

THE PROPORTIONS OF THE DENOMINATIONS IN ENGLISH MINT OUTPUTS, 1351–1485

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Introduction

BETWEEN 1351 and the introduction of the testoon or shilling in 1504 the only silver coins issued by the English mints were the groat, halfgroat, penny, halfpenny and farthing. The gold coinage consisted of the noble with its half and quarter until 1465, when the ryal and angel became the principal gold coins. A knowledge of the proportions of these denominations in the outputs of the English mints would be highly desirable, as the basis for an understanding of the relative sizes of their contributions to the currency in circulation. This is a subject which is potentially of great interest to economic and monetary historians, because the availability or otherwise of coins of particular denominations could have a significant effect upon economic activity, for example in the disruption of retail trade by shortages of small change.¹ It is extremely unfortunate that the records of the royal mints do not usually specify the quantities of each denomination struck after 1351, as the king's seignorage and the other minting charges were only related to the gross quantities of gold and silver minted.² From 1355 to 1434 the mint indentures often specify the proportions of gold or silver to be allocated to each denomination, but contemporary complaints about the failure of the royal mints to produce enough small change suggest that it cannot be assumed that the indenture proportions were always adhered to in practice.³ Records of pyx trials might contain some indication of the real proportions of the denominations in mint outputs, but they only provide explicit evidence of this for one brief period in 1413–14. Documentary references to numbers of dies of each denomination supplied or authorized, and estimates of die numbers used based upon die studies, are further sources of evidence, but numbers of dies may not be reliable indicators of the relative sizes of the outputs of denominations. Hoards cannot provide direct evidence of the proportions, as they tend to be biased towards the largest denominations available to hoarders, but they may give some indication of changes in the proportions through time.⁴ This article will combine the evidence of mint indentures, pyx trials, numbers of dies and hoards in an investigation of the problem of the proportions from 1351 to the end of the reign of Richard III in 1485.

Mint indentures

The indenture of 20 June 1351 (which instituted the groat and halfgroat as regular components of the English silver currency) and the subsequent indenture of 28 March 1353 did not specify the proportions of the denominations in the gold and silver outputs.⁵ The reintroduction of the halfpenny (which had been discontinued along with the farthing in 1351) in the indenture of 31 May 1355 was, however, accompanied by specifications for the proportions

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¹ Mayhew 1974, 69–70, and Sargent and Velde 2003, 131–5, discuss shortages of small change in late medieval England.

² Challis 1992, 680–4, tabulates the mint outputs of 1351–1485. The output of halfpence was recorded separately in 1446 (see p. 000).

³ Challis 1992, 703–16, summarizes the indentures in force from 1351 to 1485.

⁴ See pp. 202–6.

⁵ *Calendar of Close Rolls* [hereafter *CCR*] 1349–1354, 379–81 [20 June 1351]; Rymer *et al.* 1816–69, III, part I, 256 [28 March 1353].

of the silver denominations. Each £100 (150 marks) of silver minted was to consist of 50 marks in groats (2,000 coins) and also in halfgroats (4,000), 45 marks in pence (7,200), and 5 marks in halfpence (1,600).⁶ These specifications, which were repeated in the indentures of 27 January and 1 November 1356, are tabulated in Table 1, with all of the subsequent indenture specifications for silver before 1485.⁷ Robert de Portyco's indenture of 5 March 1361 specified the proportions of the gold denominations for the first time (as summarized in Table 2), and it made new arrangements for the silver. Each Tower pound (12 oz) of gold was to provide 4 oz in nobles, 6 oz of half nobles, and 2 oz in quarter nobles, and each pound of silver minted should consist of 3 oz in groats, 4 oz in halfgroats, 4 oz in pence, and 1 oz of halfpence.⁸ These specifications were repeated in the indenture of 20 June 1361, but the London indenture of 11 February 1363 and the Calais indenture of 1 March 1363 introduced an additional requirement to mint 100 pounds weight of farthings per annum (worth £125).⁹ The revised terms, including the 100 pounds in farthings, were repeated in the Calais indentures of 20 May 1371 and 20 May 1372, but the farthings were omitted from the London and Calais indentures of 9 October 1394, 9 July 1395 and 1 July 1402.¹⁰

TABLE 1. Silver coins in the indentures

Date	Silver (by value or weight)					Percentage of silver coins				
	4d.	2d.	1d.	½d.	¼d.	4d.	2d.	1d.	½d.	¼d.
31.5.1355	50 marks	50 marks	45 marks	5 marks	—	13.5	27.0	48.6	10.8	—
5.3.1361	3oz	4oz	4oz	1oz	—	8.6	22.9	45.7	22.9	—
11.2.1363	3oz	4oz	4oz	1oz	100lb per annum	—	—	—	—	—
9.10.1394	3oz	4oz	4oz	1oz	—	8.6	22.9	45.7	22.9	—
c.1409	—	—	—	—	—	—	—	—	—	—
13.2.1422	4oz	2oz	3oz	2oz	1oz	7.1	14.3	21.4	28.6	28.6
13.12.1445	—	—	—	—	—	—	—	—	—	—

TABLE 2. Gold coins in the indentures

Date	Gold (by weight)			Percentage of gold coins		
	Noble	½ noble	¼ noble	Noble	½ noble	¼ noble
11.2.1361	4oz	6oz	2oz	16.7	50.0	33.3
c.1409	—	—	—	—	—	—
13.2.1422	8oz	3oz	1oz	44.4	33.3	22.2
13.12.1445	—	—	—	—	—	—

The customary arrangements, which had remained unaltered since 1361 (apart from the provision for an annual 100 lb of farthings), were disrupted by the appointment of Richard Garner as master of the London and Calais mints in February 1409. Richard Garner's undated indenture of c.1409, which might not have been implemented, reduced the weights

⁶ CCR 1354-1360, 235-8 [31 May 1355].

⁷ CCR 1354-1360, 296-8 [27 Jan. 1356]; CCR 1354-1360, 335 [1 Nov. 1356]. Craig 1953, 75, tabulates the indenture proportions for silver in 1351 (*sic*), 1356, 1362 (*recte* 1361) and 1364 (*recte* 1363, omitting the 100 lb in farthings), and notes that indentures also specified proportions for gold, without giving details. Mayhew 1992, 168 n.273, notes the proportions of silver in the indenture of 1355, and the appearance of specifications for gold in Robert de Portyco's indenture of 1361. Woodhead 1996, 200-1, tabulates the gold and silver specifications for the Calais mint in 1362 (*recte* 1363) and 1422.

⁸ CCR 1360-1364, 296 [5 March 1361].

⁹ CCR 1360-1364, 293-5 [20 June 1361]; The National Archives: Public Record Office [hereafter TNA: PRO] C 54/201 m. 30d. [11 Feb. 1363]; CCR 1360-1364, 535-6 [1 March 1363]. Brooke 1950, 128-9, cites the indenture provisions of 5 March 1361 and 1 March 1363. Potter 1964, 306-7, argues that the indenture proportions for silver were never adhered to in the Treaty period (1361-69), because the smaller denominations would have been inconvenient to merchants as well as to the mint masters, and that it is also possible that fewer half nobles were struck than the indentures required.

¹⁰ CCR 1369-1374, 303-6 [20 May 1371]; TNA: PRO C 54/210 m. 18d.-19d. [20 May 1372]; CCR 1392-1396, 381-4 [9 Oct. 1394]; TNA: PRO C 54/237 m. 28d. [9 July 1395]; CCR 1399-1402, 579-82 [1 July 1402].

of the coins, and it omitted any reference to the proportions of the denominations.¹¹ In a further innovation this indenture provided for the additional costs of minting the smaller denominations by allowing the production of 28*s.* 4*d.* in halfpence and 29*s.* in farthings from each Tower pound of silver, instead of the 28*s.* per pound to be allowed for other silver coins under the indenture (the standard since 1351 had been 25*s.* for all denominations). Richard Garner may have had a new indenture for the light coinage of Henry IV authorized by parliament in November 1411 and implemented from Easter 1412 (with silver at 30*s.* per Tower pound), but no text of such an indenture is known at present.¹² The first indenture of the reign of Henry V (1413–22), dated 14 April 1413, does not specify the proportions of the denominations, but new specifications appear in Bartholomew Goldbeter's indenture of 13 February 1422.¹³ Each Tower pound of gold was to be minted into 8 oz of nobles, 3 oz of half nobles and 1 oz in quarter nobles, and a pound of silver was to provide 4 oz in groats, 2 oz in halfgroats, 3 oz in pence, 2 oz in halfpence and 1 oz of farthings. These provisions were repeated in the indentures of 16 February 1423, 8 September 1431 and 10 July 1434, but they do not appear in the indenture of 13 December 1445 and subsequent indentures.¹⁴ The disappearance of the allocations of bullion to denominations in 1445 may be seen as a concession to the new master, Robert Manfeld, who also received the London exchange without the payment of a £100 annual farm required by the indentures of 1431 and 1434.¹⁵ The indenture of 6 March 1465 for Edward IV's light coinage left the proportions to be determined by 'the comptroller and chaungeour which in this part(ie) shale have consideracion to the desire ease and contentacion of the people', but the results of this provision are unknown.¹⁶

The terms of the royal mint indentures did not apply to the ecclesiastical mints of Durham and York, which issued only the penny between 1351 and 1485, apart from a very limited issue of halfpence at Durham authorized by Edward IV in 1473.¹⁷ The archbishop of Canterbury received a grant of the right to strike the halfgroat and halfpenny in addition to the penny in 1463, and this right was exercised between 1464 and 1483.¹⁸

The parliament rolls and shortages of small change

A major source of evidence for possible non-compliance with the mint indentures, and related shortages of the smaller denominations, is the parliament rolls, which were cited at length by Ruding from their eighteenth-century publication, and which are now available with translations in a new digital edition.¹⁹ The first appearance of public concern about small change is in 1363, when a common petition that half nobles, halfpence and farthings should be minted, for the purchase of food and other commodities, was answered by the government with an assurance that this was already required by the mint indenture.²⁰ In 1379 a petition concerning various aspects of the coinage included a complaint that there was a shortage of halfpence and farthings, which were needed for purchases of small quantities of merchandise, religious payments and charity. In response it was promised that this problem would be

¹¹ *Calendar of Patent Rolls* [hereafter *CPR*] 1408–1413, 102; Blunt 1967, 106, 111–13.

