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# The search for seignorage: periodic re-coinage in medieval Sweden

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## ABSTRACT

A specific monetary tax – called periodic re-coinage – was applied for almost 200 years in large parts of medieval Europe. Old coins were frequently declared invalid and exchanged for new ones based on publicly announced dates and exchange fees. A theoretical framework of how periodic re-coinage works in practice is tested on Swedish coinage. The theory suggests that economic backwardness, limited monetisation of society and separate currency areas facilitated re-coinage. The Swedish experience is extraordinarily consistent with this theory. It is shown that Sweden adopted coin types similar to those minted in Continental Europe during the Middle Ages and the corresponding coinage and monetary taxation policies. Periodic re-coinage was applied with varying frequency from 1180 to 1290. However, monetisation increased in the late thirteenth century, making periodic re-coinage more difficult, and long-lived coins were introduced in 1290. With the end of periodic re-coinage, Swedish kings accelerated the debasement of long-lived coins, which continued until the beginning of the sixteenth century.

## ARTICLE HISTORY

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Sweden

## 1. Introduction

A tax on money holdings existed for nearly 200 years in large parts of medieval Europe. Old coins were frequently declared invalid and were required to be exchanged for new ones based on publicly announced exchange fees and dates. These re-coinages were recurrent; thus, the phenomenon is called periodic re-coinage.<sup>1</sup> In the twelfth and thirteenth centuries, re-coinage could occur once or twice per year in Germany and Central Europe, and a common exchange fee was four old coins for three new ones (Kluge, 2007, p. 61ff; Röblitz, 1986, p. 21).<sup>2</sup> In practice, periodic re-coinage was implemented by changing the main design when re-minting the coins, whereas the monetary standard of the coinage (weight, fineness, diameter, shape of the flan) remained largely unchanged (Spufford, 1988, p. 93). Thereby, it was easy for coin users to distinguish between valid and non-valid types.

The phenomenon of periodic re-coinage has been observed and discussed in the economic history literature; see Spufford (1988, p. 94), Kluge (2007, p. 64), Allen (2012, p. 35ff) and Bolton (2012, p. 99ff). Svensson (2016) develops a theory aimed at understanding how this monetary system worked in practice. The theory suggests that frequent periodic re-coinage is facilitated by low monetisation and small currency areas. Currency areas that experienced periodic re-coinage were often characterised by the minting of uni-faced bracteates and the absence of debasement. For many

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<sup>1</sup>This monetary taxation system is also called coin renewal, or in Latin, *renovatio monetarum*.

<sup>2</sup>Both the frequency and the exchange fee of coin renewals varied across Europe; see more in Svensson (2016, p. 1112ff).

currency areas, written documents reveal whether periodic re-coinage occurred in the Middle Ages. In other cases, one must rely on other sources, such as the composition of coin hoards or the number of coin types per reign and/or time period.

The purpose of this study is to test this theory of periodic re-coinage on a specific country, namely, medieval Sweden during the period 1153–1520. Sweden provides a good testing ground for the proposed theory for two reasons. First, Sweden adopted similar coin types to those minted in Continental Europe during the Middle Ages, but the monetary taxation policies applied in medieval Sweden remain unknown. For example, there are no written documents about periodic re-coinage in Sweden. Second, a rich archaeological collection of coin hoards and a numismatic literature identify when and by whom different medieval coin types were issued in Sweden. This information will be used to identify the coinage policies.

The analysis shows that the Swedish experience is extraordinarily consistent with the theory. Sweden not only adopted similar coin types to those minted in Continental Europe during the Middle Ages but also the corresponding Continental coinage and monetary taxation policies linked to these coin types – in particular those applied by the Hanseatic League cities in Northern Germany. Re-coinage was applied with varying frequency during the period 1180–1290 when only bracteates were minted,<sup>3</sup> as evidenced by the many different coin types minted during each king's reign, coin hoards that are dominated by a few coin types and the dating of coin types to specific periods of kings' reigns. However, monetisation increased in the late thirteenth century, making periodic re-coinage more difficult. Uni-faced bracteates were replaced by long-lived, two-faced coins in 1290. With the end of periodic re-coinage, Swedish kings then accelerated the debasement of long-lived coins to compensate for the fact that re-coinage fees could no longer be levied. Such debasements – interrupted by several coinage reforms – were continually conducted until the beginning of the sixteenth century. The analysis also shows that coinage policies and monetisation are strongly connected to the growing local markets and urbanisation of medieval Sweden.

This study is organised as follows. In Section 2, the theory and conditions of periodic re-coinage are outlined, and its distribution throughout medieval Europe is empirically described. In Section 3, Swedish medieval coins of different periods are described and analysed. Swedish monetary taxation policies are discussed in Section 4. In the final section, the main conclusions are presented.

## 2. Coinage policies in medieval Europe

### 2.1. *The demand for coins, division of labour and growing local markets/towns*

Money in medieval Europe overwhelmingly took the form of commodity money based on silver, while fiat money did not exist in its pure form. As coins were standardised with respect to weight and fineness, they worked more effectively as a medium of exchange and standard of value than unminted metal. When conducting daily transactions, it is clearly more convenient to count coins than to weigh silver and to ascertain fineness. People were thus generally willing to pay a premium to have their silver transformed into standard coins. This enabled the minting authority to charge a seignorage when minting coins (Sussman, 1993, p. 50).

The minting authority could not strike coins without restraint. There always had to be a demand for coins as a medium of exchange and a standard of value in daily life. The surplus coins would otherwise flood the market with higher prices, and their face value would diminish towards their intrinsic value. Increased local trade might increase the demand for coins. However, it is then crucial to explain why local trade increased in the Middle Ages. In an economy with limited division of

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<sup>3</sup>Bracteates are thin, uni-faced coins struck with only one die. A piece of soft material, such as leather or lead, was placed under the thin flan. Consequently, the design of the obverse can be seen as a mirror image on the reverse of a bracteate.

labour and in which every household was in principle self-supporting, there should have been no need for a local market and the associated coins for local transactions.<sup>4</sup>

In the twelfth and thirteenth centuries, the population in Europe grew, which resulted in an increased division of labour among peasants, handicraftsmen and households. This increased division of labour had two important consequences. First, efficiency in production increased, as some specialised in producing tools while others specialised in producing shoes or clothes (Smith, 1776). In other words, the total production of goods and services per capita increased in the feudal economy, resulting in an economic boom. Second, specialisation led to increased requirements in terms of buying and selling goods and services in local markets. An increasing portion of the surplus from farming and handicrafts was sold at the local markets in the growing cities.<sup>5</sup> This increased the demand for coins as a medium of exchange and standard of value in the local markets. The development of local markets was a sufficient condition, or at least strong documentary evidence, that the division of labour had begun. Fried (2000, p. 109) shows that the number of coins in circulation (based on coin hoards) increased with the number of local markets and mints in central Germany between 1140 and 1300. Although the usage of coins increased over time in medieval Europe, barter and alternative payment methods (e.g. bullion) remained important for transactions for a long time.

