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Lottum, Jelle van; Poulsen, Bo

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Jelle van Lottum<sup>a</sup> & Bo Poulsen<sup>b</sup>

<sup>a</sup> Cambridge Group for the History of Population and Social Structure, Geography Department, University of Cambridge, Cambridge, CB3 3EN, UK

<sup>b</sup> Department of Environmental, Social and Spatial Change, and Department of Culture and Identity, Roskilde University, Roskilde, Denmark

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## Estimating levels of numeracy and literacy in the maritime sector of the North Atlantic in the late eighteenth century

Jelle van Lottum<sup>a\*</sup> and Bo Poulsen<sup>b</sup>

<sup>a</sup>*Cambridge Group for the History of Population and Social Structure, Geography Department, University of Cambridge, Cambridge, CB3 3EN, UK;* <sup>b</sup>*Department of Environmental, Social and Spatial Change, and Department of Culture and Identity, Roskilde University, Roskilde, Denmark*

This paper reconstructs comparative levels of numeracy and literacy for seamen of different ranks from 14 countries in the eighteenth century using the British Prize Papers. Results show how skill was rewarded in the maritime labour market, where captains show higher levels of numeracy and literacy than lesser officers and ordinary sailors. The levels of numeracy and literacy among ship masters and Scandinavian sailors are among the highest found anywhere, while Dutch, French and Spanish sailors were at par with the common labour force. This is discussed in light of the migratory and competitive character of the maritime sector.

**Keywords:** Scandinavia; Atlantic; human capital; early modern; maritime sector

On Als and in the Duchies in general, especially in places inhabited by seafarers, reckoning is much more appreciated than here in Funen, in the countryside so to say.<sup>1</sup>

This remark stems from a schoolmaster, who in the 1770s wrote an account of his experiences with teaching in different parts of Southern Denmark, including the island of Als, located off the east coast of the Duchy of Schleswig. Literacy became widespread in the Danish territories during the 1700s, but numeracy, expressed in the teaching of arithmetic, seems to have been more prolific in Schleswig.<sup>2</sup> The writings of several remarkable eighteenth-century individuals from this area testify to the importance of reckoning in maritime communities. Hark Olufs, a ship captain from the island of Amrum in the Waddensea was seized by Algerian corsairs in 1724 and enslaved, but within a number of years he managed to build a career culminating with the appointment as minister of finances in the Constantine province of the Algerian state. Much of this we know from Hark Olufs' autobiography, and surely his extraordinary life illustrates that he was a man of arithmetic skills.<sup>3</sup>

In itself, anecdotal evidence on the levels of numeracy in Southern Denmark, or the story of Hark Olufs spectacular life, cannot be regarded as direct evidence of relative levels of numeracy or literacy in the maritime sector in general, nor does it necessarily reveal information about the skill levels of Danes or Scandinavians vis-à-vis seamen from other nations or regions. Nevertheless, the question how numeracy and literacy levels differ within each economic sector and whether or not geographical differences in these levels can be discerned is an important one. It

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\*Corresponding author. Email: [jv266@cam.ac.uk](mailto:jv266@cam.ac.uk)

touches upon an important issue such as the link between investments in schooling or training and economic performance, which for more than a century has been seen as belonging to the heart of the rise of modern rational capitalism. In this paper, the level of numeracy and the ability of a population to read and write are seen as expressions of society's human capital.<sup>4</sup>

The importance of possessing skills in the maritime sector is difficult to overstate. For its time, a ship was a highly technologically advanced environment.<sup>5</sup> Here, groups with high levels of human capital are more likely to perform better than lesser educated groups. Reading and writing skills were of special importance to a ship's master in terms of navigating by use of reading an atlas or filling out a logbook, while most commercially related activities would benefit from handling the various ship's papers in a swift and efficient way. Numeracy would come in handy for captains and mates alike, when charting a course and position at sea. In terms of bookkeeping and accounting, the success of trading and paying or receiving salaries would all be matters where numeracy would be highly beneficial, and similar to the literacy skills, this would be most beneficial for the higher ranks aboard a ship.<sup>6</sup>

The Early Modern maritime sector was one of the largest employers in Western Europe,<sup>7</sup> while at the same time it has been hailed as a highway of commerce, communication and cultural encounters in the booming Atlantic economy of the early modern era. The importance of the maritime sector for the economy and the North Atlantic society at large makes a case for investigating the human capital levels within the maritime sector relative to other sectors in Early Modern society. How did human capital levels in the maritime sector compare between different countries in the Atlantic? How are skill levels correlated with different ranks? Existing literature suggests that the maritime sector (especially in northern Europe) was an open and competitive labour market, where one would expect that investments in training will have paid off. In this paper we aim to answer the question of whether there was a premium on skill in the maritime sector. The relative levels of numeracy and literacy in the maritime sector of the North Atlantic are investigated using source material not previously used for this purpose: the depositions of sailors in the High Court of Admiralty for the second half of the eighteenth century, which have the advantage of containing information on both numeracy and literacy in the same sources.