¹² Strachey *et al.* 1783, III, 658–9. On 27 March 1413 (one week after the death of Henry IV) John Drax and Richard Kays, serjeants at arms, were ordered to arrest Richard Garner and Thomas de la Croys (alias Thomas Drayton, the mint's assayer-comptroller) without delay and to bring them before the king in chancery for an unspecified reason (*CPR* 1413–1416, 34). Two days later John Drax received a further order to arrest Richard Garner and bring him before the king and council, to answer a charge of making money contrary to the ordinance of 1411 (*ibid.*). Garner was pardoned on 10 January 1415 (*CPR* 1413–1416, 272). His troubles in 1413–15 are discussed by Craig 1953, 84–5; Reddaway 1967, 13; Mayhew 1992, 172–3.

¹³ *CCR* 1413–1419, 64–6 [14 April 1413]; *CCR* 1419–1422, 230–4 [13 Feb. 1422]. The indenture of 14 April 1413 was reissued in an amended form on 26 July 1421 (*CCR* 1419–1422, 204–5).

¹⁴ *CCR* 1422–1429, 59–62 [16 Feb. 1423]; *CCR* 1429–1435, 173–7 [8 Sept. 1431]; *CCR* 1429–1435, 318–22 [10 July 1434]; TNA: PRO EXT 6/146 no. 6 [13 Dec. 1445]; *CCR* 1447–1454, 368–71 [16 Dec. 1451]; *CCR* 1454–1461, 384–7 [11 April 1459]; *CPR* 1461–1467, 370–1 [13 Aug. 1464].

¹⁵ Mayhew 1992, 175–7.

¹⁶ Blunt and Whitton 1945–48, 53–7.

¹⁷ *CPR* 1467–1477, 392; Allen 2000; Allen 2003, 15, 22, 65, 92–3, 192–4.

¹⁸ *Calendar of Charter Rolls 1427–1516*, 195; Blunt and Whitton 1945–48, 11, 16–17; Allen 2000, 256.

¹⁹ Strachey *et al.* 1783; Ruding 1840; Given-Wilson *et al.* 2005.

²⁰ Strachey *et al.* 1783, II, 276; Ruding 1840, I, 231.

addressed as soon as the king was provided with the necessary bullion.²¹ The Calais indentures of 1371 and 1372 allocated 1 oz in every pound of silver to halfpence, and 100 lb of silver to farthings every year, but these provisions could have only a limited effect in a period of bullion shortage at the mints.²² A petition in 1380 about the shortage of halfpence and farthings for small purchases of bread and beer requested that every pound of new coins should include 3s. 4d. in these denominations. It was promised that a certain quantity would be made, with the advice of the council.²³ In 1381–82 five goldsmiths and merchants of London appeared in parliament to report their answers to seven articles of enquiry concerning the coinage, the third of which asked what should be done to remedy the lack of halfpence and farthings. Richard Leicester stated that the master of the mint was bound by the terms of his indenture to make halfpence in proportion to the quantity of silver minted, and John Hoo said that the mint officials should be compelled to make halfpence and farthings.²⁴ In 1382 the mayor of London (John Northampton, alias John Comberton) resorted to self-help by obtaining £80 in farthings from the London mint to distribute to bakers, brewers, hostellers and hucksters at the Guildhall. The mayor issued a proclamation that, to help the poor, bakers were to make farthing loaves and brewers were to sell by farthing measures. Priests of London churches were forbidden to require more than a farthing for a mass at vigils of the dead or similar ceremonies.²⁵ A new parliamentary petition in 1394 again complained about the shortage of halfpence and farthings, arguing that the poor often lost money when they paid a penny for a halfpenny purchase and could not be given change, and that the lack of halfpence and farthings also prevented the giving of alms to mendicant friars. The king responded with an injunction that more halfpence and farthings should be made, and with a prohibition of the melting down of English coins and the import of Scottish coins.²⁶ A final petition in 1402 about the shortage of halfpence and farthings stated that that none of these coins was being made, and that people were having to resort to the use of Scottish halfpence, 'galley-halfpence' (Venetian *soldini*), clipped foreign coins, and even in some places lead tokens. This petition resulted in a statute stipulating that one third of the mint's silver should be allocated to halfpence and farthings, divided equally, and that no halfpence and farthings were to be melted down.²⁷ Richard Garner's indenture of c.1409 does not refer to the provisions of the statute of 1402, but its separate weight standards for halfpence and farthings indicate an awareness of the need to encourage the minting of the smallest coins by allowing for the additional costs of their production.²⁸ Hoard evidence examined below suggests that there was a sustained attempt to produce substantial quantities of halfpence at least between 1377 and 1412.²⁹

A petition in the parliament of 1423–24 about the activities of the master of the royal mints, Bartholomew Goldbeter, complained that few or no coins smaller than the noble or groat were being struck, contrary to the terms of the master's indenture.³⁰ Paradoxically, it was only after the indenture ceased to specify the proportions of the denominations in 1445 that a parliamentary petition actually led to a documented issue of small change. A petition in the 1445–46 parliament about the shortage of halfpence and farthings, which it attributed to the melting down of these coins, asserted that travellers were being obliged to break pennies in two to pay for a halfpenny purchase and that the shortage of small change was affecting the trade of retailers. The government responded with a provision that, for up to two years

²¹ Strachey *et al.* 1783, III, 64–5; Ruding 1840, I, 237.

²² Average annual silver output at the London mint fell from £3,171 in 1361–69 to £1,393 in 1369–77 and £1,212 in 1377–87. There was no production of silver coinage in Calais between 1365 and 1422.

²³ Strachey *et al.* 1783, III, 94; Ruding 1840, I, 238.

²⁴ Strachey *et al.* 1783, III, 126; Ruding 1840, I, 239–42; Craig 1953, 82–3; Feaveryear 1963, 33–5; Reddaway 1967, 12; Mayhew 1992, 170–1.

²⁵ Sharpe 1907, 183–4; Kent 1987; Kent 2005, 30–1.

²⁶ Strachey *et al.* 1783, III, 319–20; Ruding 1840, I, 245; Craig 1953, 82.

²⁷ Strachey *et al.* 1783, III, 498; Statutes 4 Henry IV, cap. 10; Ruding 1840, I, 250–1; Craig 1953, 82.

²⁸ Blunt 1967, 106, 111–13. The conversion of a given weight of bullion into halfpence or farthings would require the striking of more coins, with greater labour costs, than the minting of the same weight of larger coins.

²⁹ See p. 205.

³⁰ Strachey *et al.* 1783, IV, 258; Ruding 1840, I, 272; Allen 1995, 124.

from 8 April 1446, halfpence were to be minted at 33*s.* per pound (instead of the 30*s.* standard for larger silver coins), with 10*d.* allowed for the additional labour of the moneyers.³¹ This exceptional halfpenny issue lasted only until June 1446, but the London mint's account of 13 December 1445 to 24 June 1446 records the striking of 1,872lb 10¼dwt of silver into halfpence according to the terms of the statute, which is about 74 per cent of the total weight of silver in the account.³²

