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The prime movers of iron production in the Norwegian Viking and Middle Ages

By Kjetil Loftsgarden


The thousands of iron production sites scattered across the mountain and valley regions of Norway are testament to a massive surplus production from the latter half of the Viking Age throughout the High Middle Ages. Archaeological and historical sources indicate that this production was carried out by singular farms. Still, the amount of iron produced surpassed both local and regional demands and constituted a regional and interregional commodity in the period 950–1300 AD.

The point of departure in exploring the organisation of iron production, and the subsequent trade, is the spatial distribution of various types of iron bars. The regional differentiation in iron bars may reflect differences in trade and economic sophistication. The smaller and standardised axe-like bars indicate that the trade in Valdres, Hallingdal, and Østerdalen had a layer of professionalism and a relatively more hierarchical social and economic organisation. In contrast the larger, less standardised split blooms points to Numedal, Telemark, and Setesdal as less economically and socially differentiated, with less professionalism and homogeneity.

This study shows how farmers in marginal agricultural areas could provide a surplus of iron and is important in furthering our understanding of the socio-economic development of Scandinavian Viking and Middle Ages. The substantial production of iron in the inland shows a willingness to risk valuable time and resources. The risk lay on the farmers, but so did the possible gains. The extent of the iron production alone suggests that it was a risk worth taking.

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From the late Viking Age throughout the High Middle Ages (950–1300 AD) specialised farmers produced iron on a massive scale, surpassing both local and regional demands (Larsen 2009; Rundberget 2013, pp. 253–254; Loftsgarden 2017, p. 69). The production took place on thousands of sites in the mountain and upper valley regions of South Norway. These areas were sparsely populated, they were exempted from several taxes, and there was a high degree of self-ownership of farms compared to other regions.

How the surplus production of iron and the subsequent trade was organised remains little explored in Scandinavian research. Building on previous research (Loftsgarden 2017), this study shows how singular farms in marginal agricultural areas could provide a surplus of iron and is important in furthering our understanding of the socio-economic development of Scandinavian Viking and Middle Ages.

The paper aims to discuss the surplus production of iron and shed light on the next stage of the production process – from the furnace to a commodity. I show and discuss raw iron as a standardised commodity, and explore the regional distribution of various types of iron bars in rela-
tion to the administrative and economic divisions in the inland of South Norway. This enables a further understanding of the actors and the organising of iron production and trade – who were the people behind the iron production and subsequent trade? Moreover, what were their motivations?

Regarding structure, I will first introduce iron as a standardised commodity and present the regional distribution of different types of iron bars. Subsequently, I will explore how the surplus production of iron was organised. My results are then integrated into the ongoing discussion on production and trade in Scandinavia in the Viking and Middle Ages.

**Data sources and methodical approaches**

The extent of the exploitation of outfields resources such as iron, hunting and trapping in the Viking and Middle Ages is well known through a number of archaeological excavations and research projects e.g. (Martens 1988; Mikkelsen 1994; Magnusson 1999; Englund 2002; Holm et al. 2005; Bergstøl 2008; Indrelid 2009; Larsen 2009; Tveiten 2012; Rundberget 2013; Stene 2014; Hennius 2018). Even though non-agrarian resources were of great importance and value, they are barely featured in written sources from the Middle Ages. This means that archaeological findings and sites make up the most important data material to increase our knowledge about the socioeconomic role of these resources.

In Scandinavia, numerous archaeological collections as well as almost all surveyed archaeological sites, are digitised and available online (for Norway see unimus.no and askeladden.ra.no; for Sweden see fornsok.se; for Denmark see kulturdk/fundogfortidsminder). One thus has access to thousands of findings and sites with detailed information. This big data requires a structured approach, in that regard geographic information systems (GIS) is a valuable tool for documentation, illustration, and analysis. All geographic analyses and maps in this paper are made with the GIS application ArcMap. Background maps are derived from the public domain map dataset “Natural Earth” or from the Norwegian or Swedish Mapping Authority (maps from naturalearthdata.com is freely available, and many maps from the Norwegian and Swedish Mapping Authority (Kartverket and Lantmäteriet) are available through the license Creative Commons Attribution 4.0 International CC BY 4.0).