### **Approaches in literacy and numeracy**

Within the last three-decades' investigations into historical levels of human capital, literacy has been the most common approach to estimate levels of skills. For the Early Modern period, literacy has been measured using methods ranging from estimating book production per capita to analyses of the frequency with which people have signed legal documents, or estimates from protestant societies of the percentage of a population that have confirmed their faith through reading of scriptures and catechisms.<sup>8</sup> Distinct maritime oriented studies dealing with literacy however have been rare.<sup>9</sup> In a Danish context, Degn analysed the literacy levels of skippers around 1640. The general impression is that Copenhagen-based skippers had the highest rates of literacy with 82%, while the rates dropped markedly in the more rural areas, while a national average was 47%.<sup>10</sup> However, especially following

active state policies on schooling in the 1730s, literacy rose considerably in Denmark, a trend that can be seen in most countries in Northern Europe.<sup>11</sup>

Studies of early modern numeracy however, have a much shorter historiography than literacy studies. Anecdotes such as the introductory paragraph of this paper and the appearance of books about arithmetic give some indications on the spread of numeracy.<sup>12</sup> In the past couple of decades however, several papers have dealt with numeracy levels in various pre-modern societies in Europe, North America and Asia based on the phenomenon of *age heaping*. Age heaping is defined as the effect of misreporting of age, when a group of people (usually between 23 and 72) is asked how old they are. When a tendency to give out ages divisible with 5 and 10 occurs, it is a sign that not everyone in the group knows how old they are. The level of age heaping is usually expressed by the so-called Whipple index. The Whipple-index measures the degree to which age groups ending on 5 and 0 are overrepresented in a population group.<sup>13</sup> The Whipple index gives scores ranging from 0 if the ages ending on 5 and 0 are not represented at all, and up to 500 if all ages mentioned end with 5 or 0. Thus, if the score for the Whipple index ( $W$ ) is 100 or lower, there is no sign of age heaping of these age groups. In this paper we use the alternative Whipple Index  $\hat{W}$ , a variant of  $W$ , as used by A'Hearn, Crayen and Baten, which gives the share of individuals within a group that correctly reports their age.<sup>14</sup> This method makes it easier to compare *numeracy* to *literacy*, where commonly the share of people that could sign a document is used as a proxy.

It is important to stress that both indicators are rough proxies of what can in fact be a very broad set of skills. In fact, what the methods of age heaping and calculating average literacy rates especially do is pick up the level of investments in human capital. In the case of numeracy this is likely to be training or education where numbers play a larger role, which in the case of the maritime sector could relate to navigation, for instance, while in the case of literacy, reading and writing skills are approximated. The bottom line is that the dual approach allows one to measure the level of training in two types of skills, reflecting investments in different types of human capital, which in turn can be used to look at the correlation with economic performance.

In fact, using age heaping methods, A'Hearn, Crayen and Baten suggested that a large increase in all of the Western World, and much of the rest of the World in the nineteenth century, captures the human capital impact on growth successes – and in cases where numeracy and literacy levels did not rise, the failures of economic growth became apparent.<sup>15</sup> While the global take off towards modern levels of numeracy and literacy appeared during the course of the nineteenth century, A'Hearn et al. found that in much of Europe this process occurred during the Early Modern period. Scandinavia, England, The Netherlands, all in Northern and Western Europe, witnessed a rise in levels of numeracy and literacy during the seventeenth and eighteenth centuries, while Southern and Central European areas such as Hungary, Central German territories and Poland were lacking behind.<sup>16</sup> The present paper, however, is the first investigation of levels of both numeracy and literacy that adopts a strict sectoral approach.

### Sources: the Prize Papers

The main source we use in our analysis of numeracy and literacy levels in the Western Europe maritime sector are the so-called Prize Papers, kept in the National Archives

in London.<sup>17</sup> This archive is part of the overarching archive of the High Court of Admiralty and consists of the documents dealing with the privateering activities of the Royal Navy from the middle of the seventeenth century up until the first decades of the nineteenth century. During times of war, the British Navy and private men-of-war were instructed to capture as many enemy ships as possible, something that was common practice all over the Atlantic.<sup>18</sup> To establish whether a vessel was a lawful prize or not, the English developed a procedure. They confiscated all ship's papers and questioned the master of the ship as well as a couple of crewmembers.

Since it was of the utmost importance to determine if a ship or its cargo belonged to an individual from an enemy state, crewmembers were interrogated about all matters dealing with the ownership of the ship and its cargo.<sup>19</sup> The most relevant information for the purpose of this paper can be found at the beginning of the interrogations where the crew members were asked to reveal personal information; here they were asked for their rank, place of origin and age; another relevant piece of information was given at the end of the interrogation, each was instructed to sign the interrogation at the bottom of the document – thereby revealing information on the level of literacy.