Pyx trials

There are surviving records of pyx trials of the coins produced in the royal mints at various periods between 1413 and 1432.³³ The patent roll record of Lewys John's acquittance for the pyx trial of the London mint's coins held at Westminster on 18 February 1414 is exceptionally important evidence, as it is the only one of these records that explicitly states the quantities of each denomination minted.³⁴ Tables 3 and 4 tabulate the quantities reported in 1414, which relate to one period of nearly ten months for the gold and two periods of nearly eight and less than two months respectively for the silver.³⁵ The total mint outputs from April/May 1413 to February 1414 were equivalent to about £133,753 or £133,919 in gold and £4,983 in silver.³⁶ The level of these outputs is very similar to that of the figures provided by the accounts of the London mint for a period of about the same length between 29 November 1412 and 29 September 1413 (£138,826 in gold and £5,464 in silver).³⁷ The pyx trial record seems to imply that production of the first gold coins of the reign of Henry V (who acceded to the throne on 20 March 1413) began on 20 April 1413, but that the minting of silver coins was delayed until 4 May 1413. Lewys John's indenture for the coinage of Henry V was issued on 14 April 1413, and there may have been a brief delay in its implementation caused by the need to provide dies for the new mint contract, which Lord Stewartby has argued were identified by the use of the cinquefoil (or so-called 'mullet') mark of Henry V class C.³⁸ The quarter nobles seem to have been struck at the rate of 2oz per pound of gold, as specified in the indentures of 1361–1402, but the remaining 10oz of gold was divided between nobles and half nobles in a ratio of about 2:1 by weight, departing from the 2:3 ratio of the indentures. The proportions of the three largest silver denominations are more straightforward, in a ratio of 3:2:1 by weight in the first period and 3:2 for groats and halfgroats only in the second period. It is possible that the denominations were produced in sequence rather than simultaneously, and that production of the 50lb in pennies needed to match the 150lb of groats and 100lb in halfgroats of the second period was prevented by the calling of the pyx trial on 18 February 1414. The production of only one denomination at a time may well have been found to be the most convenient and effective use of labour and equipment in the London mint. The striking of nearly four dozen pounds of silver into halfpence and farthings in the first period and exactly two dozen pounds of these coins in the second period does not satisfy the stipulation of the statute of 1402, that one third of the silver should be devoted to these two denominations, but it is in the spirit of the earlier requirement of the indentures that 100lb of silver should be allocated to farthings each year.

³¹ Strachey *et al.* 1783, V, 108–9; Ruding 1840, I, 275–6; Craig 1953, 87; Mayhew 1992, 176. Legal tender of these coins was to be limited to 1*s.* in the pound.

³² Brooke and Stokes 1929, 32; Mayhew 1992, 176 n. 311. 653 lb 4 oz of silver was minted into unspecified denominations, under the normal terms of the indenture. The 1,872 lb 10¼ dwt of halfpence would have had a face value of about £3,089.

³³ Ruding 1840, I, 71, and II, 451–2.

³⁴ Ruding 1840, II, 451; *CPR 1413–1416*, 191–2 [14 May 1414].

³⁵ Weights stated in shillings and pence notation are the same fraction of a pound as in the reckoning of coins by face value.

³⁶ The stated total weight of gold coins produced is 8,025 lb 3*s.* 4*d.*, but the total of the individual weights for the three denominations is 8,035 lb 3*s.* 2*d.*

³⁷ Challis 1992, 682.

³⁸ *CCR 1413–1419*, 64–6; Stewartby 2003, 103.

TABLE 3. Pyx trial of gold coins, 1414

Period	Gold (by weight)			Percentage of gold coins		
	Noble	½ noble	¼ noble	Noble	½ noble	¼ noble
20 April 1413 – 17 Feb. 1414	4,420lb	2,260lb	1,355lb 3s 2d	30.8	31.5	37.7

TABLE 4. Pyx trial of silver coins, 1414

Period	Silver (by weight)				Percentage of silver coins ³⁹			
	4d.	2d.	1d.	½d. + ¼d.	4d.	2d.	1d.	½d. + ¼d.
4 May 1413– 24 Dec. 1413	1,500lb	1,000lb	500lb	47lb 18s 4½d	23.9–25.5	31.9–34.0	31.9–34.0	6.5–12.3
[after 24 Dec. 1413]–17 Feb. 1414	150lb	100lb	–	24lb	20.4–27.7	27.2–36.9	–	35.4–52.3

It is unfortunate that the indenture of 14 April 1413 does not include specifications of the proportions to compare with the results of the pyx trial of 1414, and it is equally unfortunate that the proportions in the indentures of 1422, 1423 and 1431 cannot be directly tested by comparison with the information from pyx trials summarized in Tables 5 and 6.⁴⁰ The parliamentary complaint of 1423–24 that very few small coins were being struck, contrary to the terms of the current indenture, does however invite investigation of any evidence that might be used to test the extent of adherence to the indenture proportions at this time.⁴¹ Marvin Lessen has attempted to calculate alternative estimates of the proportions of groats, halfgroats and pence produced at the York mint in 1423–24, using percentages of the three denominations in hoards and numbers of dies found in a die-study of the surviving coins, but he has acknowledged the shortcomings of these sources of evidence.⁴² The record of the pyx trial of the York coins of 1423–24 shows that the three gold denominations were presented for trial in a ratio of about 2:3:4 by number, but adherence to the indenture of 1423 would have required production of these denominations in the opposite ratio of 4:3:2.⁴³ The five silver denominations were in the ratio 1 to 1.4 to 2.8 to 4.2 to 5.3 in the trial, whereas the indenture required 1:2:3:4:4. The percentages of the gold and silver denominations in Tables 5 and 6 are extremely variable and none of them have any close resemblance to the indenture proportions in Tables 1 and 2, which remained constant throughout the period of the tables. Quarter nobles were always the most numerous gold coin in the trials, although the indentures required the production of twice as many nobles as quarter nobles. It may be concluded that the numbers of coins of each denomination reserved for the pyx trial were not directly related to the numbers produced.

³⁹ The percentages are given as a range of possibilities for each denomination, because the numbers of halfpence and farthings in the allocations of silver to the fractional denominations are unspecified in the sources.

⁴⁰ *CPR 1422–1429*, 117–18 [6 July 1423; trial of 1 July 1422]; *CPR 1422–1429*, 337–40 [12 Dec. 1425; trials of 14 Oct. 1424 and 30 July 1425]; *CPR 1422–1429*, 519–20 [8 Nov. 1428; trial of 7 July 1428]; *CPR 1429–1436*, 254–7 [16 Feb. 1433; trials of 7 July 1428 and 27 Oct. 1432]; *CPR 1429–1436*, 258–9 [1 Dec. 1432; trial of 27 Oct. 1432]; Ruding 1840, II, 451–2; Allen 1995, 124–5. There is one further available record of a pyx trial, on 1 Dec. 1475, which was published by Symonds 1926, 108. When the pyx containing the samples of the gold and silver coins minted in London between 14 April 1471 and 30 Nov. 1475 was opened it was found to contain thirty-six sinches (or satchels), thirty-four of them each containing two angels, one half angel, six groats, four halfgroats, four pence, seven halfpence and two farthings. The remaining two sinches contained £7 10s. in gold and 37s. 6d. in silver.

⁴¹ Strachey *et al.* 1783, IV, 258; Ruding 1840, I, 272; Allen 1995, 124.

⁴² Lessen 1993, 60–1, 64; Lessen 1995; see Table 13 (p. 201).

⁴³ Allen 1995, 124–5.

TABLE 5. Pyx trials of gold coins, 1422–32

<i>Mint</i>	<i>Period</i>	<i>No. of coins in the trial</i>			<i>Percentages</i>		
		<i>Noble</i>	$\frac{1}{2}$ noble	$\frac{1}{4}$ noble	<i>Noble</i>	$\frac{1}{2}$ noble	$\frac{1}{4}$ noble
London	19 Feb. 1422–1 July 1422	365	495	714	23.2	31.4	45.4
London	4 July 1422–10 June 1423	120	157	326	19.9	26.0	54.1
London	8 June 1423–17 July 1425	133	194	414	17.9	26.2	55.9
London	28 July 1425–6 July 1428	67	114	214	17.0	28.9	54.2
London	7 Aug. 1428–27 July 1431	88	108	173	23.8	29.3	46.9
London	16 Oct. 1431–22 Oct. 1432	36	36	52	29.0	29.0	41.9
Calais ⁴⁴	20 July 1422–30 Jan. 1424	37	74	148	14.3	28.6	57.1
Calais	24 Jan. 1424–24 Dec. 1427	30	58	114	14.9	28.7	56.4
Calais	20 May 1428–2 Aug. 1431	5	11	20	13.9	30.6	55.6
York	16 Oct. 1423–7 Aug. 1424	116	182	246	21.3	33.5	45.2

TABLE 6. Pyx trials of silver coins, 1422–32

<i>Mint</i>	<i>Period</i>	<i>No. of coins in the trial</i>					<i>Percentages</i>				
		<i>4d.</i>	<i>2d.</i>	<i>1d.</i>	$\frac{1}{2}d.$	$\frac{1}{4}d.$	<i>4d.</i>	<i>2d.</i>	<i>1d.</i>	$\frac{1}{2}d.$	$\frac{1}{4}d.$
London	19 Feb. 1422–1 July 1422	26	42	50	24	24	15.7	25.3	30.1	14.5	14.5
London	4 July 1422–10 June 1423	64	88	122	140	128	11.8	16.2	22.5	25.8	23.6
London	19 June 1423–28 June 1425	64	110	164	238	192	8.3	14.3	21.4	31.0	25.0
London	1 Sept. 1425–31 May 1428	39	55	88	166	220	6.9	9.7	15.5	29.2	38.7
London	1 Dec. 1428–6 July 1431	71	116	210	296	480	6.1	9.9	17.9	25.2	40.9
London	12 Oct. 1431–13 Oct. 1432	28	31	66	120	224	6.0	6.6	14.1	25.6	47.8
Calais	20 July 1422–30 Jan. 1424	45	90	167	104	208	7.3	14.7	27.2	16.9	33.9
Calais	25 Feb. 1424–31 Jan. 1428	220	440	868	310	620	9.0	17.9	35.3	12.6	25.2
Calais	20 Feb. 1428–3 Aug. 1431	241	482	964	482	964	7.7	15.4	30.8	15.4	30.8
Calais	31 Oct. 1431–30 Sept. 1432	68	136	272	136	272	7.7	15.4	30.8	15.4	30.8
York	16 Oct. 1423–7 Aug. 1424	10	14	28	42	53	6.8	9.5	19.0	28.6	36.1

Dies authorized and supplied

If the numbers of dies used to produce the various denominations at a mint in a particular period are known, this might provide some evidence of the proportions of the denominations in the output. We happen to be particularly well informed about the dies used at the York royal mint in 1353–55, as two orders for the supply of dies are recorded in the close rolls, and the dies themselves have been preserved in the National Archives.⁴⁵ On 25 July 1353 William de Rothwell, warden of the London mint, was instructed to deliver specified numbers of obverse and reverse dies for groats, halfgroats and pence to Henry de Brisele, master of the York mint, and on 21 February 1354 there was a further order to supply dies for the three denominations.⁴⁶ Table 7 shows the numbers of dies ordered (and which were actually supplied, as the surviving dies demonstrate).⁴⁷

⁴⁴ There is an obvious contradiction between the last day of the period covered by this trial (30 Jan.) and the opening day of the following period (24 Jan.).

