



Deskilling and decline in skill premium during the age of sail: Swedish and Finnish seamen, 1751–1913



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ABSTRACT

The study examines the evolution of skill premium and share at industry level in shipping during the age of sail. We argue that the period from the 1750s to the 1910s represented deskilling for the seamen working in sailing ships. The growth of international trade and shipping during the first era of globalization increased the overall demand for sailors but decreased the relative demand for skilled labor in favor of less skilled ones. This deskilling was associated with a decline in wage inequality, as the premium for high skilled seamen fell relative to mean wages in the shipping industry. The decline in skill premium may have facilitated the growth of trade and shipping, as the relative costs of transport declined. This in turn might have hastened the first era of globalization.

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1. Introduction

Shipping was (and still is) an international activity in which the wage costs play an important role. Numerous studies have shown rising labor productivity in shipping (e.g. Lucassen and Unger, 2011; van Zanden and van Tielhof, 2009; van Tielhof and van Zanden, 2011).¹ Recently, van Lottum and van Zanden (2014) have illustrated that a sharp increase in man-ton labor productivity occurred during the eighteenth century. These increases were more common on ships with more literate and numerate crews. These recent findings appear to contradict a widely held view that sailors did not need any specialized skills, and that the majority of the men were young and rather inexperienced (Alexander, 1980; Kaukiainen, 1997; Kindleberger, 1992; Sager, 1989; Vickers and Walsh, 1999).

This article analyzes skill shares and premia of sailors working on sailing ships between the middle of the eighteenth century and the First World War. With a rich dataset of seamen from various port towns in Sweden and Finland, we argue that the period witnessed deskilling and a decline in wage premia. In general, skill premia reflect both the supply and demand of skills in the eighteenth and nineteenth centuries, and thus one must take into account the increasingly globalized nature of the labor markets in shipping. Skill-biased technological changes, especially the change from sail to steam, reinforced the role of capital deepening in trade. Although this study provides evidence of changes in the labor composition and skill-specific wages using historical contract data on a specific industry, the findings can be linked to research on the overall evolution of skill premia in the long run. Based on the typology of high-, medium- and low-skilled maritime labor, we argue that the growth of international trade and shipping increased the aggregate demand for seamen, while also decreasing the relative demand for skilled labor. This development was associated with a decline in wage inequality, as the premium for high-skilled seamen fell. Moreover, the declining labor share, with an increasing relative wage of the middle-skill group implies that the supply decreased more than its relative demand. Finally, the rising labor share, along with increasing

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¹ For "classic" studies on this, see e.g., Davis (1962), Harley (1988) and North (1968).

relative wage throughout the period, suggests that the demand for low-skill labor increased more than its relative supply.

The wage dispersion and changes in skill premia have recently been analyzed in the context of the change from sail to steam and the rise of Atlantic trade in the nineteenth century (van Lottum and Poulsen, 2011; van Lottum and van Zanden, 2014). Thompson (2003), Chin et al. (2006), and Hynninen et al. (2013) argue that technological change increased wage dispersion among sailors. Chin et al. posit that the change created demand for new skilled occupations and had a deskilling effect overall. However, neither Thompson (2003), Chin et al. (2006), nor Hynninen et al. (2013) focus on the long-run distribution of wages or the development of the skill premium in shipping prior to the mid-nineteenth century.

The period from the mid-1750s to the First World War featured both the peak and decline of shipping by sail (Harlaftis et al., 2012). The first era of globalization increased the demand for shipping capacity, especially after the Napoleonic wars, but to a certain extent even before. As noted by North (1968), Harley (1971), and Kaukiainen (2009, 2012), the freight rates had been declining since the late eighteenth century. Trade costs in the late nineteenth century decreased as well, which accelerated globalization in this period (Jacks et al., 2008, 2010, 2011). The demand for maritime labor increased, creating larger international markets for sailors. The average wage costs declined as the productivity in shipping increased.

Both Sweden and Finland were typical late industrializing countries engaged in domestic and international shipping; both were dependent on exports and imports carried by sailing vessels, yet these ships – especially the large, ocean-going ones – were also used in international freight-carrying trades (Alanen, 1957; Högberg, 1969; Kaukiainen, 1993; Magnusson, 2000). Subsequently, the shipping tonnage of Swedish towns more than doubled between 1795 and 1850. In Finland, the increase was almost five fold. The Swedish tonnage increased even more rapidly, over nine fold, between 1850 and 1910, whereas the Finnish tonnage expanded only modestly at the same time (Swedish Official Statistics, 1880, 367; 1910, VII).² The number of merchant seamen in Swedish towns (without Finland) was 5500 in 1795, c. 8000 in 1850, and increased to 27,500 by 1910 (Swedish Official Statistics, 1850, 1910). Both Swedish and Finnish merchant tonnages per capita were among the largest ones in the world during the 1870s (Kaukiainen, 1991). The Swedish share was 2.5–3.0% of the world's total merchant fleet in the late nineteenth century and, therefore, substantially more than its share of the world GDP (circa 0.6%) and population (0.3%) (Fritz, 1980; Maddison, 2001).