## 2.2. Short- and long-lived coinage systems

For the purposes of analysis, the European coinage systems of the High Middle Ages (ca. 1000–1300) are divided into two main systems. One system had long-lived coins that were valid during the entire reign of the coin issuer.<sup>6</sup> The other system had short-lived coins that were only valid for specific intervals of the issuer's reign.<sup>7</sup> In the latter system, periodic re-coinage occurred. The following three methods have been used to identify periodic re-coinage and its frequency; for details, see Svensson (2016, appendix):

- (A) written documents that indicate the dates, frequency and/or exchange fees of periodic re-coinage;
- (B) the number of coin types per ruler and the years for a specific mint/currency area;
- (C) the distribution of coin types in hoards. If re-coinage has occurred, one would expect a few young types to strongly dominate the composition of the hoard. Older types should have more sparse representation.

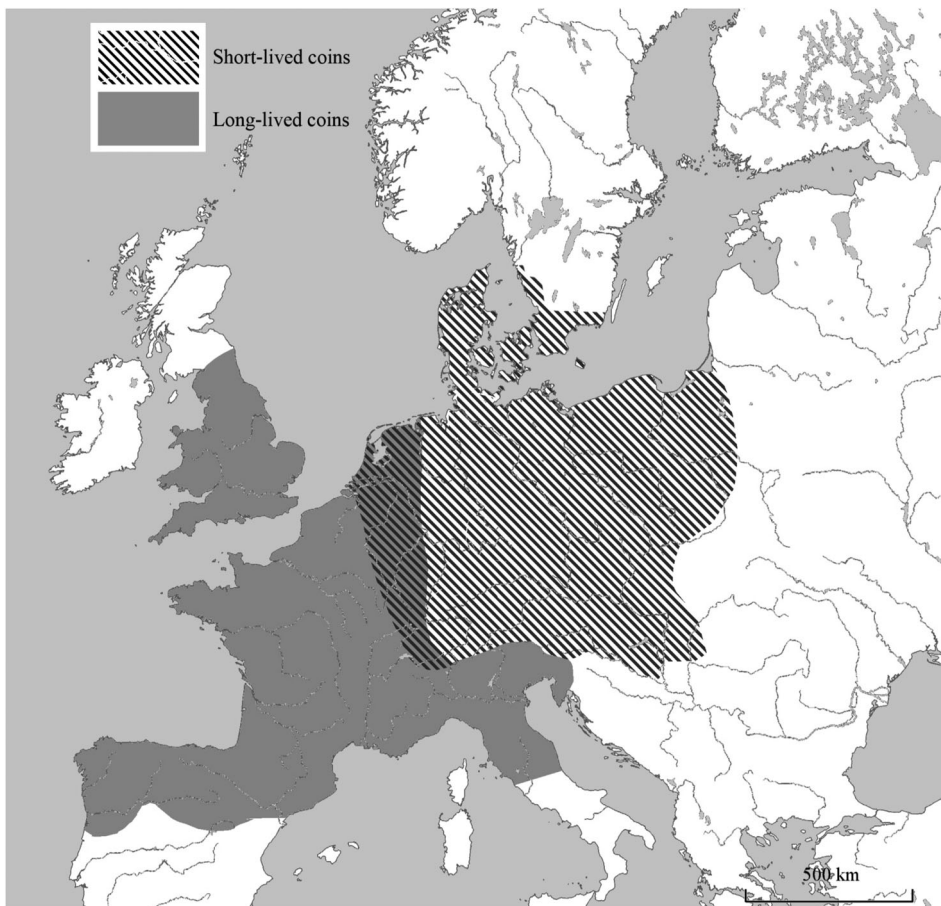
Based on these methods, there is a consensus regarding the extension through time and space of long- and short-lived coinage systems. As shown in Figure 1, long-lived coins were common in western and southern Europe (France, Italy, Christian Spain and England after 1150) in the High Middle Ages, whereas short-lived coins dominated in central, northern and eastern Europe (Germany, Austria, Denmark, Poland, Bohemia/Moravia and England before 1125) (see Kluge, 2007, p. 62ff; Svensson, 2016, p. 1112ff for an overview). Periodic re-coinage started in Normandy ca. 930–1100 and was practised in England from 973 to 1125. However, the best examples of short-lived and geographically constrained coins can be found in central and eastern Germany, where the currency areas were relatively small. Here, periodic re-coinage started in the middle of the twelfth century and lasted until the beginning of the fourteenth century and could occur annually or

<sup>4</sup>However, there may have existed regional imbalances, e.g. a lack of salt or metals, which necessitated foreign trade. This picture is in line with society from Viking-Age Scandinavia.

<sup>5</sup>Empirical research has documented that specialised workers (craftsmen) often settled in growing towns and cities (Steguweit, 1987, p. 16). Theoretically, craftsmen were more dependent on the local market and transactions than were peasants. The former had incentives to establish themselves in proximity to the market. Therefore, towns were founded and started developing.

<sup>6</sup>Sometimes, successors minted variants of the same coin type. These are called immobilised types and could be valid for very long periods – occasionally centuries – surviving through the reigns of several new rulers (Kluge, 2007, p. 62–63).

<sup>7</sup>The term 'regional coins' is widely used instead of short-lived coins in the numismatic literature. However, the term is misleading inasmuch as long-lived coins were also geographically constrained and thus regional.



**Figure 1.** Short- and long-lived coinage systems in Europe, 1140–1300.

twice per year (Kluge, 2007, p. 63). The short-lived coinage system defined legal tender for almost 200 years in the central, northern and eastern parts of medieval Europe.

### **2.3. Theory and conditions for periodic re-coinage**

The basic conditions for periodic re-coinage outlined in Svensson (2016, p. 1114ff) are shown in Table 1. Both short- and long-lived coinage systems require a geographic currency constraint (foreign coins are invalid) and an exchange monopoly.<sup>8</sup> Furthermore, the coin-issuing authority must control both the local market and the coinage. This control is facilitated if the rights to charge market customs and to mint are possessed by a single authority, which was normally the case in medieval Europe (Kluge, 2007, p. 53).

For a system of periodic re-coinage to be practical, it is essential that (1) only one coin type circulates and (2) it is easy for users in everyday life to distinguish among the various issues. It is then logical that differences in the main design of the coins are linked to different issues, while details are used by the minting authority to control coinage.<sup>9</sup>

<sup>8</sup>In the High Middle Ages, silver ingots were legally used for large-scale trade and international trade (Haupt, 1974, p. 72). In the Late Middle Ages, standardised high nominal international coins like ducats, florins (goldgulden) and groschen were often used for international trade in the large cities (Nau, 1977, p. 97).

<sup>9</sup>The details may represent a different mint, weight, fineness or mint master.

**Table 1.** Similarities and differences between long- and short-lived coinage systems.

Conditions/characteristics	Long-lived coins	Short-lived coins	
Geographic constraint (foreign coins invalid)	Yes	Yes	
Exchange monopoly	Yes	Yes	
Market right necessary	Yes	Yes	
Sources of coin issuer profit	Minting of bullion ( <i>gross seignorage</i> )	Yes	
	Re-minting of foreign coins ( <i>gross seignorage</i> )	Yes	
	Periodic re-coinage and issues (exchange fee)	Only when shift of issuer	Frequent
	Debasements of weight and fineness	Often	Sometimes
Number of coin types (same denomination) circulating simultaneously in a given currency area	One or few	One	
Volume of coins circulating in the economy	Large	Small	
Relative development of the economy	High	Low	
Geographic area	Large or small	Preferably small	
Number of mints in <i>large</i> currency areas	Few	Many	

Source: Svensson (2016, p. 1115).