⁴⁵ Cook 2000, 219–34, discusses the origin and custodial history of the dies in the National Archives and the related dies in the British Museum and the Royal Mint Museum.

⁴⁶ *CCR 1349–1354*, 555; *CCR 1354–1360*, 2; Lawrence 1926, 433; Stewart 1963, 102–3.

⁴⁷ Stewart 1963, 103–5, compares the numbers of dies ordered with the numbers of surviving dies in the Public Record Office (now part of the National Archives) published by Allen 1938–41, 35–41.

TABLE 7. Dies supplied to the York mint, 1353–54

<i>Date</i>	<i>Denomination</i>	<i>Obverse</i>	<i>Reverse</i>	<i>Total</i>
25 July 1353	Groat	6 (46%)	18 (43%)	24 (44%)
	Halfgroat	4 (31%)	12 (29%)	16 (29%)
	Penny	3 (23%)	12 (29%)	15 (27%)
	Total	13	42	55
21 Feb. 1354	Groat	5 (38%)	15 (38%)	20 (38%)
	Halfgroat	5 (38%)	15 (38%)	20 (38%)
	Penny	3 (23%)	9 (23%)	12 (23%)
	Total	13	29	52

We are also very well informed about numbers of dies supplied or authorized for the Calais mint between 1425 and 1441. Mint accounts and other documents record numbers of dies supplied to Calais in 1425–31, because Richard Buckland (the treasurer of Calais and warden of the Calais mint) had to pay for them. In an account of 29 September 1425 to 20 April 1427 Richard Buckland bought 2,713 dies for gold and silver coins of unspecified denominations, at 6s. per dozen, and he received a further 1,405 or 1,412 dies for silver coins only between 29 May 1427 and 31 March 1430.⁴⁸ From May 1427 the numbers of dies of each denomination had to be recorded, because the price of the dies now depended upon the denomination. The sixteen supplies of dies from 29 May 1427 to 27 February 1430 were recorded in sixteen separate indentures, which have provided the figures in Table 8. Groat dies were supplied on every occasion, but halfgroat dies were included in only five of the supplies, penny and halfpenny dies were supplied on three occasions, and farthing dies just twice.⁴⁹ Richard Buckland's account of 31 March 1430 to 29 September 1431 for the Calais mint states the total numbers of dies supplied for each denomination between 1 April 1430 and 24 September 1431 (shown in Table 9), and it also specifies the prices of the dies: 5s. per dozen for groat dies, 4s. for halfgroat dies, and 3s. for penny and halfpenny dies.⁵⁰ The proceedings of the privy council record the numbers of dies authorized for supply to Calais in 1435 and 1441. On 13 December 1435 Richard Buckland was given authority to receive 350 dies for groats, sixty dies for halfgroats, thirty dies for pence, and sixty dies for halfpence and farthings. He was to pay 7*d.* for each groat die, 6*d.* for halfgroat dies, 5*d.* for penny dies, and 4*d.* for the halfpenny and farthing dies, which shows an increase in prices since 1430–31.⁵¹ In 1433 the engraver's annual fee of 20 marks (£13 6s. 8*d.*) for making the Calais dies had been replaced by payments at these new rates for silver coins, with 8*d.* for nobles, 7*d.* for half nobles and 5*d.* for quarter nobles in addition.⁵² On 29 January 1441 Buckland's successor, Robert Whittingham, was authorized to receive twelve obverse dies and ninety-six reverse dies for groats, three obverse dies and twelve reverse dies for halfgroats, and the same for each of the smaller denominations (pence, halfpence and farthings).⁵³ Table 9 includes the numbers of dies authorized in 1435 and 1441.

⁴⁸ TNA: PRO E 364/60 rot. 7 m. 1–2 [1425–27]; TNA: PRO E 364/65 rot. 9 m. 1*d.* [account of 29 Sept. 1428 to 31 March 1430]. The total number of dies supplied in 1427–30 is variously stated as 117 dozen + 8 (= 1,412) or 1,405.

⁴⁹ TNA: PRO E 101/293/19, no. 3.

⁵⁰ TNA: PRO E 364/65 rot. 9 m. 2*d.* The 1,412 or 1,405 dies supplied in 1427–30 cost £26 5s. 1*d.* at an average of nearly 4.5s. per dozen, which is consistent with the application of the same prices as in 1430–31.

⁵¹ Nicolas 1834–7, IV, 306–7; Walker 1921–2, 92, reports the number of half groat dies as being 600, but the number in the original text is sixty (*sessant*). The prices are equivalent to 7s., 6s., 5s. and 4s. per dozen.

⁵² Symonds 1918.

⁵³ Nicolas 1834–7, V, 130–1; Walker 1921–2, 93.

TABLE 8. Dies supplied to the Calais mint, 1427–30

<i>Date</i>	<i>4d.</i>	<i>2d.</i>	<i>1d.</i>	<i>½d.</i>	<i>¼d.</i>	<i>Total</i>
29 May 1427	10 (<i>obv.</i>) + 30 (<i>rev.</i>)	—	—	—	—	10 + 30
22 July 1427	16 + 80	—	—	18 + 50	—	34 + 130
24 Sept. 1427	15 + 40	—	—	—	—	15 + 40
30 Nov. 1427	10 + 40	8 + 30	8 + 30	—	3 + 9	29 + 109
22 March 1428	10 + 40	4 + 16	4 + 16	—	—	18 + 72
14 June 1428	10 + 40	—	—	—	—	10 + 40
9 Aug. 1428	6 + 40	—	—	—	—	6 + 40
8 Sept. 1428	6 + 40	—	—	—	—	6 + 40
14 Nov. 1428	10 + 40	15 + 40	—	—	—	25 + 80
24 Jan. 1429	0 + 60	—	—	10 + 30	—	10 + 90
23 April 1429	16 + 80	—	—	—	—	16 + 80
7 July 1429	4 + 80	—	—	—	—	4 + 80
21 July 1429	8 + 0	—	—	—	—	8 + 0
16 Oct. 1429	10 + 80	5 + 40	—	—	—	15 + 120
14 Jan. 1430	8 + 40	10 + 0	10 + 0	16 + 48	8 + 18	52 + 106
27 Feb. 1430	10 + 16	—	—	—	—	10 + 16
Total	149 + 746 = 895 (67%)	42 + 126 = 168 (13%)	22 + 46 = 68 (5%)	44 + 128 = 172 (13%)	11 + 27 = 38 (3%)	268 + 1,073 = 1,341

TABLE 9. Dies supplied or authorized for the Calais mint, 1430–41

<i>Date(s)</i>	<i>Denomination(s)</i>	<i>Obverse</i>	<i>Reverse</i>	<i>Total</i>
1 April 1430–24 Sept. 1431	Groat	282 (63%)	1,220 (70%)	1,502 (69%)
	Halfgroat	96 (21%)	311 (18%)	407 (19%)
	Penny	55 (12%)	172 (10%)	227 (10%)
	Halfpenny	15 (3%)	36 (2%)	51 (2%)
	Total	448	1,739	2,187
13 Dec. 1435	Groat	—	—	350 (70%)
	Halfgroat	—	—	60 (12%)
	Penny	—	—	30 (6%)
	Halfpenny and farthing	—	—	60 (12%)
	Total	—	—	500
29 Jan. 1441	Groat	12 (50%)	96 (67%)	108 (64%)
	Halfgroat	3 (12.5%)	12 (8%)	15 (9%)
	Penny	3 (12.5%)	12 (8%)	15 (9%)
	Halfpenny	3 (12.5%)	12 (8%)	15 (9%)
	Farthing	3 (12.5%)	12 (8%)	15 (9%)
	Total	24	144	168

