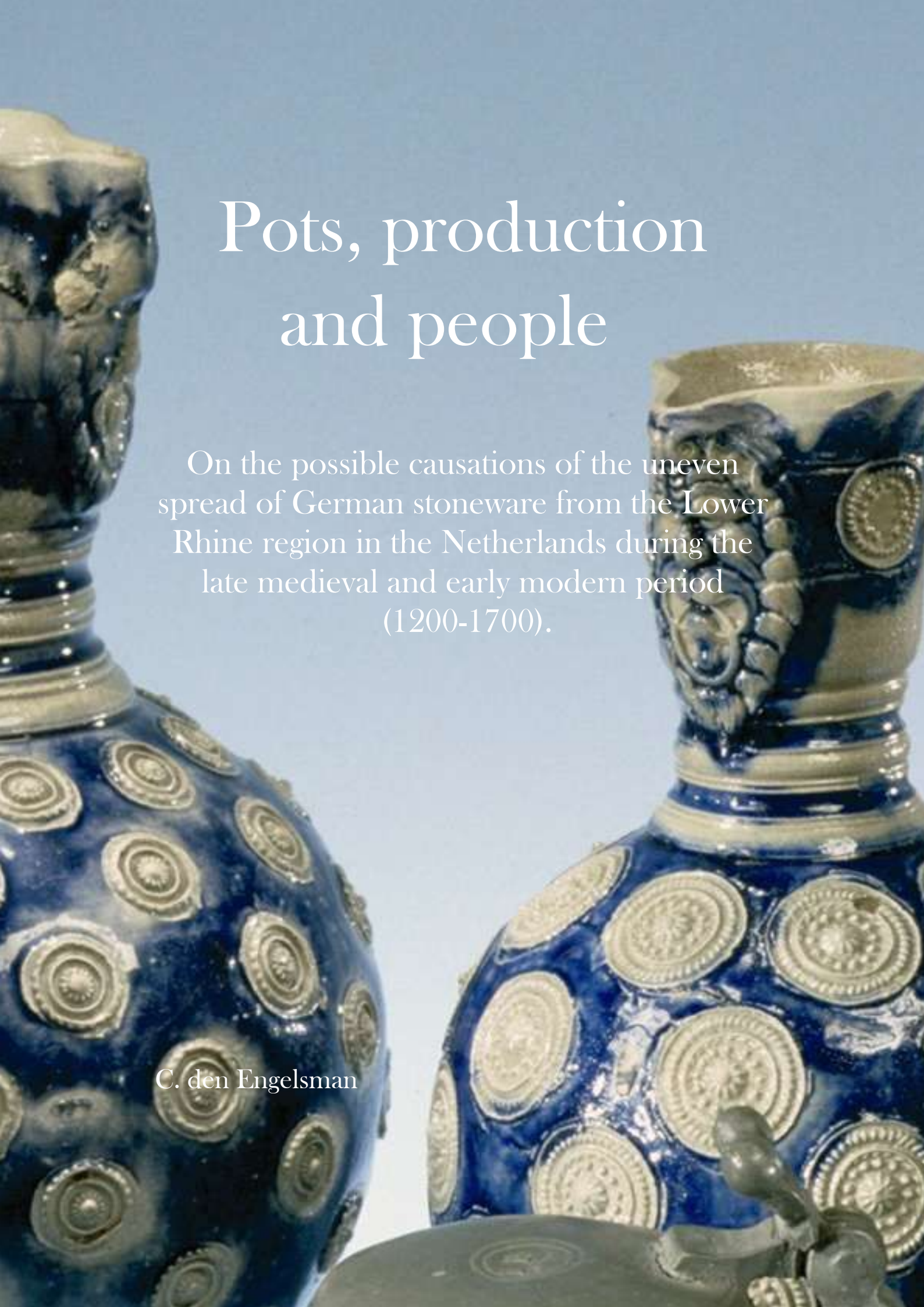

Pots, production and people

On the possible causations of the uneven spread of German stoneware from the Lower Rhine region in the Netherlands during the late medieval and early modern period (1200-1700).

C. den Engelsman

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Pots, production and people: on the possible causations of the uneven spread of German stoneware from the Lower Rhine region in the Netherlands during the late medieval and early modern period (1200-1700).

C. den Engelsman, s1338994

Masterthesis

Drs. E.J. Bult and Prof. Dr. F.C.W.J. Theuws

Archaeology of the Roman Provinces, Middle Ages and Modern Period

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Content

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Chapter 1 Introduction

1.1 Research problem

German stoneware is a common find in Dutch medieval and post medieval archaeology. In the past, during an enormous timespan from circa 1200-1800 and in a widespread area from America to Europe (Gaimster 1997, 7), it was much appreciated by users because of the high quality. The main quality is the fact that the fabric is impervious to liquids, which makes it suited for, for example, storing liquids, pouring and drinking (Gaimster 1997, 7). This special quality was mainly appreciated in the north, while in the more southern areas fabrics which were better at keeping the content cool, through being pervious, were preferred (drs. E.J. Bult, personal communication, April 17, 2018). Most of the existing shapes of the pottery are related to these functions, such as jugs.

But how was stoneware distributed over northern Europe and what factors influenced the distribution pattern? Gaimster argues that "beyond relics of complex distance trading mechanisms, their archaeological distributions [that of stove-tiles and stoneware] provide a measure of the penetration and promotion of Hanseatic cultural codes and practices, notably in the sphere of dining culture and interior decoration" (Gaimster 1999, 66) and furthermore he rejects the idea that the commodity just hints at long-distance trade and the exchange of technical expertise: "rather the patterns of consumption identified reflect a brand loyalty element and something of the embedded cultural and possibly ethnic motivations which characterise the Hanseatic mercantile communities on the Baltic rim (Gaimster 1999, 67). He calls it therefore a 'Kulturträger'. He also calls it a 'type-fossil', as he finds it the most occurring type of ceramic for the (late) medieval period and links it to the Hanseatic league. The Hanseatic league was a trading community during the medieval period which involved large areas of north-western and eastern Europe. In this thesis both 'Kulturträger' and 'type-fossil' will be used to refer to the same idea, that of a link between the stoneware product and the membership of a trading community. This idea will be called throughout the work the 'Hansa or Hanseatic theory'.

Following Gaimsters statement, German stoneware should be a widespread product in cities part of the Hanseatic league. However, the spread of stoneware throughout the Netherlands does not seem to coincidence with whether the particular town is part of the Hansa or not. For example, Dordrecht, Heer Heyman Suysstraat (cesspit, findnumber 22-683) exhibits the high amount of 49.3% stoneware (Bartels 1999f), while Dordrecht was not a Hansa member. Also, on the countryside, especially on castle sites, stoneware is also present (E.J. Bult, pers. comm., 18th of October 2018). Furthermore, in general, in the Netherlands, large bulks of German stoneware are observed on excavations in the east. However, we do not observe these large quantities when we take a look at the west. The differences, are, in fact, quite large. In the east, it makes up to 25% of the ceramic assemblage, while in the west it can only add to about 10% (Carmiggelt 1993 in Van Oosten 2005, 160). The question which is immediately raised is, if this spread is indeed linked to this Hansa identity theory. The process of trade in this specific type of ceramic and the means of how it ended up in our country are not fully grasped yet. Furthermore, despite the frequent publications on the topic by Gaimster, his theory has never been empirically tested on a large Dutch dataset.

1.2 Hypothesis

In this thesis an alternative hypothesis to the problem, that of uneven distribution of stoneware throughout the Netherlands, is proposed. In this hypothesis it is believed that the foundation of the Hanseatic league was more based on shared economic interests (Wubs-Mrozewicz 2017, 66; Wubs-Mrozewicz 2013, 6), which later turned in a league of cities, than on cultural ties. The federation was not based on any central authority, but on the act of mutual consent between family and friend networks (Wubs-Mrozewicz 2017, 64; Jahnke 2014, 66). It is doubtful that while large parts of Europe were united by a common economic bond, that this also united them in a strong cultural way, as proposed by Gaimster (1999, 61). Not even to mention that they wanted to share a common tableware resulting from the same economic practices. Therefore, the alternative hypothesis for the previously described problem is that the distribution pattern can be explained by the law of monotonic decrement. Throughout this thesis this law will be referred to as the 'fall off curve theory'. According to this theory, often used in prehistoric

archaeology, one would expect most of the products close to the production centre and less as one goes further away from the source (Renfrew 1977, 73). When one would project this into a graph, a fall-off curve would be formed. The driving mechanism can be explained, in medieval archaeology, by an increase in transportation costs further away from the production centre. This would result in lower levels of demand, and thus a lower number of products further away from the source. Therefore, the alternative hypothesis is that the uneven spread of German stoneware throughout the Netherlands, in the period 1200-1700, can be explained, in essence by this law of monotonic decrement used in the fall off curve theory.

1.3 Research questions

This research will try to make the previously proposed fall-of curve plausible by projecting the research question over a large dataset. The dataset includes thousands of ceramic finds coming from the Netherlands from the medieval period until the modern period. The results will be tested using statistics.

The main research question of this thesis is:

'What has been the cause for the uneven spread of German stoneware, dated from the medieval until the post medieval period, on excavations found in the Netherlands?' Which of the conceptual models, the Hansa theory or the fall-off curve theory, provides the best fit for the data?

To be able to answer the main research question, subquestions have been proposed:

1. Do Hanseatic towns gain more stoneware than non-Hanseatic towns?

2. Do Hanseatic towns lay closer towards the center of distribution (Cologne) than non-Hansa towns?

3. What is the influence of the distance from source Cologne on the percentage of stoneware?

4. Could a general picture over time be established? Does the friction of distance, which is the cause of rising costs for the stoneware, increase, decrease, or stabilize over time? Does the amount of stoneware which is imported into the Hanseatic and non-Hanseatic towns change over time?

1.4 Selections made in the data retrieved from reports and a note

In the field of archaeological reports there is a tremendous amount of data available, therefore the following selections for the data were made.

- A problem of quantitative origin regarding the cities occurred. Not all towns had sufficient amounts of archaeological reports (available) to be used. Complexes should exhibit at least 20 sherds total, otherwise one sherd extra will make too much of a difference (while now it will only add up to 5% difference). This will make the chance of hitting outliers smaller.
- Cities which are not, for the majority of the journey, accessible through a waterway, were removed. This is due to the fact that it is unclear how the final stage of (land)transport influenced the total transportation costs. Cities which were only accessible over land were kept, since they can function as a control group for the results. It is expected that cities only accessible over land will exhibit less stoneware compared to cities that were accessible through waterways.
- A selection in the complexes (the excavations performed in those cities) was made. Complexes which exhibited a high social class were excluded as much as possible, since they deviate from the average of society. Complexes with a known function related to drinking, such as taverns and hostels, were excluded, since it deviates from an average household waste. It is expected that those sites contain more than average amounts of stoneware, due to their drinking activities taking place. Furthermore, high-class sites such as castles were excluded since stoneware is

> often, in high quantities, found on those sites. The upper class exposed their status through a rich dining and drinking culture. The high levels of stoneware on castle sites represent this "drinking culture" (Bult 2014, 128).

Furthermore, it is important to notice that most of the data in the database is coming from cesspits. Cesspits were underground features (pits) in which faeces were collected as well as household waste. Since they only come into use, in most Dutch cities after 1375, with the exception of Dordrecht, which started 1250 onwards (Van Oosten 2014, 155), it is important to notice that the data from the earliest period might be underrepresented. It is assumed that the richer part of society was the first to obtain a cesspit already in the 13th and 14th century (Van Oosten 2005, 164). However, it was chosen in this thesis to exclude data from upper class sites. It is known that before cesspits came into use, waste was dumped into nearby waters (Van Oosten, 2014, 180), archaeologically there is a blindspot for this kind of places. Other than dumping waste into waters, it was also common to collect waste in rubbish pits on the property (E.J. Bult, pers. comm., 18th of October 2018).

1.5 Reading guide

The second chapter serves as an introduction on the topics central to this thesis: Hanseatic trade, stoneware and trade mechanisms. Besides, it will provide the reader with insights into this notorious trading community, which has been surrounded by false nationalistic views for centuries.

The third chapter explains the methodology. Central are extrapolation of data from different kinds of sources, the Deventer system, the Dutch classification system for medieval and post-medieval ceramics, and lastly, the applied statistics will be discussed.

The fourth chapter deals with the results on all the research questions earlier proposed. Furthermore, it provides the reader with the results of the statistical tests.

The fifth chapter will interpret those results. What do they mean for the hypotheses? Can they be maintained? I will elaborate on factors which possibly could have led to bias of the results. The chapter ends with advices for further research and a new methodology.

The thesis ends with a conclusion.

Chapter 2 Hanseatic trade and German stoneware

2.1 The Hanseatic trade

2.1.1 Origin and functioning

Contact around the North Sea was facilitated by trade and resulted in large networks between communities (Ayers 2016, 1). The Hanseatic trade is one of such large networks. The trading league emerged after the emergence of the town of Lübeck around 1159 (Gaimster 2014, 61). The Hanseatic league was a trading confederation between the eastern part of Europe and the western part (fig. 2.1). It stretched from the Baltic all along the coast to the Northern Europe. It served as a mean to exchange goods. In the beginning, merchants from Northern Germany started trading which each other as part of a loose trading confederation. Later, during the 14th century, it evolved into what we now know as the Hanseatic trade. Around this period, cities became involved. At its heyday, in the 14th to 15th century when four permanent kontore were established (Gaimster 2014, 61), around 200 cities participated. The Hansa exhibited no central control. However, the cities did occasionally meet at the so-called 'Hansetag'. Transactions were built upon kinship relationships. The Hansa functioned as a mean of risk-reduction, by building relationships between merchants sharing their risk of trading between two places (De Boer 2007, 53; Heinze 2003, 72; Looper 2017, 18). For example, by travelling together, risks were spread and costs could be kept low. Four 'kontore' existed: London, Bergen, Bruges and Novgorod. In those places traders would work and live. They would bring their goods there, save them, and later transport them to their final destination. The Hanseatic league was also active in the Netherlands. Deventer, Zutphen, Harderwijk and Kampen are examples of cities that actively took part in this trading league (Weststrate 2007, 325). Cities in the province of Holland and Zeeland, such as Amsterdam, Dordrecht and Middelburg (Weststrate 2007, 298) only participated when they had similar interests of trade and after 1400 they choose and independent path and became the main competitor of the Hanseatic league *(ibid.).* The Hanseatic league has been surrounded by false nationalistic views by German historians in the 19th and 20th centuries (Jahnke 2014, 66). Their main view of the league was that of an organized and structured entity while it was actually in the beginning only

based upon loose transactions and only later became more permanent with the main seat of Lübeck *(ibid.).* The exact meaning of the Hansa is still unknown to historians.

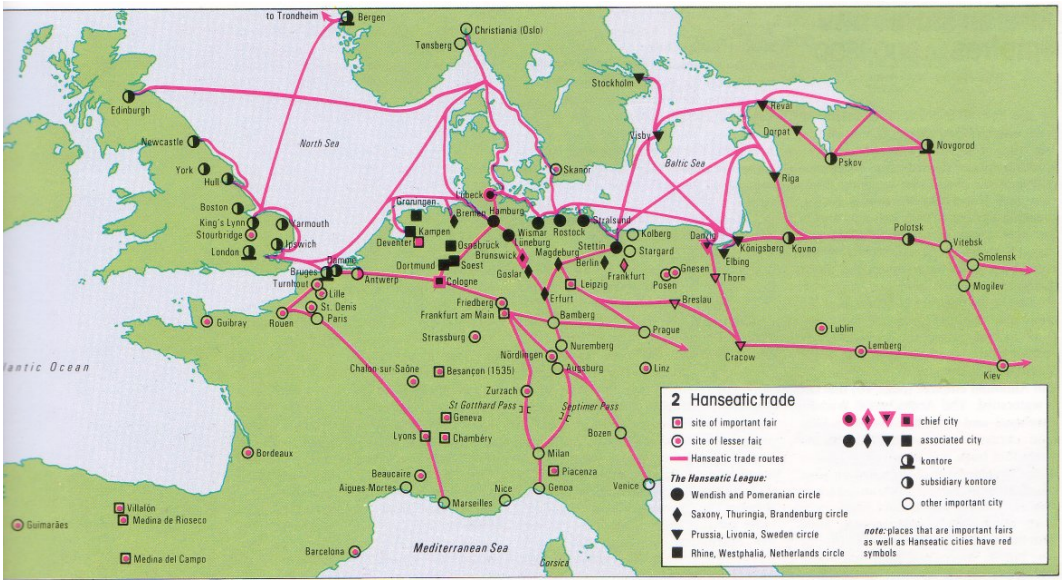

Figure 2.1: Hanseatic trade routes and involved cities during the 13th to 17th centuries. Source: http://www.writeopinions.com/hanseatic-league

2.1.2 Traded goods

It is important to realize that some parts of Europe were lacking certain resources while other were rich in it by nature. Still everybody had the same demands. The people who will bridge this gap, between production and consumption, will be economic winners (Jahnke 2014, 65). Taking this into one's mind it is no surprise that the Hanseatic league became so successful. Commodities coming from the east were materials such as fur, wax and amber (Weststrate 2010, 146). Coming from England were wool, cloth and salt. From Flanders mainly cloth was exported. Cologne was mainly active in the export of wine and iron (Looper 2017, 17; Dollinger 1999, 225). Ceramics were not one of the main traded commodities of the Hanseatic league. However, as mentioned before, wine was. The Rhenish wine was first offered to the merchants of Cologne after which the barrels were transported downstream into the Netherlands (Rose 2011, 99). The wine was, arrived at its consumer, poured in stoneware vessels. The trade of ceramics happened in bulk

transport (Gaimster 1997, 51-52). It is generally assumed that transport happened through the use of cog ships. The cog, originating from the later part of the 12th century onwards, was based on large Nordic cargo ships but with a broader and higher hull, thus increasing cargo capacity (Crumlin-Pedersen 2000, 244).

2.1.3 Influence

The influence of the Hanseatic league was mainly economical. However, sometimes it stretched a bit further. For example, defense was organized mutually by means of traveling together (Dollinger 1999, 147). From the 15th century onwards, the eastern part of the Netherlands was part of the economic region of the 'Hanse', while the western part was in the sphere of the economical region 'Holland' (Looper 2007, 185-186). Could this statement explain why in the archaeological record of the Netherlands, more stoneware is observed in the east than in the west?

2.1.4 Decline

The Hanseatic league had existed almost 500 years before it vanished in the 17th century. Internal problems during the 16th century had weakened the league severely. During this century, the confederation got competition from the Low Countries as well as from Denmark (Winter 1948, 286). The first mentioned country developed cities, which were not engaged in the trade. The latter could open and close the gate through which the trade was performed (*ibid.*). To make matters worse, both countries cooperated on military and political levels (*ibid.*). It was during the thirty-years-war that the Hanseatic federation finally collapsed. It failed to stay neutral in the dispute, after which it was decided to stop. After the war, several attempts were made at reviving the league, however, without success.

2.2 German stoneware

2.2.1 Definition and physical properties

Stoneware is considered as such when the clay exceeds heating of around 1200°C-1300°C during manufacturing process and then vitrifies (Adler 2005, 13). It then becomes as hard as stone, which its name refers to. German stoneware is made from Tertiary clay deposits near the Rhine (fig. 2.2). Only this clay is suitable to be heated at high temperatures (Gaimster 2014, 64). Due to the impervious properties of stoneware, it is mainly used for storing liquids. In comparison to for example redwares (Groeneweg 1992, 166), which need to be heavily glazed, making the product more expensive, before the fabric is to be considered watertight. The physical properties of stoneware make it not preferable to be used for cooking (Gaimster 1997, 117). It is during this activity that it will be exposed to high temperatures, which may result in cracks in the pottery.

2.2.2 Production centers

Several production centers were active during the late medieval and modern period. It is no coincidence that they can all be observed in the same area: the lower Rhine area. As mentioned before, only this clay has special properties, needed for the firing process. Besides, the area is rich in wood, needed as fuel for the firing process. Lastly, their location close to the river was favorable in terms of their way to transport (Gaimster 1992, 240). The production centers did not exist at the same time, but originated and vanished at different time periods. Some of them produced for longer periods of time, while others were only in use for a short amount of time. Ceramic specialists are able to distinguish between those differences in place of origin, mainly on the basis of color differences in fabric and glaze. In Dutch archaeology, it is common to do so. Here, the most important are discussed, the ones with the most intensive export to the Netherlands, in chronological order.

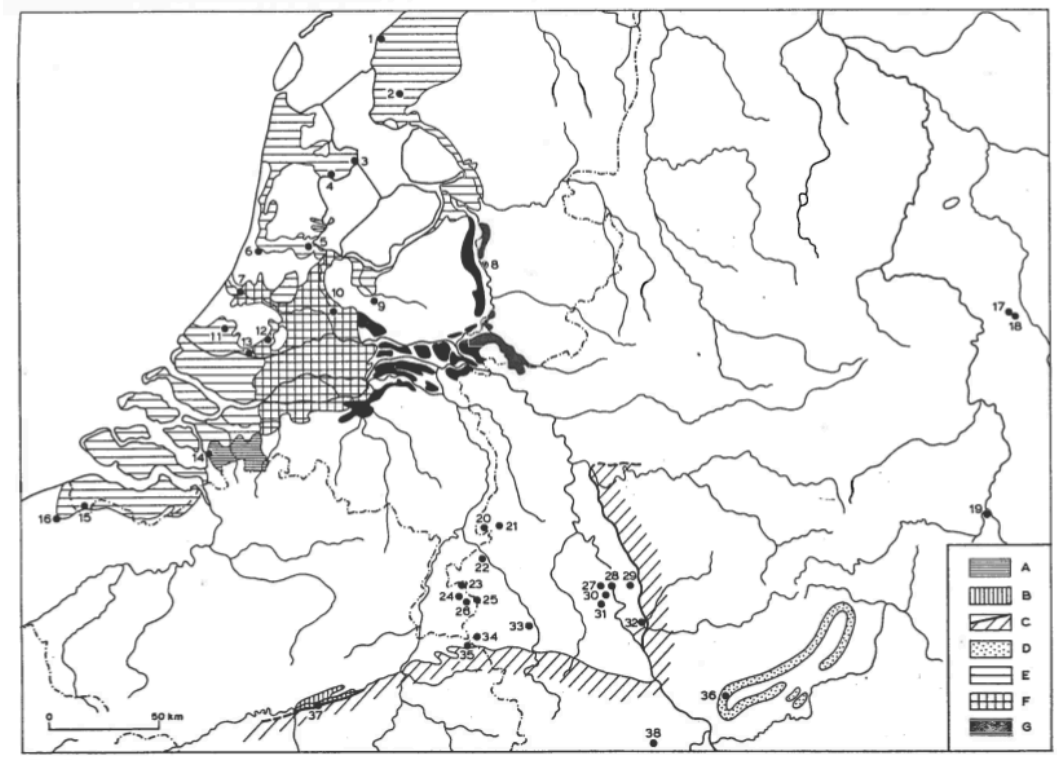

Figure 2.2 The Dutch and West German production centers related to clay-bearing deposits. As the map shows, the stoneware production sites are all located close to the Tertiary clay border (C). 23= Brunssum, 27= Frechen, 28= Cologne, 32= Siegburg, 33= Langerwehe, 35= Raeren. Source: Van Wageningen 1988, IX-5.

2.2.2.1 Siegburg

This production center was most influential for the Dutch market of all stoneware production centers. The ware was perfectly able to fulfil the increasing demand for domestic drinking vessels during most of the late medieval and early modern period (Gaimster 2006, 93). It started in the 13th century and stopped producing in 1632, during the Thirty Years War (Gaimster 2006, 92; Hurst *et al.* 1986, 176). The fabric can be distinguished by its white grey colour, which is much lighter than that of Langerwehe. During the late 14th and 15th centuries the ware is particularly well recognizable because of its orange 'blushes'. Those orange-brown patches originated from its ash glaze. Later on,

during the 16th century, the products get a white salt glaze (Hurst *et al.* 1986, 176). Types include jugs, like the most famous funnel-necked drinking jug or 'Jacoba' jugs (fig. 2.3), which were used for drinking wine (Gaimster 1997, 118). When Siegburg stopped producing, Westerwald industries took over (Gaimster 2006, 93; Hurst *et al.* 1986, 176).

Figure 2.3 Siegburg 'Jacoba' jug, from http://collectie.boijmans.nl/en/research/alma-en/jacobas-jug

2.2.2.2 Brunssum

A less well-known producer of stoneware is Brunssum. It lays along a small tributary of the river Meuse. This production centrum produced 'proto' stoneware. Until 1225 the color of this fabric is yellow/white up to orange. The next 25 years the fabric turns into greyish brown. In the final stage the products have a purple outlook (Bult 2017, 102). The main shapes produced are jugs. The products was mainly exported to the southern parts of the Netherlands, via the river Meuse.

2.2.2.3 Langerwehe

Langerwehe type stoneware was produced at the northern border of the Eifel (Gaimster 2006, 93). Earliest evidence for production stems from 1324 (Hurst *et al.* 1986, 184). The ware is known for its dark grey fabric and salt glazed or purple/brown glazed outlook. Large differences in this glazing can be found, which supports the idea that firing of the kilns was not fully under control (Hurst *et al.* 1986, 186). Decorations are rare but can include pressed stamps on the shoulder of the vessel or just beneath the edge. The main type produced were jugs (fig. 2.4), ranging in size from very large to smaller variants.

Figure 2.4 Langerwehe jug, from https://www.vskmcollections.eu/webshop/middeleeuws-van-1200-1600--late-medieval/

2.2.2.4. Raeren

Raeren was a German stoneware production center, which is now located in Belgium. The golden age of Raeren stoneware began 1550/1560 A.D. (Adler 2005, 259). Raeren can be recognized by the dark grey fabric and brown slib, which is covered with a salt glaze (Reineking-Bock 1976, 43). Forms produced in Raeren include (panel) jugs, tankards and so-called 'schnellen', which were used to drink beer (Gaimster 1997, 118). The ware is often highly decorated. Decorations include heraldic and biblical scenes. Sometimes jugs were decorated with faces, so-called Bellarmine jugs or 'Bartmann krugs' in German. According to Ostkamp (2007, 55), the jugs were related to marriage. The faces of a wild man were used as a decoration to remind man of its wild nature. Only a virgin wife could 'tame' the man (Ostkamp 2007, 56). The jugs were thus meant to show how marriage should work. Another common form of decoration is the peasant dance panel on wide panel jugs (fig. 2. 5).