As noted previously, periodic re-coinage was the dominant monetary policy in the central, eastern and northern parts of Europe. These areas were relatively undeveloped and had less experience with coinage and local markets than western and southern Europe.<sup>10</sup> Periodic re-coinage works particularly well in relatively undeveloped economies because there is a small volume of coins circulating, i.e. low monetisation. This key factor facilitates re-minting (Spufford, 1988, p. 93; Svensson, 2016, p. 1115). Furthermore, when monetisation is low, there are few places where coins are used for transactions and few groups in society who use coins. These factors facilitate monitoring and enforcement in a short-lived coinage system.

Typically, in Germany, a short-lived coinage system that used only new local coins as legal tender was enforced within a city's borders, while any coin could be used outside the city (Hess, 2004, p. 16). The coin-issuing authority used several methods to monitor and enforce re-coinage. First, the authority placed exchangers and other administrators at the city markets, and the usage of invalid coins was penalised (Haupt, 1974, p. 29; Grinder-Hansen, 2000, p. 69). Second, the designated re-coinage date often occurred just before an important annual market or tax payment date (Grinder-Hansen, 2000, p. 69). Third, any fees, taxes, rents, tithes or fines had to be paid in new coins (Grinder-Hansen, 2000, p. 69; Hess, 2004, p. 19).

Although periodic re-coinage occurred in many areas with two-faced coins (e.g. Normandy, England, western Germany, Denmark), renewals were especially frequent in areas where uni-faced bracteates were minted (e.g. central and eastern Germany, Poland, Bohemia, Moravia). Bracteates had several favourable characteristics for such a policy (Svensson, 2016, p. 1123): (1) low production costs – only one die was needed, which lasted longer than dies for two-faced coins; (2) old bracteates were easy to hammer out and overstrike; and (3) a variety of pictures could be displayed on the relatively large diameter, making recognition of valid and invalid coins fast and reliable. The fragility of bracteates was not a significant problem because they would not circulate for long periods.

#### 2.4. Alternative monetary taxation policies

A goal of the minting authorities in medieval Europe was to create a preference for the issuer's coins over competing foreign coins, with sustained acceptance enhancing issuer profits. Therefore, legal tender laws stated that foreign coins were precluded from circulation. Foreign coins and bullion were to be exchanged for current coins at mints. Here, the minting authority had an exchange monopoly and could thereby benefit from *gross seignorage* (Kluge, 2007, pp. 62–63).

<sup>10</sup>In the High Middle Ages (eleventh–thirteenth centuries), southern and western Europe (as well as western Germany) had had relatively large towns for several hundred years, whereas the first towns in northern and eastern Germany, Poland, Bohemia, Moravia and Scandinavia were founded in the eleventh–twelfth centuries or later.



In addition to the re-minting of foreign coins and bullion, there were two main methods of using coinage as a monetary tax: periodic re-coinage and debasement. Of course, re-coinage occurs, by definition, in a short-lived coinage system but never in a long-lived system. However, debasement can occur in all coinage systems. Thus, periodic re-coinage and debasement are not inherently mutually exclusive and can occur simultaneously.<sup>11</sup> Both types of monetary taxes cause old coins to be driven out of circulation, either through administrative re-minting (re-coinage) or due to Gresham's Law (debasement).

The empirical evidence indicates that debasement mostly occurred in long-lived systems in which the issuer's revenue from minting was limited, especially in medieval France, Spain and Italy (compare with Figure 2) (Kluge, 2007, p. 64). For many regions of Germany, for as long as periodic re-coinage occurred, silver fineness was sustained at a high level of at least 90%. Not until the fourteenth century, when long-lived coins replaced short-lived coins, did debasements accelerate in Germany (Gaettens, 1963, pp. 18, 35, 58; Jesse, 1967, p. 209).

### 2.5. A development theory of urbanisation, monetisation and coinage system

In Table 2, an overview of the expected relationship over time between state formation, urbanisation, local markets/trade, monetisation and coinage systems is presented (based on Sections 2.1–2.4). In stage 1, scarcely any state or king has control over the country. The economy is almost purely rural, and there is a need for distant trade of goods that people lack locally. Foreign coins are imported or imitated and often valued by weight at the few market places.

In stage 2, the state is formed with a taxation system, and a king now has political control of the country. Craftsmen start to specialise and settle in small growing cities. Due to increased specialisation, there is a need for daily transactions in local markets, and the demand for standardised coins – which facilitate transactions – increases. Local coinage starts, and coins are valued by tale. Monetisation is low, and at this stage periodic re-coinage is possible.

In stage 3, specialisation of the work force increases, and cities become larger. Coins are not used only in the city markets but also in the countryside. The level of monetisation is higher, and it is no longer possible to undertake periodic re-coinage (limited time to re-mint and difficult to monitor). Long-lived coins are introduced, and possible debasements start as income compensation.