The figures for the dies supplied in 1427–31 are much better evidence for the relative numbers of dies for each denomination than the numbers authorized in 1435 and 1441, which are only maximum allowances that may not have corresponded to the numbers actually supplied. Nevertheless, the allocations of 1435 and 1441 share with the figures of 1427–31 a predominance of the groat dies, which constitute about two thirds of the total in each case. There are twice as many halfgroat dies as penny dies, or thereabouts, in 1427–30, 1430–31 and 1435. Halfpenny dies decline from 13% in 1427–30 to only 2% of the total in 1430–31, and farthing dies, which constitute 3% of the total in 1427–30, are completely absent in 1430–31, although they were authorized in 1435 and 1441. The halfpenny and farthing should have both constituted 28.6% of the total number of coins minted according to the indenture specifications of 1422–45, but this was clearly not happening at Calais in 1427–31.⁵⁴ The groat has only 7.1% of the output in the indentures, but it required 67% of the total number of dies in 1427–30

⁵⁴ See Table 1 (p. 191).

and 69% in 1430–31. There is smaller disparity between indenture proportions and dies supplied at York in 1353–54. The indenture of 1355 allocated the equivalent of 13.5% of output by number to the groats, which had 41% of the total number of dies supplied in 1353–54.⁵⁵ The divergence of the figures might be at least partly attributable to differences in the durability of dies according to the size of the denomination. Table 10 summarizes estimates of average outputs of dies for three denominations at various periods between 1248 and 1483, which show a clear tendency for dies of larger coins to be less productive.⁵⁶ Thus it is theoretically possible, for example, that the York mint struck 13.5% of its output from groat dies that constituted 41% of the 1353–54 total, assuming that the indenture of 1355 codified proportions already applied in royal mints since 1353. It is more difficult to believe that the Calais mint struck only 7.1% of its output into groats in 1427–31, as required by indenture, when the groat needed 67% of the total number of dies supplied in 1427–30 and 69% in 1430–31. If groat dies were less productive than dies for smaller denominations, the groat may well have had less than 67% or 69% of total output at Calais in 1427–31, but probably not as little as 7.1%.

TABLE 10. Estimates of average die-output⁵⁷

<i>Mints</i>	<i>Period</i>	<i>Denomination</i>	<i>Diameter</i>	<i>Obverse dies</i>	<i>Reverse dies</i>
Winchester	1248–50	penny	c.19 mm	35,000–41,000	23,000–28,000
Shrewsbury	1249–50	penny	c.19 mm	46,500	20,000
Bury St Edmunds	1280–87	penny	c.19 mm	65,000	–
Bury St Edmunds	1280–97	penny	c.19 mm	56,000	–
Six mints	1300	penny	c.18 mm	22,030–35,040	11,010–17,520
London	1471–82	angel	c.27 mm	12,000	6,000
London	1483	groat	c.26 mm	7,000 or less	–

Die studies

A comparison of the results of a die study of the London pence of 1355–77 with the outputs that should have been allocated to the denomination according to the indentures has suggested that actual outputs were much lower than allocated outputs in 1355–61 and 1369–77.⁵⁸ In Table 11, n is the number of coins studied, d is the number of obverse dies found, and D_{est} is the estimate of the original number of dies used.⁵⁹ The numbers of dies expected if the allocated outputs were actually produced, which have been estimated assuming an average output of about £100–£200 (24,000–48,000 coins) per obverse die, are much greater than the numbers of dies estimated from the die study in 1355–61 (Pre-Treaty Series F and G) and 1369–77 (Post Treaty). The die study data of 1361–69 (Treaty) have not been used as the basis of an estimate, as only two of the obverse dies recorded are known from more than one coin, but it has been suggested that the number of dies used must have been considerably more than the number in the study (29), and that it might have been sufficient to strike the output of pence required by the indentures.⁶⁰

⁵⁵ See Table 1 (p. 191).

⁵⁶ Allen 2004. This interpretation of the data in Table 10 is supported by David Greenhalgh's practical experiments in the making and use of dies. I have greatly benefited from discussion of this subject with Mr Greenhalgh. Differences in the outputs of dies may have been related to the metal being struck (gold or silver), changes in the technology of the dies, or variations in the administrative practices of the mints, but the overall trend of lower output from dies for coins of larger size is clear.

⁵⁷ Allen 2004; Allen forthcoming.

⁵⁸ Allen 2003, 62–3.

⁵⁹ Metcalfe 1977, 26, described the method of estimation employed, which is based upon the numbers of dies recorded and the numbers of coins not unique for the die (the 'non-singletons').

⁶⁰ Allen 2003, 62–3.

TABLE 11. Die study of London pence, 1355–77 (obverse dies)

<i>Period</i>	<i>n</i>	<i>d</i>	<i>D_{est}</i>	<i>Allocated output</i>	<i>Die estimate from allocated output</i>
1355–61	57	28	39	£30,350	c. 150–300
1361–69	31	29	?	£10,079	c. 50–100
1369–77	13	7	9	£3,716	c. 20–40

Tim Webb Ware's unpublished die study of the coinage of Richard II (1377–99) is an important source of evidence for the proportions of the silver denominations after 1377. He has very kindly provided the data in Table 12, and further unpublished statistics for the reign of Richard III (1483–85) in Table 15 below. In Table 12 the data for Richard II obverse dies and formulae devised by Warren Esty have been used to estimate the coverage (C_{est}), which is the proportion of each denomination struck from the dies represented in the study, and point estimates of the original numbers of dies (D_{est}), with 95 per cent confidence intervals.⁶¹ Esty's method is not appropriate for use with the penny data, but the complete absence of penny obverse dies known from only one coin (d_1) suggests that all of the dies may have been found. The number of penny obverse dies (7) is less than the estimate for 1369–77 (9), but the incomplete total of silver output at London in 1377–99 (with a gap in the records in 1384–87) is nearly twice as large as the entire output of 1369–77: the figures are £21,567 in 1377–99 and £11,147 in 1369–77.⁶² This suggests that the penny's overall share of the London mint's output may have been lower in 1377–99 than in 1369–77. The point estimate of farthing obverse dies in 1377–99 (14) is exactly twice as large as the penny estimate and, taken together with the data in Table 10 suggesting that smaller dies may have been more productive on average, this may indicate that farthings had a significantly larger share of output than pence in 1377–99. Hoard evidence discussed below indicates that halfpence had a relatively large share of output in 1377–99, and the halfpenny coinage of Richard II is so extensive that Webb Ware has not attempted a full die study of it.⁶³ The estimate of groat dies (32) considerably exceeds the halfgroat and penny estimates, and the groat's dominance over the halfgroat and penny while it was in production may have been greater than the figures suggest, as Webb Ware's study of the coinage of Richard II has led him to the conclusion that there may have been a long break in the output of groats from perhaps the early 1380s to a period late in the reign.⁶⁴ It is worth noting that there are no known groats of Henry IV's heavy coinage of 1399–1412, which seems to indicate that there was a further suspension of groat production after the deposition of Richard II in 1399. It is possible that the production of groats was temporarily abandoned for the first time, and that output of halfpence and farthings was significantly increased, after the parliamentary enquiry into the state of the coinage in 1381–82.⁶⁵

TABLE 12. Die study of silver coins of London, 1377–99 (obverse dies)

<i>Denomination</i>	<i>n</i>	<i>d</i>	<i>d₁</i>	<i>C_{est}</i>	<i>D_{est}</i>	<i>95% confidence intervals</i>
Groat	170	31	1	0.994	32	31–32
Halfgroat	71	8	1	0.986	9	8–9
Penny	25	7	0		7	
Halfpenny	no data				?	
Farthing	30	12	2	0.933	14	12–20

There are two published die studies of the full range of denominations in gold or silver at English mints in the fifteenth century. Marvin Lessen's die study of the York royal mint in

⁶¹ Esty 1986. Table 12 uses Esty's formula J1 for C_{est} , H5 for D_{est} , C2 for the 95% confidence intervals, and refinements to Esty's methods described by Crafter 2002, 240–1.

⁶² Challis 1992, 681–2, tabulates the mint outputs of 1369–99.

⁶³ See p. 205.

⁶⁴ Discussion of this subject with Mr Webb Ware has been exceptionally helpful.

⁶⁵ See p. 193.