Figure 2.5 Raeren paneljug with a peasant dance, from http://www.toepfereimuseum.org/Raerener-Steinzeug/Steinzeug-der-Renaissance.aspx?lang=en-gb

2.2.2.5. Cologne and Frechen

Only 10 km is in between the two production centers of Cologne and Frechen. It is unknown as to when the production centre of Cologne started (Hurst *et al.* 1986, 208). The oldest production of Frechen is also unknown, unfortunately. We do know, however, that Frechen potters moved to Cologne at the beginning of the 16th century but already returned halfway of the same century, since the population of the town was afraid of fire and detested the smoke (originated from the glazing process) (Adler 2005, 179). The frequent move of the potters between both places make interpretation of the correct origin of the fabric complicated. Both wares have a dark grey fabric and a brown slib with salt glaze. Frechen is characterized by its 'tiger' salt glaze. Decoration, in the case of Cologne Maximinenstrasse (Reineking-Von Bock 1976, 40), was usually applied in the shape of (oak) leaves (fig. 2.6). Further decoration for both wares include floral motives, faces and heraldic scenes. Common types in both wares are Bellarmine jugs (fig. 2.7).

Figure 2.6 Cologne jug with leaves, from http://discover.medievalchester.ac.uk/learn-more/objects/

Figure 2.7 Frechen Bellarmine jug with heraldic scene, from https://historicjamestowne.org/collections/ceramics-research-group/frechen-stoneware/

2.2.2.6. Westerwald

Westerwald pottery was produced from roughly the 17th century onwards (Reineking-Bock 1976, 47). Raeren potters left their production centers, took their molds with them, and settled on the east bank of the Rhine in the area of Westerwald (Hurst *et al.* 1986, 221). The ware is characterized by a grey fabric with salt glaze, which gave the product a light grey color. It is often decorated with cobalt-blue ornaments, but it can also have a manganese-purple colored ornaments. The cobalt variant is, however, more common. Types range from biconic jugs in the 17th century, tankards in the 18th century and from the middle of the 18th century onwards, chamber pots (Hurst *et al.* 1986, 222). Early decorations include rosettes all over the object (fig. 2.8), while later decorations are often less abundant and less detailed; for example, floral motives.

Figure 2.8 Westerwald jug with rosettes, from
https://historicjamestowne.org/collections/ceramics-research-group/frechen-stoneware/

2.2.3 Transport of stoneware to the Netherlands

As mentioned before, it is generally accepted that German stoneware was transported in terms of bulk transport (Gaimster 1997, 117). Stoneware had the advantage of being robust as well as stackable (Gaimster 1997, 117; Gaimster 2014, 64). The main pottery market was located in Cologne. This town had 'staple rights' (Weststrate 2007, 104). The begin and end stations of the river Rhine transport were Dordrecht and Cologne (Weststrate 2007, 288; Van Petersen 2002, 521). In between Dordrecht and Cologne lay over 10 toll stations (Weststrate 2010, 151). The river Rhine and its branches such as the Waal, 'Nederrijn' and the 'IJssel' were the main transport routes via river for the Hanseatic trade (Weststrate 2010, 146). The Rhine was the main connector between Germany and the markets of Flanders, Brabant, Holland and Zeeland *(ibid.).* Goods were transported up until Dordrecht, a town with a staple market, and from there on transported onto smaller vessels to Holland. Most shipped product was wine (Van Petersen 2002, 523). The IJssel connected the Dutch Hansa cities with the north, e.g. Scandinavia and the Baltic (*ibid.*). It is generally assumed that river transport was cheaper than land transport (Gaimster 1992, 240; Weststrate 2010, 148). Land transport was mostly only used when the distance which

had to be covered was low or the when cattle had to be moved (Weststrate 2010, 148). Another advantage of riverine transport is the fact that one could load more goods onto a ship, so-called bulk transport, then one could when travelling over land (Weststrate 2010, 148). Transport over land happened through the use of pack animals and carts *(ibid.).* Furthermore, riverine transport was also thought to be safer than travelling over land. Therefore, it is assumed that stoneware was mainly transported via the rivers. However, Gaimster mentions that two production centres chose to transport their stoneware via land. Langerwehe and Raeren were transported along the Imperial Road, the old Roman trade route, along Bruges (Nottebrock 1926 in Gaimster 1992, 240). Indeed, a large road network existed through much of the southern Netherlands and ending at Bruges or Antwerp, the so-called Hessen trade (Van Petersen 2002, 103). The other stoneware production centres brought their products to Cologne from which it was shipped onto the river Rhine into our country. Van Wageningen mentiones indeed that Langerwehe is underrepresented in Amsterdam during the period 1350-1550, but the same is not true for Raeren (1988, 123). The statement of Gaimster is therefore doubtful. Furthermore, it is mentioned that pedlars played an important role in the distribution of the stoneware by supplying it on fairs or markets (Gaimster 1992, 242; Gaimster 1997, 52). This way of transport is highly inefficient especially compared to riverine routes, so this will probably only be the case at the end of the route, or if towns were not located near a river. Furthermore, it is expected it to be of less influence on the Dutch ceramic market than bulk transport via river, since the rivers were the motorways of the medieval period.

2.3 Other wares

Since the amount of stoneware will always be expressed as a percentage (as opposed to other wares), it is important to highlight those other wares. It goes beyond scope of this thesis to mention them all, but the most important will be discussed in chronological order. The 'replacers' of stoneware will also be highlighted. Note that glass (also available in the Deventer system), was not included in those 'other wares'. This is since this material could be recycled and will likely be underrepresented. Still, glass, metal and wood will be discussed in this section since it is important to highlight the fact that those materials were

also in use, however they are massively neglected by archaeologists, which tend to focus on less perishable and non-recyclable materials such as ceramics.

1150-1300: Wood was an often used product in this period, but unfortunately the material is not often discovered in archaeological context. Earthenware cooking pots were multifunctional objects: different sizes were used for cooking, storage, pouring and drinking. 90% of those cooking pots were produced locally (Ruempol *et al.* 1991, 11). But there became an increasing need for higher quality ceramics. In the Rhineland, due to the high quality clays, ceramics were produced since a long time already. Pingsdorf and Brunssum-Schinveld produced near-stoneware and exported this through the large river to the Netherlands (*ibid*.). Around 1200 the first Venetian glass was exported to our country, which was only available for the aristocrats (Ruempol *et al.* 1991, 31).

1300-1400: around 1300 the first production of glass in western-Europe happened (Ruempol *et al.* 1991, 31). It is assumed that metal and glass were still too expensive to be discarded, which led to recycling, and this is why they barely occur in the archaeological record at this time. Also wooden dishes and bowls were still in use on a large scale. The demand for stoneware products from the Rhineland increased. Nonetheless, red- and greywares were still produced by local potters (*ibid.*). Almost every town had one or more potters (E.J. Bult, pers. comm., 18th of October 2018). The fabric of redware is the largest contemporary other ware, however, this ware exhibited less quality and was a less luxurious good. Most common household utensils, such as pots and pans (Bartels 1999c, 105), were performed in a redware clay, coming from Bergen op Zoom or present-day Belgium (Gawronski 2012, 31) and from local pottery production centers.

1400-1500: the stoneware pouring and drinking vessels became more common, as opposed to red pouring and drinking vessels. (Mediterranean) Majolica, from Spain and Italy, came into existence in this period (Gawronksi 2012, 47) and was a luxurious good as table ware for eating. Pewter vessels came into existence. Glass was still not for everyone, only the richer used the material to drink wine and beer in the shape of cups or beakers (Ruempol *et al.* 1991, 65). Local redwares were now treated with a lead glaze and decorated with all sorts of symbols. But the local redwares had a competitor in the shape

of metal; iron and copper kettles came into existence (*ibid.*). Much of the table utensils were still made from wood or metal.

1500-1600: some of the kitchen wares were still made of wood. The wealthy merchant class started to use burnished pewter. Stoneware drinking and pouring vessels became more popular in the 16th century (Ruempol *et al.* 1991, 111). Raeren produced grey and brown jugs, mainly decorated with faces or farmer dances, mugs and pint-pots. Siegburg made grey-white funnelbeakers and tankards. Keulen and Frechen were known for their Bartmann jugs/bellarmines. Majolica and tinglazed ceramics were first imported and later produced locally. Dutch majolica, from Haarlem or Utrecht and Delft, are first found in the second half of the 16th century (Gawronski 2012, 55). Plates were most often produced in this type of fabric and they were regarded as superior to the previous wooden or tin plates and therefore became widespread (Bartels 1999e, 201). Ordinary people started using German glass. The richer chose for the Venetian glass. At the end of the 16th/beginning of the 17th century, new wares came into existence such as (Mediterranean) faience, from Italy and Portugal, an earthenware tin-glazed at both sides (Gawronksi 2012, 67). This fabric also found its way to the consumers in the shape of plates, albeit the fact that other shapes existed as well. Lastly, the early imports of 'kraak'-porcelain had just started at the end of the 16th century (Bartels 1999d, 183). This new fabric found its way to the richest of society and was treated with care resulting in long life spans of pieces (*ibid.).* Shapes included bowls, cups and plates *(ibid.).*

1600-1700: Copper pots started to be introduced into the kitchen utensils. The tin-glazed ware/Delft reached high popularity. Chinese porcelain started being imported. In the same century, Japanese porcelain entered the Dutch ceramic market (Gawronski 2012, 79). Ceramics in general became less abundant, since metal was taking over as a material for household utensils *(ibid.).* Another important material, competing with stoneware, was glass. The range of glassware increased (Ruempol *et al.* 1991, 164). At the end of the 17th century, new beverages, such as tea, coffee and chocolate, started being introduced. This resulted in new drinking and pouring vessels made of porcelain and faience.

It is important to realize that the percentage of stoneware is thus a relative percentage, derived from the relation to other ceramic wares, and thus follows the eb and flow of other wares as well. However, this influence will only be minor. It is true that many other wares come to existence in the same period when stoneware thrives, yet those fabrics fulfilled other purposes on the ceramic market. For example, the fabric of 'faience' was used to make plates, bowls and other shapes like the tea-and coffeecups. Jugs of this fabric almost never exist. Stoneware, however, is mainly used to make jugs rather than other objects such as plates or cooking pots. This makes a comparison between fabrics possible since the competence is nihil. Only with glass there was a competition, but these objects were not taken into consideration, since it can be recycled and will likely be underrepresented.

Chapter 3 Dataset and methodology

In this chapter, the dataset and the applied methodology in this thesis will be discussed. Not one particular methodology is used in this research, rather it is composed of multiple. Without those, obtaining results would not have been possible. The workflow starts with obtaining the data, including filtering the data from the Dutch archaeological (grey) literature, using the Deventer system if possible and, finally, to test the statistical significance. Those, the dataset, the Deventer system and the applied statistics will be explained in this chapter.

3.1 The dataset

The data was collected by the author from several different sources. Those sources included:

- Excavation reports from contract archaeology, often including a specialist's section on the ceramics;
- Excavation reports from large excavations from contract archaeology issued as large books;
- Excavation reports from municipal archaeology;
- Amateur archaeology booklets related to cities;
- *Steden in Scherven 1*;
- Students work: e.g. internship report and thesis;

Lastly, the dataset was complemented with new complexes originating from dr. R. Van Oosten her database (SHAReDD)[1], which she made for her doctoral thesis.

It will be discussed how the sources can be reached and what the quality of the information is.

The first and most often used source were the excavation reports from contract archaeology. In the Netherlands several large commercial archaeological companies exist,

[1] The database was deposited in Dans Easy

such as RAAP, BAAC, ADC and many smaller ones. They perform archaeological research when building will take place and archaeology is or might be in the ground. The constructor will pay for this research. Important to notice is thus that the constructor has no other interest than to remove the archaeology from the soil before building. Companies are obliged to publish their results from all kinds of research (coring, test trenches, excavation) within two years after the last date of research. This deadline is not always kept. Furthermore, their accessibility for the general public is rather poor. Digitally, they are stored on a website called Dans Easy, but a certified account needs to be requested and approved. Companies also keep them on paper, in their own libraries, and these are not accessible without contacts within the company. Most often, the companies have their own specialist working on the ceramics of the excavation. The section on the ceramics will be, in this case, most often, very elaborate and of high quality. The reports of ADC, which are often written by ceramic specialist S. Ostkamp, are a good example of this. This is important since data extrapolation will become extremely hard in the case of rather ill-written reports.

The second source were the excavation books. In essence they do not differ too much from the excavation reports, only they are larger and published as a book. The main difference is the fact that they tend to present the excavation results in a wider context, e.g. through comparison of the site with other sites in the same region or town. Furthermore, excavation books are more accessible to the general public than for example 'regular' reports. Since usually many finds are found and published, a specialist has most often carried research on them. An examples of those excavation books, used in this thesis, is the excavation of the Markthal Rotterdam, published by BOOR.

Thirdly, excavation reports from municipalities exist. Their accessibility is often a bit better since some of them are free online accessible such as the reports from Amsterdam. Others still have to be found at Dans or at their own private library.

Fourthly, little booklets on the archaeology/history of towns exist. Those are often not very recent publications of small excavations performed by (amateur) archaeologists in towns. Their treatment of the data is often quite good. An example is the series on archaeology from Haarlem, *Haarlems bodemonderzoek*.

Fifthly, *Steden in Scherven 1* was used. This is a massive reference book for ceramic researchers and involves archaeological data from four towns (Deventer, Dordrecht, Nijmegen and Tiel). Excavations in those towns were performed in the light of a project on urbanism in the medieval period in fluvial areas. Many cesspits and rubbish pits were excavated and used in this project. From each excavation a much-detailed inventory is available. Much of the complexes' data in this thesis from the four above-mentioned towns comes from this inventory in *Steden in Scherven 1.* The second book, *Steden in Scherven 2* serves the first book as a catalogue to the archaeological finds, ranging from ceramics to glass, metal and claypipes. It is often used as a reference book since many finds are displayed in there.

Very rarely students work was used. One can think of internship reports and theses. In such, the student often works on one site and elaborates on the archaeological finds (often one category, e.g. ceramics, zoology, flint etc.). This makes them good sources of information since the complete findings are described. Still, one should take into account that the author is often not a (ceramic) specialist.

Lastly, Dr. Van Oosten her database (*SHAReDD*) was used to complement the dataset on certain towns and time periods in which data was still lacking at that point. It was produced by herself in the light of her doctoral thesis, but it could be used by others as well. This is because the database ranks many archaeological reports from the Netherlands and their findings. In the column of 'baksel', one can distinguish between the different wares and thus select the correct ware needed. In this way, it could easily be found on which sites stoneware was yielded.

So, different sources were read and scanned for data. As mentioned before, it was tried to avoid sites related to a drinking culture, or contexts with less than 20 sherds in total. Secondly, the site should date somewhere between 1200 and 1700 roughly. Short dated sites were preferred over sites with a long dating since the data will be separated over the centuries later on; to look for patterns in time. To overcome the problem of sites with a dating in multiple centuries the sites were ranked according to their related century, so

e.g. a date of 1420-1460 will be 15th century, but 1475-1525 will be 15th/16th century. Sites with a dating in three or more centuries were deleted since patterns might become blurred. In the appendix all the sites can be found, the deleted ones were stroked out.

Various contexts were taken from the literature for the dataset. The main two categories were cesspits as well as level raising. The first mainly contain household waste, since they are often located close to the house. The second is a combination of all waste of different households together. When a town needed level raising all general household rubbish from the area was collected to serve as this layer. Therefore, it is possible that both waste contexts contain very different sherds.

All the data was collected in a standardized table, as shown below (tab. 3.1). The results were ordered chronologically, to enhance searchability.

Table 3.1 Collected data on complexes

Name of the town and complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century

In the first column the name of the town and complex was given. This includes the name of the town, the street and the number or the nickname for the excavation. Then detailed features were given such as from which plane, layer or pit the material was coming from. In the second column the date of the complex according to the authors of the literature was given. Most of the times, this date is based on the ceramic assemblage. Then, the number of stoneware pieces was counted as well as the number of other earthenwares (this includes all other ceramic wares, except for clay pipes). It was calculated how much stoneware was part of the total assemblage, resulting in a 'percentage'. Lastly, the assigned

century was given since this will give the reader transparency in which complex was counted for what century.

The 'number of stoneware' was most often copied from the literature as a 'MAE' ('Minium Aantal Eenheden') or 'MNI' ('Minimum Number of Individuals') in English. This means that the sherds were tried to fit together and based on this result a Deventer system entry sometimes could be assigned. 'Leftover' sherds, the ones which did not match with others, should be observed as new individuals. However, in inventory lists, it is often chosen to only publish the 'nice' sherds. This will lead to underrepresentation of less complete vessels. Other times other quantifying methods, such as weighing and counting were used. The 'number of stoneware' was collected by adding all S1,S2,S4 and S5 together. All of the codes, originating from the Deventer system, refer to certain types of stoneware. More information on the Deventer system can be found in section 3.2.

It is important to notice that each quantifying method has its own limitations and strengths. 'MAE' will only count individuals, but the risk exists that the observer might not recognize certain pieces of the same pot, thus resulting in overrepresentation of this type. Counting sherds will overcome this problem, but this will not take the different types into account. Furthermore, some wares have a softer fabric resulting in multiple breakages, leading to overrepresentation of the ware. Weighing the sherds also overcomes this problem, but distinguishing on type level will then not be possible anymore. Research on quantifying methods for ceramics, despite being extremely important, is often neglected. Most often, the 'MAE' method is applied in contract archaeology, however, we do not fully understand which method works best for the data.

The sample which was created consists of 23 Dutch cities. The selection was mainly based on the availability of the data. First, not all cities had sufficient numbers of contexts and objects, therefore they could not be used for the research. Secondly, some complexes were of high status and/or related to a drinking culture. This was tried to avoid at any times. Thirdly, two groups were made and filled with cities; cities in the county of Holland and Zeeland and Hanseatic cities in the east. This resulted in a total number of 280 different

complexes. The spread of this total amount over the different towns and centuries can be found in tab. 3.2.

Table 3.2 Overview of the number of different complexes per town per century

Town/century	*13*	*13/14*	*14*	*14/15*	*15*	*15/16*	*16*	*16/17*	*17*	*Total*	*%*
Alkmaar	1	1	1	1	1	1	1	3	2	12	4.3%
Amsterdam	1	0	1	1	1	3	1	0	4	12	4.3%
Delft	1	0	0	1	0	1	0	0	1	4	1.4%
Den Bosch	1	1	1	1	0	0	4	0	1	9	3.2%
Den Haag	0	0	3	0	1	1	1	3	5	14	5%
Deventer	3	0	0	1	5	2	1	1	4	17	6.1%
Dordrecht	0	2	18	3	11	3	14	4	4	59	21.1%
Eindhoven	1	1	1	0	1	1	1	1	0	7	2.5%
Enkhuizen	1	1	0	0	0	0	4	0	0	6	2.1%
Groningen	0	0	0	0	1	0	1	1	1	4	1.4%
Haarlem	1	1	1	2	1	1	1	4	2	14	5%
Harderwijk	1	0	1	0	0	0	0	0	0	2	0.7%
Hasselt	0	0	0	0	0	1	0	1	1	3	1.1%
Kampen	0	0	0	4	2	1	1	3	3	14	5%
Leiden	1	0	3	1	3	1	1	0	0	10	3.6%
Middelburg	0	0	2	1	0	0	2	1	1	7	2.5%
Nijmegen	1	0	1	1	6	3	7	3	7	29	10.4%
Rotterdam	4	1	3	1	1	0	1	1	3	15	5.4%
Tiel	0	0	0	0	0	0	4	0	0	4	1.4%
Venlo	0	1	1	0	1	0	3	2	3	11	3.9%
Vlissingen	0	0	0	0	0	0	2	1	3	6	2.1%
Zutphen	0	1	5	1	3	1	0	0	1	12	4.3%
Zwolle	0	0	0	1	2	1	2	1	2	9	3.2%
Total	17	10	42	20	40	21	52	30	48	280	100
%	6.1%	3.6%	15%	7.1%	14.3%	7.5%	18.6%	10.7%	17.1%	100	X

3.2 Deventer system

Within this system it is possible to have a universal way of describing ceramics, which makes it thus possible to exchange knowledge in a uniform way. The system is very well incorporated into Dutch archaeology and is a standard procedure for describing late- and post medieval ceramics in post-excavation process. Every type of pottery is given a certain code. This code starts with a (combination of) letter(s) referring to the fabric. For example

'r' stands for redwares. Followed by a '–' the typology will be described. This means that the recognized shape will determine what typology we are dealing with. For example, the abbreviation 'pis'; pispot is Dutch for chamber pot. Again a '–' will follow after which a number can be placed. This number refers to the vessel with the exact same shape. So for example the second type of redware chamberpots will be a hit in the *Deventer systeem* as r-pis-2. As already mentioned, German stoneware also occurs in this system. However, this ware is a bit more complicated than others, for example redwares, since the *Deventer syteem* also distinguishes between different types of fabric between the stoneware ware. Those types are placed with a number after the letter 's'. Eight different types of stoneware are distinguished.

S5, the oldest type of stoneware, refers to the 'proto-steengoed', which dates from 1200-1280 (Bartels 1999a, 43). The fabric is characterized by a non-full sintering of the ware, resulting in still pieces of coarse sand and gravel visible on the breakage. The color of the fabric is often quite dark up till purple.

S4, slightly younger, refers to the 'bijna-steengoed' a type of very early stoneware; dated 1250-1310 *(ibid.)*. This fabric is a bit further down the sintering process, almost becoming as hard as stoneware, but not yet there. The ware feels as 'sandpaper' with only small pieces of sand left on the breakage. The color of the fabric slowly becomes lighter.

S1 is a type of stoneware without glaze, although it may exhibit the typical red blush of Siegburg wares (Bitter 2009, 4). The ware has completely sintered at this moment.

S2 is the most common of all types of stoneware, since the 15th century. This type is a salt glazed 'normal' stoneware. Production centers included for example Cologne, Raeren, Frechen and Westerwald.

S3 is an industrial produced type of stoneware, dating from 1720 onwards *(ibid.).* Production is not only located in the Rhineland, but includes areas in England.

S6 refers to French stoneware, with a dating 1350-1700 (Ostkamp and Jaspers 2011, 8).

S7 refers to Asian stoneware, which dates 1550-1850 *(ibid.).*

S8 refers to a type of industrial stoneware with secondary applied lead glaze. Examples of this type are the mineral water- and gin bottles, common in Dutch modern period archaeology.

Both S3, S6, S7 and S8 will not be referred to in this thesis since they are of later date, than 1700, or from a different origin than from German source, and production and transport might differ too much from the indicated period.
It is now possible to 'read' datasets or excavation reports which often use the Deventer system. It provides the researcher with all the information needed for this investigation. Therefore, understanding this particular ranking system, makes performing research easier.

3.3 Statistics

Statistics are an important method in a research based on numerical quantifications. Where something could be seen as odd or not following a certain pattern, statistics can prove there is no reason to believe something is significantly different. In this way, applying statistics will add more weight to a statement. Secondly, not many archaeological studies use statistics and that is why I want to show the reader how helpful, yet easy to conduct, it can be.

Most statistics are built upon the same principle. This principle holds that it is calculated how something would have looked when the numbers were randomly distributed. You build on the assumption that when it is not randomly distributed something might have been influencing the data. The expected is then compared to the observed, which is the researchers' own data. This may result in a small or a large difference. Most often, the significance of this difference is being calculated. This is done since the result might have been coming from random variation and a researcher wants to exclude this possibility. Depending on the sample size and the chosen critical value, the result will either be significant or just the result of random variation. A critical value is the level of certainty, most often 5% is chosen which is a certainty of 95%. Other critical values, but less chosen, are 1% (99%) and 10% (90%).

3.3.1 Pearson's product-moment correlation coefficient

Pearson's product-moment correlation coefficient, or short Pearson's correlation coefficient, is a statistical test to observe the correlation between two variables measured on an ordinal or interval scale. It tries to capture how well the data could be fit into a linear equation, i.e. a straight line between two points. This is important to notice, since the test will fail to respond to non-linear relationships (Doran and Hodson 1975, 61) and in this case it is better to use logarithmic functions. H0 holds the idea that there is no correlation between the variables while H1 states that there is some association.

The test is started by listing all x and y data in a table. Those are then added which results in the $\sum$x and $\sum$y. Afterwards, both the x and y values need to be added by themselves, resulting in x.x and y.y. Lastly, x multiplied by y needs to be calculated. At the final row, all parameters can be added resulting in the $\sum$ values.
The obtained values then need to be put in the following formula:

$$R = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[n\Sigma x^2 - (\Sigma x)^2][n\Sigma y^2 - (\Sigma y)^2]}}$$

The value of n refers to the total sample size, so the total of x and y pairs tested. Correlation results (R) can vary between -1 and +1. -1 is a perfect negative association while + 1 is a perfect positive association, both of them, in practice, never occur. 0 means that no association was found. Multiplying the result of R with itself will yield the R^2, this number will tell how much of the data (in %) has been causing the observed pattern. Furthermore, it is possible to test the significance of the result of R using a reference table. Important values for this reference table are: the result of R, n (total sample size) and the critical values. The 'allowed R' can then simply be consulted in the table. When this 'allowed R' is smaller than the yielded R, one can say that results are significant and that H0 can be rejected.

3.3.2 F-test and T-test

Before undertaking a t-test, it should be investigated whether the two populations have equal variances. This can be done through a f-test. This test will determine the amount of variances between two populations. The formula is:

$$TS = \frac{s\hat{}1^2}{S\hat{}2^2}$$

This formula holds that one should calculate S hat of the first group and should be squared. This answer should be divided by the same result but then for the second group. S hat can be calculated as follows:

$$S\hat{}2 = \frac{\mathrm{n}}{\mathrm{n}-1}s^2$$

The total population should be divided by the total population -1 and should then by multiplied by the standard deviation.
The result of TS should then be looked up in the f-table, which has a top row and a down row. The d.f. which should be used are n1-1 and n2-2. If the result is larger than the number shown in the table (which is always at the same confidence level of 5%), we can be 95% certain that there is indeed a difference in the variability of the two. If the result is smaller, there is no difference in variability. The last-mentioned is desired to be able to perform a t-test.

This test will search for differences between the two samples in terms of their means. It assumes that both means are the same (H0). One should use the following formula (Fletcher and Lock 2005, 97):

$$TS = \frac{\mathrm{Mean1} - \mathrm{Mean\ 2}}{s\hat{}\sqrt{\frac{1}{n1} + \frac{1}{n2}}}$$

S hat has to be calculated according to the following formula (*ibid.*) and then be square rooted.

$$S\hat{}^2 = \frac{(\mathrm{n1}-1)S\hat{}1^2 + (n2-1)S\hat{}2^2}{\mathrm{n1}+\mathrm{n2}-2}$$

TS will yield a result which should be used in the table with percentage points of the t-distribution. D.f. is in this case: n1+n2-2. If the result is larger than the result of the table, H0 can be rejected, meaning that there is significant evidence that the means are different (Fletcher and Lock 2005, 97).