**Iron as a commodity**

In Scandinavian Viking and Middle Ages iron was produced on thousands of small-scale bloomery furnaces in valleys and mountain areas (fig. 1–2). The relatively small furnaces with slag-tapping were well suited to be operated by specialised farmers in these areas (Tveiten & Loftsgarden 2017). Calculations indicate that as much as 190,000 tons of iron were produced in Norway during this period. The extent of the iron production must, however, be considered in relation to the demand for iron. While there are several uncertain factors, all estimates so far show that the production of iron was significantly greater than the need for iron (Rundberget 2013; Loftsgarden 2017, pp. 71–72). These calculations demonstrate that iron from the inland of Norway should be regarded as a regional and interregional commodity in the period 950–1300 AD. In addition, there was an increasing amount of iron produced in blast furnaces in Sweden from the 12th century (Magnusson 2009).

In archaeological approaches to trade and trade networks, the association is often made between long-distance trade and luxury items. However, this may in part be the result of the difficulties in assigning provenance to staple commodities and raw materials (Ashby et al. 2015, p. 681). Recent excavations and research projects have found evidence for long-distance trade of raw materials and products from the Norwegian inland, such as whetstones, soapstone vessels and reindeer antlers (Ashby et al. 2015; Baug 2015; Baug et al. 2018). It is likely that iron should also be included on this list (Buchwald 2006; Rundberget 2015, pp. 178–182).

Still, the trade in iron itself can be difficult to uncover. Iron produced in the same furnace could have different uses, and iron was forged and re-forged several times (Jakobsen 1991, p. 146). However, we can interpret findings of malleable iron blocks or bars outside of the iron producing areas as indications of trade and exchange of iron, and the regional distribution of hoards containing
Fig. 1. Kernel density map showing the distribution of known charcoal pits (32,668). Charcoal pits are closely connected to iron production in Norway in the Viking and Middle Ages (Bloch-Nakkerud 1987; Loftsgarden 2015). The spatial distribution of charcoal pits will, therefore, indicate the core areas of iron production in this period. Data from the Norwegian database for cultural heritage (Askeladden), and the Swedish National Heritage Board’s database for archaeological sites and monuments (Fornsök). Map by K. Loftsgarden.

Fig. 2. The dark grey distribution is the sampled Kernel Density estimated distribution (KDE) of 1,101 radiocarbon dates from excavated charcoal pits in South Norway. The blue line and lighter blue band overlying this show the mean ±1σ for snapshots of the KDE distribution generated during the MCMC process and indicate the significance of any features. The dates are analysed in OxCal (Ramsey 2017).
iron bars can thus be used to indicate trade routes and catchment areas for produced iron.

*Axe-like iron bars and split blooms*

To produce an iron bar the raw iron is hammered free of slag and forged to standardised forms and can be defined as a semi-finished product with a set value (Magnusson 1986, p. 274; Jørgensen 2010, p. 112). There are different types of iron blocks or bars, and there are regional and chronological differences. Here I focus on two types; the axe-like iron bar and the split bloom. Both of which are especially prevalent in South Norway (Martens 1979; Jakobsen 1991, p. 44).

An axe-like bar is an iron rod where one end is flattened while the other end has either a hole or a hook (fig. 3a). Split or notched iron blooms, on the other hand, are only lightly processed by hammering the bloom and then splitting it almost in half (fig. 3b). Medieval Icelandic written sources distinguish between two types of split blooms, ‘blásturjárn’ and ‘fellujárn’ (Olafsen 1916, p. 9; Hauge 1946, p. 149; Martens 1979, p. 195). Of the two types, the fellujárn was slightly more processed. In the Icelandic Jónsbók (c. 1280) there is a difference in value between blásturjárn and fellujárn (J X 5) indicating a difference in quality. However, since there does not exist a consistent use of the two terms in archaeological research, I will use split blooms as a collective term.