1423–24, summarized in Table 13, cannot unfortunately provide useful estimates of the total numbers of dies of each denomination. The numbers of recorded coins (n) and dies (d) are too small and there are too many dies known from only one coin (d_1). In contrast, the data provided by Webb Ware's die study of the London mint's gold coinage of 1465–85 in Table 14 can certainly be used as a source of estimates, applying Esty's formulae.⁶⁶

TABLE 13. Die study of silver coins of York, 1423–24

<i>Denomination</i>	<i>Dies</i>	<i>n</i>	<i>d</i>	<i>d₁</i>
Groat	obverse	13	3	0
	reverse	13	9	4
Halfgroat	obverse	5	2	0
	reverse	5	4	3
Penny	obverse	3	2	1
	reverse	3	3	3
Halfpenny	obverse	3	2	1
	reverse	3	2	1
Farthing	obverse	1	1	1
	reverse	1	1	1

TABLE 14. Die study of gold coins of London, 1465–85

	<i>Denomination</i>	<i>Dies</i>	<i>n</i>	<i>d</i>	<i>d₁</i>	<i>C_{est}</i>	<i>D_{est}</i>	<i>95% confidence intervals</i>
Edward IV	ryal	obverse	230	68	24	0.996	80	80–82
		reverse	230	144	92	0.600	317	255–394
	half ryal	obverse	44	24	13	0.705	43	29–65
		reverse	44	32	20	0.545	77	46–133
	quarter ryal	obverse	72	22	7	0.903	28	23–35
		reverse	72	38	20	0.722	66	49–91
	angel	obverse	265	75	15	0.943	87	168–185
		reverse	265	133	62	0.766	214	184–251
	half angel	obverse	57	8	0	1.000	8	8–9
		reverse	57	24	11	0.807	37	27–49
Henry VI (restored)	angel	obverse	78	12	3	0.962	14	2–16
		reverse	78	20	2	0.974	22	20–26
Richard III	angel	obverse	97	13	1	0.990	14	13–15
		reverse	97	28	5	0.948	32	28–38

Webb Ware has suggested that the angel obverse and reverse dies were used in a ratio of about 1:2, while the ratio for half angel dies seems to have been about 1:4, and the figure for ryal dies was 1:3 in some phases of the ryal's production in 1465–70, increasing to 1:5 at other times.⁶⁷ The ratios of the die estimates of the ryal and its half and quarter are about 3 to 1.5 to 1 for obverse dies and about 5 to 1.2 to 1 for reverse dies. One possible explanation of the difference between these two sets of ratios is that the reverse dies for the ryal, which was the largest English coin of its time (c.34mm), were particularly vulnerable to damage during striking. The predominance of the ryal over its two fractions in both sets of ratios does not necessarily indicate that it had the largest share of output by number, as the figures in Table 10 suggest that dies for larger coins tended to have lower outputs. The relatively large ratios of angel dies to half angel dies in the Edward IV estimates (about 11:1 for obverse dies and 6:1 for reverse dies) may however be evidence of a real dominance of the angel in gold outputs, which exclusively consisted of angels and half angels from the restoration or 'read-emption' of Henry VI in 1470–71 to 1485. Webb Ware has recorded only six half angels of Richard III (1483–85), from two obverse dies and three reverse dies.⁶⁸ The data from Webb

⁶⁶ Webb Ware 1985, 95–7, 113, provides the data summarized in Table 14, and estimates that the Edward IV angels of Blunt and Whitton types XII-XXI (1471–82) were struck from about 79 obverse dies and 163 reverse dies.

⁶⁷ Webb Ware 1985, 97.

⁶⁸ Previously unpublished information kindly supplied by Mr Webb Ware.

Ware's unpublished die study of the silver coinage of Richard III in Table 15 clearly illustrate the dominance of the groat in the London mint's silver output, even with due allowance for the possibly higher average outputs of dies for smaller denominations.

TABLE 15. Die study of silver coins of London, 1483–85 (obverse dies)

<i>Denomination</i>	<i>n</i>	<i>d</i>	<i>d_i</i>	<i>C_{est}</i>	<i>D_{est}</i>	<i>95% confidence intervals</i>
Groat	222	71	28	0.874	97	86–110
Halfgroat	19	5	1	0.947	6	5–8
Penny	1	1	1		1?	
Halfpenny	no data				?	

Hoard

A survey of English hoards deposited between 1158 and 1544 has shown that these hoards tend to contain coins of the largest denominations available, as might be expected.⁶⁹ The only apparent exception to this rule in Table 16 is provided by the preponderance of pence in 1351–1412, after the establishment of the groat and halfgroat as the largest silver denominations in 1351. It should be noted that the Cambridge (Chesterton Lane) and Rickerby hoards (both deposited in the 1350s) supplied about 3,540 of the pence in the 1351–1412 data, 475 of the halfpence, and all of the farthings. Without these two hoards the percentage of pence in 1351–1412 would decrease from 74.5% to 59.2%, but this is still much higher than the percentage in 1412–64 (22.6%), when the groat and halfgroat had become fully established in the currency. The preference of hoarders for groats and their almost complete avoidance of coins smaller than the penny is very evident after 1412, and it would clearly be wrong to assume that the statistics in Table 16 are an accurate reflection of the proportions of the denominations in the silver currency. It might perhaps be suggested that the percentages of groats in 1412–64/5 (60.4%) and 1464/5–1544 (67.9%) are greater than the groat's overall share of output in these two periods. The penny percentages exceed the halfgroat percentages in 1412–64/5 and 1464/5–1544, but this may bear no relation whatsoever to the relative sizes of the halfgroat and penny outputs in the royal mints, as the ecclesiastical mints of Durham and York were the principal suppliers of pence in the fifteenth century.⁷⁰ The preference for coins of the largest denomination inferred from the post-1412 data for the silver coinage is even more apparent in the gold statistics. The percentages of nobles in 1351–1412 (84.0%) and 1412–64/5 (87.7%) are much higher than the highest groat percentage (67.9%), and the percentage of angels in the angel gold figures (91.9%) is even higher. The half and quarter ryals do not feature in the statistics at all.

Hoard may be an unreliable guide to the proportions of the denominations in mint outputs, but it is still possible that they might provide some evidence of changes in the proportions through time, by comparison of the numbers of coins of each denomination in successive periods. Comparisons of this kind could only be applied to relatively short periods of a few decades at most, as the silver denominations and possibly the gold had different rates of survival in circulation. The stock of groats was most liable to attrition over time, particularly through recoinage after the reductions of the weight standard in 1411/12 and 1464.⁷¹ The use of hoard data to detect changes in the proportions of the denominations is further limited by the almost complete absence of halfpence and farthings from English hoards of 1351–1544. The three main sources of halfpence and farthings in Table 16 are the Rickerby hoard (which included 474 halfpence and 52 farthings, and was deposited too soon after 1351 to provide any useful data), the Attenborough hoard, and the Sherborne hoard (which contained 121 halfpence of Henry VIII issued after the period of this investigation).⁷² There is

⁶⁹ Allen 2002, 26–9.

⁷⁰ Allen 2000, 258–9.

⁷¹ Allen 2005, 51–5.

⁷² Allen 2002, nos 172, 226 and 312.

TABLE 16. Gold and silver coins in English hoards of 1351–1544

<i>Denomination</i>	<i>1351–1412</i>		<i>1412–6415</i>		<i>146415–1544</i>	
	<i>Coins</i>	<i>% of gold or silver</i>	<i>Coins</i>	<i>% of gold or silver</i>	<i>Coins</i>	<i>% of gold or silver</i>
Noble	798–799+	84.0	c. 1,518	87.7		
Half noble	96	10.1	140	8.1		
Quarter noble	56	5.9	72	4.2		
Ryal					80	25.4
Half ryal					0	0.0
Quarter ryal					0	0.0
Angel					216	68.6
Half angel					19	6.0
Groat	c. 956	12.9	6,387	60.4	c. 5,167–5,178+	67.9
Halfgroat	c. 371	5.0	1,734	16.4	913	12.0
Penny	c. 5,522	74.5	2,390	22.6	1,342	17.6
Halfpenny	515	6.9	69	0.7	189	2.5
Farthing	52	0.7	0	0.0	0	0.0

also a shortage of good hoard data for the gold denominations, as the Fishpool hoard is the only adequately recorded find with significant numbers of coins of more than one denomination.⁷³ The hoard data are best for the three largest denominations of the silver coinage (the groat, halfgroat and penny) in 1351–69 and 1412–c. 1455.

The London mint data from the Durham 1930, Beulah Hill, Coventry 1967, Grantham, Attenborough, Reigate 1972 and Reigate 1990 hoards in Tables 17–23 show the proportion of halfgroats in Pre-Treaty series A–C (1351–c. 1352) exceeding the proportions in series D–E (c. 1352–1355/6) and F–G (1355/6–1361) in five of the seven hoards.⁷⁴ The exceptions to this rule are the Grantham and Attenborough hoards, which have the smallest number of coins and hence arguably the most unreliable statistics. The Reigate 1990 hoard, which has by far the largest numbers of coins, shows a clear break between the high percentage of halfgroats in Series A–C and the lower figures in Series D–E and F–G, which are very similar to each other. It seems that there was a relatively large output of halfgroats in the early stages of the new coinage of 1351 and that the proportion of halfgroats was reduced in c. 1352 to a level that may have been sustained after the first appearance of stipulated proportions in the indenture of 1355. If the indenture proportions of 1355 for groats and halfgroats (13.5% and 27% by number, respectively) were adhered to practice, then the Reigate data would suggest that halfgroats supplied more than 27% of the output by number in 1351–c. 1352. The missing element in this hypothesis is the penny, which does not feature very strongly in the hoard data. It is difficult to detect a consistent trend in the penny percentages, which are based upon relatively small numbers of coins. The Series D–E percentage is the highest of the three periods in the Coventry and Grantham hoards, but it is lowest in the Durham and Attenborough hoards. The die study data already discussed suggest that the penny outputs actually achieved in 1355–61 and 1369–77 were much lower than the outputs allocated to the penny by the indentures.⁷⁵

TABLE 17. Durham 1930 hoard (c. 1360)⁷⁶

<i>Period</i>	<i>4d.</i>	<i>2d.</i>	<i>1d.</i>	<i>Total</i>
Pre-Treaty A–C	19 (39%)	21 (43%)	9 (18%)	49
Pre-Treaty D–E	33 (72%)	10 (22%)	3 (7%)	46
Pre-Treaty F–G	8 (42%)	6 (32%)	5 (26%)	19
Total	60	37	17	114

⁷³ Archibald with Cherry 1967.⁷⁴ Allen 2003, 185–6, discusses the chronology of the Pre-Treaty coinage.⁷⁵ See pp. 199–200.⁷⁶ Lawrence 1931.