3.3.3 Fall off curves for curvilinear relationships

As stated above, the Pearson's product-moment correlation coefficient only works well in cases in which the data follow a linear pattern. There are, however, also cases in which data follows another pattern such as a curvilinear one. The previously described theory of the fall-off curves follows this particular pattern, that of a curvilinear one. It is proposed that this theory is a fit for the Dutch archaeological picture on stoneware. It was argued that a relationship between the occurrence of stoneware (Y) and the distance from its source (X) existed. The raw data needs in those cases to be transformed into logarithmic data. This means that all y values (percentage of stoneware compared to other wares) need to be transformed into logged y values. Unfortunately, it is not possible to test the strength of a curvilinear relationship using a Pearson's correlation coefficient. Therefore, it was chosen to present the results as a linear relationship, which will still be able to test if there is a correlation between the occurrence of stoneware and the distance from source.

3.4 Geographical models in archaeology

The field of human geography can aid in understanding the issue at stake. Part of the study deals with questions regarding human spatial interaction in certain environments. This subpart is particularly useful for the research question and can function as a model for the archaeological data. For example, it is argued that a measurement of 1 km distance between A and B solely is not important. This 1 km distance, which needs to be covered, can be for example urban or rural. This makes a large difference. Both differ in "time, money, reliability, convenience and comfort" and therefore are essentially different (Abler *et al.* 1977, 292). We can project this statement to the archaeological data seeing that river and land transport are as well essentially different. On rivers boats are used, which are quicker than carts which are used on land. Therefore one can cover larger differences in shorter amount of time, resulting in lower costs. However, tolls need to be taken into account. Reliability differs between the two as well, when there is no wind or, even worse, storms ships cannot sail. When the road is too muddy carts will not move. A boat is more convenient as well as comfortable than a cart. These examples show that simply measuring distance from A to B will lead to a wrong understanding of distance in the past.

A second example is the fact that a correlation exists between distance, which needs to be covered, and the form of transport chosen by people. When one's work is 5km away from home, one is more likely to reject walking for an hour and chose another way of transport such as bike, subway or car. This example highlights the "psychological law" involved in choosing way of transport (Abler *et al.* 1977, 294). Projecting this onto archaeological data it is more likely that shorter distances were covered by walking or carts and that larger distances were met by using boats or ships. This rule also depends upon the possibilities of the certain location.

3.5 Measurement of distance

According to the alternative theory, distance is the determining factor for the spread of stoneware over the Netherlands. This theory stands opposed to the theory of David Gaimster, who claims that membership of the Hansa is the determining factor. To obtain data and test the alternative theory, it is thus important to explain how measurements of distance were taken. Not one method, without the use of computational calculation work,

is perfect for this task, but it will be explained how it was done. The dataset can be divided into two geographical groups of cities: Western cities and Hanseatic cities. In tab. 3.3 all of the cities are linked to one of those groups.

Table 3.3 Cities categorized into two groups.

Western/middle (non-Hansa) towns	*Eastern/middle Hanseatic towns*
Alkmaar	Deventer
Amsterdam	Groningen
Delft	Harderwijk
Den Bosch	Hasselt
Den Haag[2]	Kampen
Dordrecht	Nijmegen
Eindhoven	Tiel
Enkhuizen	Venlo
Haarlem	Zutphen
Leiden	Zwolle
Middelburg	
Rotterdam	
Vlissingen	

By dividing the cities into this kind of groups, both of the theories can be tested. For example, the alternative theory will gain strength when even in the group of Hanseatic cities a relation between distance from source (Cologne) and receiving town can be established.

Distance was calculated from the source, which is Cologne. Distance was taken from Google maps where using the 'bicycle' route, distances can be 'measured' by adjusting the

[2] In this research Den Haag is treated as a town, but formally and juridically it had not that status (Renes 2005, 15).

line over bicycle lanes, which run along the rivers. It was tried to measure as accurately as possible by following the relevant rivers or trade routes (fig. 3.1). It is expected that this way of measuring will have resulted in an off-set of 10 km at maximum. Therefore, the data was grouped according to classes of 10km. For example, a 32 km distance would be in this system the third class. The towns' locations (red numbers; see meaning in tab. 3.4) are shown individually on a map in fig. 3.2. The data will be presented in chapter four in the same way.

Figure 3.1 The different trading routes in the Netherlands in the 14th century. In blue the routes used in this thesis. Towns are marked by red numbers. The correspondence of those numbers with the different towns can be found in table 3.4. After: https://en.wikipedia.org/wiki/History_of_the_Netherlands.

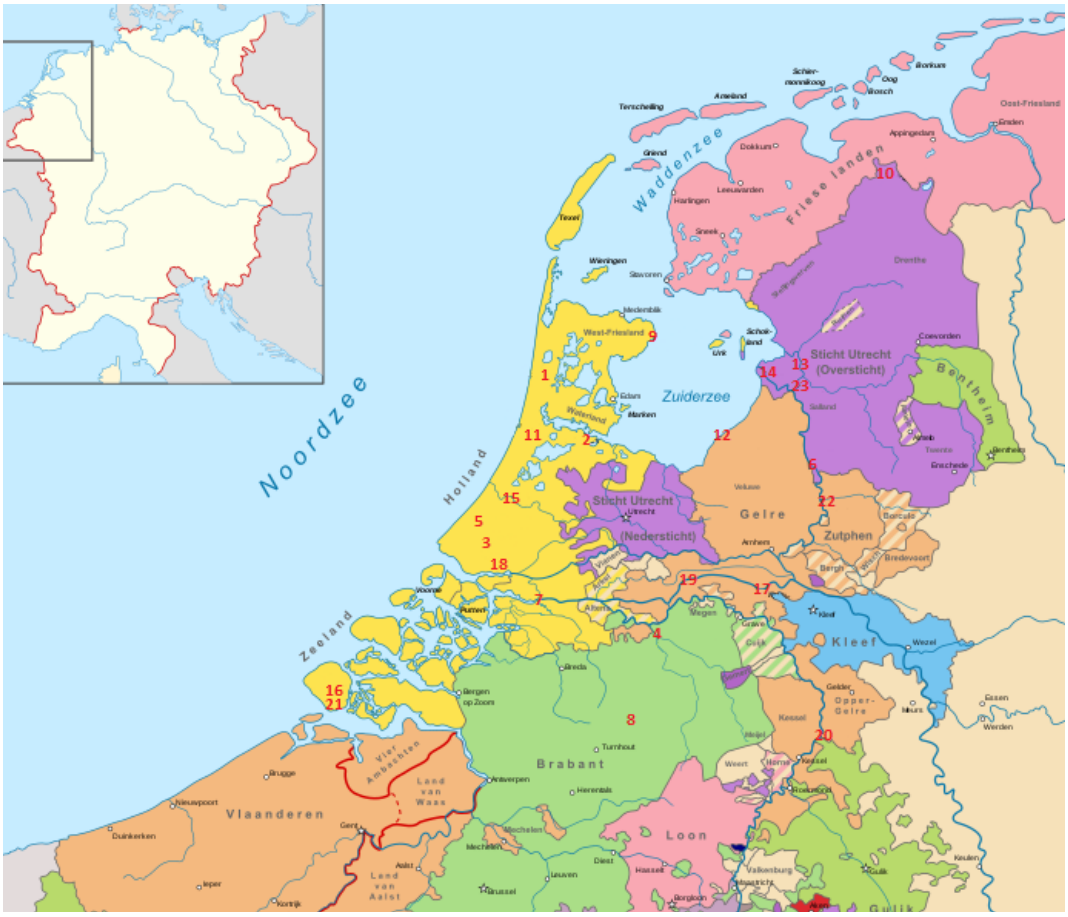

Figure 3.2 The different towns, used in this thesis, in the Netherlands in the 14th century. The red numbers correspond to different towns. The correspondence of those numbers with the different towns can be found in table 3.4. After: https://en.wikipedia.org/wiki/History_of_the_Netherlands.

Table 3.4 Red numbers and their corresponding cities

Red number on map	Corresponding town	Red number on map (continuation)	Corresponding town (continuation)
1	Alkmaar	13	Hasselt
2	Amsterdam	14	Kampen
3	Delft	15	Leiden
4	Den Bosch	16	Middelburg
5	Den Haag	17	Nijmegen
6	Deventer	18	Rotterdam
7	Dordrecht	19	Tiel
8	Eindhoven	20	Venlo
9	Enkhuizen	21	Vlissingen
10	Groningen	22	Zutphen
11	Haarlem	23	Zwolle
12	Harderwijk		

3.6 Note on Hansa membership

It is important to notice that many cities have been member of the Hanseatic league, even cities in the West, in fact. Examples of this statement are Dordrecht, Amsterdam and Middelburg. Still, it was decided to not count them as such. They were engaged in trade and military initiatives of the Hansa only until the fourtheenth century (Weststrate 2007, 277). Later, those towns joined the economic bond of Holland, which influenced them, in the course of the 16th century on a large (international) scale by enforcing their growth as towns (Renes 2005, 37) Taking them, thus, into account as a 'full' Hansa member, for the complete period of 1200-1700, would therefore be wrong.

Chapter 4 Results

This chapter will provide the results of the investigation. In the first section it will be explained how the research question was shaped into a testable research. After this, the first subquestion, on whether Hanseatic towns gain more stoneware than non-Hansa towns, will be answered. Then, the second question, on distance from source, will be looked at. The third research question will deal with the possible relationship between distance from source and occurrence of stoneware. Lastly, it will be tried to answer the final question: which of the two relationships is stronger? In the end, some comments on the general picture surrounding stoneware will be made.

4.1 Execution of the research question

After data collection had taken place, all of the complexes were counted and noted. As described in the previous chapter, distances were measured from Cologne over riverine and sea routes as much as possible. It is known that bulk transport over water was the cheapest and most used method. In the cases of Eindhoven and Groningen, some parts of the route had to take over land. In these cases, historically known routes were taken. For instance, the route from Cologne to Groningen was calculated following Riverine routes, over the Rhine, lower Rhine, IJssel and Beilerstroom after which the 'Hondsrug' was used to reach destination by road. Eindhoven was reached via Den Bosch onto the river Dommel after which oxes pulled carts with goods till destination (N. Arts, pers. comm., 29th of June 2018). The percentage of stoneware was calculated according to the following formula:

$$Percentage\ of\ stoneware = \frac{\text{all stoneware}}{\text{all other wares including stoneware}} * 100\%$$

In the case of multiple complexes in the same town during the same century/centuries the average of the different complexes was taken. When the average is taken of a high number of complexes, the percentage for that particular town will get more reliable. To demonstrate this statement, a distribution graph (fig. 4.1) was created for Dordrecht in the 14th century. The graph shows that the distribution of the percentages of stoneware

follows a normal distribution. The number of complexes in the 14th century Dordrecht is 18. The mean is 44.6% with a relatively small standard deviation of 12.3%. This means that 68.2% of the complexes can be found between 32.3 % and 56.9% of stoneware.

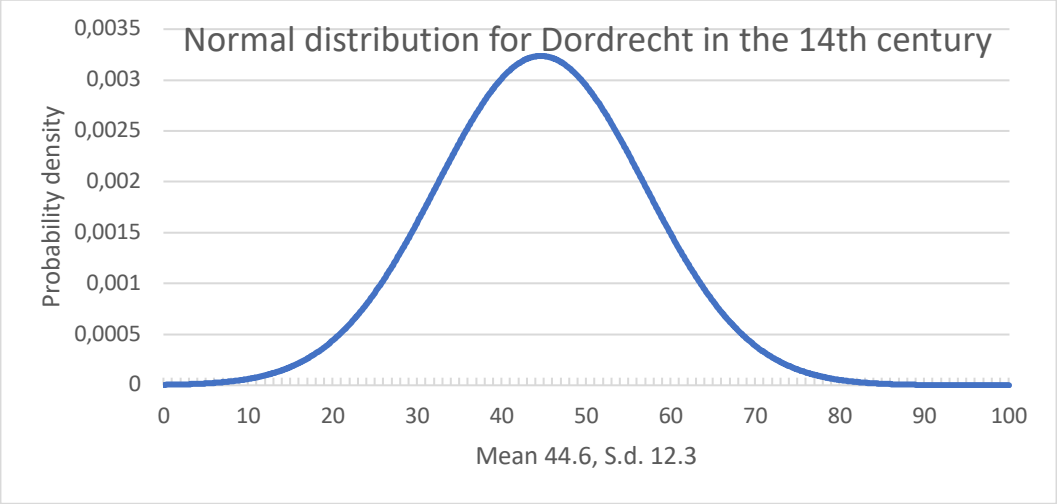

Figure 4.1 Normal distribution for Dordrecht in the 14th century.

In other cases, the results will get more unreliable for towns with only a few complexes. To illustrate this example a distribution graph was created for Nijmegen in the 16th century (fig. 4.2). The number of complexes is seven. The mean is 23.4% and the standard deviation is quite large with 17.8%. This means that 68.2% of the complexes has a percentage of stoneware between 5.6% and 41.2%. This example shows that the spread of dates of

complexes for Nijmegen in the 16th century is quite large.

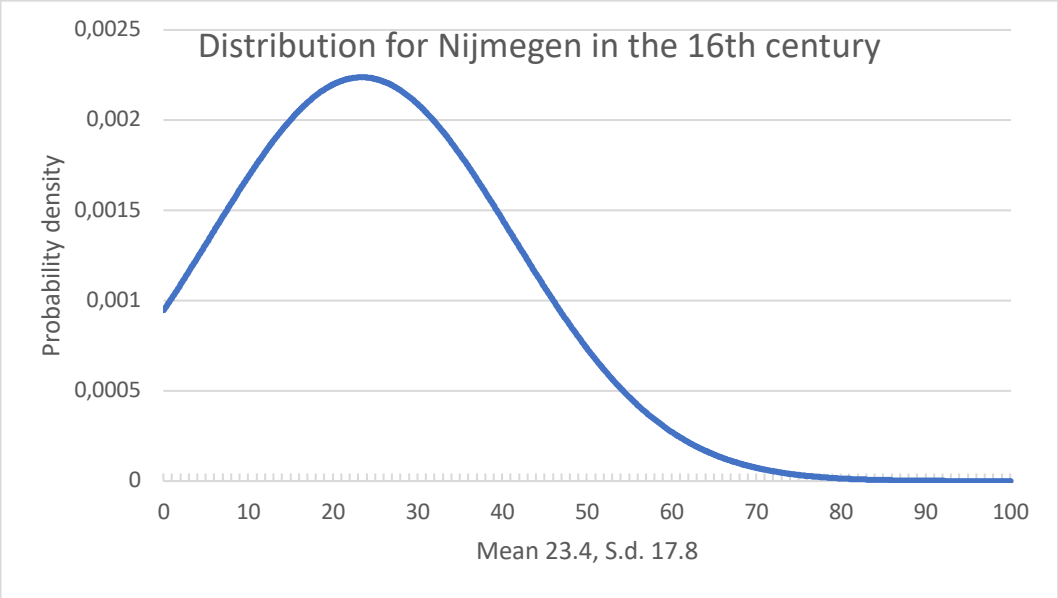

Figure 4.2 Distribution for Nijmegen in the 16th century.

It is obvious from the above-mentioned examples that the more data available the more reliable the mean percentage of stoneware will be.

Unfortunately, in many towns only one context within a century was available. It is thus very doubtful if the percentage for this town in that century is a realistic representation of the average percentage of stoneware in that town. However, this problem is inherent to the discipline of archaeology, unfortunately.

4.2 Presentation of results

The first question holds 'do Hanseatic towns gain more stoneware than non-Hansa towns?' In order to investigate this question, the average percentage of stoneware of every town was calculated for each period. The towns were divided in Hanseatic and non-Hanseatic towns. By putting results for every period in the same figure, it is easy to compare the difference between Hanseatic and non-Hanseatic towns for each century. This question can be answered positively. In all centuries, the Hansa towns yield more stoneware than the towns in Holland, Zeeland and Brabant (fig. 4.3). The difference between them is in

general quite large, with the exception of the 15th and the 15th/16th centuries. In both, the Hanseatic and the non-Hanseatic towns, the amount of stoneware is almost the same. If we take a look at the moving average, we can observe the trends for both types of towns. Up until the 14th/15th centuries the moving averages form almost identical trends. After this period they coincidence for the 15th and 15th/16th centuries, after which the 'normal' trendline continues for the 16th/17th and 17th centuries. The moving average shows that, since the arise of (proto)stoneware in the 13th century, the amount of stoneware increases and reaches its peak at the 14th century. After this century, the percentage of stoneware gradually decreases for the Hanseatic towns. The non-Hansa towns lose stoneware as well from this peak onwards, but a revival in the 15th century occurs. After this revival, the amount of stoneware sharply decreases.

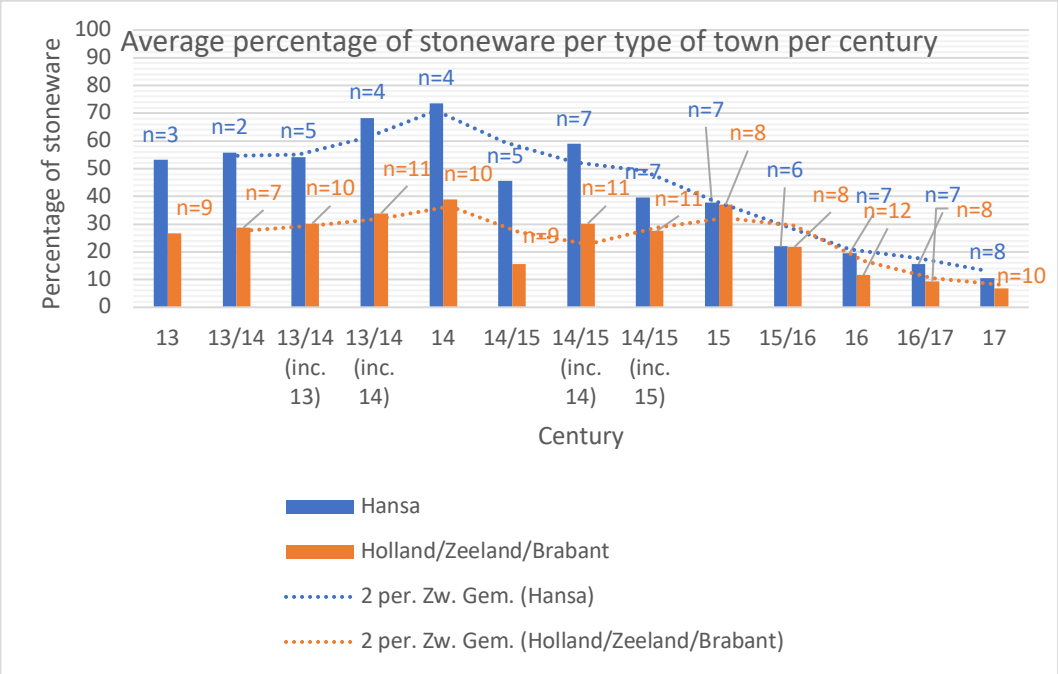

Figure 4.3 Average percentage of stoneware per type of town per century. n= the number of towns.

The second question is 'do Hanseatic towns lay closer towards the center of distribution, Cologne, than non-Hansa towns?' This second question can also be answered positively. If we project all of the towns used in this thesis, according to their distance from Cologne, in groups of 5km, the following picture develops (fig. 4.4).

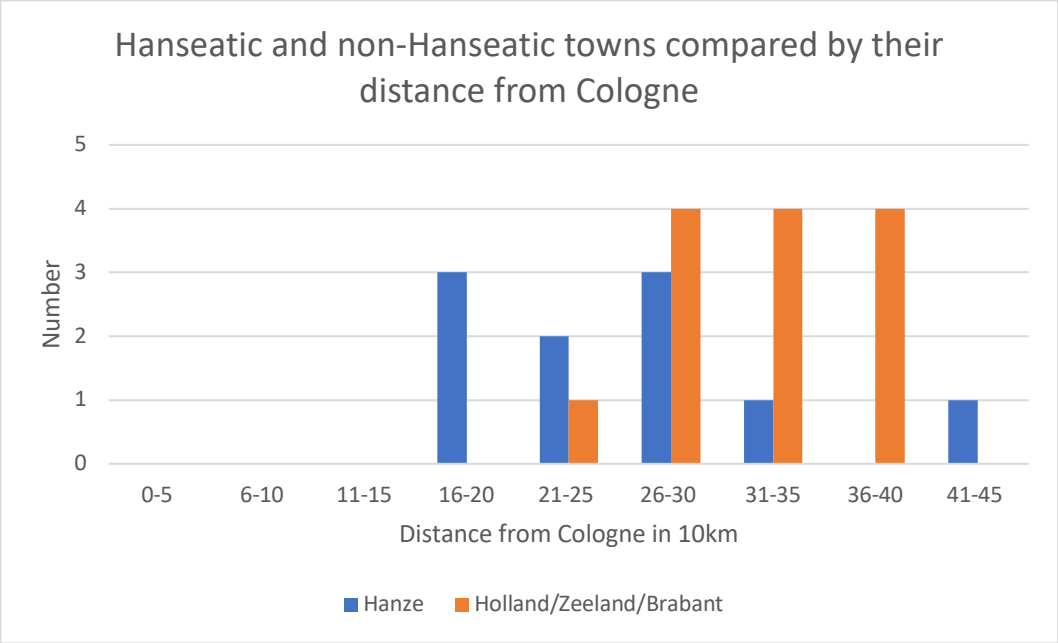

Figure 4.4 Hanseatic and non-Hanseatic towns compared by their distance, in classes of 40km, from Cologne.

It should be noted that the group of Hansa towns (n=10) is smaller than the group of the towns in Holland, Zeeland and Brabant (n=13). Hanseatic towns have a more diverse spread, therefore a larger standard deviation, over the groups of 5km of distance: they have at least one town in each distance group, except for the group of 36-40km of distance. Almost all of non-Hanseatic towns can be found within 140km of distance, except for Den Bosch, which lays slightly closer. Judging from the graph, it seems that Hanseatic towns lay closer to Cologne than towns in Holland, Zeeland and Brabant: 80% of Hanseatic towns can be found before 300km of distance from Cologne, while this is less than 40% for Holland, Zeeland and Brabant. But is the result significant when judged at the appropriate statistical test? First, it was tested whether the two samples had equal variances with a F-test. This is needed since it will determine which test should be used afterwards. The results from the F-test showed that the two samples indeed had equal variances, at 95% confidence (TS=1.849<2.9 allowed; not significant). This means it is allowed to use a two sample T-test, since it assumes equal variances (Fletcher and Lock 2005, 95). The question which was

asked was 'is there a significant difference between the two means?' (*ibid.*). The result of TS was 2.501 (with d.f. being 21); 10+13-2), which means we can be 95% certain that the means are indeed significantly different. Therefore, we can conclude that Hanseatic towns indeed lay closer to Cologne.

The third question is 'what is the influence of the distance from source Cologne on the percentage of stoneware?' To answer this question, each century will be dealt with separately. Also, both groups of towns will be separated to show differences. Next to the name of the town, separated by ; , the amount of complexes will be given. It will be mentioned explicitly, when the result is significant. Due to the small sample size in general, establishing significant results was hard.

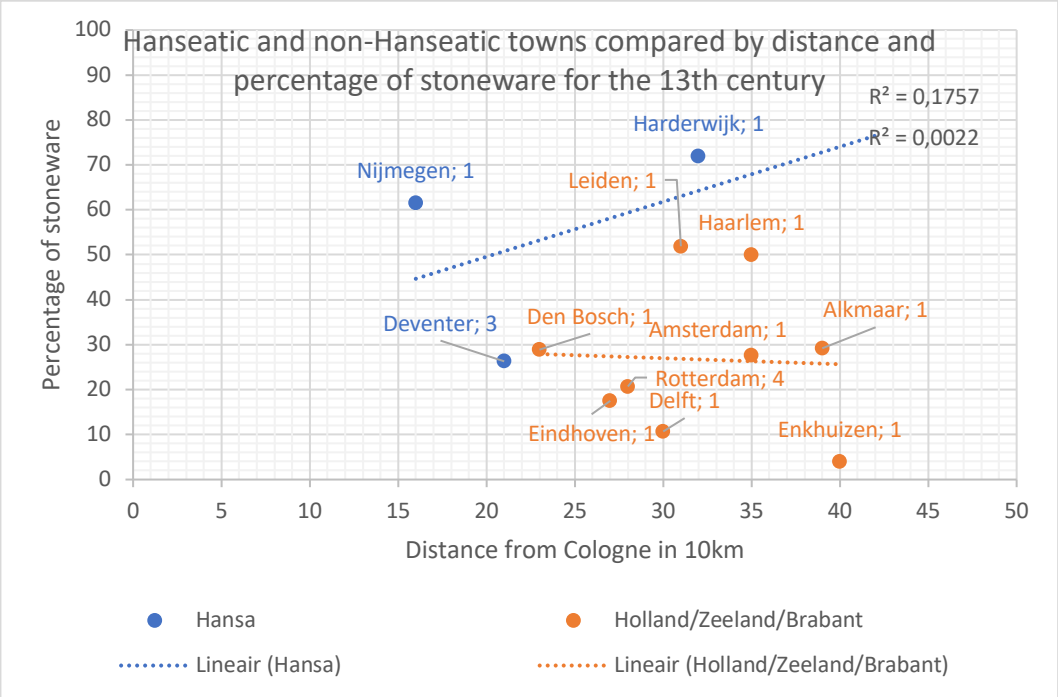

Figure 4.5 Hanseatic and non-Hanseatic towns compared by distance and percentage of stoneware for the 13th century.

First, the results in the 13th century are studied. The Hanseatic towns are represented by three towns and five complexes, while the non-Hansa are represented by nine towns and 12 complexes. It is clear that the towns in Holland, Zeeland an Brabant are much better

represented. Rotterdam is represented by most complexes, four in total. Secondly, Deventer has three complexes, but unfortunately the rest of the towns only exhibit one complex each. When looking at the regression lines, it becomes clear that both types of towns exhibit large differences. While the correlation in the Hansa towns is positive, the correlation for the non-Hansa towns is negative (fig. 4.5). This means that for the Hanseatic towns the increase in distance coincides with an increase in the amount of stoneware. This is not logical, since a longer distance will make stoneware more expensive, so there must be another reason why Harderwijk got more stoneware than e.g. Deventer. This reason can well be sought in the function of the complex. Unfortunately the exact function is not known, but the fact that the building was made of brick in such an early phase and was possibly located outside the town walls, must suggest a special status (Schabbink 2010, 153). The authors propose functions like a monastery, a function related to a nearby hospital or maybe even the residence of the landlord (Schabbink 2010, 154). On the other hand, Leiden and Haarlem seem to deviate as well from the general picture with the non-Hansa towns. The correlation with the Hansa towns is +0,4192 a weak-moderate positive relationship between distance from source and occurrence of stoneware, but as mentioned before, this makes no sense. The negative correlation of -0,0470 of the non-Hansa towns can be seen as no correlation at all, since it is close to 0. It is clear that the positive correlation of the Hanseatic towns was caused by the large numbers of stoneware found in the one complex of Harderwijk, if left out a negative correlation occurs, while the pattern at the non-Hansa towns can be explained by the high levels of stoneware in Leiden, Haarlem and Alkmaar.

