting the more profitable large coins. Regarding the demand side, small change works better as a medium of exchange and renders more liquidity services than large coins. Moreover, a lack of small change leads to a reduction in the number of low-value transactions, which tend to be inefficiently low.

The standard formula proposed by Carlo Cipolla to avoid the shortage problem of small change is to issue *on government account* small coins having a commodity value lower than their monetary value and excluding free minting for these (see Sargent and Velde 2002, 5 and 366). Thus, overvalued small coins must be fully convertible into full-bodied large denominations, for example by accepting them as payment for taxes (Sargent and Velde 2002, 5–7). There must also exist a technology for producing counterfeit-proof small denomination coins.

Small Change in the Ancient Economies

Greece

In the Archaic Greek world (until 480 BC), small change took the form of tiny silver coins, issued as fractions of the silver staters. In both economic and social terms, there was a major transformation of the Greek currency system from the middle of the fifth century BC. Fractional silver coins were replaced by overvalued coins made by base metals, such as bronze

and brass. Syracuse in Sicily was perhaps the first mint to experiment with such token bronze coins, see Von Reden (2010, 32) and Elliott (2020, 71). Bronze coins as small change was introduced on a *large scale* in the Greek world in the late fifth and early fourth century BC, see Ashton (2006) and Thonemann (2015, 128).

Rome

During the Roman Republic, silver and bronze coins were approximately valued according to their metal contents. When Emperor Augustus reformed the Roman coinage system c. 27–23 BC, the metal base coins became officially real ‘token coins’. Base metal coins (brass and copper) were now overvalued, especially the brass sestertii and dupondii.¹ But by making the overvalued coins convertible, they were accepted in society.² The base metal coins were likely minted on the government’s account, i.e., ‘free minting’ of these denominations were not allowed. Thus, already Augustus used a system with similarities to the ‘the standard formula’ when minting small change. However, the Romans never invented a counterfeit-proof technology; counterfeiting and imitations were frequent for the base metal coins (Harl 1996, 89).

Addressing Divisibility in the Early and High Middle Ages

From the establishment of Charlemagne’s denier c. 800 until 1250, there were few other denominations than the silver penny (abbr. = d) (denier, denaro, dinero, pfennig, etc.) in medieval Europe. Small change in the form of round half pennies or obols were rarely coined, as evidenced by their high rarity. Instead, half pennies and quarters were created by cutting one-penny coins into two halves or four quarters. This made the production costs of small change as a share of the value the same for the halved and full pennies.

In England, cut half pennies and farthings from the period 973–1279 constitute a significant share in the coin hoards and single finds. A survey of finds from 1180 to 1278 suggests that 72–95 per cent of coins circulating could be cut fractions such as half-pennies (24–68 per cent) or farthings (14–76 per cent) (see Allen 2012, 346–52). The coin hoards from Germany show that

- 1 The following exchange rates were introduced by Augustus: 1 denarius equalled 4 sestertii (brass), 8 dupondii (brass), 16 asses (bronze), 32 semisses (bronze), and 64 quadrantes (bronze).
- 2 Based on the fixed exchange fees between denarius and as, the relation between silver and copper, c. 1:45, was far below actual market ratios of at least 1:100.

halved bracteates were considerably more common than official round half pennies. Halved bracteates could constitute up to one third of all coins in hoards, see Svensson (2013, 139 Table 13). This observation also applies to large coin hoards with several thousand coins, e.g., the hoards found in Erfurt, Ohrdruf, and Seega.

Hohlpfennigs as Small Change

Hohlpfennigs, a type of small uniface bracteates minted in the late Middle Ages, can be seen as a solution to the small change problem, by reducing the minting costs of small change. There are several reasons why the bracteate technology is less costly than the traditional coin technology. Firstly, only one die is needed for the bracteate technology. Engraving dies is one of the costliest steps in the minting production.

Secondly, a lower die — the preferred choice for the engraved die for the bracteates — last longer than an upper die. The upper die is more often damaged because of the impact of the hammer and the recoil upwards that follows.³ Thus, when striking bracteates, it is economical to use an engraved lower die and a flat cylinder as upper die, as it is far cheaper to produce a new cylinder than an engraved die. This conclusion is also empirically supported by the fact that almost all preserved bracteate dies from the Middle Ages are lower dies (Svensson 2013, 128).

Thirdly, a lower bracteate die will last longer and can strike more coins than a lower die for biface coins because a soft material like leather is used in between the upper die and the coin flan. The soft material cushions the hammer strike and the recoil is smaller. Furthermore, the thin silver flan and the soft material require a markedly less powerful strike.

Finally, there is a possibility that multiple bracteates were simultaneously struck by placing several flans above each other, which would reduce the cost of coining (Kühn 2000, 13).