TABLE 18. Beulah Hill hoard (c.1365)⁷⁷

<i>Period</i>	<i>4d.</i>	<i>2d.</i>	<i>1d.</i>	<i>Total</i>
Pre-Treaty A-C	33 (70%)	14 (30%)	0	47
Pre-Treaty D-E	23 (92%)	2 (8%)	0	25
Pre-Treaty F-G	31 (86%)	5 (14%)	0	36
Total	87	19	0	108

TABLE 19. Coventry 1967 hoard (c.1365)⁷⁸

<i>Period</i>	<i>4d.</i>	<i>2d.</i>	<i>1d.</i>	<i>Total</i>
Pre-Treaty A-C	13 (27%)	27 (55%)	9 (18%)	49
Pre-Treaty D-E	14 (26%)	18 (33%)	22 (41%)	54
Pre-Treaty F-G	11 (58%)	6 (32%)	2 (11%)	19
Total	38	51	33	122

TABLE 20. Grantham hoard (c.1375–c.1380)⁷⁹

<i>Period</i>	<i>4d.</i>	<i>2d.</i>	<i>1d.</i>	<i>Total</i>
Pre-Treaty A-C	19 (51%)	12 (32%)	6 (16%)	37
Pre-Treaty D-E	9 (33%)	11 (41%)	7 (26%)	27
Pre-Treaty F-G	16 (67%)	3 (13%)	5 (21%)	24
Total	44	26	18	88

TABLE 21. Attenborough hoard (c.1420)⁸⁰

<i>Period</i>	<i>4d.</i>	<i>2d.</i>	<i>1d.</i>	<i>Total</i>
Pre-Treaty A-C	3 (8%)	18 (49%)	16 (43%)	37
Pre-Treaty D-E	5 (15%)	17 (50%)	12 (35%)	34
Pre-Treaty F-G	1 (5%)	5 (26%)	13 (68%)	19
Total	9	40	41	90

TABLE 22. Reigate 1972 hoard (c.1455)⁸¹

<i>Period</i>	<i>4d.</i>	<i>2d.</i>	<i>1d.</i>	<i>Total</i>
Pre-Treaty A-C	24 (60%)	16 (40%)	0	40
Pre-Treaty D-E	25 (78%)	7 (22%)	0	32
Pre-Treaty F-G	17 (85%)	3 (15%)	0	20
Total	66	26	0	92

TABLE 23. Reigate 1990 hoard (c.1455)⁸²

<i>Period</i>	<i>4d.</i>	<i>2d.</i>	<i>1d.</i>	<i>Total</i>
Pre-Treaty A-C	114 (32%)	233 (66%)	4 (1%)	351
Pre-Treaty D-E	165 (63%)	97 (37%)	2 (1%)	264
Pre-Treaty F-G	69 (62%)	42 (38%)	1 (1%)	112
Total	348	372	7	727

⁷⁷ Dolley 1953.⁷⁸ Archibald 1973.⁷⁹ Cook 1996; the data in Table 20 exclude one penny not attributable to one of the three periods.⁸⁰ Archibald with MacCormick 1969.⁸¹ Archibald 1978.⁸² I am extremely grateful to Dr Barrie Cook, who has provided statistics from his study of the Reigate 1990 hoard in advance of publication. Twenty-five London pennies of 1351–77 could not be attributed to a specific coinage (Pre-Treaty, Treaty or Post-Treaty).

Any attempt to use hoard evidence to detect changes in the proportions of the silver denominations after 1361 must be severely hampered by the decline in the numbers of London mint coins in hoards during the remainder of the fourteenth century, in a period of declining mint output.⁸³ In the Attenborough hoard the figures fall from 90 in 1351–61 to 42 in a much longer period in 1361–99, and the Reigate 1972 hoard figures drop from 92 in 1351–61 to only 6 in 1361–99. The best hope of usable data for the groat and halfgroat is provided by the Reigate 1990 hoard, where the numbers of London mint coins before and after 1361 are so much greater. The data in Table 24 seem to indicate that the groat had a smaller share of output compared with the halfgroat in 1361–69 than in c.1352–1361. This is consistent with the decline in the proportion of groats in the indentures from 13.5% by number in 1355–61 to 8.6% in 1361–69, which is a fall of 36%, far exceeding the 15% reduction of the proportion of halfgroats, from 27.0% to 22.9% by number.⁸⁴ The figures for the Post-Treaty coinage of 1369–77 and the reign of Richard II (1377–99) are too small for meaningful analysis.

TABLE 24. London mint coins of 1351–99 in the Reigate 1990 hoard

<i>Period</i>	<i>4d.</i>	<i>2d.</i>	<i>1d.</i>	<i>Total</i>
Pre-Treaty A-C	114 (32%)	233 (66%)	4 (1%)	351
Pre-Treaty D-G	234 (62%)	139 (37%)	3 (1%)	376
1361–69	30 (52%)	27 (47%)	1 (2%)	58
1369–77	3	5	2	10
1377–99	9	5	0	14
Total	390	409	10	809

The data from the Attenborough hoard in Table 25 provide valuable evidence of the production of relatively large numbers of halfpence in 1377–1412, in apparent contradiction of the frequent parliamentary complaints in this period about the failure to mint sufficient quantities of halfpence and farthings.⁸⁵ No halfpence were struck in 1369–77, and there are no halfpence of 1412–22 in the Attenborough hoard, but 32 of the 34 London mint coins of 1377–1412 belong to this denomination.

TABLE 25. London mint coins of 1351–1422 in the Attenborough hoard

<i>Period</i>	<i>4d.</i>	<i>2d.</i>	<i>1d.</i>	<i>½d.</i>	<i>Total</i>
1351–61	9	40	41	0	90
1361–69	0	3	8	1	12
1369–77	0	2	2	0	4
1377–99	0	0	1	25	26
1399–1412	0	0	1	7 ⁸⁶	8
1412–22	5	1	1	0	7
Total	14	46	54	33	147

Numbers of London mint silver coins in the two Reigate hoards increase substantially after the weight reduction of 1411/12, which marked the beginning of a period of greatly increased output, and between 1422 and c.1440 there are also large numbers of coins from the Calais mint.⁸⁷ Tables 26 and 27 summarize the data provided by the hoards from 1412 to the deposition of the hoards c.1455.⁸⁸ The London figures from the Reigate 1990 hoard seem to suggest

⁸³ See n. 22.

⁸⁴ See Table 1 (p. 191).

⁸⁵ See pp. 192–3.

⁸⁶ Archibald with MacCormick 1969, 75, lists a Richard II/Henry IV mule halfpenny with 'Rev. die of Henry IV Heavy (?) Coinage'.

⁸⁷ Average annual output of silver at the London mint rose from only £194 in 1399–1408 to £4,365 in 1411–22 and £2,981 in 1422–30. The activity of the Calais mint between 1422 and c.1440 is discussed by Spufford 1979 and Woodhead 1979.

⁸⁸ In Tables 26–28 data for the Annulet issue include the Annulet-Trefoil issue.

an overall increase in the proportion of groats between the Annulet issue of 1422–c.1430 and the period of Henry VI's Rosette-Mascle to Trefoil issues (c.1430–c.1445), and a corresponding decline in halfgroats.⁸⁹ The Reigate 1972 hoard may also provide some equivocal evidence of an increase in the proportion of groats c.1430, although the numbers of halfgroats in each period are small and arguably unreliable as a source of statistics. The Calais data in Table 27 show the same trend, with rising percentages of groats after the end of the Annulet issue. It seems that the shortage of smaller denominations in the output of the royal mints depicted by the parliamentary petition of 1423–24 actually got worse after c.1430.