The 13th/14th century alone will be skipped since for the Hanseatic towns only two towns were available. We, therefore, move on to the 13th/14th century combined with the 13th century.

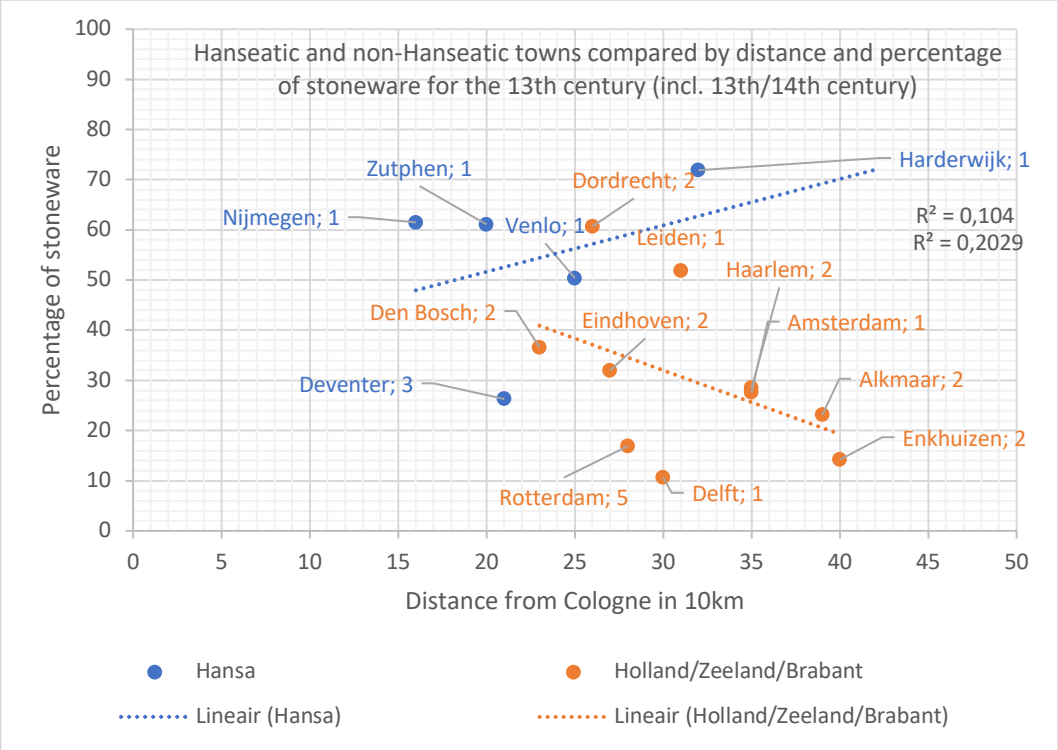

Figure 4.6 Hanseatic and non-Hanseatic towns compared by distance and percentage of stoneware for the 13th century (incl. 13th/14th century).

In the graph (fig. 4.6) we find five Hanseatic towns and seven complexes. Holland, Zeeland and Brabant are represented by 10 cities and 20 complexes. This means that the non-Hansa have twice as much the amount of cities and almost three times the amount of complexes. Most complexes can be found in Rotterdam (n=5) and Deventer (n=3). Least represented are all of the Hanseatic cities except Deventer and for Holland, Zeeland and Brabant Leiden, Amsterdam and Delft. The regression line of the Hansa shows a positive correlation between distance from source and the percentage of stoneware, while the regression line of Holland, Zeeland and Brabant shows the opposite. The main reason for the positive result with the Hansa is the high amount of stoneware found in the (same) only complex in Harderwijk. With the towns in Holland, Zeeland and Brabant, Rotterdam and Delft have low amounts of stoneware, while Leiden and Dordrecht have more than the regression line. The strength of the relationship is +0,322 for the Hansa and -0,450 for non-Hanseatic towns. The first is a weak positive relationship, but makes no sense, and the second is a weak-moderate negative relationship.

For the same reason as the 13th century was combined with the 13th/14th century, the 14th century was combined with the 13th/14th century.

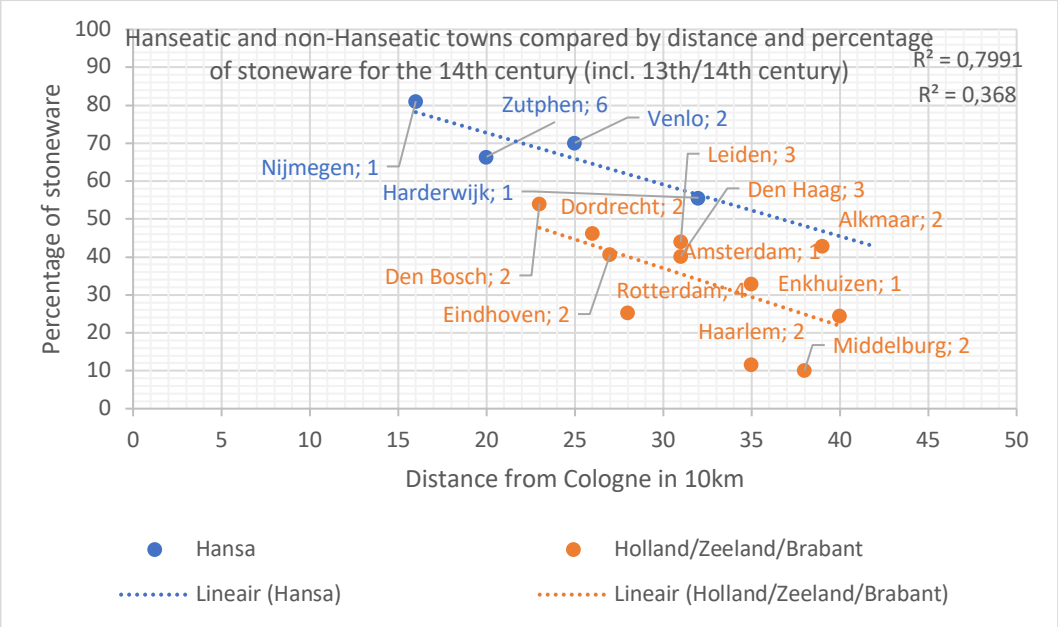

Figure 4.7 Hanseatic and non-Hanseatic towns compared by distance and percentage of stoneware for the 14th century (incl. 13th/14th century).

The Hanseatic towns are represented by four towns and 10 complexes. The non-Hansa are much better represented with 11 towns and 24 complexes. Zupthen has most complexes, six in total, followed by Rotterdam with four. Nijmegen, Harderwijk and Enkhuizen unfortunately only exhibit one complex each. Both regression lines show a negative correlation between distance from source and occurrence of stoneware (fig. 4.7). All of the Hansa towns follow the regression line almost perfectly, while Alkmaar, Haarlem and Middelburg disturb the picture a bit for the non-Hansa towns. The strength of the relationship is -0,8939 for the Hansa towns and -0.6066 for Holland, Zeeland and Brabant. The first can be interpreted as an almost perfect negative correlation (which is significant at the 5% level) and the second as a moderate-strong negative correlation.

The next century which will be looked at is the 14th century, separately.

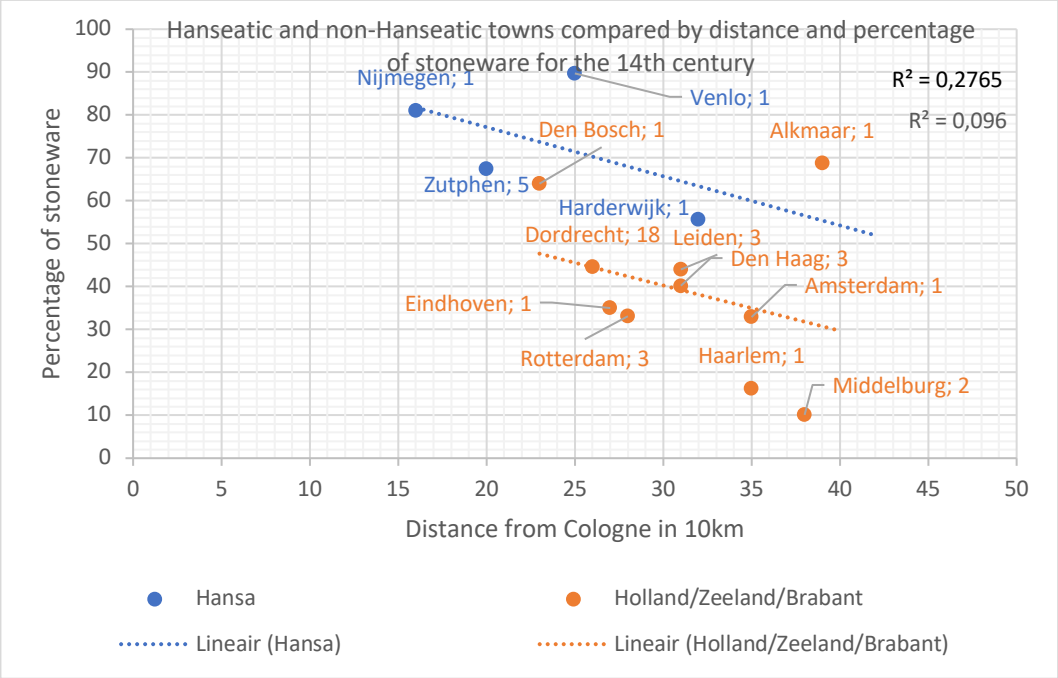

Figure 4.8 Hanseatic and non-Hanseatic towns compared by distance and percentage of stoneware for the 14th century.

The Hansa group in this century exists of four towns and eight complexes. The non-Hansa group has 10 towns and 34 complexes. Both groups show a negative correlation (fig. 4.8). In the Hansa group Venlo was deviant from the pattern, with an enormous amount of almost 90% stoneware. The correlation of the Hansa towns was -0.5258, a moderate negative correlation. The correlation of the non-Hansa towns was -0.3098, meaning there is a weak negative correlation. Multiple towns have caused this picture for the non-Hansa towns, however, Alkmaar has the strongest offset, with almost 70% stoneware.

The next period is the 14th/15th century.

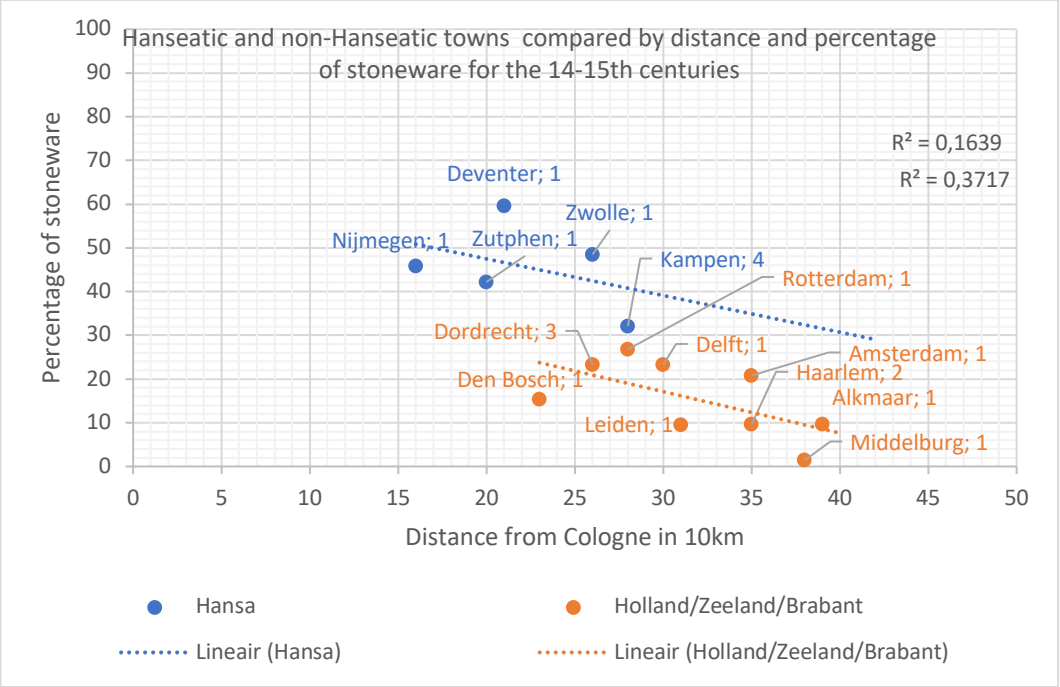

Figure 4.9 Hanseatic and non-Hanseatic towns compared by distance and percentage of stoneware for the 14th/15th century.

The Hanseatic towns compromise of five towns and eight complexes. Holland, Zeeland and Brabant are represented by nine towns and 12 complexes. Half of the complexes from the Hanseatic towns is originating from Kampen, the rest is evenly distributed among the other four towns. Dordrecht (n=3) and Haarlem (n=2) are best represented towns among the non-Hansa towns. Both regression lines show a negative relationship between distance from source and occurrence of stoneware (fig. 4.9). Deventer is most deviating from the regression line among the Hansa, while Middelburg is in the same position among the non-Hansa towns. The strength of the relationship is for the Hansa -0.4048, a weak-moderate negative correlation. For Holland, Zeeland and Brabant this relationship can be expressed as -0.6097, a moderate-strong negative correlation.

To add more data, it was chosen to combine the previously discussed period, the 14th/15th century, with the 14th century.

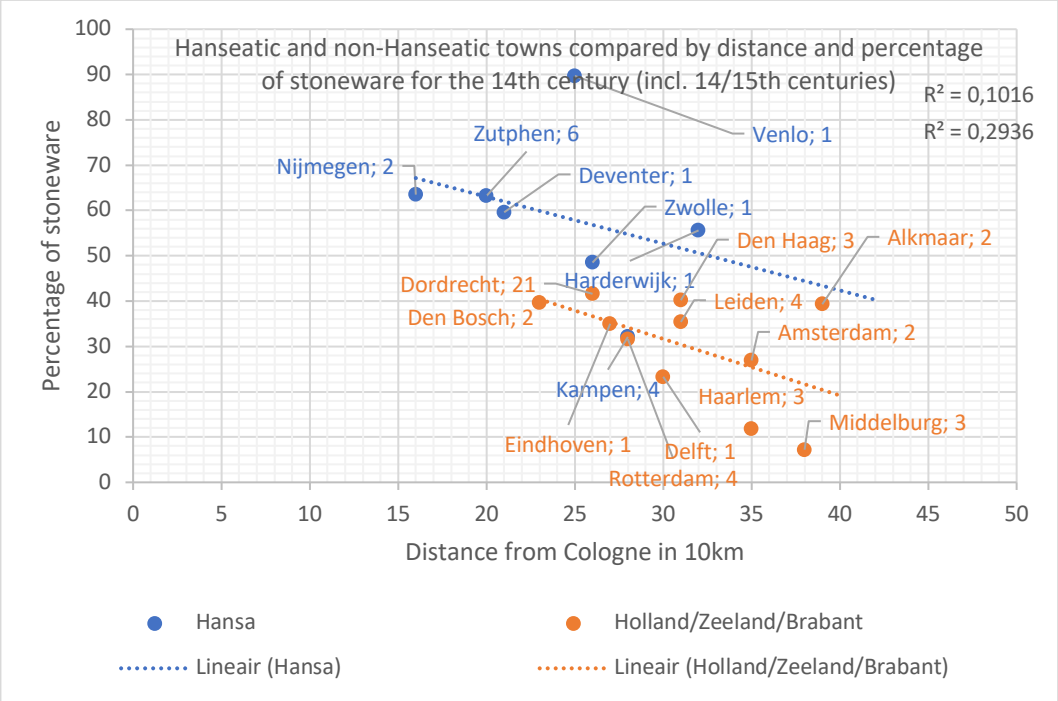

Figure 4.10 Hanseatic and non-Hanseatic towns compared by distance and percentage of stoneware for the 14th century (incl. 14th/15th centuries).

The Hanseatic towns exist in this graph of seven towns and 16 complexes. Holland, Zeeland and Brabant are represented by 11 towns and 46 complexes. Zutphen and Kampen are best represented in terms of complexes, with six and four respectively. Dordrecht has the extreme amount of 21 complexes. In general, the representation of the towns in terms of number of complexes for the non-Hansa towns is in this particular period quite well; all exhibit at least two complexes except for Eindhoven and Delft. Both regression lines show a negative correlation (fig. 4.10). Striking is the location of Venlo in this graph, but this might be caused by the fact that this town only has one complex. Furthermore, Kampen seems to be off, albeit the fact that this data point is based on four (!) complexes. In the non-Hansa group, Middelburg and Alkmaar are far off from the regression line; the first in a negative manner the latter in a positive manner. The Hanseatic towns yield a negative correlation of -0.3187, meaning a weak negative correlation, and the non-Hansa -0.5418, a moderate negative correlation. The reason for the low correlation within the Hansa must be sought in the high percentage of Venlo. It seems unrealistic that a towns' ceramic assemblage is comprised of almost 90% stoneware.

The next graph was made with the same intention: to create a larger dataset. Therefore, this time, the 14th/15th centuries were added to the 15th century.

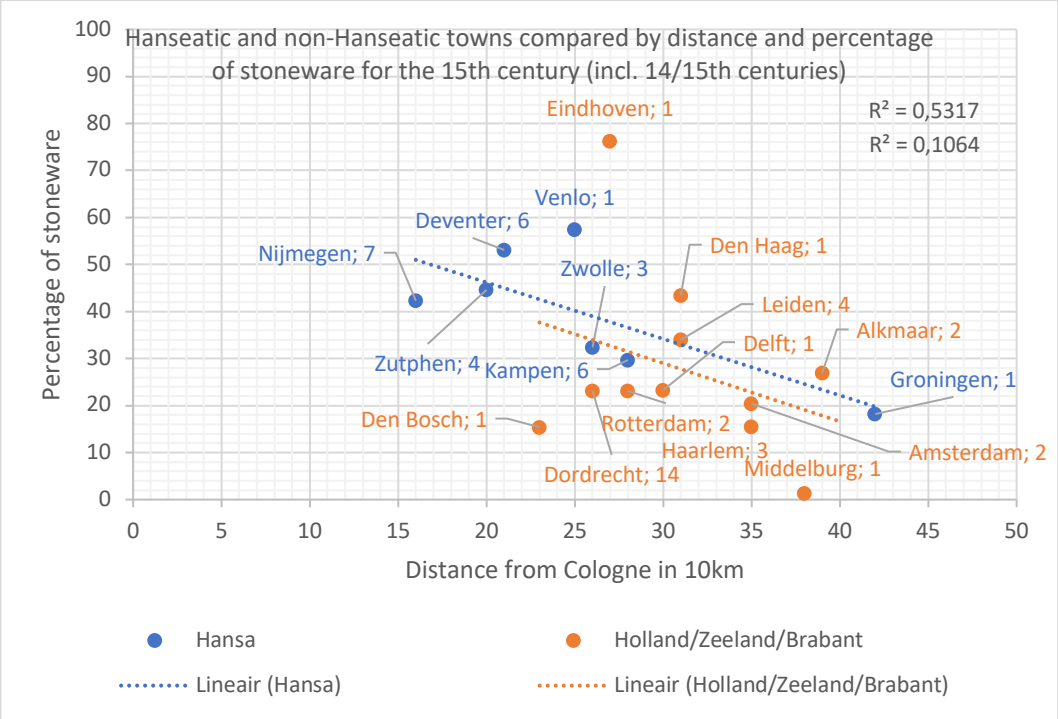

Figure 4.11 Hanseatic and non-Hanseatic towns compared by distance and percentage of stoneware for the 15th century (incl. 14th/15th centuries).

The Hanseatic towns are represented by seven towns and 28 complexes. Holland, Zeeland and Brabant are represented by 10 towns and 32 complexes. Best represented town, in terms of complexes, is for the Hansa Nijmegen (with seven complexes) and is Dordrecht (n= 14) for the non-Hansa. Second places are for Deventer and Kampen (n=6) and Leiden (n=4). Both regression lines show a negative correlation between distance from source and occurrence of stoneware (fig. 4.11). Not many outliers can be identified for the Hansa towns, only Venlo seems a bit high. In the case of Holland, Brabant and Zeeland, outliers are much clearer. Eindhoven is most off with around 76% stoneware, followed by the low percentage of around 16% for Den Bosch. Once again, Middelburg has an extremely low amount of stoneware. The strength of the correlation is -0.7292 for the Hansa and -0.3262 for the non-Hansa group. The first can be interpret as a strong negative correlation and the

latter as a weak negative correlation. It is mainly because of the one complex of Eindhoven that the correlation of Holland, Zeeland and Brabant became so weak.

We now take a look at the 15th century exclusively.

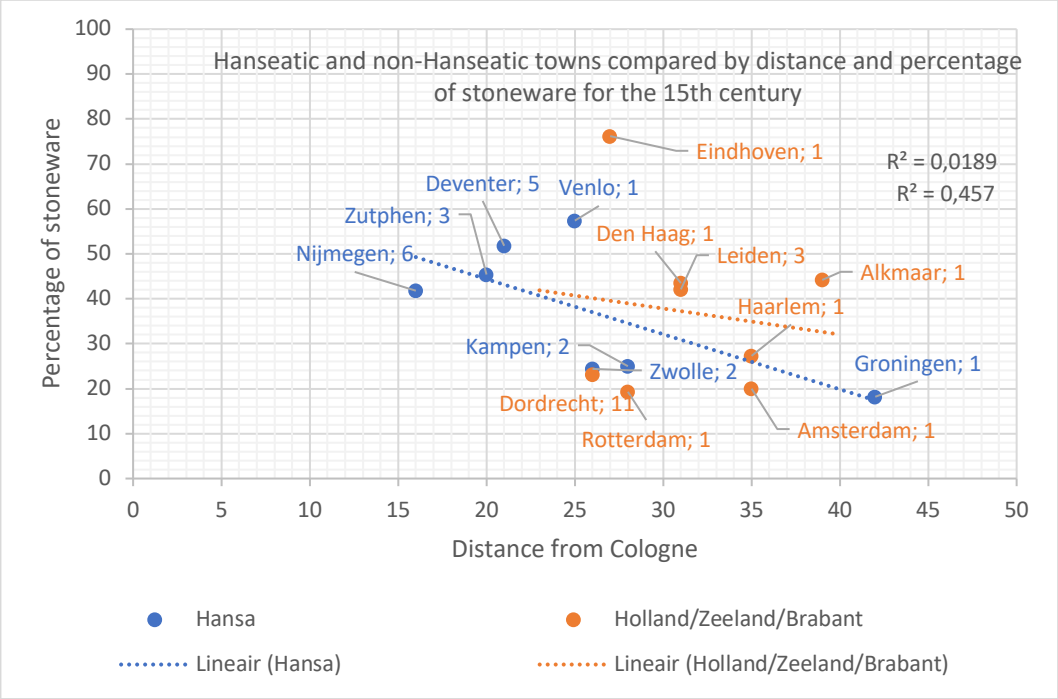

Figure 4.12 Hanseatic and non-Hanseatic towns compared by distance and percentage of stoneware for the 15th century.

The Hansa exist of seven towns and 20 complexes, while the non-Hansa have eight towns and also 20 complexes. Nijmegen (n=6) is best represented town, in terms of complexes, among the Hansa and Dordrecht (n=11) is the same for the non-Hansa. Both types of towns show a negative correlation (fig. 4.12). Venlo is an outlier for the Hansa group, while the non-Hansa data points are rather well spread over the graph. Therefore, there is no correlation between distance from source and occurrence of stoneware in the non-Hansa group (-0.1375). The correlation is strong with the Hansa towns, with -0.6760. Eindhoven has been the main cause for the lack of correlation within the non-Hansa, despite the fact that other towns deviate too much as well.

The next century is the 15th/16th century.

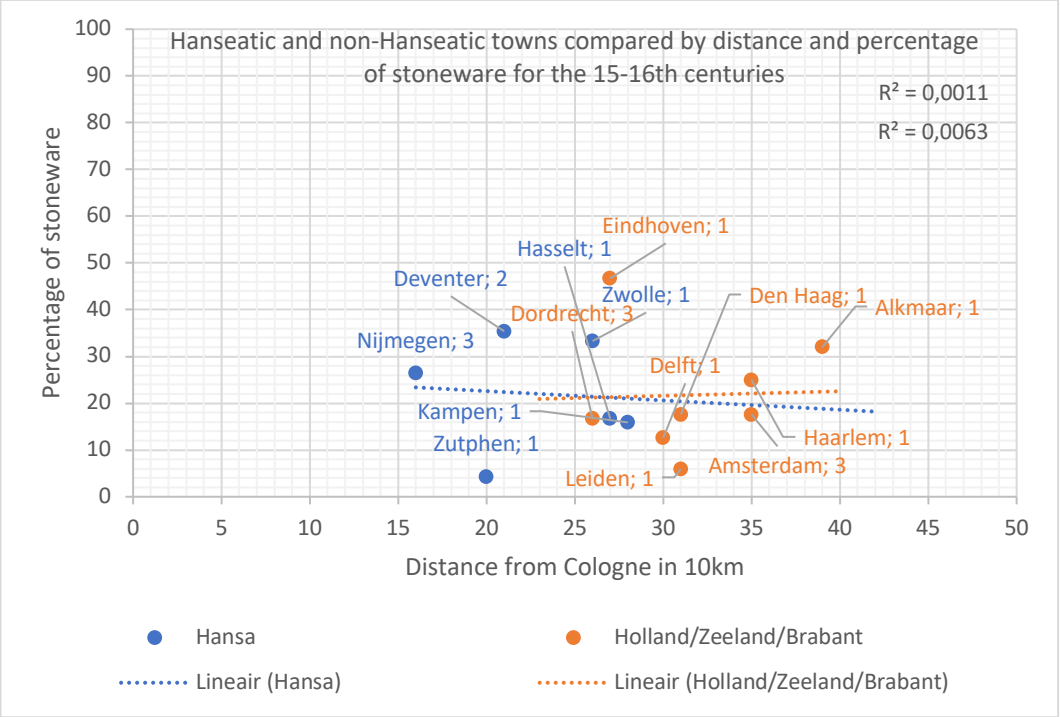

Figure 4.13 Hanseatic and non-Hanseatic towns compared by distance and percentage of stoneware for the 15th/16th century.

The Hansa is represented by six towns and nine complexes, while the non-Hansa are represented by eight towns and 12 complexes. Best represented towns, in terms of complexes, are Nijmegen (n=3) and Dordrecht/Amsterdam (n=3). Neither of the Hanseatic and non-Hanseatic towns show a correlation (fig. 4.13). The towns are randomly spread across the figure. Both correlations are close to 0 (+0.0332 for the non-Hansa; -0.0794 for the Hansa), meaning no correlation in fact. Once again, the level of stoneware in Eindhoven is striking. Furthermore, the percentages of Zutphen and Leiden seems too low. Alkmaar, on the other hand, seems too high in stoneware.