Although there are instances in which the entire crew was interrogated with the help of a sworn-in interpreter, usually three crewmembers were quizzed. The composition of those who were interrogated could vary; nonetheless, the High Court of Admiralty appeared to have aimed to question a cross-section of all ranks on board of a ship, i.e. in most cases the master of the ship, one of the officers or a ship's craftsman, and an ordinary sailor were cross-examined.

In this paper we focus on the part of the archive that deals with the second half of the eighteenth century, 1756–83, where the material is particularly rich of information. The interrogations in this period were held in a uniform and standardized way: every interrogated crewmember had to answer the same list of questions. Based on the interrogations that were held in the Seven Years' War (1756–62) and the Revolutionary Wars (1776–83), we have constructed a database consisting of some 300 merchant ships, comprising the interrogations of 966 men who were born in 14 countries. For every individual seaman we have recorded the country of birth, rank, the ability to sign the document, and the age.

It is important to note that the relation between the origin of the ship and its crew is not always that straightforward. Although, incidentally, non-enemy ships were brought to shore, understandably the lion's share of the ships in our database were registered in enemy nations. This means that due to Danish–Norwegian and Swedish neutrality during most of the European wars of these decades, British privateers took hardly any Scandinavian ships. However, since many Scandinavian seamen served on Dutch vessels, they ended up in the database via the 'Dutch route'. In the discussion section at the end of the paper we will return to this issue.

Finally, a country that is completely lacking in the database is England itself.<sup>20</sup> Although there are interrogations of English-born crews in the Prize Papers archive, they were not interrogated in a similar way as the crews from foreign ships, so in order to keep the database as uniform as possible, the English-born crews are not included. Unfortunately, English sailors hardly entered foreign labour markets and hence do not show up on board ships in our database via a foreign route.<sup>21</sup>

### Geographical differences

The aim in this section is to determine whether geographical differences in numeracy and literacy skills in the maritime sector can be discerned: from which parts of the Atlantic in the second half of the eighteenth century came the most numerate and literate seamen? Let us start by dividing the Atlantic in three relatively large geographical regions. This has the advantage of being able to include the data of those countries for which the total number of individuals is too small to calculate numeracy levels on a national level. The first grouping is labelled 'Northern Europe', and consists of the data of seamen originating from the present day territories of Norway, Sweden, Finland, Denmark, The Netherlands, Belgium, Ireland and Germany, including the areas along the southern Baltic coast. The second group is 'Southern Europe' comprising seamen from France, Spain, Portugal and Italy. Finally, the relatively small third group 'North America' comprises seamen from Canada and the US.

All three categories in Table 1 show that seamen from the Northern European countries had higher numeracy and literacy levels than their Southern counterparts, confirming for the maritime sector the differences in human capital levels between Northern and Southern Europe found by A'Hearn et al. using other data. If we first look at the category 'captains', we see that the Southern Europeans with a  $\hat{W}$  of 100% do slightly better than their Northern European colleagues who score a near perfect 98%, thus indicating that (near) excellent numeracy skills are in fact the minimum requirement one needs in order to run a ship in the eighteenth century. The variation with regard to literacy levels is, however, somewhat larger: nearly all of Northern European skippers are literate, while 93% of the Southern European captains signed their own testimonies. This indicates that numeracy was clearly more important.

In the larger group of ordinary sailors, the differences in numeracy and literacy levels between North and South are more pronounced. Northern European sailors seem to have much higher human capital stock, especially in terms of numeracy, with 96% of the sailors correctly reporting their age against 83% of their Southern counterparts. Literacy rates also differ significantly between North and South: 80% against 70% respectively. The 'All seamen' category shows that in terms of literacy,

Table 1. Numeracy and literacy levels for masters and sailors in three regions (%).

Country/region	Captains			Sailors			All seamen*		
	<i>n</i>	Num	Lit	<i>n</i>	Num	Lit	<i>n</i>	Num	Lit
Northern Europe	164	98%	99%	178	96%	80%	543	96%	88%
Southern Europe	116	100%	93%	139	83%	70%	370	92%	82%
North America	11	—	91%	29	—	76%	53	84%	85%
All areas	291	97%	96%	346	91%	75%	966	93%	85%

Notes: Numeracy only calculated when the number of observations is larger than 50. Numeracy calculated as  $\hat{W}$ .

\* Including other ranks such as ships mate and carpenter.

Source: Database Prize Papers.

the North Americans were more or less average, but when it comes to numeracy, they perform much worse than sailors from Northern and Southern Europe; still, the sample is too small to really draw any conclusions on this.

Having established that the differences in numeracy and literacy levels between North and South are largest in the lower category of sailors, we can refine our analysis by looking at individual countries and clusters of smaller countries – which is obviously a better scope of comparison than the crude division between North and South. Although seamen from 14 countries appear in the dataset, we have only made estimates of age heaping for five nationalities, where the number of observations was larger than 50 individuals (Table 2). The group of Danes was also larger than 50, but we have chosen to include them in a separate category of Scandinavia, thus including Norwegians and Swedes as well.