TABLE 26. London mint coins of 1412–c.1455 in the Reigate 1972 and 1990 hoards

<i>Period</i>	<i>Reigate 1972</i>				<i>Reigate 1990</i>			
	<i>4d.</i>	<i>2d.</i>	<i>1d.</i>	<i>Total</i>	<i>4d.</i>	<i>2d.</i>	<i>1d.</i>	<i>Total</i>
1412–22	58 (100%)	0	0	58	285 (79%)	69 (19%)	9 (2%)	363
Annulet	38 (88%)	5 (12%)	0	43	169 (82%)	31 (15%)	7 (3%)	207
Rosette-Mascle to Trefoil	33 (97%)	1 (3%)	0	34	313 (88%)	39 (11%)	4 (1%)	356
Leaf-Pellet to Cross-Pellet	56 (95%)	3 (5%)	0	59	75 (90%)	5 (6%)	3 (4%)	83
Total	185	9	0	194	1,232	553	33	1,818

TABLE 27. Calais mint coins of 1422–c.1440 in the Reigate 1972 and 1990 hoards

<i>Period</i>	<i>Reigate 1972</i>				<i>Reigate 1990</i>			
	<i>4d.</i>	<i>2d.</i>	<i>1d.</i>	<i>Total</i>	<i>4d.</i>	<i>2d.</i>	<i>1d.</i>	<i>Total</i>
Annulet	413 (89%)	50 (11%)	0	463	1,780 (75%)	554 (23%)	37 (2%)	2,371
Rosette-Mascle to Trefoil	238 (96%)	10 (4%)	0	248	1,395 (84%)	250 (15%)	16 (1%)	1,661
Total	651	60	0	711	3,175	804	53	4,032

The data for gold coins in the Fishpool hoard in Table 28 seem to provide further evidence of a shift towards the largest denominations after the end of the Annulet issue in c.1430. The percentage of nobles in the London mint data increases from 78% in the Annulet issue to 93% in Rosette-Mascle to Trefoil, and the half noble disappears from the figures altogether from the introduction of Leaf-Pellet in c.1445 to 1464. Eighty-four London coins in this last period include just one quarter noble. The figures also seem to suggest that there was a greater effort to produce the half and quarter noble in the period of the Annulet issue (1422–c.1430) than in 1412–22. The combined percentage of half and quarter nobles in the pyx trial of 1414 (69.2%) is actually significantly higher than the figure from the indentures of 1422–34 (55.5%), but the proportions seen in the pyx trial period of 1413–14 may not have been sustained until 1422.

TABLE 28. Gold coins in the Fishpool hoard (c.1464)

<i>Period</i>	<i>London</i>				<i>Calais</i>			
	<i>Noble</i>	<i>½ noble</i>	<i>¼ noble</i>	<i>Total</i>	<i>Noble</i>	<i>½ noble</i>	<i>¼ noble</i>	<i>Total</i>
1351–1412	27	2	0	29	3	2	0	5
1412–22	294 (97%)	8 (3%)	1 (0.3%)	303				
Annulet	320 (78%)	72 (18%)	17 (4%)	409	55 (89%)	7 (11%)	0	62
Rosette Mascle to Trefoil	62 ⁹⁰ (93%)	5 (7%)	0	67	3	0	0	3
Leaf-Pellet to Unmarked	21	0	0	21				
1461–64	62	0	1	63				
Total	786	87	19	892	61	9	0	70

⁸⁹ Woodhead 1996, 29–30, 80–4, proposes a chronology of the coinage of Henry VI which is used here. Whitton 1938–41, 403, 413–14, associated the introduction of the Leaf-Pellet issue with the appointment of Robert Manfeld as master of the London and Calais mints on 13 Dec. 1445, arguing that the common Leaf-Pellet halfpence were the coins issued under the terms of the parliamentary provisions of 1445. The issue of the new coins was actually intended to start on 8 April 1446.

⁹⁰ Including three coins described as 'New type. Leaf at left of shield, trefoil as sword pommel, pellet, and trefoils in *rev.* legend' (Archibald with Cherry 1967, 142).

Conclusion

The indentures of 1355 and 1356 allocated fixed proportions of the London mint's silver to the groat, halfgroat, penny and halfpenny, but the die study of London pence indicates that the actual output of pence in 1355–61 was much less than the indentures stipulated.⁹¹ Figures from the Reigate 1990 hoard clearly indicate that the relative proportions of the groats and halfgroats were the same in c.1352–1355 as in 1355–61, and that the halfgroat had a larger share of the combined groat and halfgroat output in 1351–c.1352 than it had after c.1352.⁹² From 1361 the indentures specify the proportions of the gold denominations, and they allocate smaller shares of the silver output to the groat, halfgroat and penny than before, while the allocation for the halfpenny was more than doubled, and a requirement to mint 100lb. of farthings every year was added in 1363.⁹³ Data from the Reigate 1990 hoard certainly suggest a decline in the groat's share of output in 1361–69.⁹⁴ The results of the die study of London pence are inconclusive in 1361–69, but they might be consistent with the enforcement of the indenture allocation of silver output to pence in this period. The die study gives a clearer indication that penny output fell far below the indenture specification in 1369–77.⁹⁵ Production of the halfpenny seems to have ceased altogether in 1369–77, although this denomination was allocated one twelfth of the total weight of bullion in the indentures of 1361–94, equivalent to 22.9 per cent of the total number of coins issued.⁹⁶ Webb Ware's die study of the silver coinage of 1377–99 suggests that the penny's share of output declined even further in this period, and groat production may have been suspended altogether in the early 1380s, possibly as a result of the parliamentary enquiry of 1381–82. The perceived shortage of halfpence and farthings referred to by the parliamentary petitions of 1379, 1380, 1394 and 1402, and in the enquiry of 1381–82, does not necessarily indicate a failure to implement the indenture allocation of output to halfpence after 1377. The figures from the Attenborough hoard clearly indicate that a relatively high proportion of the London mint's silver output of 1377–1412 was devoted to halfpence, and Webb Ware's die study suggests that the farthing had a larger share of output by number in 1377–99 than the halfgroat or the penny.⁹⁷ The indentures of 1363, 1371 and 1372 stipulated the production of 100lb weight of farthings each year, but this disappeared from the indentures in 1394. The statutory requirement of 1402 to strike one third of the mint's silver into halfpence and farthings might have been observed in practice, but supplies of silver were very limited at this time.⁹⁸ Production of groats seems to have been suspended for a second time in 1399–1412.

The proportions of the denominations disappear from the indentures between c.1409 and 1422, but the record of the pyx trial of 1413–14 seems to show the gold and silver denominations from the noble to the penny being produced in new sets of fixed proportions, with an additional allocation of silver to the halfpenny and farthing.⁹⁹ The brief period of less than a year covered by the 1413–14 pyx trial is the only period between 1351 and 1485 for which we have reliable information about the proportions of the denominations actually produced, and these proportions may not have been achieved throughout the reign of Henry V (1413–22). The proportions of the denominations were again specified by the indentures from 1422 to 1445, but a parliamentary petition of 1423–24 complained about the shortage of coins smaller than the noble and groat.¹⁰⁰ The numbers of dies supplied to Calais in 1427–31 suggest that the groat had a larger share of output than was required by indenture, and that the relatively generous indenture allocations of output to halfpence and farthings were not being

⁹¹ See Tables I and II (pp. 191, 200).

⁹² See Table 23 (p. 204).

⁹³ See Tables I and 2 (p. 191).

⁹⁴ See Table 24 (p. 205).

⁹⁵ See Table II (p. 200).

⁹⁶ See Table I (p. 191).

⁹⁷ See Tables 12 and 25 (pp. 200, 205).

⁹⁸ The London mint's output in 1402/3 was only £162, and the annual average for 1399–1408 is £148.

⁹⁹ See Tables 3–4 (p. 195).

¹⁰⁰ See Tables 1–2 (p. 191).

honoured in practice.¹⁰¹ Data from the Fishpool hoard and the two Reigate hoards seem to indicate that the failure to mint sufficient quantities of the smaller denominations in gold and silver got worse after c. 1430, although there was a brief boost to halfpenny output in 1446.¹⁰² The proportions of the gold and silver denominations in Edward IV's first reign light coinage of 1464/5–70 are obscure at present, but Webb Ware's die studies show that the angel dominated gold outputs from 1470 to 1485, and that the groat was dominant in the silver coinage of Richard III (1483–85).¹⁰³ The proportions attested by documentary evidence between 1351 and 1485 are summarized in Table 29.

TABLE 29. Proportions in documentary sources

Date(s)	Source	Percentage of gold coins			Percentage of silver coins or weight of silver				
		Noble	½ noble	¼ noble	4d.	2d.	1d.	½d.	¼d.
1355–61	Indentures	-	-	-	13.5	27.0	48.6	10.8	-
1361–63	Indentures	16.7	50.0	33.3	8.6	22.9	45.7	22.9	-
1363–94	Indentures	16.7	50.0	33.3	8.6	22.9	45.7	22.9	100 lb per annum
1394–c. 1409	Indentures	16.7	50.0	33.3	8.6	22.9	45.7	22.9	-
1402	Statute	-	-	-	-	-	-	Sixth of total weight	Sixth of total weight
1413–14	Pyx trial ¹⁰⁴	30.8	31.5	37.7	27.3	36.4	36.4	Fixed weight	per annum?
1422–45	Indentures	44.4	33.3	22.2	7.1	14.3	21.4	28.6	28.6

It must be emphasized that the conclusions presented here refer to the outputs of the royal mints only, and not to the proportions of the denominations in the English currency in circulation, which was composed of coins of various ages from the ecclesiastical as well as the royal mints, supplemented by foreign coins serving as substitutes of English coins.¹⁰⁵

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¹⁰¹ See Tables 1 and 9 (pp. 191, 198).

¹⁰² See Tables 26 and 27 (p. 206).

¹⁰³ See Tables 14 and 15 (pp. 201–2).

¹⁰⁴ Percentages based upon the figures of the first of the two periods covered by the Pyx trial (4 May to 24 Dec. 1413).

¹⁰⁵ Allen 2000, 258–9, examines the contribution of the ecclesiastical mints to the late medieval English currency. Cook 1999, 255–66, discusses the circulation of foreign coins in the fourteenth and fifteenth centuries.

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