The next period to be discussed is the 16th century.

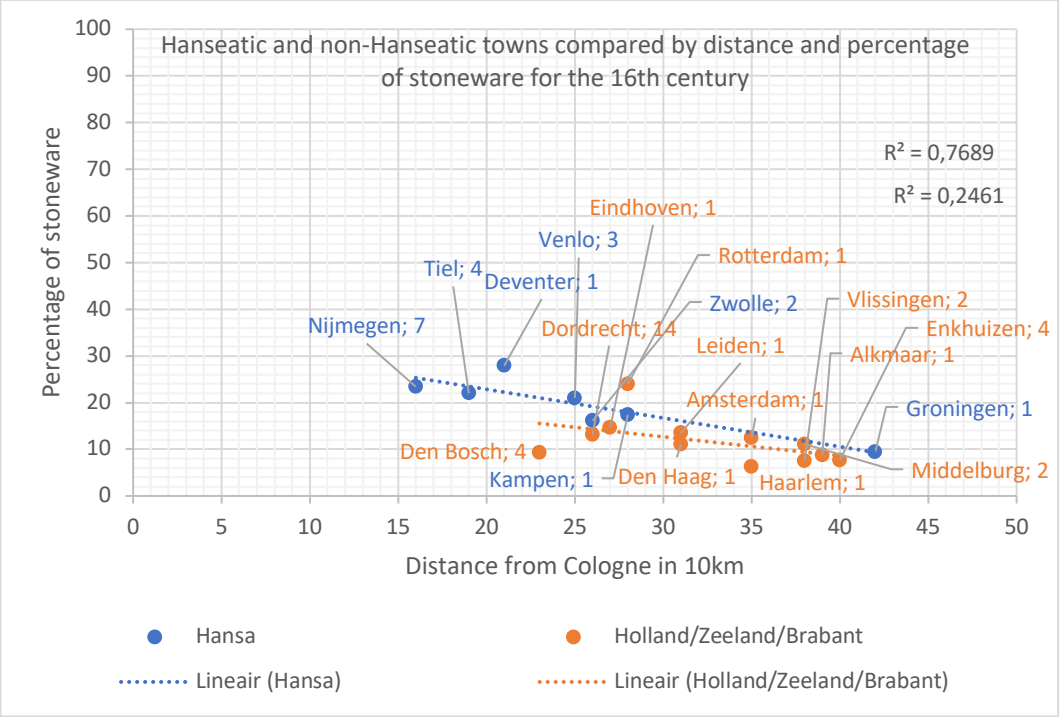

Figure 4.14 Hanseatic and non-Hanseatic towns compared by distance and percentage of stoneware for the 16th century.

In figure 4.14 the Hanseatic league is represented by seven towns and 14 complexes. Holland, Zeeland and Brabant are represented by 12 towns and 33 complexes. Best represented are, in terms of complexes, Nijmegen (n=7) and Dordrecht (n=14). Secondly are Tiel (n=4) and Den Bosch/Enkhuizen (n=4). Both types of towns show a negative correlation between distance from source and occurrence of stoneware (fig. 4.14). In the case of the Hansa, Deventer seems a bit too high. In the case of Holland, Zeeland and Brabant, Rotterdam, seems a bit too high as well. On the other hand, Den Bosch, despite the high number of complexes, seems a bit too low. The strength of the correlation is -0.8769, meaning almost perfect and significant at the 1% level for the Hansa. The correlation is -0.4961, meaning moderate, for the non-Hansa.

The next century is the 16th/17th century.

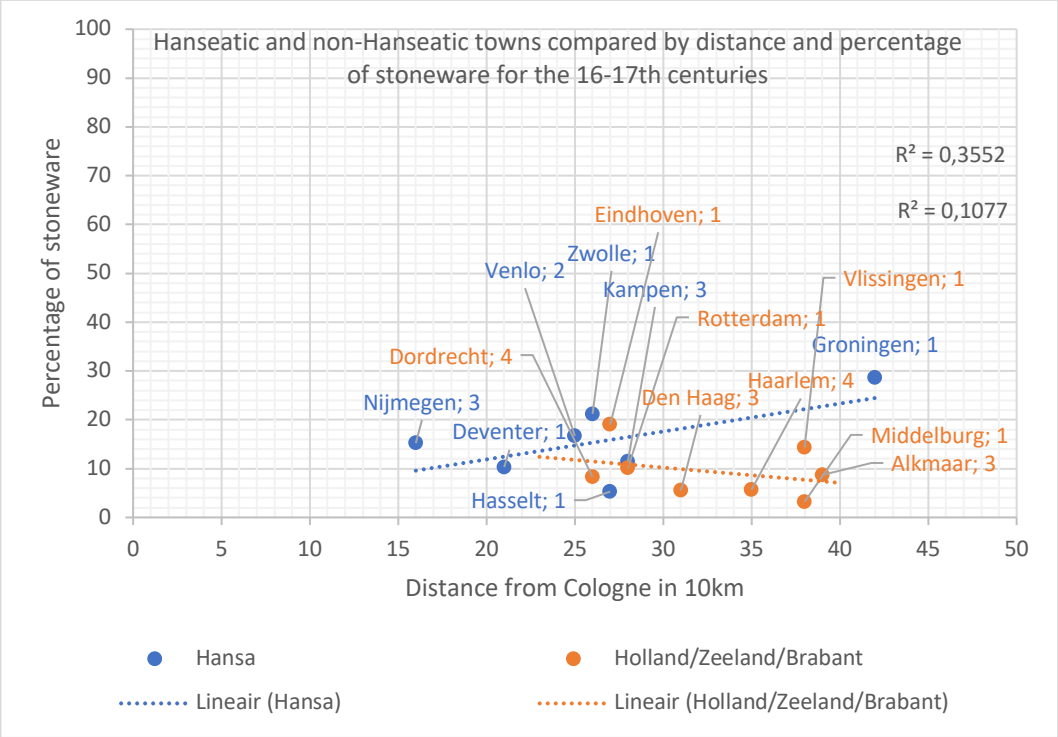

Figure 4.15 Hanseatic and non-Hanseatic towns compared by distance and percentage of stoneware for the 16th/17th centuries.

The Hansa is represented by seven towns and 12 complexes. Holland, Zeeland and Brabant compromise of eight towns and 18 complexes. Hanseatic towns Nijmegen and Kampen are best represented in terms of complexes (n=3). Dordrecht and Haarlem have the most complexes (n=4) for the non-Hansa. The correlation is positive for the Hansa and negative for the non-Hansa (fig. 4.15). Groningen is the most deviant town for the Hansa, it has the highest percentage of stoneware despite its marginal location from Cologne. In the case of the non-Hansa, Eindhoven and Vlissingen are too high in their percentage of stoneware. The positive correlation of the Hansa was +0.5960, a moderate-strong positive result, which makes no sense. For the Hansa the correlation was -0.3282, a weak negative correlation. The causation for the positive correlation must be sought in the extremely high number of stoneware found in Groningen, which is unfortunately only based on one complex. This complex in the Schoolholm and Singelstraat was used for an internship on describing ceramics. This raises questions about the quality of the data, more than when for example a ceramic specialist had worked on the ceramics.

The last century of this study is the 17th century.

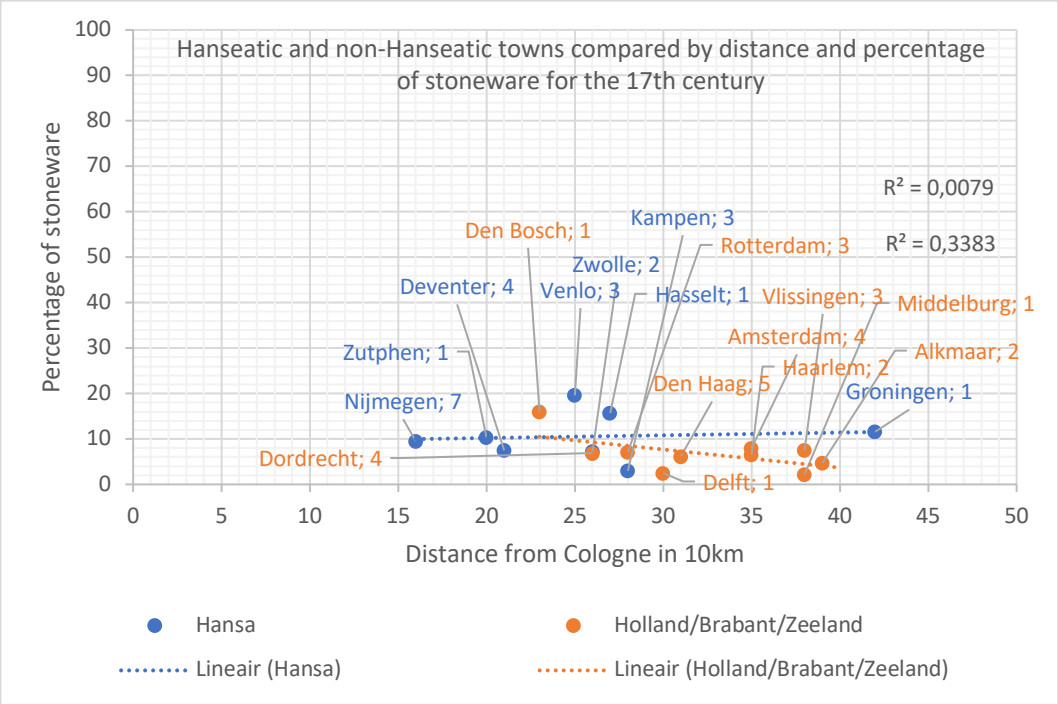

Figure 4.16 Hanseatic and non-Hanseatic towns compared by distance and percentage of stoneware for the 17th century.

The Hanseatic league is represented by eight towns and 22 complexes. Holland, Zeeland and Brabant are represented by 10 towns and 26 complexes. Best represented towns, in terms of complexes, are Nijmegen (n=7) and Den Haag (n=5). The correlation for the Hansa is positive, while the correlation for the non-Hansa is negative (fig. 4.16). Venlo is greatest outlier with the Hansa, while greatest outlier for the non-Hansa is Den Bosch. The correlation for the Hansa is so close to zero (+0.0889) that one can speak of no correlation. The correlation for the non-Hansa was -0.5816, a moderate-strong negative correlation. Main causation for the lack of a correlation within the Hansa is Groningen (n=1). Delft and Den Bosch, both only one complex, have caused weakening of the correlation for the non-Hansa towns.

In the next section we will zoom out from the separate results and start to picture the larger framework. Two questions are central to this. First, does the friction of distance, which is the cause of rising costs for the stoneware, increase, decrease or stabilize over time? Secondly, does the amount of stoneware which is imported into the Hanseatic and non-Hanseatic towns change over time?
The first question can answered by looking at the a in the formula of the regression line $y=\alpha x+\beta$. The α is responsible for the steepness of the correlation. The more the α deviates from 0, the greater the influence of the friction of distance is on the amount of stoneware that is found within towns. Since the costs of transport will only rise if the distance from Cologne will increase, only a negative coefficient will be relevant when one is looking for the effect of transport costs on the amount of stoneware. Positive coefficients in this view can be seen as a result of a lack of sufficient data/complexes.

The first question can be answered with a yes. We can find indeed, looking at tab. 4.1, that the value of a changes through time. It seems that the negative correlation between the distance from the source and the occurrence of stoneware is stronger, meaning α is a higher negative number In the formula, in the first few centuries than later in time. In this period, α is on average somewhere between -1 and -1.5. In the later periods, from the 15th century onwards, this negative correlation, if present, becomes less evident and decreases. The negative correlation has then decreased to about -0.5, so the negative correlation decreased over time. Archaeologically this means that in later centuries the costs relating to the distance from Cologne played a less important role in the amount of stoneware that was found in towns. This can mean that the transportation costs diminished or that people no matter where they lived wanted to buy a certain amount of stoneware anyhow.

The second question can be answered by looking at the b in the formula of the regression line $y=\alpha x+\beta$. The β value stands for the point of intersection with the y-axis at $\alpha=0$. Since no town in this study lays at 0km distance from Cologne, the β value is thus a fictive value. Still, this data can be used to make a comparison between different centuries or between the two types of towns. The higher the β, the higher the amount of stoneware is.

The second question can be answered positively as well. As turns out from the formulas, the value of β differs between the Hanseatic and non-Hanseatic towns. In almost all of the cases, the starting percentage of stoneware (β) was higher in the group of Hanseatic towns than in the group of non-Hansa, except for the cases with a positive correlation coefficient. But, as stated before, a positive correlation coefficient can be seen as the result of lack of sufficient data/complexes. In fig. 4.17 the β of Hanseatic and non-Hanseatic towns are given per period. As can be seen, the trend of both types of towns is a loss of stoneware over the course of the different centuries. The decrease in stoneware is however sharper with the Hanseatic towns than with the non-Hanseatic towns.

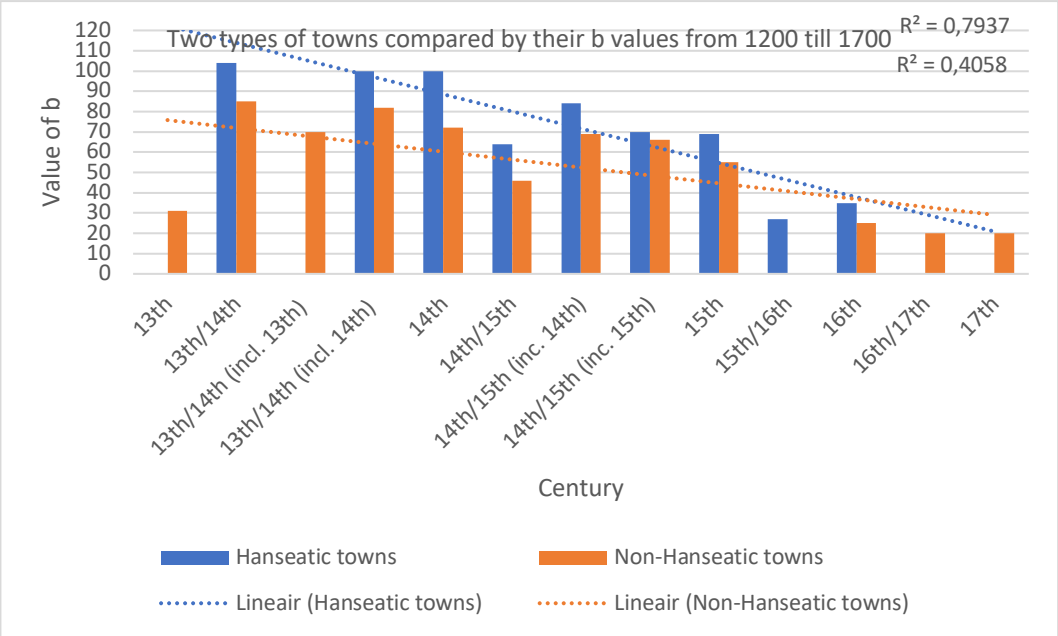

Figure 4.17 The β values of the regression formula y=αx+β *for the Hanseatic and non-Hanseatic towns per period. The* β*-values from formulas with a positive correlation coefficient were left out.*

However, we neglect the fact that the Hanseatic towns are in general closer to the source, Cologne. To fully understand why the value of β is higher in Hanseatic towns, we need to adjust the data to this above mentioned fact. Only then we will understand the full meaning of this value β.

Table 4.1 Formulas of the regression lines separated by century and type of town. The significant correlations are indicated in green. Due to the small sample sizes not many correlations could be labeled 'significant'.

Century	Type of town	Formula of the regression line	Correlation R/R^2
13th	Hansa Holland/Zeeland/Brabant	Y=1,2239x+25,084 Y=-0,1337x+31,001	+0,1757/+0,4192 -0,0022/-0,0470
13th/14th	Hansa Holland/Zeeland/Brabant	Y=-2,14x+103,9 Y=-1,7953x+84,653	-1/-1 -0,3013/-0,5489
13th/14th (incl. 13th)	Hansa Holland/Zeeland/Brabant	Y=0,9247x+33,158 Y=-1,2727x+70,191	+0,104/+0,3224 -0,2029/-0,4504
13th/14th (incl. 14th)	Hansa Holland/Zeeland/Brabant	Y=-1,3632x+99,995 Y=-1,5202x+82,648	-0,7991/-0,8939 -0,368/-0,6066
14th	Hansa Holland/Zeeland/Brabant	Y=-1,1457x+100,09 Y=-1,0581x+72,019	-0,2765/-0,5258 -0,096/-0,3098
14th/15th	Hansa Holland/Zeeland/Brabant	Y=-0,8388x+64,261 Y=-0,9483x+45,564	-0,1639/-0,4048 -0,3717/-0,6097
14th/15th (incl. 14th)	Hansa Holland/Zeeland/Brabant	Y=-1,0328x+83,672 Y=-1,2497x+69,149	-0,1016/-0,3187 -0,2936/-0,5418
14th/15th (incl. 15th)	Hansa Holland/Zeeland/Brabant	Y=-1,2013x+70,219 Y=-1,2393x+66,181	-0,5317/-0,7292 -0,1064/-0,3262
15th	Hansa Holland/Zeeland/Brabant	Y=-1,2264x+68,9 Y=-0,5781x+55,173	-0,457/-0,6760 -0,0189/-0,1375
15th/16th	Hansa Holland/Zeeland/Brabant	Y=-0,1991x+26,579 Y=0,0968x+18,689	-0,0063/-0,0794 +0,0011/+0,0332
16th	Hansa Holland/Zeeland/Brabant	Y=-0,6149x+35,149 Y=-0,4088x+24,936	-0,7689/-0,8769 -0,2461/-0,4961
16th/17th	Hansa Holland/Zeeland/Brabant	Y=0,572x+0,44 Y=-0,3135x+19,618	+0,3552/+0,5960 -0,1077/-0,3282
17th	Hansa Holland/Zeeland/Brabant	Y=0,0594x+9,0284 Y=-0,4009x+19,708	+0,0889/+0,0079 -0,3383/-0,5816

As mentioned before, it turned out that the value β was in almost all cases higher in the group of Hanseatic towns. This indicated that the average percentage of stoneware in

Hanseatic towns is higher than in non-Hanseatic towns. We should, however, not neglect the fact that this type of town in general lays closer to Cologne.

Chapter 5 discussion

In the fifth chapter, interpretation of the results will be presented. The chapter will be started with a short recapitulation of the results. After this, the results will be interpreted. What do the results mean for the two opposing theories? Afterwards, the general picture will be sketched and interpret. Determining factors for the amount of stoneware will be given. Furthermore, this study will be tried to be incorporated into the larger framework of Hansa studies and suggestions for further research will be given. Finally the research questions will be answered in the conclusion.

5.1 Recapitulation of results

In the last chapter several research questions were examined. First, the difference in gain of stoneware between Hanseatic and non-Hanseatic towns was studied and showed that Hanseatic towns in the east gained more stoneware than towns in Holland, Zeeland and Brabant. Secondly, it was proposed that this might have been due to the difference in distance from the source, Cologne, between the two groups of towns. It was argued that the difference in distance would have made transportation costs higher, resulting in a higher price for the same product for towns that laid further away from Cologne. This would have made them more expensive, resulting in a lower demand. The result of the t-test was significant, meaning that, with 95% certainty, there is a significant difference in distance from source between the Hansa and the non-Hansa towns.

5.2 Interpretation of results

The third question researched the influence of this factor 'distance' on the occurrence of stoneware. The proposed theory was shaped into an executable research by representing the different towns as data points in scatterplots. On the x-axis their distance was plotted and on the y-axis their percentage of stoneware. If the theory is correct, the scatterplot will be filled with nearby towns of Cologne with much stoneware and more distant towns with less stoneware. If this is the case, a negative trendline could be drawn through the data points. Data was ranked in chronological order and looked at per century separately.

This was done to look for major differences between the centuries. Furthermore, the Hanseatic (in blue) and the non-Hansa (in orange) were displayed as separate entities in order to display differences between the two. It was shown that in the majority of cases, the theory turned out to work on the archaeological data. Only the first century of the study and the latter centuries did not follow the proposed pattern. Later in the discussion it will be tried to explain why some centuries in this study did not follow the distance from source theory. Still, it can be concluded that the theory works and that distance is indeed a determining factor in the spread of stoneware through the Netherlands during the period of 1200-1700 A.D for both the Hanseatic towns as well as the non-Hanseatic towns.

5.3 General picture surrounding stoneware

A general picture regarding the popularity of the product could be established (fig. 5.1), since in this thesis an extensive study of different sites over a longer period of time was undertaken.

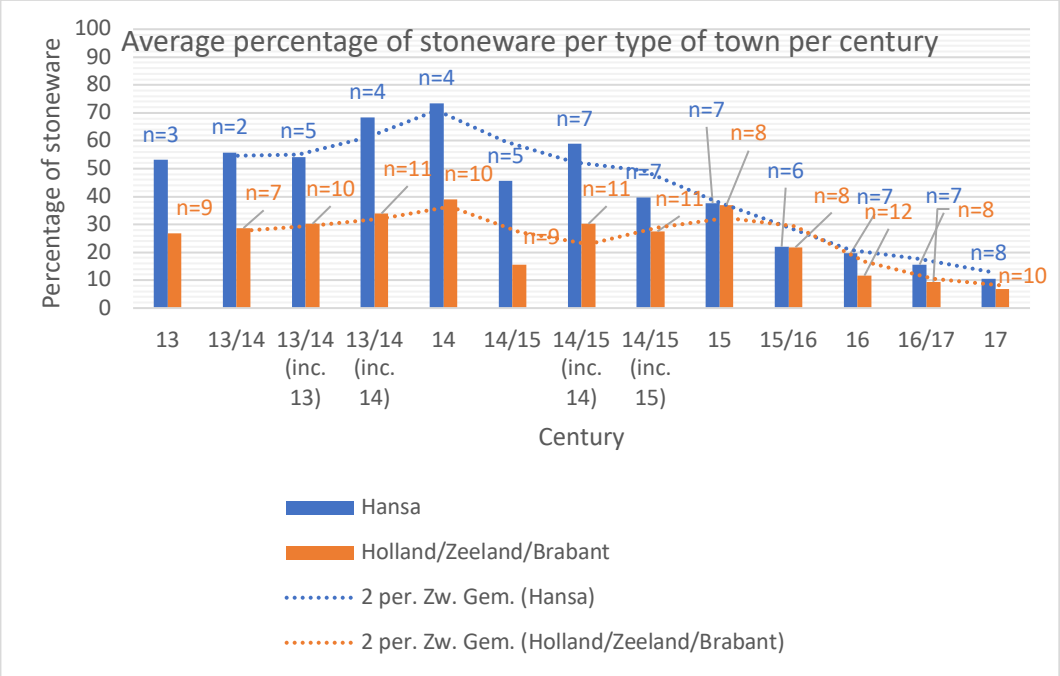

Figure 5.1 Average percentage of stoneware per type of town per century

This provides useful information on how the ware was adopted, when it was at its peak and when consumers started leaving the product. Unfortunately, as of right now, it is

impossible to distinguish on a more detailed level due to a shortage of enough complexes with a small dating range in each town. The level of detail in the 13th century is especially low, unfortunately. In the future, when more data becomes available, it would be interesting to look at a more detailed scale at this specific century, since it was the period in which stoneware came into existence and became a popular item. Then, it might be possible to derive how quick the ware was adopted and how the spreading mechanism worked. The starting dates of the different production centers are known, so we might interfere from this new data how quick the ware was adopted. The hypothesis is that this was rather quick, since predecessors of the ware, e.g. the popular Pingsdorf, were already coming from the same area in Germany. Pingsdorf also produced stoneware, until its popularity was overgrown by nearby producing towns such as Siegburg and Langerwehe. Siegburg, in fact, produced Pingsdorf-like products before it started producing its well-known stoneware products (Hähnel 1987, 13)[3]. It is thus needless to say that the area was involved in an extensive pottery industry, centuries before the production of stoneware. It is thus expected that trading routes and exchange networks between the two areas already existed. With stoneware new on the market, these relationships would just be reinforced. Therefore, it is expected that the ware was rather quickly adopted. The ware reached its peak in the 14th century, so only about 100 years after the starting point of the different production centers. After this, the ware declines in popularity. However, there is a revival in the 14/15th (incl. 14th century) and the 14/15th (incl. 15th century), which might be due to the start of the production of so-called s2's (Ostkamp and Jaspers 2011). This is the type of stoneware with a treatment of the outer surface. This is most often a salt glaze. But after this introduction the ware quickly loses popularity.

5.4 Determining factors for stoneware

This research has shown, besides the fact that the distance from source theory turns out valid, many other factors for the spread of stoneware are at stake. In the following section there will be attention given to the other factors which have influenced the percentage of stoneware.

[3] Siegburg production period I until ca. 1200

It will be started with the closeness to a large town. The same distance from source theory can be observed as well on micro level, e.g. a town and sites on its surrounding countryside. These sites receive as a matter of fact less stoneware than households in the nearby town. An example of this are the farms located in the neighborhood of Delft and Rotterdam (fig. 5.2).

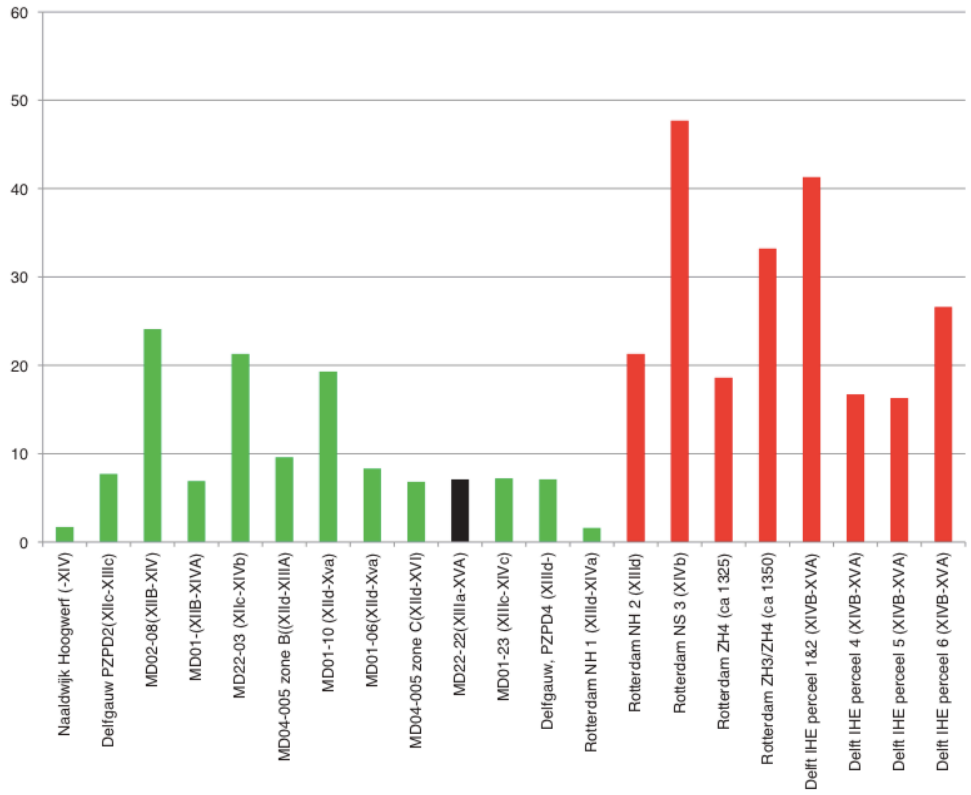

Figure 5.2 The amount of stoneware (expressed as a percentage) compared on different types of sites. The green charts represent the farmyards in the countryside, the red the urban sites. Black is a site in Midden-Delfland which the report, where this graph was taken from, deals with. From: Bult 2014, 129.