Table 2 shows that when all ranks of seamen are compared, the level of age heaping is lowest in Scandinavia as a whole: in terms of numeracy they score a perfect 100%. The Netherlands, France and Germany all show clear evidence of age heaping (ranging between 94% and 96%), while Spain (90%) and the United States (82%) have clearly the worst level of numeracy. In terms of the ability to sign documents, Dutch seamen have the highest rate of literacy (94%), Scandinavia comes second with 88%, while the other nationalities have literacy levels of 86–81%. With regard to the captains, numeracy levels could only be calculated in the case of France and The Netherlands, confirming the European-wide picture with a full 100%, while literacy levels were 93% and 100% respectively.

For the larger group of sailors, numeracy rates were calculated for more countries. Interestingly, the group of Scandinavian sailors turns out to have really high levels of numeracy with a perfect 100% comparable to that of any group of captains, while Spain (82%), France (84%) and The Netherlands (86%) all demonstrated a tendency for age heaping. The most illiterate sailors came from France (only 69% of them were literate), to be followed by Germany (71%), Spain (75%), United States (79%), and Scandinavia (81%), while 87% of the Dutch sailors could write their names below their testimonies. When looking at the literacy rates in Table 2, Germany is an exception to the general North–South pattern of literacy rates. This may be attributable to the great East–West dispersion of the group of

Table 2. Numeracy and literacy for masters and sailors.

Country/region	Captains			Sailors			All seamen		
	<i>n</i>	Num	Lit	<i>n</i>	Num	Lit	<i>n</i>	Num	Lit
Germany	27	–	100%	41	–	71%	115	94%	82%
Spain	44	–	95%	60	82%	75%	140	90%	86%
France	68	100%	93%	72	84%	69%	216	96%	81%
Netherlands	100	100%	99%	64	86%	87%	250	94%	94%
United States	10	–	90%	28	–	79%	51	82%	86%
Scandinavia	33	–	96%	63	100%	81%	145	100%	88%
All areas*	291	97%	96%	346	91%	75%	966	93%	85%

Notes: Numeracy only calculated when the number of observations is larger than 50. Numeracy calculated as  $\hat{N}$ .

\* Including countries with smaller samples such are Ireland, the Southern Netherlands, Italy and Finland. Source: Database Prize Papers.



German seamen ranging from Emden on the North Sea coast to East Prussian Königsberg.<sup>22</sup>

### Occupational comparisons

Having elucidated differences between numeracy and literacy levels for different ranks and countries, the results lend themselves to a comparison between the maritime labour market and other occupational and social groups (see Figure 1).

The only occupation that comes near to the captains in terms of numeracy levels is another maritime profession: that of fishing skippers in the Netherlands.<sup>23</sup> In comparison, burghers in Amsterdam, the urban population in England and the branch of 'professionals' in the Southern Netherlands (present-day Belgium) are the only groups with levels comparable to that of the ship masters. The graph shows that uneducated segments of society, such as the poor in Belgium and the rural population in England, were by far the least numerate group, but the sailors from Spain, France and The Netherlands also reveal relatively low levels of numeracy. Again, the one remarkable exception is the group of Scandinavian sailors with numeracy levels comparable to that of the shipmasters, and indeed far above the levels of other nations' sailors or, for that matter, any other group in Europe for which numeracy estimates exist. This is also a better score compared with the level of age heaping of Danish sailors in 1801 (88%), calculated by using the unpublished census of that year.<sup>24</sup>

The literacy levels among sailors in the Prize Paper dataset correspond well with other available estimates of literacy rates for the countries involved (Figure 2). Estimates of literacy levels based on the Amsterdam marriage registers for instance show that between 1751–75 Dutch grooms born in the cities of Holland had a literacy rate of 84% (against 87% in of the Dutch sailors in the Prize Paper dataset).<sup>25</sup> Estimates of the proportion of free males in North Carolina with an ability to write is also close to the estimate of literacy of US sailors in the dataset, or in fact identical (79%).<sup>26</sup>

German, French and Spanish sailors were, on average, about as literate as groups such as German day labourers and craftsmen from Lower-Saxony or inhabitants of rural Iceland.<sup>27</sup> Since the German sailors came from North western Germany as well as the German territories along the Baltic there is probably a large variation between the different sailors, even if they were all from German territories. Likewise, literacy in France was very unevenly spread over the country.<sup>28</sup> For Spain it is difficult to find direct eighteenth century comparisons. For the seventeenth century though, literacy levels from a handful of cities such as Madrid, Toledo, Santiago and provinces such as Andalusia fluctuate around 60–70% for the urban male population, while in Murcia only 30% were literate.<sup>29</sup> Overall, one could say that the average eighteenth-century sailor from Germany, France or Spain was relatively well schooled compared with workers in other sectors, but depending on which region he came from, his skills would range from average to exceptional.