There are known both axe-like iron bars and split blooms outside Scandinavia. The majority of axe-like bars are found in three regions – the southeast Czech Republic (Moravia), the southeast of Poland (Lesser Poland) and South Norway (Szmioniewski 2010, p. 289). In contrast, the split blooms have a wider geographical distribution and from the 10th–13th centuries, split blooms are known in central Asia, Russia and central Europe, in addition to Scandinavia (Buchwald 1999; Pleiner 2003, p. 186). This is to be expected since the split blooms are a less standardised form and could easily be forged from an iron bloom.

The primary study area in this paper is South Norway, and it is evident that here the axe-like iron bars are by far the most numerous. They have mainly been found in farmland areas in southeast Norway (fig. 4). These regions have relatively few traces of iron production in the Viking and Middle Ages, but must be regarded as catchment areas for iron made in the surrounding valleys and mountain areas. In western and southernmost parts of Norway, there are close to no findings of axe-like bars. In these areas split blooms have been found, although the total number is low.

Most iron bars or blooms are found buried or hidden away in between rocks and boulders and interpreted as hoards. In some cases, the hoard

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**Fig. 3a. Axe-like iron bars, C24471. Photo: O. Holst, Museum of Cultural History, UiO.**

**Fig. 3b. Split bloom, C33241. Photo: L. Pedersen, Museum of Cultural History, UiO.**
also consists of iron tools, such as celts, axes or ploughshares. The axe-like bars are usually found in numbers, up to over a hundred bars in a single hoard. While the largest hoard consisting solely of split blooms is a hoard with six split blooms (C25340) found in Telemark, close to the mountain plateau Hardangervidda.

Axe-like bars occur mainly as two standardised sizes, respectively, of approximately 30 cm and 100–125 g and about 15 cm and 10–15 g (Hauge 1946, p. 170; Resi 1995, p. 142). The split blooms are considerable heavier, most weighing several kilos. This means that out of one large split bloom, such as a bloom weighing 12.5 kg found in Telemark (C33241), one could make 100 axe-like iron bars of the large type or close to 800 of the smaller type. Figure 4 visualises the number of iron bars that have been found – but not the weight of the iron. An overview of the geographical distribution of items based on weight will possibly give a different picture, but in descriptions of found iron bars, the weight is usually not included.

**Dating**

Most iron bars are found without other artefacts or material which can be dated. Axe-like iron bars are found on 146 different sites in Norway, in

Fig. 4. Spatial distribution of axe-like iron bars (7120) and split blooms (21) in South Norway. Data from the Museum of Cultural History in Oslo (UiO), the Archaeological Museum in Stavanger (UiS) and the University Museum in Bergen (UiB). Map by K. Loftsgarden.
only ten of these sites do the bars appear alongside other artefacts, allowing a typological dating (see table 1). The same applies to the split-blooms. These are found on 15 sites, where only two sites contain other artefacts (see table 2).

There are examples where axe-like iron bars are found in an early iron age context (Høst-Madsen & Buchwald 1999; Simonsen 2007, p. 214). Still, as seen in table 1, this type of iron bar seems to have been mainly used from the beginning of the Late Iron Age (c. 550–1050 AD) and are utilised until the Early Middle Ages, possible later. The split blooms seem to have been introduced in the Late Iron Age, and, as mentioned, also appears in medieval written sources. Besides, the shape and dimensions of the split blooms

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**Tab. 1. Axe-like iron bars found in a dated context.**