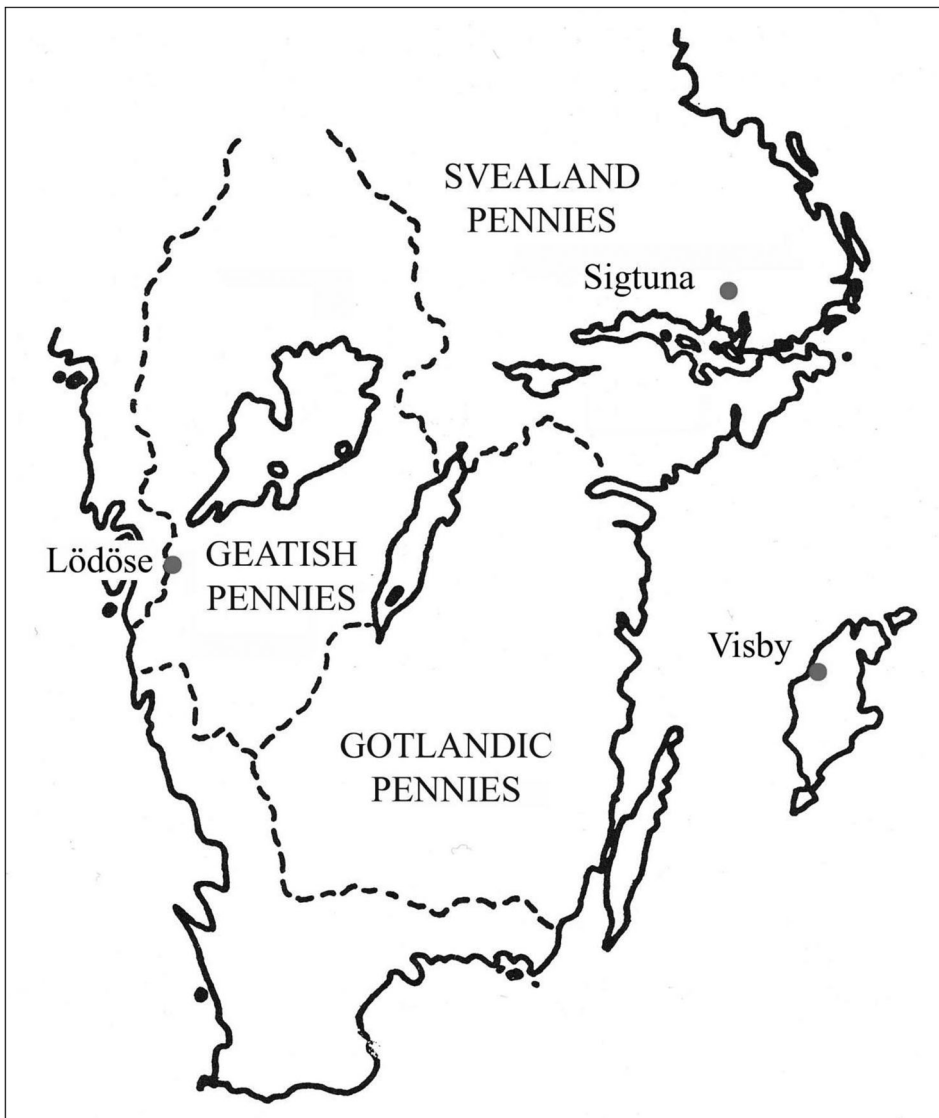
## 3. Coinage in Sweden 1153–1523

In the Sigtuna (Svealand) mint, two-faced imitations inspired by English coins were struck from 995 to 1030. Studies of dies and die-links show that the quantity of coins minted in Sigtuna was considerable (Malmer, 2010). No actual state called Sweden existed during this period. Since the imitations had a high silver content but were non-standardised with respect to weight, Kilger (2011, p. 273ff) argues that transactions in Viking-Age Sweden were based on weighing silver. However, both English coins and their imitations were regarded as more reliable due to their high silver content. Therefore, they had a higher exchange value than other silver coins and bullion. The minting of English imitations in Sigtuna ceased around 1030 for hitherto unexplained reasons. This Viking-Age period corresponds to stage 1 in Table 2.

### 3.1. Different currency areas

In the eleventh and twelfth centuries, the area that would later be called Sweden consisted of three independent regions (Svealand, Western Götaland and Eastern Götaland) with their own regional laws. Different dynasties competed for sovereign power in these regions during this period. A

<sup>11</sup>For example, this occurred in Denmark during a civil war 1260–1340 (Grinder-Hansen, 2000, p. 67ff).



**Figure 2.** Currency areas in Sweden until 1250. Source: Jonsson (1995, p. 51).

Note: The dots represent known Swedish and Gotlandic mints in the 12<sup>th</sup> century.

**Table 2.** Development trends of local trade, monetisation and coinage systems.

	State formation/urbanisation	Trade/markets	Monetisation	Coinage system
Stage 1	State is barely formed. Scarcely any towns. Almost a pure rural self-supported society	Foreign trade involving necessities (salt, metals)	Scarcely any coins. Foreign coins are weighted or counted	Imports or imitation of foreign coins
Stage 2	King is established, and a state is formed with a taxation system. Craftsmen start to specialise and settle in small towns	Both local markets and local trade start to arise	Low monetisation. Local coins are used in local markets in small towns	Own coinage system is established. Periodic re-coinage or long-lived coins
Stage 3	Urbanisation continues and towns become larger	Trade in local markets and in the countryside is substantial	High level of monetisation. Coins are used in towns and also partially in the countryside	Long-lived coins



genuine central authority with a distinct administration and royal tax collection was not established until the late twelfth or early thirteenth century. The ecclesiastical power began to become established in the eleventh century, and many churches were built in the twelfth century. Sweden lagged behind other countries in northern and central Europe, e.g. Denmark and Germany, both politically and economically. Above all, the area's economic backwardness is demonstrated by the scarcity of towns and the absence of a local coinage system.

There were three monetary standards and currency areas in Sweden from 1153 to 1250: Svealand pennies, Geatish pennies (Western Götaland) and Gotlandic pennies (Gotland and Eastern Götaland) (Figure 2) (Jonsson, 1995, pp. 50–51).<sup>12</sup> Gotland was in a union with Sweden, but it retained a self-governing position and its coinage rights (see Section 3.4). In the middle of the thirteenth century, two Svealand pennies had the same value as three Gotlandic or four Geatish pennies.<sup>13</sup> Svealand bracteates weighed ca. 0.30 g and Geatish ca. 0.15 g, and both had a silver fineness of 94% until 1250. This view of separate currency areas is largely supported by the fact that the design and style of the bracteates in Svealand and Götaland were very dissimilar. As with regional laws, coinage was geographically constrained in Sweden, which resembled a union of discrete regions under a common king (Jonsson, 1995, p. 47ff). This arrangement – with different currency areas (mints) under the control of the same minting authority – closely matches the pattern in Continental Europe.

### 3.2. The bracteate period 1153–1290

On the mainland, there was a long break in coinage that lasted for approximately 120 years. Minting was resumed in Lödöse (Western Götaland) in approximately 1153 (Ekre, 1988, p. 30).<sup>14</sup> For the next 140 years, until 1290, only bracteates were minted on the mainland. Not much is known about the earliest bracteates (1150s) in Lödöse beyond that they were ecclesiastical issues, as documented by the image of the double cross (Arnell, 2001, p. 4ff). Additionally, Skara's chronicle of bishops states that Bishop Bengt (ca. 1150–90) paid with 'his' coins (Klackenberg, 1992b, p. 125). There are no written documents about periodic re-coinage, and only a few coin hoards and cumulative finds from churches have been located from the 1153 to 1180 period. The sparse available evidence means that, to date, the question of whether these early bracteates were short- or long-lived coins remains unsettled.

It was not until the later period (after 1180) of King Canute I's reign (1167–1196) that several types of bracteates were continuously minted in Sigtuna (Svealand) and Lödöse (Götaland).<sup>15</sup> A rigorous survey of listed and identified bracteate types shows that Canute I minted at least 16 different types in Sigtuna (Svealand) and 3 types in Lödöse (Western Götaland) during the period 1180–1196 (Lagerqvist, 1970), see Table 3.<sup>16</sup> Thus, King Canute issued several types in both mints within a

<sup>12</sup>The currency areas largely coincided with the dioceses of (1) Uppsala, Västerås and Strängnäs; (2) Skara; and (3) Linköping and Växjö (Jonsson, 2002, p. 51). Dioceses and monetary standards were also related in Germany (see Nau, 1977, p. 94). Sweden did not have firm control over Finland until ca. 1300. Cumulative finds in churches show that during the period 1200–1300, Gotlandic and Baltic coins dominated. After 1300, monetisation increased and Swedish coins dominated completely (Klackenberg, 1992a, p. 165ff).

<sup>13</sup>One-mark pennies consisted of 192 Svealand, 288 Gotlandic or 384 Geatish pennies.

