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# Membership in Mutual Health Insurance Societies: The Case of Swedish Manufacturing, circa 1900

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## Abstract

Industrialization brought significant economic and social changes. As a response to the risk of income loss due to illness and workplace accidents, mutual health insurance was the main financial vehicle for workers at the turn of the twentieth century across the Western world. We studied individual and firm-level determinants of membership in health insurance societies among male workers in Swedish manufacturing by using matched employer-employee data from the tobacco, printing, and mechanical engineering industries. Such data are extremely rare but important for our purpose. They cover all workers (i.e., members and non-members) and firms in a specific year around 1900 (N>12,000). In the years before the first statutory attempts to improve working conditions, we find remarkably high rates of membership, especially in mechanical engineering. We also find an association between membership and age, which is mainly a difference between younger and older adults, but the societies' egalitarian pricing gave workers no reason to defer enrolment until a higher age related to health problems. Social interaction may explain early membership in the printing and tobacco industries, where we find a positive association between membership among older workers and the enrolment of younger workers.

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# 1.    Introduction

Industrialization brought significant economic and social changes and accompanying the birth of modern industrial society were social movements that addressed progress, prosperity, and well-being in different ways, though these did not benefit all equally (Tilly, 2013). In response to the increasing reliance on wage work and the decline of traditional forms of emergency relief and self-insurance within family or other local networks[5], mutual health insurance societies[6] gained momentum from the mid-nineteenth century onwards. Before the introduction of statutory social insurance in most contexts, these organizations offered an early form of health insurance and a way in which industrial workers could mitigate the financial risks of illness, workplace accidents, and death.

The idea of mutual aid was not new but became increasingly important as the industrial workforce grew. Hence mutual health insurance societies attracted members in parallel with industrial growth around the turn of the last century (Beito, 2000; Di Mateo and Emery, 2002; Edebalk and Olofsson, 1999; Emery and Emery, 1999; Murray, 2007, 2008). In the United States, membership in different kinds of health insurance societies rose from 25 per cent of industrial workers surveyed in the early 1880s to 30-40 per cent of non-agricultural workers around 1920 (Beito, 1999, p. 585). In the United Kingdom in the late nineteenth century, about half of all adult males belonged to a friendly society (Gilbert, 1965, pp. 552). Between 1895 and 1905, the number of health insurance society members in Austria, Germany, France, and Belgium increased from 11 to 19 million (Murray, 2008, pp. 228-229). In Sweden, 14 per cent of workers in manufacturing and services in 1884 were

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[5] In agrarian societies, sickness and disability were seen as the landowner's responsibility. In the areas of crafts and commerce, it commonly fell upon guilds to support sick members. Early forms of sickness benefit were developed in the mining industry where working conditions were particularly detrimental to workers' health (Edebalk and Olofsson, 1999).

[6] In the existing literature, various concepts are used for organizations that provided their members with benefits or support in case of death, sickness, disability, old age, or unemployment. Common ones are 'mutual aid society' and 'industrial sickness funds'. Both are examples of an early form of health insurance and refer to a system of voluntary insurance offering social protection in return for a basic fee. The mutual aid society paid benefits to its members in case of illness, disability, or death. Industrial health insurance societies extended cash payments and, in some cases, medical benefits to members unable to work due to illness or injury. We use the term 'health insurance societies' to refer to mutual aid societies that provided members with financial protection against income loss due to illness or injury related to workplace accidents – protection that to some extent covered funeral costs. In Sweden, such societies were called *sjukkassor*.

members. This share increased to about 50 per cent by 1907 (Arbetareförsäkringskomitén, 1889; Jungenfelt, 1966; Kommerskollegium, 1912).[7]

Although mutual health insurance was important before the introduction of statutory social insurance, many workers remained uninsured. Those who acted in favour of general health insurance argued that those most in need were not joining the societies in their current form (Johansson, 2003), and this begs the question why some did decide to join while others did not.