### The correlation between numeracy and literacy

The foregoing sections showed that apart from the link between numeracy and literacy levels and occupation – the fact that captains were in fact the best skilled

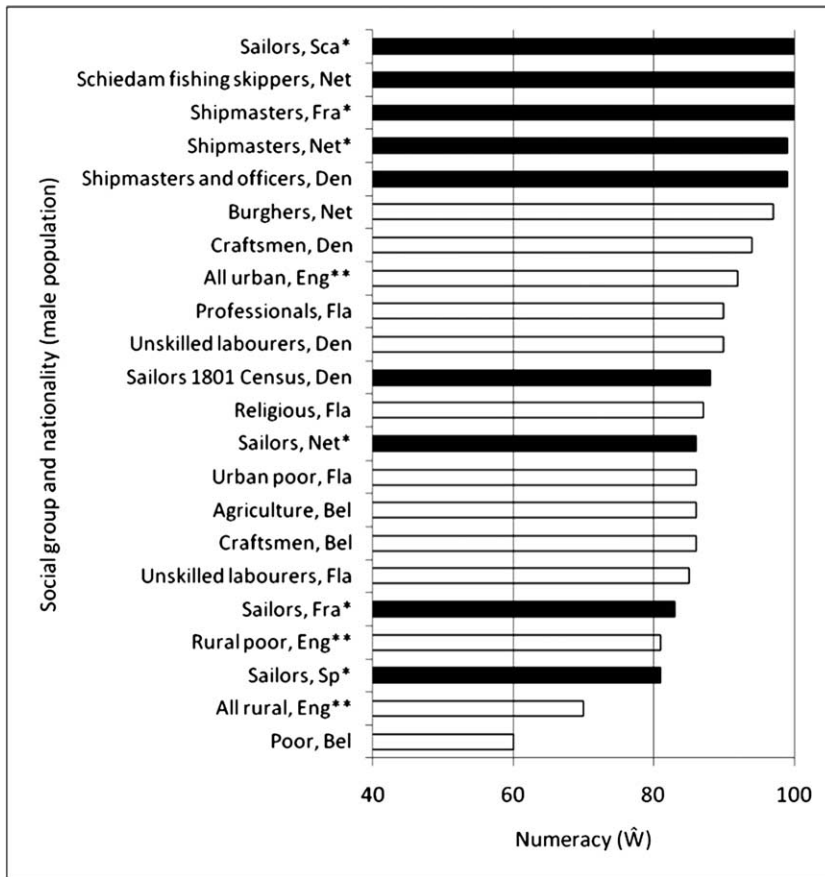


Figure 1. European numeracy levels in different social groups, c. 1750–1800.

Notes: Numeracy only calculated when the number of observations is larger than 50. Numeracy calculated as  $\bar{W}$ . The black bars represent maritime occupations; the starred (\*) items are derived from the Prize Paper database. (\*\*) means that the group may also consist of females.

Sources: Database Prize Papers; Gemeentearchief Schiedam, ‘Haringcertificatien, 1597-1788’; J. Toftgaard and G. Keyes ‘1801 Danish Census Database’; G. Clark *A Farewell to Alms*, p. 178 and T. De Moor and J.L. Van Zanden, ‘Every Woman Counts’.

– there also seems to be a more general correlation between numeracy and literacy. Most sub-groups in the foregoing table that have a relatively low numeracy level have a low literacy while high levels of numeracy seem to equate with high levels of literacy. The Scandinavian sailors seem to be the only exception to this rule with a strongly skewed ratio between numeracy and literacy. A’Hearn et al. have also dealt with the issue of the correlation between the two human capital indicators. In their paper they showed that a basic OLS regression of numeracy on literacy – using nineteenth-century US censuses – indeed demonstrated a statistically significant correlation between the two indicators. More specifically, such a regression yielded slope estimates in the range of 1.5 and 3.0. The latter implies that small changes in numeracy are linked to somewhat larger changes in literacy.