Steam passed sail slowly in all seafaring nations during the late nineteenth century (Graham, 1956). As previous studies have suggested, technological changes – although incremental ones – had already occurred in shipping by sail before and during this slow leap from sail to steam and from wood to iron (North, 1958, 1968; Ojala, 1997). As Mokyr (1990) has argued, sailing vessels were completely redesigned between 1820 and 1860. The technological development during the age of sail may also have affected the demand for skills and, therefore, the skill-specific wages of maritime labor. As previous studies have shown, there was a depreciation of skill on merchant sailing ships from the eighteenth century onwards that was related to the simplification of rigging and ship types, increase in ship size, standardization of work processes, and increased security at sea. Moreover, the improvements in ports reduced turn-around times and the need for extra men on-board for loading and unloading (Frykman, 2014; North, 1968; Ojala, 1997; Rediker, 1987; Sager, 1989). The increase in Swedish and Finnish tonnages was mainly due to an increase in the number of sailing vessels until the 1880s. Thereafter, steamers represented an increasing share of the ships, which ultimately replaced sail in Sweden in 1899

and in Finland during the 1920s. By 1907, the steam tonnage was double the size of the sailing tonnage in the Swedish merchant fleet (Layton, 1981, 245; Swedish Official Statistics, 1880, 1910; Fritz, 1980; Kaukiainen, 1980, 1991). It was not until 1906 that more men were enrolled on steamers than on sailing ships in our data.

In the following, we will first discuss the earlier studies on skill premia and skill shares in different types of industries. Then, we will elaborate on the data we used in this study. Section 4 describes the occupational groups, and Section 5 features analysis of the changes in the skill shares. In Section 6, we focus on changes in the skill premium. Finally, we will conclude with our main findings and speculate on future research challenges.

2. Perspectives on the study of skill premium and share

Previous studies have shown that the share of skilled and unskilled workers in society and their wage differences has an impact on the aggregate economic growth rates. van Zanden (2009) has shown that European skill premium declined sharply in the fifteenth century and remained low compared to other parts of the world. Therefore, the decline in the skill premium aided long-run European economic growth prior to the industrial revolutions. Similarly, De Pleijt and Weisdorf (in press) have recently found evidence of an increase in the number of high-skilled and unskilled workers at the cost of semi-skilled ones in English data from the mid-sixteenth to mid-nineteenth century. On the other hand, several studies have tried to find correlations between high-skilled labor (education) and economic growth; namely, whether an investment in human capital pays off for a society or individual is a classic question for studies that analyze skill premium (Allen, 2009; Mokyr, 2002). At the industry level, skill shares and premia are studied especially during periods of disruptive technological changes. For example, the US case has been linked to skill-biased technological change, partially arising from the IT revolution (Autor et al., 2008). Another source of debate pertains to the role played by education in either mitigating or exacerbating the inequality between groups, and whether the choice over schooling is an exogenous or endogenous process (Acemoglu, 2002b; Chen, 2008).

Most of the analyses of skill shares and premia cover a relatively short time period, typically from the Second World War to the present. Studies focusing on periods prior to the First World War, especially during or before early industrialization, are rare (see, e.g., Acemoglu, 2002a; Acemoglu and Lyle, 2004; Piketty and Saez, 2003). Nevertheless, there is a growing number of studies analyzing the demand for skilled and unskilled workers in early modern England that try to explain the change from artisan workshops to factory production (for a review, see De Pleijt and Weisdorf, 2016). The studies concentrating on the period from the 1850s onward typically do not take into account the changes brought on by the nineteenth century globalization, and often, the data only cover the manufacturing sector or urban skilled (or unskilled) workers in a particular sector. These studies emphasize skill biases over crucial watershed moments such as various wars and crises, as well as the impacts of the industrial revolutions (Atack et al., 2004; Card and DiNardo, 2002; Goldin and Margo, 1992a, 1992b; Jones and Engerman, 1996; Katz and Autor, 1999).

Typically, skill intensity is analyzed using models such as the Goldin–Katz model, wherein establishment size, capital intensity, and energy use are the main explanatory variables. According to Atack et al. (2004), wages and skill intensity were increasing with capital intensity and the use of steam in the nineteenth century in the United States, with wages decreasing along with establishment size. Thus, in manufacturing, the labor force became deskilled (Atack et al., 2004). However, as observed by Betrán and Pons (2004), the period from 1870 to 1930 embodied different outcomes for different countries: wage inequality (= ratio of wages of skilled to wages of unskilled workers) increased in the United States and Spain prior to the First World War and decreased in France, Italy, and the UK. Until 1930,

² See also: Swedish National Archives, Commercial Collegium's Annual Reports on Shipping, 1766–1807; Finnish Official Statistics; The Finnish National Archives: Archives of the Finnish Senate, Annual Reports on Shipping, 1815–1860.

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