There are three types of methods to determine whether there was a shortage or surplus of small change as hohlpfennigs in the late Middle Ages: first, information from coin hoards; second, written sources that mention shortages of small change; third, the situation in the today's collector's market as to if small denomination hohlpfennigs are common and what their price level is.

In the region Thuringia (eastern Germany), many towns struck small bracteates, called hohlpfennigs, as small change in the period 1330–1490. No higher denomination was minted in Thuringia 1340–1460, but foreign Groschens from Bohemia and Meissen were imported and used as regular coins. They had a fixed exchange rate to the hohlpfennigs; 1 Groschen equaled c. 8–9 hohlpfennigs. When the Meissner Groschen was debased c. 1400, the hohlpfennigs also got a lower fineness (Arnold 2003, 104–05). The frequency of Thuringian hohlpfennigs has been documented by Walter Hävernick (1955). In many of the Thuringian hoards, hohlpfennigs dominate, with the exception of a few hoards that are almost entirely groschen hoards. The most frequent Thuringian hohlpfennigs cost 40–60 Euros in the collector's market, i.e., like the hohlpfennigs from northern Germany, they are not rare. Similar evidence is available in northern Germany, Brandenburg and for the Teutonic Order in Prussia (see Volckart 2019, 21; Volckart 1996, 92 and 99–101).

The hohlpfennigs were abandoned as small change in the period 1520–1540. This issue must also be explained. The main reason is that silver prices fell sharply relative to other commodities when large amounts of silver were imported from America. While tiny hohlpfennig coins with a weight of 0.3–0.4 g and a fineness of c. 40–60 per cent had been an appropriate amount of silver for small-scale daily transactions in the fourteenth and fifteenth centuries, it was not enough in the sixteenth and seventeenth centuries. When larger coins were needed, the bracteate technology became unpractical, since it could not be used for coins with a weight higher than 1.0 g.

³ Many die-link studies from the Viking Age confirm that there are two to three upper dies for every lower die used to strike biface coins; Malmer 2010, 43.

Works Cited

- Allen, Martin. 2012. *Mints and Money in Medieval England* (Cambridge: Cambridge University Press) <<https://doi.org/10.1017/CBO9781139057394>>
- Arnold, Thomas. 2003. 'Grundlinien des Thüringischen Hohlpfennigmünzwesens', *Jahrbuch der Gesellschaft für Thüringer Münz- und Medaillenkunde*, 14: 105–30
- Ashton, Richard H. J. 2006. 'The Beginning of Bronze Coinage in Karia and Lykia', *The Numismatic Chronicle*, 166: 1–14, pl 1–5
- Elliott, Colin P. 2020. 'The Role of Money in the Economies of Ancient Greece and Rome', in *Handbook of the History of Money and Currency*, ed. by Stefano Battilossi, Youssef Cassis, and Kazuhiko Yago (Singapore: Springer), pp. 67–86 <https://doi.org/10.1007/978-981-13-0596-2_46>
- Harl, Kenneth W. 1996. *Coinage in the Roman Economy 300 B.C. to A.D. 700* (Baltimore, MD: The John Hopkins University Press)
- Hävernick, Walter. 1955. *Die Mittelalterliche Münzfunde in Thüringen*, Veröffentlichungen der thüringischen historischen Kommission, 4 (Jena: VEB Gustav Fischer)
- Kühn, Walter. 2000. 'Zur mittelalterliche Prägungstechnik', *Freiberger Münzblätter*, 9: 1–16
- Malmer, Brita. 2010. *Den svenska mynthistorien: Vikingatiden 995–1030* (Stockholm: Kungliga Myntkabinettet)
- Sargent, Thomas J., and François R. Velde. 2002. *The Big Problem of Small Change*, The Princeton Economic History of the Western World (Princeton, NJ: Princeton University Press)
- Svensson, Roger. 2013. *Renovatio Monetae: Bracteates and Coinage Policies in Medieval Europe* (London: Spink & Son)
- Thonemann, Peter. 2015. *The Hellenistic World: Using Coins as Sources* (Cambridge: Cambridge University Press)
- Volckart, Oliver. 1996. *Die Münzpolitik im Ordensland und Herzogtum Preußen von 1370 bis 1550* (Wiesbaden: Harrassowitz)
- . 2019. 'Money and Its Technologies The "Principles of Minting" in the Middle Ages', in *A Cultural History of Money in the Medieval Age*, ed. by Rory Naismith, Cultural Histories Series, 2 (London: Bloomsbury Academic), pp. 15–35
- von Reden, Sitta. 2010. *Money in Classical Antiquity*, Key Themes in Ancient History (Cambridge: Cambridge University Press) <<https://doi.org/10.1017/CBO9780511763069>>
- Wallace, Neil. 2003. 'Modeling Small Change: A Review Article', *Journal of Monetary Economics*, 50.6: 1391–401 <[https://doi.org/10.1016/S0304-3932\(03\)00076-X](https://doi.org/10.1016/S0304-3932(03)00076-X)>