Looking at the graph (5.2) it becomes clear that urban sites (in red) receive much more stoneware than rural sites (in green/black), which were only located at a distance of a few kilometers of Delft or Rotterdam. Some outliers exist, but in general, in this period, from the late 13th century until the beginning of the 15th century, rural sites receive about less

than 10% while urban sites receive a little less than 20% on average. Therefore, it seems that stoneware is an urban phenomenon rather than a Hanseatic phenomenon, as proposed by Gaimster.

It must not be overlooked that the fabric of stoneware exhibited specific functions and was therefore used for specific types of ceramic vessels. It was explained before, that stoneware was not suitable to cook with, rather redwares were used for this, but was perfect for storing liquids, pouring and drinking. Following these facts, it is obvious that stoneware might not occur in the same quantities on different sites. Tavern sites are especially high in stoneware, since they are related to this pouring and drinking function of stoneware.

On the site of Hoogstraat 2 in Hasselt, the amount of stoneware, which was 15.7%, was quite high for a 17th century site. The Hoogstraat was one of the main streets in the old town center of Hasselt and was already inhabited in the 14th and 15th century (Bartels 1992, 43). The authors of the report argue that the high amount of vessels, related to a drinking function, could be due to a tavern function of the site, but reject this idea immediately by stating that the owners of the property were high-class people (Bartels 1992, 49). It is worth noting that 43.5% of the artifacts had a function related to drinking/pouring (ibid.). 93% of the glasswork (74 different individuals encountered in total) were related to drinking. Next to the parcel was a tavern located, but the authors feel it is highly unlike that they dumped their waste on the neighbours' property. The statement of the wealth is based upon a comparison of the cesspit inventory with another site in Nijmegen (Eiermarkt), besides looking at historical records. Unfortunately it was not possible to find the owners of Hoogstraat 2 in those records, but it was found that the street was one of the two streets in Hasselt were the wealthiest had their houses (Bartels 1992, 50). So both the 'wealth hypothesis' as the 'tavern hypothesis' could not be proven. Other sites such as hospital sites are low in stoneware since every patient would have had their own set of ceramics, in the earlier periods when this type of care was not centrally organized. Furthermore, even on the same site this factor does apply. Lastly, even on the same site there might be a difference in amounts of stoneware yielded. It matters if one has found the cesspit belonging to the kitchen or the cesspit near the dining room. The first one will

likely contain more (local) redwares while the second likely contains more stoneware (Clevis and Kottman 1989, 36).

Judging from this study, status seems to be an important factor at the margins of the time line. In the beginning, the 13th-14th century, on high status sites, we find more than average amounts of stoneware. An example of this the Polstraat/Assenstraat site in Deventer with 59.6% stoneware in the 14/15th century. The extension of the town Deventer to which the Polstraat belongs started at the beginning of the 13th century, but the parceling of the area only started after the second large town fire of 1334 (Clevis and Kottman 1989, 16). It is unknown who exactly inhabited the parcel to which cess cellar 54-189[4] belonged. However, it is known that the inhabitants of both streets were rather fortunate (Clevis and Kottman 1989, 19). The ceramic assemblage shows similarities in types of stoneware to castle sites. They are another example of high status castle sites, in which often high amounts of stoneware can be found. However they were excluded from this study since the deviate from the general picture.

Another recent study showed the relationship between status and amount of stoneware, for the earlier periods on the countryside as well. In this study, different sites in Midden Delfland were categorized according to their owners, which were predial peasants, free farmers and freeman. In two cases it was not possible to assign a status to the owners. The objective of the research was to find out if those different categories could be traced archaeologically (Bult 2018, 215). Those sites were then compared on four different attributes: presence and size of ditches, size of the farmyards, import of ceramics and lastly, other material culture. Without going into too much detail, it turned out that the best indicators are the "presence of one or two ditches around the free farmers yards, together with the presence of some equestrian equipment" (Bult 2018, 227). However, amounts of stoneware turned out to differ between the three social groups as well, yet to a minor extent than the above-mentioned attributes. In the following table 5.1 this becomes clear.

[4] Besides ceramics, the cess cellar contained one tin plate and two drinking glasses (Clevis and Kottman 1989, 52-54). This emphasizes the owners rather well economic situation (Clevis and Kottman 1989, 55).

Table 5.1 Percentage of imported stoneware when totaled with local red-and greywares per social class. Source: Bult 2018, 222.

Perc. Import/Social class	N sites	Perc.
Nobility	2	22
Free farmers	9	17
Peasants	5	11
Total	16	16

It is clear from the table above that the higher the status of the owners was, the higher the percentage of stoneware (as expressed against local red-and greywares) was. Most of the sites dated from 1200-1250, only a quarter dated around 1250. This shows that status is indeed a determining factor in the very beginning of the product of stoneware.

An hypothesis for this statement is that the product was too expensive to be able to be afforded by everyone in large quantities in the beginning, since obtaining it here involved transportation costs since it had to be imported from western Germany. The β in the formula for the regression lines (fig. 4.17) shows that transportation costs were in the beginning much higher than later in time. This would have made the product higher in price than locally produced products. In the beginning this difference in price might have been too much for the average person. Secondly, it could be that the product was expensive in the beginning since production at that time was still small. It is likely that when production levels were scaled up to a higher level, maybe even mass production, production costs dropped. This could have resulted in a lower price for the product and effectively a higher demand; according to the theory proposed in this thesis. Lastly, trading routes and transportation in general might have been further optimized in the later periods by the use of new waterways or ships. Quicker routes and ships with a larger capacity would have been beneficial to dropping the price of imported wares. Concluding, stoneware likely became cheaper in the later periods as a consequence of above-mentioned reasoning.

However, the 'price-demand' curve also had its limit. Although it was tried to show in this thesis that the distance (and thus price)-demand theory works, the principle behind it does not grow in proportion. To put it simply, it is not true that the principle "the lower the price

is, the higher the demand is" holds forever. At a certain point, the product has reached maximum popularity. Furthermore, competition might arise from another (innovative) product and might steal "more wealthy" consumers away from the 'old' product.

Thus, at the end, of the studied period, the opposite of the previously described trend can be observed. Above-average amounts of the stoneware are found at low-status sites. Apparently, the product became out of fashion, only making up 10% of the assemblage at this point, but not with the lower status communities. In this period, at lower type sites, still around 20% of the assemblage is consisted of stoneware. Were the lower class people too poor to choose for new alternatives such as (European) porcelain, industrially produced wares or glass? And is it therefore that they chose to maintain their old-products longer?

Examples of the previously described case is Venlo, Bergstraat-west and Maaskade-zuid. Occupation, from 1500 onwards (Loopik 2015b, 271) and the town walls were the most important yields of this excavation. From later period (1740-1800) is the discovery of a military graveyard noteworthy (Loopik 2015b, 273). The statement of wealth is however based on the ceramics. Many redwares were found, also lower-Rhine types of redware and little 'luxerious' products such as porcelain. This made the authors think that the inhabitants were rather poor. A critical note should be made about this: we should be critical about how the status of the site was determined. Was it because of the stoneware? Circular reasoning is then at stake. It is better when the status of the occupants is derived from other material remains or historical sources, when present. Unfortunately, historical sources were not addressed in this case. Other materials were studied but gave a mixed signal. For example, botanical remains were also studied and cess cellar 1 yielded a piece of 'grain of paradise', a cheaper replacement for pepper (Loopik 2015a, 83). This shows that the inhabitants were too poor to buy pepper, so they were not extremely rich, but probably not too poor as well.

It was clearly shown in results and in the section above, that the percentage of stoneware fluctuates throughout the five centuries. It is normal for new products to follow such a battleship curve. Early adopters will adopt the product in its first phase. It is expected that the early adopters can usually be found among the richer people in society. In the end the

product will be replaced by better alternatives. In the case of stoneware, those were glass and metalwork. Both are extremely hard to find in archaeological context, since they do not preserve well. Furthermore, metalwork was often recycled since the raw material was too rare to simply get rid of (Clevis and Kottman 1989, 11). It is known, however, that some (more fortunate) families were the owners of metalwork household utensils, such as e.g. plates, cutlery, jugs and chamber pots, through their household inventories. Wood was also used as a tableware and might have been a competitor for stoneware in the beginning as well, especially in the shape of beakers. The preservation of wood is also poor, besides the fact that broken items could also be recycled as fuel for fire (*ibid.*).

In this study, the particular type-functions of stoneware were neglected since they were not valuable for the research question. In a recent study, however, Chomitz (2018) looked at the difference between stoneware vessels that were used to contain beer or wine. She tried to capture the changing consumption trend in the archeological record by using this difference in type-function. Using the different specifics of the vessels, e.g. shape, height, width etc., she was able to determine whether the piece was used to contain wine or beer. Unfortunately, she was not able to find the hypothesized trend, rather she found the opposite of it. She found that vessels that contained wine, as opposed to vessels that contained beer, became more numerous after the fourteenth century (Chomitz 2018, 4). One of the major causes for this might be found in the fact that it was not always possible to determine the right beverage to the right piece of stoneware. Sometimes, we simply do not know what the piece was used for. This resulted in a large group, 70%, of 'unknowns', potentially leading to a major bias of the data. This type of research shows that the shape is affected by changing consumption habits of society. Albeit the fact that for this research question type-functions were not of interest, her research highlights the important idea that changes in society might result in changes in the archaeological record. Since the fabric of stoneware was mainly used for pouring and drinking, we need to see change of popularity of the ware as a result of change of the previously described tasks. As mentioned before, coffee and tea were new beverages which were introduced at the end of the 17th century. It is expected that stoneware was not used to contain those drinks. Faience cups are, however, known. Furthermore, even before, glass became probably the main opponent for stoneware, especially when it became more affordable for the average of

population. In the future, it might be possible to compare stoneware and glass from about the 16th century onwards. It is expected that in the beginning they might not have been that much of competitors, since they had their own markets within society (glass was probably too expensive to be afforded by everyone in the beginning). Later on, when glass became more affordable and thus common, stoneware lost its market.

5.5 Hanseatic research and the role of this particular study

In this section it will be discussed how this particular study can be used in the larger framework of Hanseatic studies. First of all, it is doubtful whether the archaeological record in itself is able to illustrate the emergence of the Hanseatic league; a largely unknown and underestimated economic bond which shaped Europe (Müller 2013, 127).

The Hansa has been victim of popular exploration, in which it was called e.g. 'ein heimliche Supermacht', since the last decade of the previous century (Müller 2013, 128). It is in this explorations that the focus was mainly put on the cities, which is inherent to medieval archaeology as a discipline (*ibid.*). Five large themes exist in the (archaeological) Hanseatic research, those are: archaeology of Hanseatic cities, Hanseatic culture, archaeology of the Hanseatic space, archaeology of the Hanseatic period and lastly Hanseatic archaeology. It is in the second theme, Hanseatic culture, that we find the numerous ideas of David Gaimster on the adoption of 'a Hanseatic way of life' in the shape of a Hanseatic material culture, mainly represented by stoneware from the Rhineland and stove tiles (Müller 2013, 131). The similarity in urban and harbor structures (incl. the use of the same type of ship; the cog) between the Hanseatic cities is often used as an argument for the Hanseatic culture as well (Müller 2013, 132). It is problematic that the definition of the archaeological Hansa is based upon the historical Hansa and has no definition of itself (Müller 2013, 133). Furthermore, the general public is served by clichés on the Hansa in the shape of stoneware, cogs and hall houses (Müller 2013, 134). It seems that the Hanseatic trade is a formative factor for the southern Baltic region but still the archaeological materials fail to link this area to a 'Hansearaum', let alone a reestablishment of the cultural models (Müller 2013, 135). Mehler researched the Hansa outside of the Baltic in the northern Atlantic and came to the conclusion that the Hansa is in this region not a homogenous entity (Müller 2013, 136). The concept of Hanseatic culture, with its classic cultural concepts and the

roles of 'Kulturträgers', becomes more and more old-fashioned with new terms such as transculturalism, hybridization, multilocality and relationality (*ibid.*). Many traded goods of the Hanseatic league are hard to grasp archaeologically, but still can provide interesting information. Examples of this is isotopic analysis on fish remains and zoological remains. Research on the origin of the products, in combination with written records, can provide much new information for the future (Müller 2013, 141). The change in consumer ceramics in the Baltic area is due to the change in consumption habits (*ibid.*). The import of high-quality ceramic goods from north-western Europe mark a certain degree of luxury for the middle classes in northeastern Europe for which it might have functioned as a status symbol. However, this was only for a short amount of time. Glazed local ceramics, glass and metal quickly gain importance (Müller 2013, 142). Müller has made a graph (fig. 5.3) containing the different wares and the total composition over time in Rostock. The scheme shows remarkable similarities with this research.

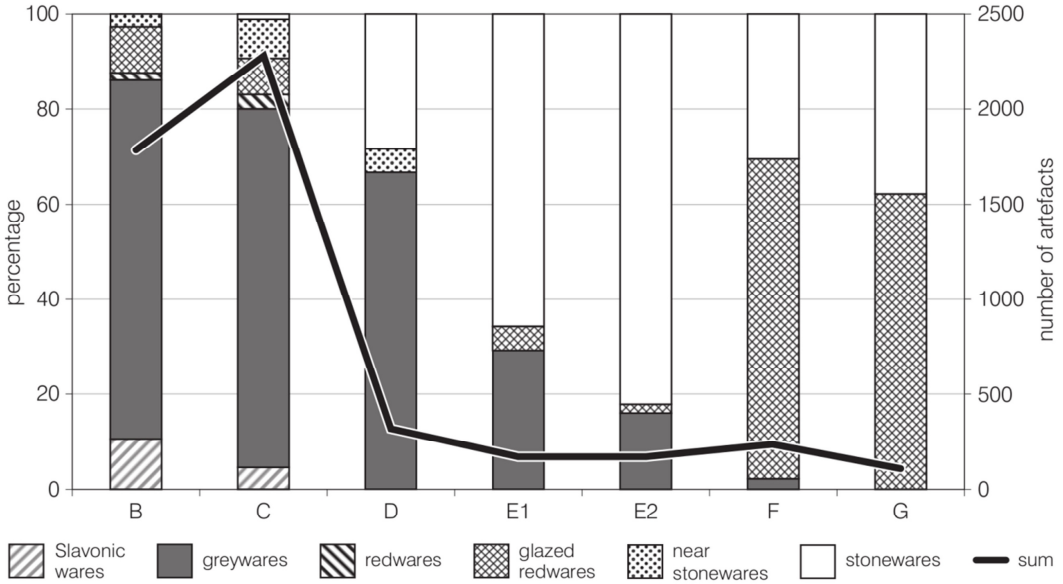

Figure 5.3 Different wares excavated in Rostock. B corresponds to the second half of the 13th century. C? D/E1-E2 to the last third part of the 13th and first third part of the 14th century. F is the late 15th century and G the 16th century. Source: Müller 2013, 165.

It is often overlooked that certain areas had a large economic network before the Hansa arrived. This is observed for example through the use of standard weights. We can ask ourselves to what extent the Hanseatic archaeology is not simply a reflection of the boundary of the discipline (Müller 2013, 149).

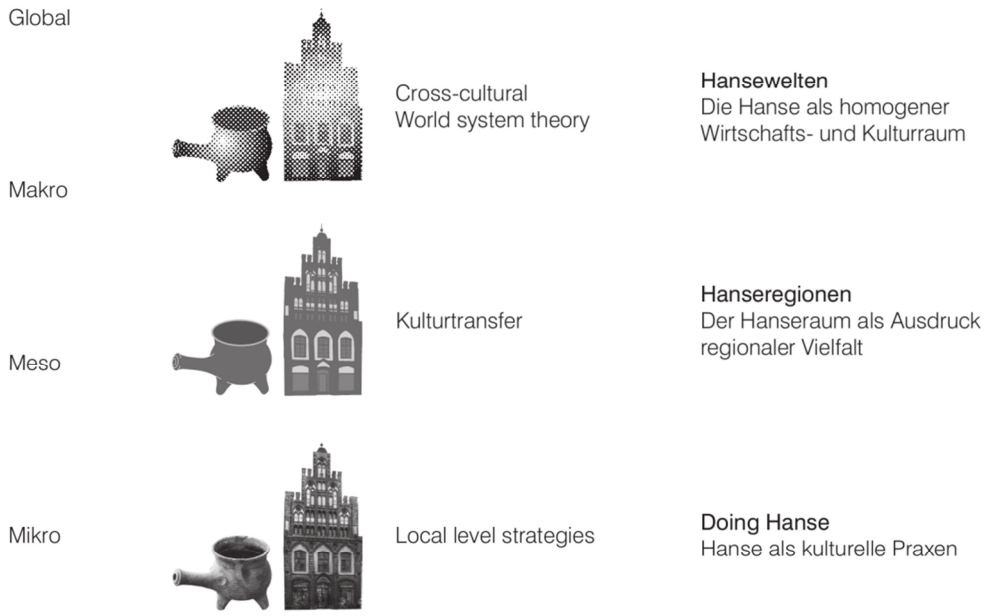

Fig. 5.4 The different levels of scales used in Hanseatic archaeology. Source: Müller 2013, 168.

So this article by Müller has shown that the discipline of Hanseatic archaeology is a rather problematic approach. When looking at the Hansa, we should distinguish different scales (fig. 5.4). One cannot simply state that the Hansa united large parts of north(west)ern Europe, not to mention a 'kulturtransfer'. What we see as Hanseatic archaeology might simply be due to urbanism; the rise of cities in a more and more connected (globalized) world.

5.6 Future research

The role between cities and their hinterland should be researched more thoroughly. Medieval archaeology tends to focus on the large cities instead of the network of interactions between towns and rural areas. It is in this 'archaeological blindspot' where economical activities, such as craftsmanship and trade, took place but we neglect this by only looking at the larger economical centers.

In future research it is advised to take caution when making assumptions about the wealth of the owners of a property. Often, high-quality ceramics are seen as status-indicator. There are many problems with assigning status based on the ceramics. First of all, when a certain type of ceramic is seen as a status symbol and is used to determine status, there is a chance of circular reason. In essence, it is a type of chicken-and-egg problem. Was the status of the owners based upon the ceramics or was the status of the ware based upon its users? Therefore it is advised to use historical sources, if present, to better determine this status. Only when the price of a certain type of ceramics is known as opposed to the price of a certain other ware, well-founded statements about the status of the product can be made. This is where the second problem comes in. Personal inventory lists, almost never mention ceramics. Rather, other objects like cloth are mentioned (E.J. Bult, pers. comm., 18th of October 2018). It is therefore expected that ceramics are not valuable belongings, since they get rarely mentioned. Archeologists, however, put a lot of weight on ceramics since they are often recovered on excavations. However, cloth, for example, is rarely recovered. This example highlights the overemphasize archaeologists make on ceramics in general.

Stoneware is one of the wares that especially suffers from the idea that status can be linked to ceramics. As shown in this thesis, stoneware was, especially for the later periods, not used to show off status. Rather (Venetian) glass was used for this. Therefore, it is wrong to use stoneware as a mean of determining status. If possible, archaeology should always be combined with historical records. This will create a larger framework.

As mentioned earlier, the arrival of new archaeological data will help us understand the problem better. It was shown that the data becomes more reliable when multiple complexes are used for the same town in the same century. Chances of hitting outliers are in this case 'smoothened out' by taking the average of the complexes. In the future, when more data becomes available through (commercial) excavations, it is highly likely that the theory will work in all centuries. It would be worth repeating this research in a few years with additional data. Furthermore, additional data for the earliest century, the 13th century, would definitely aid in understanding how the ware was adopted. Tighter date ranges, such as quarters of centuries, could aid in solving this question.

For now, two competing hypothetical models for this adoption were proposed: 1. a trickling down model, a more top down approach, and 2. an oil spot diffusion, which is more bottom up. For the first it would be interesting to know the status of the owners of the site. Historical research could aid in this, as was shown in archaeological excavation reports, such as the site of Deventer, Polstraat/Assenstraat. Sometimes, it is possible to assign an owner to a specific parcel, the occupation of the owner and other personal details. If the 'trickling down' model is correct, we should find stoneware first at the wealthiest after which it diffused to the less fortunate. At a certain point the ware is adopted by all social classes and it is expected that the top of society has already found a vice product. As mentioned earlier, it is expected that the wealthiest found glass and pewter as the replacing products.

The second hypothesis argues that the adoption of stoneware took place in a more egalitarian way. The product simply 'conquered' the market in a diffusion process, which started small and then spread as an oil spot over the low countries. To research whether this model is plausible, high quality (small date ranges) and quantity (many complexes needed) data is needed. It will then be possible to project the data on a map and 'draw' lines between towns with corresponding amounts of stoneware. This type of model was already performed on the replacement of greywares by the later redwares in the Netherlands during the 15th century (fig. 5.5).

Looking at the graph it becomes clear that greywares were first replaced in Holland, from which the trend spread to Zeeland and Flanders. This is probably due to the fact that the redwares were produced in production centers where previously greywares were produced (Bartels 1999c, 105). Afterwards the movement went from west to east; the eastern part of the Netherlands was last to leave the greyware products. The area around Waal and Lower Rhine were most persistent, only leaving the product around 1525 (Bartels 1999b, 100).

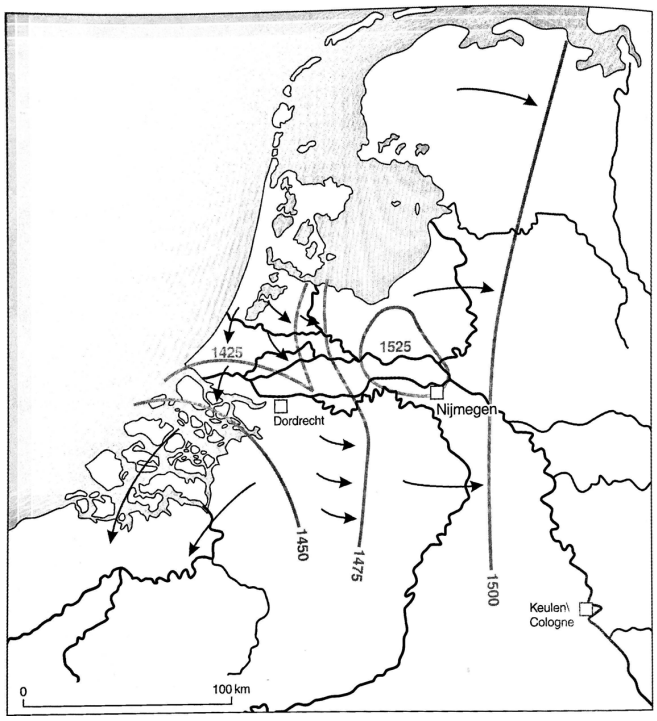

Figure 5.5 Replacement of greywares by redwares in the Netherlands during the 15th century. Source: Bartels 1999b, 100.

Lastly, simple methodological issues such as the influence of sampling strategies and counting strategies should be regarded since they can alter the final results dramatically. Firstly, under time and money constraints it is still important to excavate the site as properly as possible. Taking 'most diagnostic' pieces is definitely not a part of this. If done so, the results become unsuitable for most further research. In the case of this specific research, it would probably give a more optimistic view on the amount of stoneware found, since it will be easier spotted in the field as opposed to other wares. Secondly, counting strategies are also important to regard. Were the sherds counted (as individuals or as sherds?) or weighed? It is beyond the scope of this thesis to address this problem but the researcher should be cautious that it can result in differences in the final data. For comparing, between sites, ideally same methods should be used. Unfortunately, this was in this study not always possible.

5.7 Conclusion

The definitions of what makes a settlement a town are rather ill-defined and is topic of discussion. Generally, some rules exist but there are many exceptions of towns which do not follow (all) the rules and some minor villages which we now call towns, e.g. Stavorden. The preconditions for the predicate 'town' are according to Renes (2005, 15) the following:

- A certain size (for a medieval town, at least 1000 inhabitants);
- A mostly non-agrarian function of the settlement;
- A reinforcement through the build of (a) wall(s);
- A densely built area, at least in the core area;

The next section will discuss the chronology of the arrival of towns in the Netherlands. Not many towns which date from before 1100 exist. The ones that do exist, have a location close to navigable water and seem to have played a role in long-distance trade (Renes 2005, 21). Furthermore, many cities arose on crossroads of water and land trading routes *(ibid.).* Cities from this study from this periode include: Tiel, Deventer, Zutphen and Nijmegen *(ibid.).* In the 12th century, a small increase in the number of cities can be noticed but in general, there is not much change (Renes 2005, 23). Dordrecht developed in this period, mainly due to changes in the lower reaches of the rivers *(ibid).* The town gained a major position when it gained staple rights *(ibid.).* With this new position it replaced Utrecht, which suffered from a replacement of the rivers *(ibid.).* In the same period started the development of the Flemish towns. In the thirteenth century more and more towns developed, but still only when they are close to navigable water *(ibid.).* It is around 1200 that the 'subsistence' economy was traded for a monetary and market economy (Baart 1992, 125). This undoubtedly led to the chance for settlements to grow. The start of the development of towns in Zeeland happened, mostly due to the development of the Flemish network of towns. In Holland, an inland water transport route developed, from the waters of Zeeland via Delft and Leiden or Gouda to Haarlem and from there on to the IJ and eventually the 'Zuiderzee'. Furthermore, the 'damtowns' such as Rotterdam and Amsterdam developed, due to rivers which were flooding into inlands and were needed to be dammed. This was due to large exploitation of the land for peat which caused a drop in ground levels. Another consequence of this drop was the fact that farming became more difficult. As a matter of fact, peat areas began to specialize in cattle, often in combination

with shipping (Renes 2005, 25; Baart 1992, 126). This specialization caused the need for trade, to trade the dairy products for grain *(ibid.).* In the fourteenth century the amount of towns sharply increased (Renes 2005, 27). This century was, despite the association with the farming crisis and decrement of population, very successful for the towns *(ibid.).* Many of the new towns in this century were founded by individual landowners who profited from disputed border areas from larger lords. Many of the new towns were close to a castle and were strategically planned. However, many never became more influential than on a regional level (Renes 2005, 28). After 1400, the development of new towns largely ceased (Renes 2005, 31). In the course of the 16th century, however, many towns in Holland and Zeeland sharply grew. This is due to the replacement of the former economic European core centers such as northern-Italy and Flanders to Brabant (Antwerpen) and later on Holland. In the 17th century, Amsterdam and later on England become important in the European trade.