<sup>14</sup>For a long time, it was uncertain whether any coins had been minted in the Swedish area during the period 1150–1180. For example, in an important reference work by Lagerqvist (1970), there are no listed Swedish bracteate types from this period. However, archaeological digs in Lödöse in the 1980s found a mint house and waste products from minting dated to the period 1150–1170 (Ekre, 1988, p. 30).

<sup>15</sup>The design of the Svealand bracteates has an obvious German influence – a crowned bust or head with royal symbols on the hands. The first Svealand bracteates with a relatively high artistic style were likely struck by a German mint master. However, the style and design degenerated rapidly, and within a decade, the portrayed figure consists of pellets. This simplification of the design may have occurred because once everyday users of the coins were familiar with the representation, it was no longer necessary to waste resources on detailed designs. The Götaland types show variants of a crowned head.

<sup>16</sup>According to Jonsson (1995, p. 54), some of the Svealand types may have been minted by the successor King Sverker II the Younger (1196–1208).

**Table 3.** Coining of bracteates in Sweden 1180–1290.

Royal coin issuers	Years of issuance	Svealand types	Götaland types
Canute I Ericsson (1167–1196)	16	16 <sup>a</sup>	3
Sverker II the Younger (1196–1208)	12		3
Eric X Knutsson (1208–1216)	8	3–4	1 <sup>b</sup>
John I Sverkersson (1216–1222)	6	6	2 <sup>c</sup>
Eric XI Ericsson (1222–1229, 1234–1250)	23	6	8
Canute II the Tall (1229–1234)	5	9	0
Valdemar (1250–1275)	25	0	5
Magnus III Barnlock (1275–1290)	15	3	2

Note: The number of different types refers here to types that are easily distinguishable from each other.

<sup>a</sup>These bracteates were once attributed to Canute I, but some of them may have been minted by Sverker II.

<sup>b</sup>There are many variants of this type.

<sup>c</sup>These may be Svealand half pennies; they have the same images as Svealand types.

limited period (method B in Section 2.2 and in Svensson, 2016, appendix). These observations suggest that periodic re-coining occurred in both areas but was more frequent in Svealand than in Götaland.

Another important empirical observation that adds credence to the thesis of periodic re-coining derives from interpreting the large coin hoards (more than 10 coins) from the reign of Canute I. The composition of these hoards is strongly skewed with respect to various bracteate types (method C in Section 2.2 and in Svensson, 2016, appendix). Often, one or a few types dominate, indicating that they are late types, e.g. the hoards from Gillberga<sup>17</sup> and Mackmyra<sup>18</sup> (Jonsson, 1983, p. 79). It is difficult to imagine more unbalanced coin hoards than these to support the view that the types are chronological. In Germany and Denmark, we are quite certain that periodic re-coining occurred based on written sources. However, the German and Danish coin hoards are seldom if ever as unbalanced as the Swedish hoards from this period (Gaetens, 1963; Grinder-Hansen, 2000; Haupt, 1954; Hävernack, 1955).

The Swedish kings minted several types of bracteates in both Svealand and Götaland in the first half of the thirteenth century (see Table 3). The bracteate types within each region have the same styles but clearly visible differences in their designs. From the reign of Eric X (1208–1216), three or four different Svealand types and one Geatish type are known (Holmberg, 1995, pp. 68–69).<sup>19</sup> Six Svealand and two Geatish bracteate types have been attributed to the reign of King John I (1216–1222). These types are very rare in coin finds, but all of them are included in a coin hoard from Dimbo (Western Götaland). Given that the number of types in the hoard corresponds to the number of years, Jonsson (1999, p. 77) suggests that annual renewals were introduced by John I in Svealand in 1216.

The next Swedish king, Eric XI, had two separate reigns (1222–1229 and 1234–1250). He minted more bracteate types in Götaland (8) than in Svealand (6). It is noteworthy that two issues had the same main design in both currency areas, i.e. a bird and a crowned head. The various types have been dated to different periods of his reign (Holmberg, 1995, p. 68ff), which further supports the hypothesis of periodic re-coining. For the reign of King Canute II the Tall from 1229 to 1234, as many as nine Svealand bracteate types have been found in a coin hoard from Eskilstuna (Eastern Svealand). At least seven of them were issued by the king, and two further types may be dated to his reign. This evidence indicates that re-coining occurred annually or even more frequently in Svealand.

<sup>17</sup>The hoard from Gillberga in Uppland contains 457 bracteates from Canute's era distributed among four types. Of these, more than 99% are of two types (431 of one type and 22 of another type).

<sup>18</sup>The Mackmyra hoard from Gästrikland contains 235 bracteates distributed among 13 types, with 108 of one type and 21 of a closely related type. Two other distinctive types have 38 and 32 artefacts, and 6 types are evidenced by a maximum of 2 coins each.

<sup>19</sup>There are many variants of the Geatish type with the image of a crowned head. It is unclear whether these are different chronological issues.

No bracteates for a Geatish monetary standard are known. Therefore, it is doubtful that Canute II the Tall was accepted as king in all of Sweden (Holmberg, 1995, pp. 71–72).

Coinage rights could be delegated to ecclesiastical or civil authorities conditional on obeying the guidelines of the king. Delegation mostly occurred when the royal power was weak, as was the case in Germany from 1100 to 1300, Denmark from 1130 to 1157 and 1229 to 1340 and Sweden from 1150 to 1266. The Archbishops of Uppsala minted bracteates, probably in Sigtuna, during the period 1190–1215 (Jonsson, 1983, p. 83). The bracteate types of the kings and archbishops have the same monetary standard, so they could have circulated simultaneously. From 1215 onward, there were no ecclesiastical coin issuers, indicating that royal power had strengthened its position against the church. Earls only minted bracteates during the period 1229–1266 in Sweden.

After 1250, the minting volume increased when Western and Eastern Götaland were joined into a uniform currency area. Several new mints were established (Jonsson, 2002, pp. 48–49). Until 1250, the fineness of the Swedish bracteates was as high as the German, ca. 94%, but the Swedish fineness declined to 80% in the period 1250–1290 (Gaettens, 1963, pp. 18, 35, 58; Jesse, 1967, p. 209; Jonsson, 2002, pp. 48–49). The number of bracteate types per period was considerably smaller from 1250 to 1290 than from 1180 to 1250. King Valdemar (1250–1275) struck only five main types of Geatish bracteates during his 25-year reign (Holmberg, 1995, pp. 74–75).