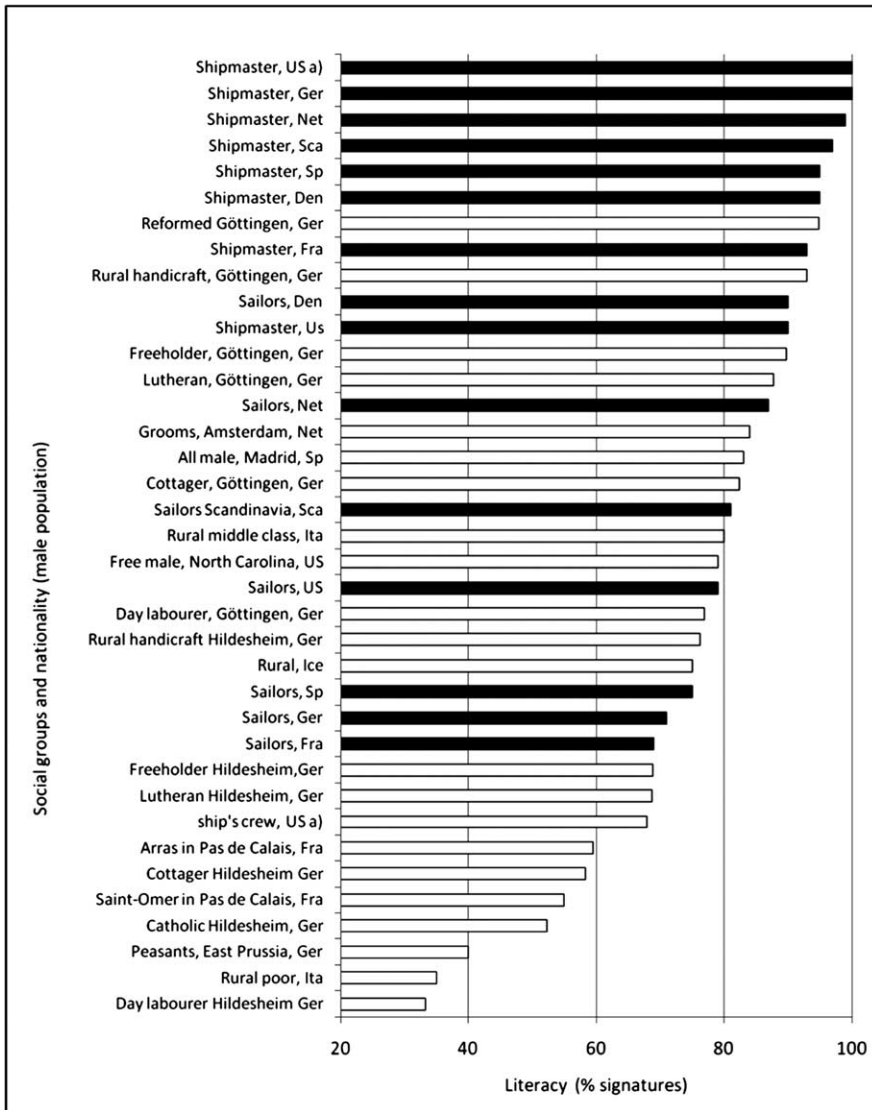


Figure 2. European literacy levels in different social groups, c. 1750–1800.

Notes: the black bars represent maritime occupations derived from the Prize Paper database except for a): from first half of the eighteenth century.

Sources: Database Prize Papers; T. De Moor and J.L. Van Zanden, ‘Every Woman Counts’; A. Hofmeister et al., ‘Elementary Education’; R.A. Houston, *Literacy in Early Modern Europe*, p. 143; R.E. Gallman, ‘The Level of Literacy’, 567–82, 574; M. Rediker, *Between the Devil*, 307, Appendix D; S. Hart, *Geschrift en getal*, 178, Table 28; R. Gawthrop and G. Strauss, ‘Protestantism and literacy’, 31–55, 53.

Using the national sub-groups for the different occupations (as shown in Table 2) for which the group was large enough (more than 50 observations) in an OLS regression of numeracy on literacy, the Prize Paper data behaved in a similar fashion. It also showed a statistically significant relation between numeracy and literacy (on

the 10% level), while it demonstrated an  $R^2$  of 0.50 (against an average  $R^2$  of 0.68 for the A'Hearn et al. dataset). The slope estimate of the regression of the maritime data differed, however, from the one A'Hearn et al. found. The regression of the Prize Paper data yielded a numeracy coefficient of 0.87, suggesting a somewhat different relation between numeracy and literacy, i.e. an increase in numeracy is associated with a smaller increase in literacy. However, as we will see below, this seems mainly the result of one specific outlier: the Scandinavian sailors.

An analysis of the data shows that this particular group stands out in two ways. First of all, the Scandinavian sailors are a numerical outlier in the sense that, as we have seen in Table 2, they have a relatively skewed ratio between literacy and numeracy, in fact they have the largest deviation from the fitted values based on the OLS regression. Secondly, they are atypical in the sense that in terms of numeracy levels they are much closer to the group of captains than to their colleague sailors.

That the Scandinavian sailors stand out from the rest of the group is further illustrated by the fact that if this group is omitted from the OLS regression, the statistical significance increases strongly (the correlation is now significant on the 5% level and the standard error is reduced from 0.38 to 0.32). Furthermore, the  $R^2$  increases strongly to 0.74, while the slope coefficient of numeracy becomes more comparable to the A'Hearn et al. dataset: it shifts from 0.87 to 1.26. It is important to note that the omission of any of the other groups in an OLS regression of numeracy on literacy had only a very small effect.

#### **Discussion: why have the Scandinavian sailors such a high numeracy level?**

The most obvious explanation for the skewness in the ratio between literacy and numeracy and the relative out-performance of the Scandinavian sailors vis-à-vis their peers, is an endogenous explanation, which would simply imply that the Scandinavian sailors in general invested relatively more in (vocational) education or training, resulting in relatively high levels of skills, in turn affecting the level of age heaping. There is, however, not much evidence to support this on a general level. The main piece of evidence that discounts an overall endogenous Scandinavian explanation came to the fore earlier. Figure 1 showed that the numeracy level of Danish sailors derived from the 1801 census was much lower than the group of Scandinavian sailors in the Prize Paper dataset, indeed much more comparable to their peer group in the Netherlands for instance. It therefore appears that the group of Scandinavian sailors was a particular group of sailors. It is likely that this selectivity was the direct result of the mechanism of the international labour market, and more in particular that of the Dutch Republic.