To conclude, the development of towns was in the first place a relationship between the settlement and the landscape. It was shown that many towns developed along navigable water(s). Many of the first towns in the Netherlands developed because of an engagement in long-distance trade over those larger rivers. Later on, the activities (specializations) which took place in the towns also determined the rate of success. The development of towns in the Netherlands had already largely taken place before 1400.

The urbanization of the Low Countries, which took mainly place in the 13th and 14th centuries, is easily confused with the Hanseatic league, since they were at stake around the same period in time. Furthermore, in fact, they are overlapping subjects. Both caused an immense boost for economic activities and led to the connection between distant areas. It is hard to tell which one led more to the archaeological distribution of today. Still, this thesis highlights the importance of economic exchange rather than cultural diffusion. It was shown that economic theories were better at explaining the archeological record than membership of the Hanseatic league. Furthermore, it was stressed multiple times in this study that the definition of this trading league is ill-defined and sometimes even erratic. It has suffered from 19th century nationalistic views, which made it into a 'superpower'.

Chapter 6 conclusion

This thesis has successfully demonstrated the link between distance from source (Cologne) and the occurrence of stoneware throughout the Netherlands. This fall off curve theory turned out to be an almost perfect fit for the archaeological data both for the Hansa and the non-Hansa towns. The model was proposed against the widespread idea of prof. Gaimster, who claims that the occurrence of stoneware can be linked to Hanseatic identity. Hanseatic towns did gain indeed more stoneware than non-Hanseatic towns, even if their location to Cologne was almost the same. So, this Hansa theory could not be fully rejected. Besides the fall off curve theory, it was proposed that the occurrence of stoneware might be an urban phenomenon. It was shown that sites located on the countryside received less stoneware even if they were on about the same distance from source as the nearby town. Trading activities between larger areas via rivers caused towns to develop, leading to increasing urbanism. Since the Hanseatic league was a confederation of towns, and trade was the main connector between the stakeholders, the two ideas are easily observed as the same driving mechanism.

Summary

The central question of this thesis was whether the occurrence of stoneware on different sites in the Netherlands could be caused by membership of the Hanseatic league. This idea was proposed by Prof. Gaimster in many of his articles. He argues that the stoneware can be seen as a 'Kulturträger', an object one, as member of the large multiregional trading confederation called Hansa, could identify with. So according to this theory, towns that were part of the Hanseatic league should receive more stoneware than towns that were not. To test this idea, the model was shaped into executable research using data from 280 different Dutch complexes. To make fair comparisons, the amount of stoneware was noted as a relative percentage, opposed to other contemporary ceramic wares. It was shown that Hanseatic towns indeed gained more stoneware, but their location to Cologne, the source, was also closer. Therefore, the idea of a link between distance from source and occurrence of stoneware was proposed. The percentage of stoneware was compared to the distance from source, Cologne. This resulted in scatterplots per century. The scatterplots showed that the alternative theory indeed worked both for the Hansa and for the non-Hanseatic towns. Nevertheless, the amount of stoneware for Hansa towns is still higher than the amount of stoneware in non-Hansa towns, who were more or less located at the same distance from Cologne. The idea of an identity of Hansa linked to stoneware could thus not completely be rejected. Rather, urbanism seems to be the main driving mechanism behind the spread of stoneware.

Samenvatting

De hoofdvraag die deze scriptie behandelde ging over de vraag of de verspreiding van steengoed op verschillende Nederlandse sites verklaard kon worden door lidmaatschap van de Hanze. Dit idee komt voort uit het gedachtengoed van prof. Gaimster, wier artikelen hier veelvuldig aandacht aan besteedden. David Gaimster ziet steengoed als een 'Kulturträger', een object waarmee de multiregionale leden van de Hanze zich kunnen identificeren. Daarom zou men wel kunnen stellen dat Hanzesteden meer steengoed ontvangen dan niet-Hanze steden. Om dit te kunnen testen zijn 280 verschillende Nederlandse complexen bekeken. Om eerlijk te kunnen vergelijken is het aantal steengoed vermeld als een percentage, nl. ten opzichte van andere aardewerken baksels. De resultaten waren dat Hanze steden inderdaad meer steengoed ontvingen dan niet-Hanze steden maar hun locatie ten opzichte van Keulen is dan ook gunstiger. Daarom is het idee geopperd dat er een relatie is tussen het percentage steengoed en de afstand van de bron, Keulen. Het resultaat hiervan waren spreidingsdiagrammen, gesplitst op eeuw. Deze diagrammen toonden inderdaad een relatie tussen afstand van de bron en het voorkomen van steengoed, zowel voor de Hanzesteden als voor de niet-Hanzesteden. Niettemin bleek de hoeveelheid steengoed in Hanzesteden hoger dan in niet-Hanzesteden indien de steden op ongeveer dezelfde afstand tot Keulen lagen. Het idee van steengoed als belichaming van de Hanze identiteit kon derhalve niet geheel worden verworpen. Urbanisatie lijkt eerder de voornaamste oorzaak voor de verspreiding van steengoed te zijn geweest.

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Figures

Tables

Appendices

*High status site
** Based on sherds/grams
***Low status site
**** Not taken into grand total since numbers are unknown
***** A part of the date also includes before 1200/after 1700.
****** Drinking site?
******* Harbor site
******** Potter

Alkmaar

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Alkmaar, 04LAA, waterpit 2C.	1225-1300	De Jonge-Lambrechts 2007.	7 17 Tot. 24	29.2%	13
Alkmaar, tellijst baksels Waag(plein). 1/2L level raising.	1285-1325	Bitter and Roedema 2009.	10 49 Tot. 59	16.9%	13/14
Alkmaar, tellijst baksels Waag(plein). 3A Burned layer.	1328-1350	Bitter and Roedema 2009.	22 10 Tot. 32	68.8%	14
Alkmaar, Langestraat 3 en 5, Kraanbuurt 1. Cesspit 3/4C.	1375-1425.	Bitter *et al.* 2010.	20 187 Tot. 207	9.7%	14/15

Alkmaar, 'de Houtmarkt', Laat/Bloemstraat. Sublayer of house mound 2, layer 2AP.	1400-1450	Bitter and van den Berg 2014.	54 68 Tot. 122	44.2%	15
~~Alkmaar, Langestraat 3 en 5, Kraanbuurt 1. Cesspit 3A~~	~~After 1418-ca. 1575/1625.~~	~~Bitter *et al.* 2010.~~	~~24 171 Tot. 195~~	~~12.3%~~	~~15/16/17~~
Alkmaar, Vrouwe Gasthuis, cesspit II (00CAN1207+1208).	1430-1590	Van Zanten 2012.	8 17 Tot. 25	32%	15/16
Alkmaar, Vrouwe Gasthuis, cess cellar C (98CAN90-95).	1525-1650	Van Zanten 2012.	10 92 Tot. 102	9.8%	16/17
Alkmaar, ALK01-89LUT.	1560-1580	Ostkamp *et al.* 2001.	18 190 Tot. 208	8.7%	16
Alkmaar, 'de Houtmarkt', Laat/Bloemstraat. Refuse at the north of the Bloemstraat, houses B936 and B937.	1575-1650.	Bitter and van den Berg 2014.	26 250 Tot. 276	9.4%	16/17
Alkmaar, 'de Houtmarkt', Laat/Bloemstraat. Refuse at the south of the Bloemstraat, houses B930-B931.	1582-1650	Bitter and van den Berg 2014.	24 325 Tot. 349	6.9%	16/17

Alkmaar, 03WAA93. Cesspit 6C.	1608-1681	Bitter and Roedema 2009.	1 19 Tot. 20	5%	17
Alkmaar, Vrouwe Gasthuis, cesspit IV, (00CAN1220).	1650-1700	Van Zanten 2012.	2 43 Tot. 45	4.4%	17

Amsterdam

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Amsterdam, Nieuwendijk bewoningslaag complex 1.	1225-1250	Van Wageningen 1988.	37 97 Tot. 134	27.6%	13
Amsterdam, Nieuwendijk bewoningslaag complex 5.	1325-1375	Van Wageningen 1988.	54 110 Tot. 164	32.9%	14
Amsterdam, Oudezijds Armsteeg 14. Cesspit S37.	1375-1425	Gawronski and Jayasena 2011.	5 19 Tot. 24	20.8%	14/15
Amsterdam, Oudezijds Armsteeg 12. Cesspit S63.	1450-1550	Gawronski and Jayasena 2011.	20 92 Tot. 112	17.9%	15/16
Amsterdam, Nieuwendijk cesspit.	1475-1500	Van Wageningen 1988.	16 64 Tot. 80	20%	15
Amsterdam, Oudezijds Armsteeg 20. Cesspit S23, filling S34.	1475-1525	Gawronski and Jayasena 2011.	3 31 Tot. 34	8.8%	15/16

Amsterdam, Oudezijds Armsteeg 14. Cesspit S36.	1475-1550	Gawronski and Jayasena 2011.	16 45 Tot. 61	26.2%	15/16
Amsterdam, Pieter Jacobszstraat 34. Cesspit 1.	1525-1575	Gawronski and Jayasena 2010.	4 28 32	12.5%	16
Amsterdam, Rapenburg. Feature 1 (s1): level raising (cover).	1600-1725	Gawronski *et al.* 2007a.	5 19 Tot. 24	20.8%	17
Amsterdam, Konijnenstraat. Cesspit 2.	1613-1700	Gawronski *et al.* 2007b.	2 33 Tot. 35	5.7%	17
Amsterdam, Konijnenstraat. Cesspit 1.	1615-1700	Gawronski *et al.* 2007b.	2 59 Tot. 61	3.3%	17
Amsterdam, Haarlemmerplein. Cesspit 1 (HAP1).	1650-1700	Gawronski *et al.* 2006.	1 50 Tot. 51	2%	17

Delft

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Delft, Huijse oft slot Harnasche. Phase 1.	1200-1225	Bult 2014.	3 25 Tot. 28	10.7%	13
~~Delft, Huijse oft slot Harnasche. Phase 1 till 4.~~	~~1225-1450~~	~~Bult 2014.~~	~~93~~ ~~1288~~ ~~Tot. 1381~~	~~6.7%~~	~~13/14/15~~
Delft, IHE site. Parcels I-II till VI.	1350-1450	Bult and Nooijen, 1992.	59 194 Tot. 253	23.3%	14/15
Delft, IHE site. Cesspits B2a, B3, B4, B5, B6, B8 and B10.	15th-16th centuries	Bult and Nooijen, 1992.	13 90 Tot. 103	12.6%	15/16
Delft, IHE site. Rubbish pits B11, B1,	17th-18th centuries	Bult and Nooijen, 1992.	8 316 Tot. 324	2.5%	17

B2b, B12 and T4.					

Den Bosch

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Den Bosch, St. Jans kerkhof phase 2.	1250-1275	Van de Vrie and Janssen 1997.	33 81 Tot. 114	28.9%	13
Den Bosch, St. Jans kerkhof phase 3.	1275-1325	Van de Vrie and Janssen 1997.	34 43 Tot. 77	44.2%	13/14
Den Bosch, St. Jans kerkhof. Phase 4a.	1300-1375	Van de Vrie and Janssen 1997.	48 27 Tot. 75	64%	14
~~Den Bosch, Schilderstraat, finds associated with deepening of plane 1-2. Findnumbers II-0-39, II-0-47, II-0-79.~~	~~1300-1700~~	~~Cleijne 2009.~~	~~21~~ ~~180~~ ~~Tot. 201~~	~~10.4%~~	~~14/15/16/17~~
Den Bosch, St. Jans kerkhof F17.	1375-1419	Van de Vrie and	~~4~~ 22	15.4%	14/15

		Janssen 1997.	Tot. 26		
Den Bosch, Museumkwartier, cesspit F538	1500-1599	Van de Venne 2014.	2 136 Tot. 138	1.4%	16
Den Bosch, Museumkwartier, cesspit F753	1500-1599	Van de Venne 2014.	2 49 Tot. 51	3.9%	16
Den Bosch, Museumkwartier, cesspit F887	1500-1599	Van de Venne 2014.	16 80 Tot. 96	16.7%	16
Den Bosch, Keizershof*, cesspit, layer B.	1525-1575	Van Genabeek 2014	? (27) ? (154) Tot. 181	15%	16
Den Bosch, Keizershof*, cesspit, layer C.	1600-1675	Van Genabeek 2014	? (20) ? (103) Tot. 123	16%	17

Den Haag

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Den Haag, channel infill Annastraat**+****	1325-1375	Carmiggelt and van Veen 1995.	? ? ?	49.7%	14
Den Haag, channel infill Spui**+****	1350 onwards.	Carmiggelt and van Veen 1995.	? ? ?	40.1%	14
Den Haag, level raising Spui**+****	1350-1399	Carmiggelt and van Veen 1995.	? ? ?	30.9%	14
Den Haag, Valkhof. Wastepit S72.	1400-1500	Pavlovic and Nieweg 2006.	10 13 Tot. 23	43.5%	15
Den Haag, Lange Voorhout (Dha96-6).	1450-1525	Van Veen and Jacobs 1996.	6 28 Tot. 34	17.6%	15/16
Den Haag, (Dha95-4a)	1500-1550	Carmiggelt and van	3 24 Tot. 27	11.1%	16

		Veen 1995.			
Den Haag, Bierstraat, channel 2a**	1570-1634	Van Veen *et al.* 2012.	? (7) ? (68) Tot. 75	8.7%	16/17
Den Haag, Bierstraat, channel 1a**	1570-1642	Van Veen *et al.* 2012.	? (7) ? (248) Tot. 255	2.7%	16/17
Den Haag, Lange Voorhout/Kazernestraat, cesspit (complex 9A).	1575/1675	Van Veen and Jacobs 1996.	2 37 Tot. 39	5.1%	16/17
Den Haag, Bierstraat, cesspits**	1600-1642	Van Veen *et al.* 2012.	? (4) ? (63) Tot. 67	5.3%	17
Den Haag, Lange Voorhout/Kazernestraat, cesspit (complex 9B).	1625/1650 - 1650/1675	Van Veen and Jacobs 1996.	4 119 Tot. 123	3.3%	17
Den Haag, Lange Voorhout/Kazernestraat, cesspit (complex 9C).	1650/1675 - 1675/1700	Van Veen and Jacobs 1996.	2 42 Tot. 44	4.5%	17
Den Haag, Lange Voorhout/Kazernestraat, waste pit (complex 11).	1600-1650	Van Veen and Jacobs 1996.	8 54 Tot. 62	12.9%	17
Den Haag, Lange Voorhout/Kazernestraat, cesspit (complex 8)	1625/1650	Van Veen and Jacobs 1996.	1 20 Tot. 21	4.8%	17

Deventer

Name of the complex	Date of the complex, according	Source	Number of stoneware	Percentage of stoneware	Assigned century

	to authors		Number of other wares Tot.		
Deventer, erf Voorink. Phase 2.	Ca. 1050-1300	Van der Wal and Mittendorf 2012.	39 201 Tot. 240	16.3%	13
Deventer, monastery Maria ter Horst, channels, primary filiing.	1200-1250	Mittendorf and Vermeulen 2012.	29 81 Tot. 110	26.4%	13
Deventer, monastery Maria ter Horst, channels.	13th century	Mittendorf and Vermeulen 2012.	69 121 Tot. 190	36.3%	13
Deventer, Polstraat/Assenstraat* Cesspit 54-189.	1375-1425	Clevis and Kottman 1989.	59 40 Tot. 99	59.6%	14/15
Deventer, Burseplein. Waste pit. Findnumber 51-53.	1425-1475	Bartels 1999f.	36 21 Tot. 57	63.2%	15
Deventer, Burseplein. Waste pit. Findnumber 52-81.	1425-1475	Bartels 1999f.	21 17 Tot. 38	55.3%	15
Deventer, Ankersteeg. Cesspit. Findnumber A96.	1425-1500	Bartels 1999f.	25 22 Tot. 47	53.2%	15
Deventer, Polstraat/Assenstraat*	1450 onwards.	Clevis and Kottman 1989.	37 51 Tot. 88	42%	15

Waste pits 51-19 and 51-51.					
Deventer, IJsselstraat. Cesspit. Findnumber Y1-10.	1475-1500	Bartels 1999f.	10 12 Tot. 22	45.5%	15
Deventer, civil orphanage, Bagijnenstraat, complex 2.	1475-1525	Smole and Mittendorf 2009.	27 69 Tot. 96	28.1%	15/16
Deventer, civil orphanage, Bagijnenstraat, complex 4.	1475-1525	Smole and Mittendorf 2009.	23 31 Tot. 54	42.6%	15/16
Deventer, Burseplein. Cesspit. Find number 52-14.	1500-1575	Bartels 1999f.	29 75 Tot. 104	27.9%	16
Deventer, Polstraat/Assenstraat* Cesspit 50-11.	1500-1700	Clevis and Kottman 1989.	24 210 Tot. 234	10.3%	16/17
Deventer, Burseplein. Cesspit. Findnumber 52-14.	1650-1700	Bartels 1999f.	2 39 Tot. 41	4.9%	17
Deventer, Burseplein. Cesspit with vault. Findnumber 54-50.	1650-1725	Bartels 1999f.	16 182 Tot. 198	8.2%	17
Deventer, Burseplein. Cesspit. Findnumber 51-10.	1670-1710	Bartels 1999f.	20 276 Tot. 296	6.8%	17

Deventer, **Polstraat/Assenstraat*** **Cess cellar 50-10**	1675- 1750	Clevis and Kottman 1989.	17 152 Tot. 169	10.1%	17

Dordrecht

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Dordrecht, Heer Heyman Suysstraat. Cesspit. Findnumber 22-683.	1275-1325	Bartels 1999f.	36 37 Tot. 73	49.3%	13/14
Dordrecht, Voorstraat. Barrel-lined pit. Findnumber 50-47.	1280-1310	Bartels 1999f.	18 7 Tot. 25	72%	13/14
Dordrecht, Heer Heyman Suysstraat. Cesspit. Findnumber 21-650.	1300-1325	Bartels 1999f.	61 51 Tot. 112	54.5%	14
Dordrecht, Torenstraat. Wastepit. Findnumber 31-822.	1300-1350	Bartels 1999f.	18 14 Tot. 32	56.3%	14
Dordrecht, Torenstraat. Wastepit. Findnumber 3.5*1.5.	1300-1350	Bartels 1999f.	22 28 Tot. 50	44%	14

Dordrecht, Heer Heyman Suysstraat. Cesspit. Findnumber 22-677+681.	1300-1350	Bartels 1999f.	71 36 Tot. 107	66.4%	14
Dordrecht, Groenmarkt. Cellar (secondly cesspit). Findnumber 62-17.	1300-1350	Bartels 1999f.	11 52 Tot. 63	17.5%	14
Dordrecht, Heer Heyman Suysstraat. Cesspit. Findnumber 23-1016+1025.	1300-1350	Bartels 1999f.	76 79 Tot. 155	49%	14
Dordrecht, Heer Heyman Suysstraat. Cesspit. Findnumber 23-1096.	1300-1350	Bartels 1999f.	39 42 Tot. 81	48.1%	14
Dordrecht, Heer Heyman Suysstraat. Wastepit. Findnumber 20-510.	1325-1375	Bartels 1999f.	18 36 Tot. 54	33.3%	14
Dordrecht, Heer Heyman Suysstraat. Cesspit. Findnumber 23-1115.	1325-1375	Bartels 1999f.	17 22 Tot. 39	43.6%	14
Dordrecht, Heer Heyman Suysstraat.	1325-1400	Bartels 1999f.	30 48	38.5%	14

Cesspit. Findnumber 22+656+668+680.			Tot. 78		
Dordrecht, Heer Heyman Suysstraat. Cesspit. Findnumber 23-903.	1325-1400	Bartels 1999f.	14 19 Tot. 33	42.4%	14
Dordrecht, Heer Heyman Suysstraat. Wastepit. Findnumber 23-1107+1119.	1340-1365	Bartels 1999f.	49 63 Tot. 112	43.8%	14
Dordrecht, Torenstraat. Cesspit. Findnumber 31-819+827+834.	1340-1380	Bartels 1999f.	49 77 Tot. 126	38.9%	14
Dordrecht, Torenstraat. Wastepit. Findnumber 31-818+823+825.	1350-1375	Bartels 1999f.	17 45 Tot. 62	27.4%	14
Dordrecht, Torenstraat. Wastepit. Findnumber 31-832.	1350-1375	Bartels 1999f.	15 18 Tot. 33	45.5%	14
Dordrecht, Heer Heyman Suysstraat. Wastepit.	1350-1400	Bartels 1999f.	24 10 Tot. 34	70.6%	14

Findnumber 23-1002+1014+1022.					
Dordrecht, Heer Heyman Suysstraat. Wastepit. Findnumber 23-1031.	1350-1400	Bartels 1999f.	25 28 Tot. 53	47.2%	14
Dordrecht, Torenstraat. Wastepit. Findnumber 31-816+824.	1360-1385	Bartels 1999f.	14 25 Tot. 39	35.9%	14
Dordrecht, Groenmarkt. Cesspit. Find number 9-28.	1375-1425	Bartels 1999f.	22 60 Tot. 82	26.8%	14/15
Dordrecht, Heer Heyman Suysstraat. Barrel-lined pit within wooden cesspit. Findnumber 21-651.	1375-1425	Bartels 1999f.	7 21 Tot. 28	25%	14/15
Dordrecht, Heer Heyman Suysstraat.Cesspit. Findnumber 23-923.	1380-1410	Bartels 1999f.	15 68 Tot. 83	18.1%	14/15
Dordrecht, Voorstraat. Cesspit. Findnumber 56-2.	1400-1425	Bartels 1999f.	16 102 Tot. 118	13.6%	15

Dordrecht, Groenmarkt. Wastepit. Findnumber 9-6.	1400-1450	Bartels 1999f.	8 43 Tot. 51	15.7%	15
Dordrecht, Heer Heyman Suysstraat. Cesspit. Findnumber 20-535.	1400-1450	Bartels 1999f.	9 24 Tot. 33	27.3%	15
Dordrecht, Tolbrugstraat waterzijde. ?. Findnumber 5-341.	1400-1525	Bartels 1999f.	6 46 Tot. 50	12%	15/16
Dordrecht, Groenmarkt. Cesspit. Findnumber 66-12.	1420-1460	Bartels 1999f.	14 150 Tot. 164	8.5%	15
Dordrecht, Tolbrugstraat waterzijde. Cesspit. Findnumber 6-376.	1425-1475	Bartels 1999f.	10 17 Tot. 27	37%	15
Dordrecht, Heer Heyman Suysstraat. Wastepit. Findnumber 20-512+517.	1425-1475	Bartels 1999f.	21 80 Tot. 101	20.8%	15
Dordrecht, Heer Heyman Suysstraat. Barrel-lined pit. Findnumber 23-955.	1430-1450	Bartels 1999f.	16 62 Tot. 78	20.5%	15

Dordrecht, Tolbrugstraat Waterzijde. Cesspit. Findnumber 6-376.	1430-1460	Bartels 1999f.	24 23 Tot. 47	51%	15
Dordrecht, Groenmarkt. Cess cellar. Findnumber 62-17.	1450-1500	Bartels 1999f.	24 81 Tot. 105	22.9%	15
Dordrecht, Groenmarkt. Cesspit. Findnumber 9-4.	1450-1475	Bartels 1999f.	16 112 Tot. 128	12.5%	15
Dordrecht, Tolbrugstraat waterzijde. ?. Findnumber 5-341.	1475-1500	Bartels 1999f.	13 41 Tot. 54	24.1%	15
Dordrecht, Torenstraat. Barrel-lined pit. Find number 31-757.	1475-1525	Bartels 1999f.	10 62 Tot. 72	13.9%	15/16
Dordrecht, Tolbrugstraat waterzijde. ?. Findnumber 4-175.	1490-1525	Bartels 1999f.	16 50 Tot. 66	24.2%	15/16
Dordrecht, Torenstraat. Barrel-lined pit. Findnumber 31-753.	1500-1550	Bartels 1999f.	6 19 Tot. 25	24%	16

Dordrecht, Heer Heyman Suysstraat. Cesspit. Findnumber 23-999.	1525-1550	Bartels 1999f.	19 74 Tot. 93	20.4%	16
Dordrecht, Torenstraat. Barrel-lined pit. Findnumber 31-801.	1525-1560	Bartels 1999f.	7 37 Tot. 44	15.9%	16
Dordrecht, Groenmarkt. Cesspit. Findnumber 67-1.	1525-1575	Bartels 1999f.	3 29 Tot. 32	9.4%	16
Dordrecht, Tolbrugstraat-Varkensmarkt. ?. Findnumber 8-438.	1530-1575	Bartels 1999f.	15 230 Tot. 245	6.1%	16
Dordrecht, Groenmarkt. Cesspit. Findnumber 66-2+3.	1540-1580	Bartels 1999f.	27 119 Tot. 146	18.5%	16
Dordrecht, Groenmarkt. Cesspit. Findnumber 66-11+12+13.	1550-1600	Bartels 1999f.	13 45 Tot. 58	22.4%	16
Dordrecht, Heer Heyman Suysstraat. Wastepit.	1550-1600	Bartels 1999f.	4 19 Tot. 23	17.4%	16

Findnumber 23-939.					
Dordrecht, Groenmarkt. Cesspit. Findnumber 9-13.	1550-1590	Bartels 1999f.	16 130 Tot. 146	11%	16
Dordrecht, Tolbrugstraat waterzijde. ?. Findnumber 5-326	1570-1600	Bartels 1999f.	8 187 Tot. 195	4.1%	16
Dordrecht, Tolbrugstraat waterzijde. Cesspit. Findnumber 2-162.	1580-1600	Bartels 1999f.	9 63 Tot. 72	12.5%	16
Dordrecht, Heer Heyman Suysstraat. Cesspit. Findnumber 22-659.	1580-1600	Bartels 1999f.	4 44 Tot. 48	8.3%	16
Dordrecht, Voorstraat. Cesspit. Findnumber 45-6.	1580-1600	Bartels 1999f.	2 45 Tot. 47	4.3%	16
Dordrecht, Voorstraat. Cesspit. Findnumber 54-2.	1580-1600	Bartels 1999f.	7 65 Tot. 72	9.7%	16
Dordrecht, Pompstraat/Riedijk. ?. Findnumber 35-5.	1580-1605	Bartels 1999f.	47 209 Tot. 256	18.4%	16/17
Dordrecht, Groenmarkt. Cellar.	1580-1610	Bartels 1999f.	11 255	4.1%	16/17

Find number 62-17.			Tot. 266		
Dordrecht, Voorstraat. Cesspit. Findnumber 42-50.	1580-1615	Bartels 1999f.	3 37 Tot. 40	7.5%	16/17
Dordrecht, Groenmarkt. Wastepit. Findnumber 9-10.	1595-1625	Bartels 1999f.	2 60 Tot. 62	3.2%	16/17
Dordrecht, Groenmarkt. Cesspit. Findnumber 9-14+9.	1600-1625	Bartels 1999f.	1 20 Tot. 21	4.8%	17
Dordrecht, Voorstraat. Barrel-lined pit. Findnumber 54-1.	1650-1675	Bartels 1999f.	2 52 Tot. 54	3.7%	17
Dordrecht, onderzoeksgebied Elhuizen. Phase VI*****	1650-1800	Hos 2008.	29 252 Tot. 281	10.3%	17
Dordrecht, Groenmarkt. Cellar (secondly cesspit). Findnumber 62-17.	1675-1720	Bartels 1999f.	15 169 Tot. 184	8.9%	17

Eindhoven

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Eindhoven, Tongelre-'t Hofke, village 1.	1200-1300	Arts 2014.	10 47 Tot. 57	17.5%	13
Eindhoven, Heuvelterrein.	1200-1325	Arts 2014.	504 582 Tot. 1086	46.4%	13/14
Eindhoven, Blixembosch.	1325-1350	Arts 2014.	27 50 Tot. 77	35%	14
Eindhoven, Tongelre-'t Hofke	1400-1500	Arts 2014.	32 10 Tot. 42	76.2%	15
Eindhoven, Stadhuisplein.	1475-1550	Arts 2014.	121 138 Tot. 259	46.7%	15/16
Eindhoven, Smalle Haven.	1525-1575	Arts 2014.	7 41 Tot. 48	14.6%	16
Eindhoven, Tongelre-'t Hofke	1575-1675	Arts 2014.	42 179 Tot. 221	19%	16/17

Enkhuizen

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Enkhuizen, Driebanen Westerkerk*****	1150-1225	Duijn 2011.	4 96 Tot. 100	4%	13
Enkhuizen, Breedstraat 38.	1250-1350	Duijn 2011.	22 68 Tot. 90	24.4%	13/14
Enkhuizen, test research, Vijzeltuin, level raising.	Around 1500	Duijn and Schrickx 2014.	19 212 Tot. 231	8.2%	16
Enkhuizen, Noorder Havendijk until Compagniesbrug. Archaeological guidance for works at the sewers.	<1544	Duijn and Schrickx 2014.	77 650 Tot. 727	10.6%	16
Enkhuizen, excavation Vijzeltuin, level raising.	1580-1585	Duijn and Schrickx 2014.	18 335 Tot. 353	5.1%	16
Enkhuizen, excavation	Probably in 1591	Duijn and Schrickx 2014.	23 318 Tot. 341	6.7%	16

Molenweg, level raising.					