It was not until the reign of King Magnus III Barnlock (1275–1290) that Svealand and Götaland were joined into a common currency area. Both Svealand and Götaland then minted corresponding bracteate types with the same image, but the Svealand types were, as usual, double the weight of the Geatish types (Jonsson, 2002, p. 50).<sup>20</sup> The first main type was a crown with a smooth edge, which was only struck in Svealand. Later, two bracteate types with the letter M were minted, one with smooth edges and another with ray edges. There were four variants of each type. Swedish numismatists have closely examined these bracteates. King Magnus' last will of 1285 mentions four mints in Svealand (Uppsala, Örebro, Västerås and Nyköping) and four in Götaland (Skara, Jönköping, Skänninge and Söderköping), which suggests that eight variants had been minted, each in a different mint (Lagerqvist, 1970, p. 58). However, attempts to match each variant to its mint using both stray finds and coin hoards have failed (e.g. Myrberg, 1995).<sup>21</sup>

Interestingly, the small hoard from Lagmansberga with 30 M-bracteates contains only the four bracteate variants with smooth and not ray edges (Myrberg, 1995, p. 18). A statistical analysis shows that the M-bracteates with smooth (older) and ray (younger) edges represent two different issues.<sup>22</sup> To the best of my knowledge, no minting authority in medieval Europe ever struck bracteates with smooth and ray edges simultaneously within a currency area. The M-bracteates were probably minted over at least 10–12 years, implying 5–6 year intervals between renewals.<sup>23</sup> The fact that other hoards from the Magnus III period contain bracteates with both smooth and ray edges indicates that these renewals were relatively inefficient. However, it was also during this

<sup>20</sup>In addition, a Geatish bracteate with the letter E in a similar style was struck in the Kalmar mint that was pawned to the Counts of Holstein.

<sup>21</sup>Her hypothesis is that bracteates struck in a mint will be found primarily in nearby coin finds. Although this method, which hinges on the vital role of proximity, seems to be common sense, it is inherently unreliable when the currency area is large and there are several mints. In that context, coins will circulate throughout the entire currency area where they are valid. Both the stray finds and coin hoards confirm this critical view.

<sup>22</sup>If all eight types were minted simultaneously in different mints and a coin hoard contains exactly four types, the probability is less than 3% that the hoard will include bracteates with only a smooth edge or only a ray edge (by calculating the number of combinations). Based on this hoard, one can, with 97% probability, reject the hypothesis of the simultaneous minting of M-bracteates with smooth edges and ray edges. Admittedly, I have not considered that each type is represented by several specimens in the hoard. An alternative statistical test is to consider a null hypothesis that bracteates with smooth and ray edges are minted simultaneously, which is tested against the hypothesis that the two edge types differ in time. Here, a binomial distribution is used. The probability that all 30 M-bracteates in the hoard – given the size of the hoard – have either smooth edges or ray edges is less than 0.15% if they have been minted simultaneously. Thereby, the null hypothesis can be strongly rejected. The exact calculations are available from the author on request.

<sup>23</sup>The different shapes of the M's and the details (pellets) would then possibly represent mints.

period that the short-lived coin system was abandoned, which provided a secure foothold for long-lived coins.

### 3.3. Long-lived coins and debasements 1290–1523

A large coinage reform was undertaken in approximately 1290 by the advisors of King Birger (1290–1318). Bracteates were replaced with two-faced pennies with a crown on the obverse and various large letters on the reverse. The interpretation of the letters has been debated, but it is very dubious that types with different letters indicate internal chronology.<sup>24</sup> A very important empirical observation – that not a single variant of the crowns on the obverse can be found on two coins with different letters on the reverse (Jonsson, 1977, pp. 120–121) – suggests that periodic re-coinage ended in Sweden in 1290.<sup>25</sup>

The Svealand monetary standard was adapted across the entire mainland of Sweden in 1290, but only two-faced pennies were being minted then. During the reign of King Birger, the fineness further declined to 63%, which was maintained until the 1350s (Jonsson, 2002, p. 49).<sup>26</sup> King Magnus IV (1319–1363) undertook coinage reform, introducing a new type of two-faced coin (Lion left or right on the obverse and crown on the reverse) when he ascended to the throne in 1319, and re-coinage occurred in 1340, when only the images of the coins (Lion left on the obverse and different letters or symbols surrounded by three crowns on the reverse) were changed.

According to Edvinsson (2011, p. 70), debasement of fineness accelerated in the period 1352–1354. Non-Swedish written sources based on the payment of the Peter penny to Rome claim that the exchange rate between mark silver and mark pennies declined from 1:5 to 1:8 over a few short years. However, it is uncertain which Swedish coin type can be linked to this dramatic revaluation. It is quite plausible that the Swedish church paid the Pope in Rome using debased Norwegian pennies. According to Lagerqvist (1970, p. 93), Sweden and Norway may have had a monetary union during long periods of the reign of Magnus Eriksson, who was King of both Sweden and Norway. The best current evidence to date of this tie is that the same coin types routinely appear in coin finds in both Sweden and Norway.<sup>27</sup>

In 1354, the two-faced pennies were exchanged for hohlpennings with a crown or letter and a ray edge. It is important to mention the Black Death (ca. 1350–1355) here because afterward, state finances must have been in extreme crisis. The fineness of these bracteates fell continuously from 45% to 10% by 1363 (Edvinsson, Franzén, & Söderberg, 2010, p. 80). Public confidence in Swedish coinage must have been in freefall, and it appeared to be close to a collapse. This backdrop of a clear downward economic spiral led to reform of the system in 1363. The hohlpennings with ray edges were replaced by hohlpennings with a letter and a smooth edge. The new hohlpennings had a fineness of approximately 90% and were struck until 1365 (Hemmingsson, 1995, p. 24ff).

The Swedish coinage system was reformed, and the 'Örtug' (eight pennies) was introduced as the main denomination around 1370.<sup>28</sup> Hohlpennings with a denomination of one penny were then minted as small change. Once again, the German monetary system (Witten and hohlpennings) was the prototype for Swedish coinage. Örtugs and hohlpennings were typical long-lived coins. The Swedish hohlpennings have the designs of a crowned head, crowned S, crowned A or crowned E,

<sup>24</sup>The interpretation of the letters is inconsistent and has not yet been determined. Jonsson (1977, p. 125) argues that some letters represent different mints (I, K, L, O and S), whereas others refer to the issuer – B for King Birger and E and W for his brothers, Dukes Erik and Valdemar. For two letters, M and R, there are no suggested references.

<sup>25</sup>If periodic re-coinage occurred, then the letters on the reverse would represent different issues. In such cases, at least one specific crown variant on the obverse should have been used for two reverses with different letters. However, such a die link has not been found on the existing coins from King Birger.

<sup>26</sup>Consequently, the bracteates of Magnus III were crowded out by new low-fineness coins (Gresham's Law). In the coin hoards from the reign of Birger, not a single bracteate minted by Magnus III prior to 1290 has been found (Jonsson, 1977, p. 89ff).

<sup>27</sup>A bracteate type with a letter between two opposite crowns (LL XXIX).

<sup>28</sup>Örtugs were coined in the mints of Stockholm, Söderköping, Västerås, Åbo and Kalmar at various intervals during the period 1370–1520.

representing the mints of Stockholm, Söderköping, Västerås or Åbo (Turku) and Kalmar. These types were minted for nearly 150 years, until the early sixteenth century, and can thus be regarded as immobilised types (see Section 2.2). Malmer (1980) has classified and dated the hohlpennings. Different details, such as the form of the design and especially the fineness, suggest which king minted them. In particular, debased fineness is characteristic of the late medieval Swedish Örtugs and hohlpennings, which is in line with the theory of long-lived coins presented in Section 2.4. For the type with a crowned head, fineness declined from 75% in the 1360s to 19% by approximately 1500 (Malmer, 1980, pp. 15, 43). For the hohlpennig with a crowned A, the fineness declined from 50% to 19% (Holmberg, 2009, p. 94).