By the end of the eighteenth century the Dutch maritime labour market was a truly international labour market. Matched in absolute size only by the English maritime labour market, the Dutch maritime labour market, dominating the intra-European trade, was the second-largest employer of maritime labour in North-western Europe.<sup>30</sup> However, in contrast to its rival across the English Channel, the Dutch could not solely rely on a national labour pool to man its ships. Having a relatively small, but above all stagnating population, it relied heavily on the influx of foreign workers with a foreign share aboard its merchant fleet of about 50% in 1780.<sup>31</sup> The main suppliers of foreign labour were the maritime nations of

north-western Europe: the largest supplier was the German States, closely followed by Scandinavia.<sup>32</sup>

The observed differences in numeracy and literacy levels between the sailors and the masters in all but the Scandinavia sub-group implied that those who were the most skilled on board were in fact also the most important and well paid people aboard, the skippers. This is confirmed below, where the numeracy and literacy indices of masters, mid-range ranks, and sailors are plotted against the average monthly wages (Figure 3). The figure also includes wages and skill indicators for the so-called mid range ranks (or officers). The level of both skill indicators indeed equates with the level of remuneration; the better the skills, the better the payment. Skippers are by far paid the highest wages, followed by the mid-range group of officers and craftsmen, while the least skilled adult workers on board of the ship – the sailors – have the lowest wage.<sup>33</sup>

What is most interesting about Figure 3 is that in terms of literacy levels the mid-range ranks are much closer to the lowest rank than to the rank of masters, while their numeracy levels almost reach that of the skippers. This stresses the fact that in the Dutch maritime labour market the real premium is on skills related to numeracy. This is what was echoed above, where it was shown that all captains had (near) perfect numeracy skills, while for instance the Spanish captains had relatively low literacy skills: numeracy-related skills were clearly more important aboard a ship. The fact that these skills were indeed rewarded by higher status and better pay confirms other research, which has shown that the Dutch maritime labour market functioned as a relatively open and liberal market where skills were rewarded.<sup>34</sup>

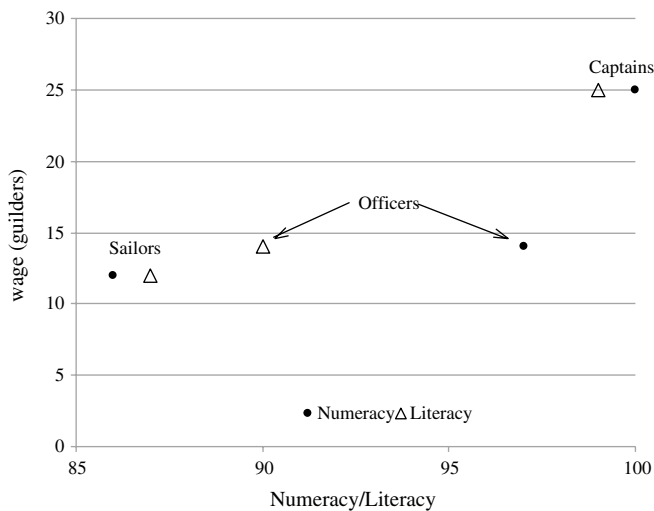


Figure 3. Wages and numeracy and literacy levels of Dutch seamen in the Dutch merchant marine in the 1780s.

Source: Database Prize Papers and NA, HCA 32, 343.

Notes: The wages in the mid-range ranks are based on the average monthly wage (17 guilders) of four mid-range ranks – boatswain and his mate (20 and 16 guilders), gunners and his mate (18 and 16 guilders) and the ship’s carpenter (14 guilders).

With regard to the Scandinavian sailors in the Prize Paper dataset appearing on mainly Dutch vessels, nearly all of them came from both small rural and strongly maritime oriented villages as well as provincial towns. The Danish sailors in the Prize Paper database were, for instance, almost without exception from either the Danish Waddensea Islands such as Fanø, Rømø and Amrum, coastal villages in Western Jutland such as Ringkøbing or from the maritime communities in towns of Aabenraa, Flensburg and Schleswig in the Duchies of Schleswig-Holstein, which all came to harbour both ship building and merchant fleets of substantial size.<sup>35</sup> These areas, as were for instance the Norwegian coastal settlements, were all maritime communities in which one can expect large portions of boys to have been trained and educated in the various maritime skills from an early age, either on the job or at schools.<sup>36</sup> Within the framework of a national (or regional) labour market, the extra skills will not have necessarily have paid off, neither in terms of status nor in terms of monetary betterment. This is especially the case if one keeps in mind that jobs in the lower ranks are obviously more plentiful than those in the higher ranks. Even though, as a result of growing up in a maritime environment, the skills of seamen from the maritime villages may have been high, the chances were high that one's peers had these skills as well. Moreover, there were often very few opportunities outside maritime work, and sons were very often simply destined to follow in their fathers' footsteps.<sup>37</sup>