Groningen

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
~~Groningen, Grote Markt.~~	~~13th-15th century~~	~~Bürmann and Tuin 2010.~~	~~59~~ ~~41~~ ~~Tot. 100~~	~~59%~~	~~13/14/15~~
Groningen, Wolters-Noordhoff-complex, cesspits 8 and 16 combined (find numbers 969 and 411).	1400-1500	Kortekaas 1992.	4 18 Tot. 22	18.2%	15
Groningen, Gedempte Kattendiep, cesspit.	1500-1575.	Carmiggelt and van Gangelen 1988.	6 58 Tot. 64	9.4%	16
Groningen, Schoolholm Singelstraat. Waterpit 205.	1525-1625	De Vries 2013.	27 67 Tot. 94	28.7%	16/17
Groningen, entrance of the parking garage Boterdiep*****	Mainly 17th-early 20th century.	Huis in 't Veld 2017.	41 313 Tot. 354	11.6%	17

Haarlem

Name of the complex	Date of the	Source	Number of	Percentage of	Assigned

	complex, according to authors		stoneware Number of other wares Tot.	stoneware	century
Haarlem, Grote markt 15. Cesspit.	1100-1299 (12th-13th century)	Bottelier 1990b.	16 16 Tot. 32	50%	13
Haarlem, Begijnestraat. Wastepit 18.	1275-1400	Peters 2013.	116 1535 Tot. 1651	7%	13/14
Haarlem, behind Kokstraat 6**, Plane 1 till 9.	1300 onwards.	Polderma ns 1983.	334 1710 Tot. 2044	16.3%	14
Haarlem, Gangolf-gasthuis. Diverse contexts.	Mainly 1300-1500.	De Groot 2013.	25 123 Tot. 148	16.9%	14/15
Haarlem, Antoniestraat 6 en 8. Cesspit 91BPIV.	1375-1450	Jacobs *et al.* 2000	1 44 Tot. 45	2.2%	14/15
Haarlem, Spaarne (Gravinnesteeg/Helmbrekerst eeg)* Cesspit 5.	1400-1450	Jacobs *et al.* 2000	6 16 Tot. 22	27.3%	15

Haarlem, Spaarne (Gravinnesteeg/Helmbrekerst eeg)* Cesspit 1, phase 1.	1450-1575	Jacobs 2002.	5 15 Tot. 20	25%	15/16
Haarlem, Spaarne (Gravinnesteeg/Helmbrekerst eeg)* Cesspit 2.	1500-1650	Jacobs 2002.	14 333 Tot. 347	4%	16/17
Haarlem (96KGB-BP2). Cesspit 2.	1575-1600	Jacobs 1998.	4 60 Tot. 64	6.3%	16
Haarlem, Spaarne (Gravinnesteeg/Helmbrekerst eeg)* Cesspit 1, phase 2.	1575-1625	Jacobs 2002.	1 44 Tot. 45	2.2%	16/17
Haarlem, Spaarne (Gravinnesteeg/Helmbrekerst eeg)* Cesspit 3.	1575-1650	Jacobs 2002.	4 50 Tot. 54	7.4%	16/17
Haarlem, Wilsonplein. Canal 2.	1585-1610	Peters 2015.	51 509 Tot. 560	9.1%	16/17
Haarlem, Burgwal 54. Cesspit.	1600-1699 (17th century)	Bottelier 1991.	1 57 Tot. 58	1.7%	17
Haarlem, cesspit. Terrain of the former Brinkmann complex.	1620-1630	Bottelier 1990a.	7 55 Tot. 62	11.3%	17

Harderwijk

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Harderwijk, Bruggestraat 8-10 and Vijhestraat 30-32. Structure 5.	1250-1300	Schabbink 2010.	23 9 Tot. 32	71.9%	13
Harderwijk, Bruggestraat 8-10 and Vijhestraat 30-32. Structure 3.	1350 onwards	Schabbink 2010.	30 24 Tot. 54	55.6%	14
~~Harderwijk, Houtwal.~~	~~14-16th centuries~~	~~Cleijne 2011.~~	~~71~~ ~~78~~ ~~Tot. 149~~	~~47.7%~~	~~14/15/16~~

Hasselt

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Hasselt, Burg Royerplein, cesspit 58 'de Eikeboom', period 1.	1475-1600	Bartels 1993.	5 25 Tot. 30	16.7%	15/16
Hasselt, Burg Royerplein, cesspit 58 'de Eikeboom', period 2.	Ca. 1590-1625	Bartels 1993.	2 36 Tot. 38	5.3%	16/17
Hasselt, Hoogstraat 2*+******, cesspit (S58+S57).	1600-1625	Bartels 1992.	16 86 Tot. 102	15.7%	17

Kampen

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Kampen. Waste pit. Blokker-75*	1375-1425	Clevis and Smit 1990.	14 19 Tot. 33	42.4%	14/15
Kampen. Cess cellar KOK-4*	1375-1450	Clevis and Smit 1990.	13 34 Tot. 47	27.7%	14/15
Kampen. Cesspit COCK-8.	1375-1450	Clevis and Smit 1990.	9 24 Tot. 33	27.3%	14/15
Kampen. Cesspit COCK-10.	1375-1475	Clevis and Smit 1990.	13 29 Tot. 42	31%	14/15
Kampen. Cess cellar Blokker-105.	1400-1500	Clevis and Smit 1990.	4 20 Tot. 24	16.7%	15
Kampen, town monastery, Vloeddijk, cesspit 5-2-25.	1425-1500	Van Genabeek 1994.	14 28 Tot. 42	33.3%	15
Kampen. Cesspit Blokker-51/54/55.	1425-1550	Clevis and Smit 1990.	7 37 Tot. 44	15.9%	15/16
Kampen, town monastery,	1500-1575	Van Genabeek 1994.	19 90 Tot. 109	17.4%	16

Vloeddijk, cesspit 2-1-8.					
Kampen. Cess cellar Meeuwenweg-2.	1500-majority of 18th century	Clevis and Smit 1990.	19 174 Tot. 193	9.8%	16/17
Kampen, Kok-331. Cess cellar.	1500-1700	Barwasser and Smit 1997.	8 43 Tot. 51	15.7%	16/17
Kampen, Kok-86. Cess cellar.	1575-1750	Barwasser and Smit 1997.	9 70 Tot. 79	8.9%	16/17
Kampen. Cess cellar de Puist.	1675 onwards.	Clevis and Smit 1990.	3 202 Tot. 205	1.5%	17
Kampen. Cess cellar KOK-3/6.	1675-1750	Clevis and Smit 1990.	9 125 Tot. 134	6.7%	17
Kampen. Waterpit Blokker-30/37.	1675-1799	Clevis and Smit 1990.	1 113 Tot. 114	0.9%	17

Leiden

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Leiden, Breestraat. Layer D.	1200-1300	Hallewas 1982.	14 13 Tot. 27	51.9%	13
Leiden, Oude Rijn/Middelstegracht, 1A Raising	1350/75	Bitter 1987.	30 30 Tot. 60	50%	14
Leiden, Oude Rijn/Middelstegracht, 1B Fill up of the ditch	1350/75	Bitter 1987.	28 21 Tot. 49	57%	14
Leiden, Oude Rijn/Middelstegracht, 1 + 1/2 pits	1350-1400	Bitter 1987.	44 133 Tot. 177	24.9%	14
Leiden, De Camp (monastery) cesspit 1.	1350-1450	Van Heeringen 1985	2 19 Tot. 21	9.5%	14/15
Leiden, Oude Rijn/Middelstegracht, 2A Raising	1400	Bitter 1987.	212 141 Tot. 353	60%	15
Leiden, Oude Rijn/Middelstegracht, 2 Pits	1400-1450	Bitter 1987.	85 345 Tot. 430	19.8%	15

Leiden, Oude Rijn/Middelstegracht, 3A Raising	1450/51	Bitter 1987.	96 110 Tot. 206	46.6%	15
~~Leiden, C&A complex Haarlemmerstraat/Spijkerboorsteeg~~	~~1450-1550 and afterwards.~~	~~Bitter 1985.~~	~~51~~ ~~715~~ ~~Tot. 766~~	~~6.7%~~	~~15/16/?~~
Leiden, Stenevelt	1450/1475-1574	Bitter 1990.	26 417 Tot. 443	5.9%	15/16
Leiden, Aalmarkt. Cesspit 56.	1525-1575	Van Horssen en Ostkamp 2011.	5 32 Tot. 37	13.5%	16

Middelburg

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Middelburg, Berghuijskazerne** Canal 3.	1300-1350	Dijkstra *et al.* 2006.	842 4547 Tot. 5389	15.6%	14
Middelburg, Berghuijskazerne** Pit 1.	1350-1400	Dijkstra *et al.* 2006.	4 83 Tot. 87	4.6%	14
Middelburg, Berghuijskazerne** Pit 18.	1375-1450	Dijkstra *et al.* 2006.	8 554 Tot. 562	1.4%	14/15
Middelburg, Berghuijskazerne** Manure pit 1.	1525-1575	Dijkstra *et al.* 2006.	35 360 Tot. 395	8.9%	16
Middelburg, Berghuijskazerne** Manure pit 2.	1500-1600	Dijkstra *et al.* 2006.	63 415 Tot. 478	13.2%	16
Middelburg, Berghuijskazerne** Cesspit 5.	1580-1610	Dijkstra *et al.* 2006.	22 670 Tot. 692	3.2%	16/17
Middelburg, Hof Ramsburg**	1675-1750	Silkens and Meijlink 2012.	82 3580 Tot. 3662	2.2%	17

Nijmegen

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Nijmegen, Grotestraat/Vleeshouwerstraat. Cesspit. Findnumber 1010-13.	1240-1275	Bartels 1999f.	24 15 Tot. 39	61.5%	13
Nijmegen, Grotestraat west. Wastepit. Findnumber 1005-3.	1325-1350	Bartels 1999f.	27 6 Tot. 33	81.8%	14
Nijmegen, de Hessenberg. Complex 1 (cesspit).	1375-1450	De Roode and Harmsen 2014.	22 26 Tot. 48	45.8%	14/15
Nijmegen, Kannenmarkt/Kriekenbeeksegas. Wastepit. Findnumber 1004-27.	1400-1425	Bartels 1999f.	31 24 Tot. 55	56.4%	15
Nijmegen, Grotestraat/Vleeshouwerstraat. Cesspit. Findnumber 1010-24.	1425-1475	Bartels 1999f.	8 15 Tot. 23	34.8%	15

Nijmegen, Eiermarkt oost. Cesspit. Findnumber 1014-77*?	1425-1475	Bartels 1999f.	27 25 Tot. 52	51.9%	15
Nijmegen, Eiermarkt oost. Cesspit. Findnumber 1014-112*?	1425-1500	Bartels 1999f.	14 22 Tot. 36	38.9%	15
Nijmegen, Rozengas. Cesspit. Findnumber 1025-80.	1450-1475	Bartels 1999f.	43 47 Tot. 90	47.8%	15
Nijmegen, Achter de Vismarkt/Schapengas. Waste in the corner cellar. Findnumber 1022-15+41.	1450-1500	Bartels 1999f.	5 19 Tot. 24	20.8%	15
Nijmegen, Eiermarkt oost. Cesspit. Findnumber 1014-115.	1450-1525	Bartels 1999f.	13 24 Tot. 37	35.1%	15/16
Nijmegen, Eiermarkt oost. Cesspit. Findnumber 1014-53+54.	1450-1525	Bartels 1999f.	10 19 Tot. 29	34.5%	15/16
~~Nijmegen, de Hessenberg. Complex 2 (cesspit).~~	~~1450-1725~~	~~De Roode and Harmsen 2014.~~	~~7 70 Tot. 77~~	~~9.1%~~	~~15/16/17~~
Nijmegen, Grotestraat. Cesspit. Findnumber 1023-76.	1490-1520	Bartels 1999f.	4 38 Tot. 42	9.5%	15/16
Nijmegen, Klokkenberg. Wastepit. Findnumber 1002-37.	1500-1525	Bartels 1999f.	15 22 Tot. 37	40.5%	16

Nijmegen, Klokkenberg. Cesspit. Findnumber 1001-40+41.	1500-1540	Bartels 1999f.	5 68 Tot. 73	6.8%	16
Nijmegen, Steenstraat. Cesspit. Findnumber 1029-68.	1500-1550	Bartels 1999f.	8 18 Tot. 26	30.8%	16
Nijmegen, Eiermarkt oost. Cesspit. Findnumber 1014-49.	1500-1600	Bartels 1999f.	19 45 Tot. 64	29.7%	16
Nijmegen, de Hessenberg. Complex 51 (pit).	1500-1600	De Roode and Harmsen 2014.	2 18 Tot. 20	10%	16
Nijmegen, Eiermarkt oost. Cesspit. Findnumber 1014-77*?	1525-1550	Bartels 1999f.	16 61 Tot. 77	20.8%	16
Nijmegen, Klokkenberg. Cesspit. Findnumber 1003-37.	1525-1575	Bartels 1999f.	5 15 Tot. 20	25%	16
Nijmegen, Eiermarkt oost. Cesspit. Findnumber 1014-128.	1550-1625	Bartels 1999f.	6 57 Tot. 63	9.5%	16/17
Nijmegen, Eiermarkt oost. Wastepit. Findnumber 1014-36+90.	1575-1650	Bartels 1999f.	5 27 Tot. 32	15.6%	16/17
Nijmegen, Eiermarkt oost. Cesspit. Findnumber 1014-102+105.	1575-1650	Bartels 1999f.	17 66 Tot. 83	20.5%	16/17
Nijmegen, Hof Batenburg*	1600/1625-	Bartels 1992.	? (10) ? (71)	12.3%	17

	1625/1650		Tot. 81		
Nijmegen, Kannenmarkt/Kriekenbeekse gas. Wastepit. Findnumber 1004-9+26.	1650-1675	Bartels 1992.	9 234 Tot. 243	3.7%	17
Nijmegen, Steenstraat. Cesspit. Findnumber 1029-69.	1650-1680	Bartels 1999f.	6 41 Tot. 47	12.8%	17
Nijmegen, Eiermarkt oost. Cesspit. Findnumber 1014-128.	1650-1710	Bartels 1999f.	7 34 Tot. 41	17.1%	17
Nijmegen, de Hessenberg. Complex 3 (cesspit).	1650-1725	De Roode and Harmsen 2014.	15 226 Tot. 241	6.2%	17
Nijmegen, Eiermarkt oost. Cesspit. Findnumber 1014-112.	1675-1740	Bartels 1999f.	44 354 Tot. 398	11.1%	17
Nijmegen, Klokkenberg. Cesspit. Findnumber 1000-19.	1690-1740	Bartels 1999f.	4 129 Tot. 133	3%	17

Rotterdam

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Rotterdam, the dam in the Rotte, filling of the sluice.	End of the 13th century	Carmiggelt and Guiran 1997.	194 1055 Tot. 1249	15.5%	13
Rotterdam, the dam in the Rotte, dike flood**	End of the 13th century	Carmiggelt and Guiran 1997.	155 711 Tot. 866	17.9%	13
Rotterdam, Hoogstraat-Noordzijde wooden houses. Elevation level + infill of the sluice.	1275-1300	Carmiggelt 1997.	42 168 Tot. 210	20%	13
Rotterdam, Hoogstraat-Noordzijde wooden houses.	1275-1300	Carmiggelt 1997.	103 248 Tot. 351	29.3%	13

Second elevation level (higher).					
Rotterdam, Hoogstraat-Noordzijde wooden houses. Pit NH1.	About 1275-1325	Carmiggelt 1997.	3 182 Tot. 185	1.6%	13/14
Rotterdam, Southern side of the Hoogstraat. Wooden houses. Parcel ZH4.	1300/1325 -1350	Carmiggelt 1997.	46 201 Tot. 247	18.5%	14
Rotterdam, Markthal. Combination of cesspits S4-363, S4-404, S4-203 and pit S4-7091.	1325-1475	Ploegaert 2013.	37 101 Tot. 138	26.8%	14/15
Rotterdam, southern extension of the dam.	Around 1350	Carmiggelt 1997.	834 1676 Tot. 2510	33.2%	14
Rotterdam, Hoogstraat-	1350-1400	Carmiggelt 1997.	158 173	47.7%	14

Noordzijde stone houses. Elevation layer, parcel NS3.			Tot. 331		
Rotterdam, Markthal. Combination of cesspits S48-127 and S40-66 and manure pit S82-134.	1450 onwards.	Ploegaert 2013.	23 96 Tot. 119	19.3%	15
Rotterdam, Hoogstraat. Cesspit parcel NS6.	1500-1675	Carmiggelt 1997.	9 80 Tot. 89	10.1%	16/17
Rotterdam, Hoogstraat. Cesspit parcel LS2*	1525-1550	Carmiggelt 1997.	6 19 Tot. 25	24%	16
Rotterdam, Hoogstraat. Cesspit parcel ZS3.	1600-1650	Carmiggelt 1997.	2 25 Tot. 27	7.4%	17
Rotterdam, Hoogstraat. Cesspit parcel NS5.	1600-1675	Carmiggelt 1997.	3 32 Tot. 35	8.6%	17

Rotterdam, Hoogstraat. Cesspit parcel LS1.	1600-1699	Carmiggelt 1997.	3 53 Tot. 56	5.4%	17

Tiel

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Tiel, Achterweg. Waste pit. Find number 5-15+25+28+29.	1500-1550	Bartels 1999f.	43 135 Tot. 178	24.2%	16
Tiel, Achterweg. Cesspit. Findnumber 8-4+10+11.	1525-1575	Bartels 1999f.	9 28 Tot. 37	24.3%	16
Tiel, plein 21-27. Level raising no.2.	From 1550 onwards.	Spitzers 2009.	44 99 Tot. 143	30.8%	16
Tiel, Achterweg. Cesspit. Find number 10-8+9.	1575-1600	Bartels 1999f.	3 31 Tot. 34	8.8%	16

Venlo

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Venlo, Maasboulevard. The pre-urban harbor quay.	1150-1300/1325	Van der Velde *et al.* 2009.	395 389 Tot. 784	50.4%	13/14
Venlo, Maasboulevard. Cesspit 83*?	1350-1375	Van der Velder *et al.* 2009.	52 6 Tot. 58	89.7%	14
Venlo, Maasboulevard. Cesspit 52.	1400-1475	Van der Velde *et al.* 2009.	273 203 Tot. 476	57.4%	15
Venlo, Maasboulevard. Cesspit 62.	1500-1600	Van der Velde *et al.* 2009.	23 85 Tot. 108	21.3%	16
Venlo, Maasboulevard. Ditch 35.	1500-1600	Van der Velde *et al.* 2009.	206 895 Tot. 1101	18.7%	16
Venlo, Maasboulevard. Cesspit 61.	1500-1700	Van der Velde *et al.* 2009.	562 2813 Tot. 3375	16.7%	16/17
Venlo, Maasboulevard. Cesspit 55.	1525-1575	Van der Velde *et al.* 2009.	31 104 Tot. 135	23%	16

Venlo, Bergstraat-west, cess cellar 3 (feature 24+33).	1550-1650	Ostkamp and Kottman 2015.	4 20 Tot. 24	16.7%	16/17
Venlo, Bergstraat-west, cess cellar 1 (feature 35/70+36/71).	1600-1700	Ostkamp and Kottman 2015.	11 54 Tot. 65	16.9%	17
Venlo, Bergstraat-west***, cess cellar 2 (feature 72+40).	1600-1700	Ostkamp and Kottman 2015.	18 61 Tot. 79	22.8%	17
Venlo, Maaskade-zuid***, cess cellar 1 (feature 11/22+24).	1650-1725	Ostkamp and Kottman 2015.	10 42 Tot. 52	19.2%	17

Vlissingen

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
~~Vlissingen, Spuistraat, context 14, trench 4.~~	~~1300-1700~~	~~Ostkamp and Kottman 2010.~~	~~3~~ ~~78~~ ~~Tot. 81~~	~~3.7%~~	~~14/15/16/17~~
Vlissingen, Dokkershaven, context 1.	1550-1600	Jaspers 2010.	? (4) ? (60) Tot. 64	6.3%	16
Vlissingen, Dokkershaven. Context 14. Barrel-lined pit filling 1,2 and 3.	1550-1650	Jaspers 2010	3 18 Tot. 21	14.3%	16/17
Vlissingen, Dokkershaven, context 5.	1575-1600	Jaspers 2010.	? (2) ? (23) Tot. 25	8.7%	16
Vlissingen, Dokkershaven, context 16.	1600-1650	Jaspers 2010.	? (3) ? (31) Tot. 34	8.8%	17
Vlissingen, Dokkershaven, context 18.	1609-1614	Jaspers 2010.	? (1) ? (24) Tot. 25	4%	17

Vlissingen, Dokkershaven, context 35.	1650-1700	Jaspers 2010.	? (5) ? (47) Tot. 52	9.6%	17

Zutphen

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Zutphen, Kruittorenplein, Nieuwstad 69, pit, S214A.	13th/14th centuries	Fermin and Groothedde 2009.	33 21 Tot. 54	61.1%	13/14
Zutphen, Kruittorenplein, Nieuwstad 69, waterpit, top.	Just after 1300-1350	Fermin and Groothedde 2009.	31 14 Tot. 45	68.9%	14
Zutphen, Komsteeg-Hagepoortplein. Infill of the cellar.	1300-1500	Vos and Groothedde 2013.	345 473 Tot. 818	42.2%	14/15
Zutphen, Nieuwstad, archaeological investigation****	1300-1350	Fermin and Groothedde 2011.	? ? ?	Ca. 66%	14
Zutphen, Komsteeg-Hagepoortplein. Water pit 102/103.	1325-1350	Vos and Groothedde 2013.	74 39 Tot. 113	65.5%	14
Zutphen, Komsteeg-Hagepoortplein. Feature 10.	From 1325 onwards.	Vos and Groothedde 2013.	62 40 Tot. 102	60.8%	14

Zutphen, Kruittorenplein, Nieuwstad 69, waterpit, center.	Around 1350.	Fermin and Groothedde 2009.	35 11 Tot. 46	76%	14
Zutphen, Kruittorenplein, Nieuwstad 69. Pit S409.	1400-1500	Fermin and Groothedde 2009.	31 13 Tot. 44	70.5%	15
Zutphen, Stadhuis. ZU-ST cesspit 7.	1450-1500	Groothedde and Henkes 2008.	12 75 Tot. 87	13.8%	15
Zutphen, Stadhuis, cesspit 473.	1425-1475	Groothedde 2002.	41 38 Tot. 79	51.9%	15
Zutphen, Stadhuis, cesspit 340.	1475-1525	Groothedde 2002.	1 22 Tot. 23	4.3%	15/16
Zutphen, Stadhuis, 1544.	1650-1657	Groothedde and van Helbergen 2007.	6 52 Tot. 58	10.3%	17

Zwolle

Name of the complex	Date of the complex, according to authors	Source	Number of stoneware Number of other wares Tot.	Percentage of stoneware	Assigned century
Zwolle, Praubstraat, Domus Parva (monastry).	1384-1450	Clevis 2001.	47 50 Tot. 97	48.5%	14/15
Zwolle, Havezate, cesspit 1.	1400-1440	Clevis 2006.	13 20 Tot. 33	39.4%	15
Zwolle, Broerenkerkplein, Proveniershuis, cess cellar (EIL99; findumber 19-10).	1465-1500	Klomp 2004.	5 49 Tot. 54	9.3%	15

Zwolle, Achter de Broeren.	1475-1575	Klomp 2007.	10 20 Tot. 30	33.3%	15/16
Zwolle, Achter de Broeren, cess cellar********	16th century	Clevis 2005.	7 386 Tot. 393	1.8%	16
Zwolle, Grote Markt 3-5.	1500-1550	Clevis and Klomp 2004b.	7 16 Tot. 23	30.4%	16
Zwolle, Havezate cesspit 2.	1525-1625	Clevis 2006.	7 26 Tot. 33	21.2%	16/17

Zwolle, Melkmarkt 30, cesspit.	1600-1675	Clevis and Klomp 2004a.	1 75 Tot. 76	1.3%	17
Zwolle, Havezate Werkeren, gracht*******	Mostly 1600-1700	Clevis 2006.	327 2187 Tot. 2514	13%	17