The development of the silver content in one-mark pennies from 1180 to 1520 is shown in Figure 3. If the penny (0.3 g) has a fineness of 94%, then one-mark pennies contain 54 g of silver (192 pennies/mark \* 0.3 g \* 0.94). As previously emphasised, there were few changes in weight or fineness before 1250. Debasements began at the close of the thirteenth century and accelerated during the reign of King Birger (1290–1318). There were two severe debasements at the end of Magnus IV's reign in 1352–1354 and 1354–1363; the first is uncertain and marked with a light-grey curve (see the earlier discussion). During the Örtug period (1370–1520), fineness continuously declined, with several stops and starts.

### 3.4. Gotland

Minting in Gotland began in approximately 1140 in Visby. During the next 80 years, a simple two-faced thin coin that remained dominant for long periods was struck. Between 1220 and 1245, several other types were minted, but between 1245 and 1288, a uniform type was once again coined (Jons-son, 2002, pp. 46–47; Myrberg, 2008, p. 177). These coins should have been long lived. However,



**Figure 3.** The development of fine weight, one-mark pennies in Sweden 1180–1520. Source: Edvinsson et al. (2010, p. 77) and my own revisions.

Note: One penny weighs 0.3 g, and there are 192 pennies per mark. If the silver fineness is 94%, then one-mark pennies weigh 54 g (192 \* 0.3 \* 0.94). The light-grey curve indicates possible debasement from 1352 to 1354 based on non-Swedish sources (Edvinsson, 2011, p. 170). Before 1275, 'one-mark pennies' refer to Svealand pennies. One-mark silver weights ca. 210 g.

their weight and fineness declined continuously in the period 1140–1220, in particular after 1200 (Myrberg, 2008, p. 75ff). The spread of Gotlandic pennies, evidenced in hoards was relatively wide; they dominate the composition of coin hoards in both Eastern Götaland and the Baltic area. The large spatial dispersion of the coins across seas and rivers and the long period of their minting together indicate that they were designed for effective use in both trade and local markets. The coin-issuing authority appears to have been primarily interested in the stability of the coinage. Therefore, a trade organisation or the city of Visby could well have been the issuer (Jonsson, 1995, pp. 52–53).

In approximately 1340, the Gote (12 pennies) was introduced (ca. 1.3 g). This was the first coin with a high denomination in the Baltic Sea region. Simple bracteates as well as those with the letter W were struck at the end of the 1280s, initially as the main coin and eventually as small change to the Gote. In principle, the same W-type bracteates were coined for over 160 years. The silver fineness of both the Gotes and the bracteates severely declined in the 1440s.

#### 4. Discussion

There are no written documents about periodic re-coinage in Sweden from the twelfth and thirteenth centuries.<sup>29</sup> Therefore, I compare the economic conditions in Sweden to those in continental Europe, where short-lived coins were used (see Table 1). A chief characteristic of regions with short-lived coins is that the economy is relatively undeveloped. The determination that continuous minting did not begin until the 1150s and the fact that there were only a few towns in Sweden in the twelfth century – Sigtuna, Uppsala and Västerås in Svealand, Lödöse and Skara in Western Götaland and Linköping and Skänninge in Eastern Götaland – underscore the region's underdevelopment relative to Germany and central Europe. Gotland, which had been a trade centre on the Baltic Sea since the Viking age, was more developed than the Swedish mainland. Logically, long-lived coins were minted there. It is therefore surprising that minting did not begin there until 1140.

Another condition for periodic re-coinage is that there must be few coins in circulation. According to Klackenberg (1992a, p. 179ff), Sweden was not fully monetised until the late thirteenth century (Götaland) or early fourteenth century (Svealand) and Finland not until the mid-fourteenth century.<sup>30</sup> This conclusion is based on cumulative finds in churches and written documents. Sweden had a limited number of coins in circulation before 1250. Thus, this requisite precondition for periodic re-coinage corresponded well with the underlying situation in Sweden. The increased monetisation at the close of the thirteenth century is in line with the known history of the founding of new towns and the emergence of local markets in Sweden: Söderköping, Kalmar, Jönköping and Västervik in Götaland and Stockholm, Nyköping, Örebro, Strängnäs and Arboga in Svealand. Thus, the number of towns in Sweden more than doubled (from 7 to 16 towns) in the thirteenth century.<sup>31</sup> Several new mints were also established. In medieval Swedish urban areas, the demand for local coins must have increased substantially. Gotland was presumably the region in Scandinavia with the most coins per capita and would thus be the worst location for short-lived coins.

According to Jonsson (1983, pp. 76–77), the volume of coins was larger in Götaland during the period 1250–1290 than in Svealand. The cumulative finds in churches from the thirteenth century corroborate this conclusion (Klackenberg, 1992a, p. 179ff). Furthermore, before 1250, there were considerably more bracteate types in Svealand than in Götaland (see Table 3). Taken together, these facts suggest more frequent renewals in Svealand than in Götaland.

<sup>29</sup>There is an old expression in the 'Västgöta law', ca. 1220: 'de heta 3 och äro 2' (they are called three but count as two). In the earlier literature, this expression has been interpreted as the exchange rate between mark silver and mark pennies (Hemmingson, 1994, p. 176). But the expression could also indicate the exchange fee (three old against two new coins) at systematic coin renewals (which was the exchange fee at such renewals in Denmark).

<sup>30</sup>His definition of monetisation is that while most peasants used coins, barter was still predominant in local transactions.

<sup>31</sup>Further 8 and 13 towns were founded in Sweden in the fourteenth and fifteenth centuries, respectively.



The rule of thumb that bracteates gained a foothold in areas with no established monetary standard (see Section 2.3) fits Sweden very well.<sup>32</sup> The region that would later constitute Sweden lacked its own minting for 120 years, from 1030 to 1153. From ca. 1153 to 1290, the bracteate was the only minted coin type on the mainland.

The theory predicts that debasement should occur in regions with long-lived coins. Therefore, the constant weight (0.30 g in Svealand and 0.15 g in Götaland) and high silver fineness (95%) of Swedish bracteates until 1250 support the hypothesis of short-lived coins. If a coin issuer can make a profit from periodic re-coinage, debasements are not required. After 1250, when royal minting increased in volume and currency areas merged, there were fewer coin types per period. Debasements as income compensation began after 1250 and continued until 1520. This scenario is exactly as the theory predicts.

Jonsson (1995, p. 56) has suggested that re-coinage would have occurred at specific intervals, primarily with shifting regents in Svealand and Western Götaland beginning in 1200 and in Eastern Götaland beginning in 1250. In Western Götaland, each bracteate type would have been valid for 6–8 years. However, this approach appears to be significantly flawed because frequent re-coinage had already occurred during the reign of King Canute I (1167–1196). We know from the historical record that there were many types of bracteates between 1180 and 1196 and that the hoards had a skewed composition (see Section 3.2). Some of the bracteate types from Sigtuna in the period 1180–1196 are stylistically similar, but so many types could not have been valid at the same time; it would only have caused confusion.