<table>
<thead>
<tr>
<th>Museum no.</th>
<th>Municipality, County</th>
<th>Other artefacts</th>
<th>Dating</th>
</tr>
</thead>
<tbody>
<tr>
<td>C3422</td>
<td>Jevnaker, Oppland</td>
<td>Axe, knife, scythe, sickle and celt</td>
<td>Late Iron Age</td>
</tr>
<tr>
<td>C3447</td>
<td>Gjøvik, Oppland</td>
<td>Celt and scythe</td>
<td>Late Iron Age–Early Middle Ages</td>
</tr>
<tr>
<td>C3549</td>
<td>Gran, Oppland</td>
<td>Celt and scythe</td>
<td>Late Iron Age–Early Middle Ages</td>
</tr>
<tr>
<td>C10510</td>
<td>Enebakk, Akershus</td>
<td>Axe and celt</td>
<td>Viking Age</td>
</tr>
<tr>
<td>C12361</td>
<td>Ringerike, Buskerud</td>
<td>Axe</td>
<td>Late Viking Age–Early Middle Ages</td>
</tr>
<tr>
<td>C12798</td>
<td>Vågå, Oppland</td>
<td>Ploughshare and celt</td>
<td>Late Iron Age–Early Middle Ages</td>
</tr>
<tr>
<td>C20608</td>
<td>Nord-Aurdal, Oppland</td>
<td>Ploughshare, Celt, scythe, arrowheads and knives</td>
<td>Late Iron Age</td>
</tr>
<tr>
<td>C23191</td>
<td>Øyer, Oppland</td>
<td>Celt</td>
<td>Viking Age</td>
</tr>
<tr>
<td>C28785</td>
<td>Øvre Eiker, Buskerud</td>
<td>Iron pan and sickles</td>
<td>Late Iron Age</td>
</tr>
<tr>
<td>C57245</td>
<td>Østre Toten, Oppland</td>
<td>The iron bar was found in a cooking pit, dated 450–550 AD</td>
<td></td>
</tr>
</tbody>
</table>

**Tab. 2. Split-blooms found in a dated context.**

<table>
<thead>
<tr>
<th>Museum no.</th>
<th>Municipality, County</th>
<th>Other artefacts</th>
<th>Dating</th>
</tr>
</thead>
<tbody>
<tr>
<td>B7492</td>
<td>Stryn, Sogn og Fjordane</td>
<td>Ploughshares, spoon augers and scythes</td>
<td>Viking Age–Early Middle Ages</td>
</tr>
<tr>
<td>B14470</td>
<td>Årdal, Sogn og Fjordane</td>
<td></td>
<td>Late Iron Age–Early Middle Ages (Found at an iron production site)</td>
</tr>
</tbody>
</table>

Fornvänner 114 (2019)
match the iron production furnaces from the Late Iron Age and Middle Ages (Martens 1979, p. 62).

The organising of surplus production

The distribution of iron as a standardised commodity indicates the trade and exchange in iron. However, to further our understanding of the organising of iron production and the subsequent trade, this must be seen in a larger cultural-historical context – who had control over the resources in the outfield?

The forest and mountain areas where iron production took place were common land (Reinton 1956, pp. 98–102; Øye 2002, p. 367). In medieval law texts, the rights of use were mandated by tradition and upheld by use (G VII 15). This applied to shieling sites, the use of the forests, fishing, and pitfall traps (Øye 2002, p. 367). Although not specified in the law texts, it is reasonable to assume that iron production followed the same principles. The adjacent farms had first access to the common land and could claim the rights of use (Øye 2002, p. 367).

In general, written sources from the Middle Ages rarely mentions iron production. One of few exemptions is a law amendment pertaining to Østerdalen from 1358. This amendment confirms that the people of Østerdalen could freely produce iron following the tradition, and the king’s ombudsmen shall not prevent them from bringing the goods to the marketplace (RN VI, nr 483; NGL IV, pp. 378–380; Rundberget 2013, p. 282). The iron production in Østerdalen was more or less over before 1300, so the amendment is pointing to a past practice where the local population produced iron (Rundberget 2013, pp. 283–285).

The impression of a locally controlled production is emphasised by examples where iron is included in property transactions, as in Valdres in the 14th century (DN II, nr 186, 225; DN X, nr 27; Tveiten 2012). Also, several diplomats mention smiths from Valdres in the same period (DN II, nr 186, 257; DN IV, nr 209). The thousands of scattered furnaces and charcoal pits in the mountain and valley areas also add to the case that iron production was combined with farming.