Had the Scandinavian maritime labour market been a closed-off national or local labour market, the chances of social mobility for Scandinavian sailors would indeed have been fairly limited, and skills would not necessarily have been rewarded by a better pay or status. In reality, labour opportunities were, however, not restricted to the community or even country where one was born. As was pointed out above, Scandinavians could go abroad to make a living there (and did so in large numbers). The obvious destination was one of the largest maritime labour markets in Western Europe, that of the Dutch Republic, the first international labour market in Western Europe. The openness of this maritime labour market meant there were still options for the specifically skilled, but locally 'under-rewarded' Scandinavian sailors to 'capitalize' on their surplus in skills, and thus reap the reward of their investment in training.<sup>38</sup> Dutch wages were on average much higher than those in Scandinavia, thereby also providing a clear monetary incentive for moving to the Dutch labour market.<sup>39</sup>

The foregoing shows that the high numeracy skills of sailors from the Danish Wadden Islands, Western Jutland or Southern Norway are likely to have contributed to their success as maritime immigrants in the Netherlands. Studies on the maritime labour market at the end of the eighteenth century show that Scandinavian sailors were much more sought after than, for instance, sailors from Germany, even if Germany had been the traditional external supplier of sailors. However, from the 1740s onwards, German sailors came increasingly from inland urban Germany and less from regions in the maritime Northwest of Germany.<sup>40</sup> The Prize Paper data provides a possible clue as to why the Scandinavians were in such demand: if a master of a vessel needed to make the choice between the German sailors or a Dane or Norwegian, it is likely he will have opted for the latter. The case of the Scandinavian sailors on board Dutch ships thus shows that within the framework of the international labour market there was a mutual positive effect: Scandinavian sailors, due to their investment in specific aspects of their human capital, were able to profit from higher wages and career perspectives, while at the same time the Dutch

maritime labour market, operating with the highest productivity levels in Europe, profited from the in-migration of skilled migrants.<sup>41</sup>

### **Conclusion**

In the diary of Hans Jørgensen Fogt from the island of Als in Denmark an entry from 1772 reveals a list of 25 crafts, which he practised, including being a maker of buttons and a schoolmaster, while five of his crafts were maritime-related, such as first mate, ship's carpenter, maker of tackle, boatswain and instrument maker. The combination of crafts for this jack-off-all-trades may have been unusual, and in his article on literacy historian Bjørn Poulsen asks if indeed Fogt may have been a loner.<sup>42</sup> We will never know for sure, but there is no doubt that as soon as Fogt or any other seaman left the shores of eighteenth-century Europe to join the ranks of sailor, officer or master, he would be one of many highly skilled numerate and literate individuals and far from exceptional.

The above testing for literacy and numeracy, tapping into previously unexploited archival material from British privateering (1750s–80s) revealed a number of important conclusions. The eighteenth-century data for different occupational groups and nations documented a statistically significant correlation between the levels of numeracy and literacy, which confirms findings from other historical datasets. From an empirical point of view several important signals emerge. First of all, there is a clear pattern throughout Europe showing that skill was rewarded in the maritime labour market, since the rank of ship captains and fishing skippers come out with significantly higher levels of numeracy and literacy than other officers at sea such as boatswains. They in turn score significantly better than ordinary sailors.

Secondly, there are a number of regional differences within Europe and North America. In line with earlier findings, which showed a correlation between economic performance and high levels of human capital, Northern European countries have overall higher levels of numeracy and literacy than Southern European countries. Thirdly, in comparison with other branches of society, the data shows that ship captains and Scandinavian sailors have the highest level of human capital found anywhere in the eighteenth century – together with Dutch fishing skippers. Dutch, French and Spanish sailors on the other hand show numerate and literate skills on par with the unskilled labour force in Northern European countries.

The high performance of the Scandinavian sailors working abroad is explained as a consequence of the migratory and competitive character of the maritime sector, and the fact that, for the lower ranks especially, numeracy was deemed highly important. It is likely that high numeracy levels equate with better technical skills. Moreover, the relative high levels of human capital among the ship captains – they scored well both in terms of numeracy and literacy – reflects just how much skill was needed for someone in charge of a ship, certainly one of the most demanding jobs in their time.

More micro research is required to really get to grips with the rank-related tasks on board of ships of different nationalities. This may give use better understanding of the link between the geographical variance in numeracy levels and maritime training and education, and its subsequent link to productivity and economic performance. In sum, the macro approach to the importance of human capital in specific sectors, as we have applied in the present paper, is only a first, although necessary, step in

fully understanding the importance of human capital in the maritime sector of the early modern North Atlantic.

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