Jonsson (1995, p. 56) suggests that the re-coinage system continued until 1363. He bases this conclusion on written sources about re-coinage from 1321, 1340, 1354 and 1363. The term ‘*monete nunc currentis*’ (now valid coins) is frequently used, indicating that old coins were replaced by new ones. However, these were not normal periodic re-coinages, where typically only the portrayed image on the coins changed. On the contrary, this is a key point: these were coinage reforms. The coin type and monetary standard were completely changed and replaced in 1290, 1319, 1354 and 1363. The change in 1340 can be considered normal (only image changes) but not *period* re-coinage.

The large geographic area of Sweden conflicts with the theory of periodic re-coinage. However, Sweden was divided into three separate currency areas until 1250 (see Figure 2), and each area was smaller than Denmark, which would facilitate periodic re-coinage. An argument against re-coinage might claim that Sweden was insufficiently developed to administer such a system at the end of the twelfth and beginning of the thirteenth centuries. Hemmingsson (2005, pp. 74–75) claims that it is more likely that re-coinage was undertaken at the end of the thirteenth century than 100 years earlier due to the limited administrative capacity of the royal government. He presumes short-lived coins to be an advanced coinage system. However, this argument is patently wrong. The historical record from continental Europe (see Sections 2.2 and 2.3) contains indisputable evidence that only relatively undeveloped regions and cities with little experience with coinage and few coins in circulation chose short-lived coinage systems. Bracteates in these circumstances were often chosen as the coin type. Swedish administrative capacity was no doubt improved by the end of the thirteenth century, but using that observation to justify a fictive chronology is manifestly circular reasoning. In fact, monetisation, the volume of coins in circulation and the number of marketplaces increased even more rapidly. Moreover, the currency area had grown substantially. These factors likely made it near impossible for the Swedish kings to maintain a system of frequent re-coinage by the close of the thirteenth century.

There are few registered coin hoards in Sweden dating to 1200–1250, but the existing ones contain almost exclusively Swedish coins (Jonsson, 1995, p. 57). However, the cumulative finds

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<sup>32</sup>In Norway, where there seems to have been a break in coinage at the beginning and middle of the twelfth century, bracteates dominated beginning in ca. 1150 for 130 years. Denmark had continuous coinage from the end of the tenth century until the 1370s and its own monetary standard beginning in the 1070s. Denmark in Jutland minted bracteates only sporadically during a single decade, 1146–1157.



in churches for the period 1150–1250 tell a different story. In Götaland, Norwegian coins account for 35–60% and domestic (Geatish) coins for ca. 30–45% of the coins (Klackenberg, 1992a, p. 181). In Svealand, domestic pennies account for 65% of the coins (and Gotlandic for the rest) in churches from the 1200 to 1250 period (Klackenberg, 1992a, p. 186). Therefore, it can be argued that the Swedish king did not have full control over coin circulation and could not exclude foreign coins (e.g. Runer, 2006, p. 86). In such a case, it would be difficult to undertake systematic re-coinage.

However, German coin hoards from this period also contain many non-local coins (see, e.g. the coin hoards in Thuringia, Hävernick, 1955), although periodic re-coinage was undertaken in almost all German currency areas. As in Germany (see Section 2.3), a system with valid current local coins was only enforced within the city borders in Sweden while any coin could be used in the countryside. It was not until the end of the thirteenth century and the mid-1300s that written documents prohibited countryside transactions in Sweden (Runer, 2006, p. 88; Yrwing, 1965, p. 283ff). Therefore, it is not surprising that foreign coins are found in Swedish coin hoards and cumulative finds from churches in the thirteenth century, even if the king controlled coin circulation and enforced periodic re-coinage within the cities.

I have outlined many reasons and provided significant evidence that supports the view that Sweden, in particular Svealand, experienced frequent coin renewals in the period 1180–1250, whereas Götaland used this system from 1200 to 1250, although with less frequent renewals than Svealand. Both regions experienced less frequent renewals from 1250 to 1290 and abandoned them altogether in 1290 when monetisation had reached a higher level. The Viking-Age period (995–1030) with imitations of foreign coins corresponds to stage 1 in Table 2, the bracteate period (1180–1290) with periodic re-coinage to stage 2, and the late medieval period (1290–1520) with long-lived coins to stage 3.

## 5. Summary

Periodic re-coinage was a predominant monetary taxation policy for nearly 200 years in large parts of medieval Europe. Old coins were frequently declared invalid and exchanged for new ones based on publicly announced dates and exchange fees. The purpose of this study has been to test a theoretical framework of periodic re-coinage in Sweden. In particular, the theory suggests that a limited number of coins in circulation (low monetisation) and separate currency areas facilitate periodic re-coinage. Currency areas that experienced periodic re-coinage were also characterised by the minting of unified bracteates and by the absence of debasement.

It has been long established that Sweden adopted coin types that were similar to those minted in Continental Europe during the Middle Ages. This study goes further by demonstrating that Sweden also adopted the corresponding Continental coinage and monetary taxation policies linked to these coin types – in particular those applied by the Hanseatic League cities in Northern Germany. The Swedish experience is extraordinarily consistent with what one would expect from the theory. Economic backwardness (continuous minting did not begin until 1153), limited monetisation of the society and the fact that Sweden had separate currency areas (Svealand, Western Götaland and Eastern Götaland) until 1250 facilitated periodic re-coinage. It is unsurprising that bracteates gained such a stronghold in Sweden for nearly 140 years (1153–1290). In these areas, no monetary standards existed before the bracteates arrived, as predicted by the theory. Periodic re-coinage (with varying frequency) was applied from 1180 until 1290, when only bracteates were minted. Thus, a clear pattern emerges that is similar to that in Continental Europe, where bracteates can be linked to periodic re-coinage.

For Sweden, we have no written documents that directly attest to periodic re-coinage between 1153 and 1290. However, other methods have been used to identify such a coinage system: (1) many different coin types during the reigns of several Swedish kings (method B, see Section 2.1); (2) coin hoards that are dominated by a few types (method C); and (3) different bracteates that have been dated to specific periods in the kings' reigns. Based on the number of bracteate types,

re-coinage was more frequent in Svealand than in Götaland during the period 1180–1250. Furthermore, the Swedish bracteates contained almost pure silver (94%) until 1250, similar to German bracteates that were frequently renewed. This finding is consistent with the outlined theory. Between 1250 and 1290, there were considerably fewer bracteate types per period, so it appears reasonable to argue that renewals must have been less frequent, perhaps every 5th or 10th year. This claim is especially persuasive because Western Götaland and Eastern Götaland – and later Svealand – were joined into one coinage area.

This study also shows that the choice of coinage policy is related to the specialisation of the working force and the growing local markets and towns in Sweden in the thirteenth century. As a result of urbanisation, the number of circulating coins and the degree of monetisation increased at the end of the thirteenth century, making periodic re-coinage far more difficult. Bracteates were thus finally replaced by long-lived, two-faced coins in 1290. This process effectively ended the practice of periodic re-coinage, and Swedish kings then began to accelerate the debasement of long-lived coins to compensate for disappearing re-coinage fees by reducing the silver content of coins. Such debasements – which were interrupted by several coinage reforms – were used until the beginning of the sixteenth century.

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