Transhumance was an essential part of the farm in the mountain and valley areas (Taksdal 1973). As climate and natural conditions in these areas are not suitable for extensive grain cultivation. Iron production could have been an integral part of a farm – based predominantly on animal husbandry – where the iron production itself may have been carried out in the winter as this interfered least with regular farm work (Taksdal 1973; Bloch-Nakkerud 1987, pp. 148–149; Loftsgarden 2017, pp. 217–218).

This scenario contrasts with what appears to be the case regarding surplus production based on other resources in the same period, for example, the millstone quarry in Hyllestad and the slate quarry in Ølve, both in western Norway. Here an external elite – a church/monastery – controlled the production (Weber 1989; Baug 2013; Baug 2015). However, there is an apparent practical difference between controlling a quarry, defined within a specific and limited geographic area, and controlling production at the many and geographically dispersed iron production sites. Additionally, iron production, as with hunting and fishing, was situated in the outfield. As mentioned, this is an important consideration as the outfield represented common land which had attached to it other rights of use.

Self-ownership and autonomy

Before discussing the organisation of iron production and trade in the interior, I will explore the economic and social divisions that can be traced in the Norwegian inland. It seems clear that this will affect the organising of trade and the integration of outfield resources into the overall economic sphere.

Based on contemporary sources, coupled with later records concerning land ownership, it is likely that most of the farmers at the end of the High Middle Ages did not own land. It is estimated that no more than 35 percent of the land in Norway was self-owned (Sandnes 1977, p. 533; Krag 2000, p. 153). However, there are regional differences, and the inland areas had a high proportion of self-ownership, such as in Setesdal, Telemark, Hallingdal, and Numedal, as well as Valdres, albeit to a lesser degree (Bjørvik & Holmsen 1972, p. 71; Helle 1974, p. 158) (fig. 5). Although these estimates apply to the High Middle Ages,
we can assume that this points to established social structures. The underlying premise in the context of this paper is that the higher the proportion of farmers who own their land, the greater the likelihood that the surplus production and subsequent trading on marketplaces were initiated and organised by a local population.

In addition to having a relatively high proportion of self-ownership, the mountain and valley areas around Hardangervidda were quite similar in terms of living conditions, social organisation, and topography. Still, there were also divisions and dependencies between people from different social and economic strata. Apparently to a greater degree in Valdres and Hallingdal than in Numedal, Telemark, and Setesdal indicated in terms of self-ownership and different tax systems. Both church and royal power seem to have had less influence in Numedal, Telemark and Setesdal (Steinnes 1930, pp. 141–142; Imsen 1990, pp. 51–53; Brendalsmo & Riisøy 2014).

Towards the Middle Ages, a gradual transition occurs from personal economic ties to taxation based on land and production (Øye 2002, p. 267). However, the taxes imposed by both the king and the church were lower in inland areas (Bjørkvik 1972, pp. 539–541). The total tax burden on an inland farm in southeast Norway in the 1290s was about half of what a farmer in the coastal areas had to pay (Dørum 2004, pp. 420–421). Even so, from the middle of the 13th century the farmers were expected to pay tithe from resource utilisation in common lands such as from hunting and trapping and the production of iron, tar and salt (RN I, nr 1009; NgL II, pp. 468–477; Øye 2002, p. 362). Still, Telemark and Numedal were exempted, and iron production, as well as hunting and trapping, seem to have taken place without taxation (NgL II, pp. 483–484; Steinnes 1930, p. 147). Nor did these areas pay the leiðangr tax, however, they did have to pay another form of tax – the older bishop- and Olav-tax (Steinnes 1930, pp. 141–142).

In 1277, peasants from Telemark and Numedal seemed to have reached an agreement with the King Magnus Lagabøte (Storm 1888, p. 95; Steinnes 1930, p. 147). This settlement in itself presupposes a conflict with the king. In sum, it seems Telemark and Numedal were on the outside and among the last regions to be integrated as part of the national kingdom.

Farmers, producers and traders
Based on the previous discussion regarding the organisation of iron production in the mountain and valley areas, the most likely scenario is a resource utilisation conducted by local farmers. The organising of iron production on relatively small sites that could be operated by two or three persons can be understood from an ownership structure where independent farms had rights of use to adjacent common land (Tveiten 2012, pp. 232–233). The relatively weak position of the king and church supports this impression and makes it unlikely that someone outside the mountain and valley communities was directly involved in the iron production. The logical question that follows is; was the farmers that were in charge of

Fig. 5. The proportion of self-owned land in 1661 (Imsen & Winge 2004) Map by K. Loftsgarden.
the resource utilisation also part of the trade?

Dagfinn Skre has recently put forth that monetary practices of valuing items in a common monetary unit and paying by means of a medium were well established in Scandinavia by the Viking Age (Skre 2017). He convincingly argues that the introduction of a monetary practice was a change in mind-set and not merely the introduction of a certain media (Skre 2017, p. 283). Thus, the inland farmers operated within a society where transactions could be monetary despite the absence of token-money, such as silver or coins.

The results presented in this paper indicates that the tons of iron produced in the sparsely populated inland were distributed through trade and transactions. Through marketplaces and economic networks, the populous coastal regions, and the elites, could gain access to the inland resources (Loftsgarden 2017). However, from the middle of the 13th century a variety of non-agrarian resources became subject to taxation. Still, it is uncertain how much this constituted, as parts of the inland were exempted from the tithe, and the tax rates seem to have been generally low. Besides, by the time iron became subject to taxation the production was fast declining, cf. figure 2.

Concerning Østerdalen, Bernt Rundberget argues that the king had established control early in the Middle Ages and that the moderate tax rate was a privilege given to the population in Østerdalen from early on to stimulate the establishment of iron production and an increase in the amount of iron produced (Rundberget 2013, p. 283). However, he finds that the principle of free trade, described in the previously mentioned law amendment of 1358, was a new right the king bestowed on the farmers in Østerdalen (Rundberget 2013, pp. 282–283).

The law amendment from Østerdalen should not be given weight in the question of resource utilisation and trade in the mountain and valley regions further west. There are notable variations in the organising of iron production in Østerdalen and that which took place in the mountain and valley areas around Hardanger-vidda. In addition, the low taxes and the relatively high proportion self-ownership in these areas indicate a greater degree of autonomy and a lack of control and influence from an outside elite. This suggests that the initial trade – as well as the organisation and production based on outfield resources – was carried out by a local population.

**Inland trade**

The time and resources spent on the large-scale iron production show a willingness for surplus production, and that there were opportunities and venues for trading off the surplus produce (Loftsgarden 2017). The farmers could transport the goods to the marketplaces themselves, but the trade may also have involved local or regional elites. Products from the outfield, be it iron, antlers, leather or butter could be a way to get the goods they could not, or would not, produce themselves. Through trade, the inland population gained access to necessary resources such as grain and salt, but also prestige goods such as weapons, clothes or jewellery (Martens 1989; Loftsgarden 2018).

Outfield resources could generate an economic profit that made it possible to maintain a socially acceptable consumption and thus participate in the community while maintaining a local affiliation (Svensson 2007, p. 197). This is, for instance, visible in the grave goods of the Viking Age. Both jewellery and weaponry found in graves in the mountain and valley regions are of the same style and type found in the grave goods from more central farms in Norway—as well as from much of the rest of Scandinavia (Hougen 1947; Mikkelsen 1994, pp. 78–87; Martens 2009). The local surplus that outfield resources enabled can thus be seen as both economic and cultural capital (Stene & Wangen 2017). In order to understand why the inland population in South Norway initiated a surplus production, they must be seen as both economic actors and social beings.

From figure 2 we see an increasing iron production from the end of the Viking Age. Indicating that more and more farms took part in the surplus production of iron, and the subsequent trade. By the 13th century, unorganised trade had gained such an extent that King Håkon Håkonsson in 1260 introduced a ban on travelling with the intention of trade (NgL I, pp. 121–123; Ngl IV, pp. 19–22; RN I, nr 975). In the Frostathing Law it is written that nothing makes the country
more desolate than if everyone wants to go on trading expeditions and no one works for the farmers; “[...] allir vilja nú í kaupferðir fara en engi vinna fyrir bóndum” (NgL I, p. 125). A minimum amount of 3 marks of silver was introduced as a prerequisite for trading from Easter to the end of September (Michaemas). This prohibition was also included in the national law (Landslov) of 1274 (L VIII 23). This does not seem to have had the desired effect since the ban was repeated in several law amendments in the 1300s. As in 1364, when the minimum amount was increased to 15 marks of silver (NgL III, p. 184). Or in an amendment of 1383, where the dangers of young men’s trading expeditions was further emphasised (NGL III, pp. 216–217; RN VII, nr 1117). The purpose of the ban was likely two-fold. Partly, there could have been a real issue with labour shortages, but it should also be seen as an attempt to prevent trade at the smaller marketplaces beyond the king’s reach.

In addition to farmers, there would have been specialised traders involved in the trade of out-field resources. These traders may have operated freely or acted on behalfs of an elite. For instance, Sverris saga depicts ‘kaupmenn’ (traders) living in the marketplace of Kaupanger in the mid-1100s (Sverres saga, ch. 79–82).

Marketplaces such as Kaupanger could constitute central hubs between iron production in
the mountain and valley regions and western Norway, including the medieval town of Bergen (Loftsgarden 2017) (fig. 6). The contrast between the many iron production sites found in eastern Norway and an almost absence of similar sites in western Norway indicates a significant import of iron to western Norway. Excavations in Kauanger have unearthed several smiths/forgeries and large amounts of slag, and there are hundreds of charcoal pits in the surrounding area (Oye 1977; Knagenhjelm 2008). This suggests that smiths in Kauanger reworked iron bars from Valdres as tools, weapons or other iron objects. Which subsequently was included in regional or interregional trade and exchange.

As shown in figure 4, there are no finds of axe-like bars south of Hardanger. This may suggest that iron from Valdres and Hallingdal supplied areas north of Hardanger, while Numedal, Telemark, and Setesdal supplied southwestern Norway, perhaps also including Bergen. This is indicated by the relatively large amounts of slag, from the reworking iron blooms, found in Bergen. Displaying a situation where iron as a commodity flowed to the medieval town from the 1100s (Brinch-Madsen 1995; Andersson et al. 2015, pp. 230, 241). Since the axe-like iron bars were significantly processed, the amount of slag left in this type of iron bar was low. In comparison, split blooms, which were only slightly modified at the iron production site contained a greater amount of slag which would be noticeable during the forging of iron items. The analysis and the amount of slag suggest that split blooms from Setesdal, Telemark or Numedal, was processed in Bergen.

Conclusion
The thousands of iron production sites in the Scandinavian inland are visible traces of an extensive regional surplus production in the Viking and Middle Ages. Archaeological and historical sources indicate that the production and at least the initial trade in iron was organised and carried out by specialised farmers. Although trade was still influenced by social and political ties involving the elites, the king and the church.

Hoards consisting of standardised iron bars indicates the trade in iron, and the regional differentiation in iron bars may reflect differences in trade and economic sophistication. The smaller and standardised axe-like bars indicate that the trade in Valdres, Hallingdal, and Østerdalen had a layer of professionalism and points to a relatively more hierarchical social and economic organisation. In contrast, Numedal, Telemark, and Setesdal appear as less economically and socially differentiated, with less professionalism and homogeneity. This meant that wealth from outfield resources was more evenly distributed, and it could have been more demanding for church and state to collect taxes and fees.

The substantial surplus production of iron in the Scandinavian inland in the Viking age and Middle ages shows a willingness to risk valuable time and resources. The risk lay on the farmers, but so did the possible gains. The extent of the iron production alone suggests that it was a risk worth taking.

References
The supply of iron and resources in Norway during the Iron Age. University of Tromso.


NgL = Norges gamle Love indtil 1387, bind I–V. Utgivne ved Rudolf Keynes og Peter Andreas Munch. Christiana 1846–1895.


RN = Regesta Norvegica. Kronologisk fortegnelse over dokumenter vedkommende Norge, nordmænd og den norske kirkeprovin.


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