The most common theoretical point of departure for investigation into health insurance society membership is that of adverse selection, an idea espoused by George Akerlof (1970) and Michael Rothschild and Joseph Stiglitz (1976). A key argument is that high-risk individuals have a greater incentive to obtain insurance (while low-risk workers are less likely to) if the price of insurance is based on average risk (Einav and Finkelstein, 2011). Part of the population is thus left uninsured, with membership biased towards high-risk individuals. This outcome is economically inefficient and has been the main reason behind government intervention in the field of health insurance.

However, empirical evidence on adverse selection and the importance of asymmetric information in health insurance markets is inconclusive in modern-day settings (Einav and Finkelstein, 2011; Pauly, 1986). The historical literature dealing with asymmetric information in health insurance has argued that at the time of industrialization the societies successfully overcame this problem by employing medical examinations and "character investigations" to screen potential members, and this was aided by social control among members (Andersson and Eriksson, 2017; Emery, 1994, 1996; Gottlieb, 2007; Guinnane and Streb, 2011). If adverse selection was not the main driver for membership, then which were the mechanisms at work, which were the important determinants, and did these vary across industries?

We studied the determinants of membership in health insurance societies among male workers in Swedish manufacturing circa 1900, using matched employer-employee data with national coverage of the tobacco, printing, and mechanical engineering industries. The data were compiled from archival records and cover all workers (i.e., both members and non-members) and firms in a specific year. Such data are extremely rare for the period but make it possible to analyse individual and firm-level determinants of membership. Being able to

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[7] Estimates of the provision and coverage of mutual health insurance in the past are surprisingly hard to obtain and are, when found, difficult to compare across contexts. Many societies were not registered, so there are no records of their members. Sometimes membership in more than one society was allowed, and therefore actual coverage was more limited than that indicated by membership figures. Nevertheless, the rise in membership around the turn of the last century across North America and Europe, including Sweden, is undisputed.

explore firm-level characteristics is of importance for this study given the salience of the firm and possibly also of co-workers in the assumption of membership.

By examining the associations between health insurance society membership and individual determinants, workplace characteristics, and social interaction, this study is the first attempt to consider a wider set of determinants for membership in historical health insurance societies. Micro-level analyses of such membership are rare, and are in the case of the Nordics non-existent, despite these countries being of both interest and relevance in this study given their ambitious statutory welfare policies in later years. The present study provides new evidence from what was in 1900 the economic periphery, to complement findings from primarily Anglo-Saxon and Continental European contexts, and it furthers our understanding of factors that mattered for membership and explain how well these societies functioned. It also completes the aggregate picture already drawn up regarding mutual insurance against sickness and accidents with a micro-level analysis focusing on individual workers and firms.

The following findings are noteworthy: 1) In the years preceding the first statutory attempts to improve working conditions for workers, we find remarkably high membership rates, especially in mechanical engineering. 2) Workers of all ages joined health insurance societies – well before the onset of potential health problems – and the societies' egalitarian pricing gave workers no reason to defer enrolment until they were older. 3) As for firm-level factors, social interaction between co-workers in the printing and tobacco industries encouraged membership in that those who were older and already enrolled encouraged those younger to follow suit.

## 2.      Understanding historical health insurance

Previous historical research on mutual health insurance has mainly focused on membership from the perspective of health insurance societies, examining how these organizations handled informational asymmetries and what the consequences were for mutual health insurance markets (Van Leeuwen, 2016).

The literature draws heavily on adverse selection arguments (e.g., Akerlov, 1970; Rothshield and Stiglitz, 1976). One would expect that the demand for health insurance is negatively associated with the price of membership: the higher the price of insurance, the fewer those willing to pay it (Chiappori and Gollier, 2006; Marquis and Long, 1995). However, unlike the standard unit demand model in most product markets, the willingness to pay for insurance is also linked to the cost of its provision (Einav and Finkelstein, 2011). This

in turn is driven by the selection of members into the society. Because a worker's willingness to pay increases with the risk of becoming sick or having an accident, the cost-curve of insurance will slope downward. If the price is set at an "egalitarian" (i.e., average) rate whereby all members pay the same premium, the net benefit will be greater for high-risk individuals. If risk is private information, we would expect a positive association between membership and risk factors.

A growing body of historical literature has established that health insurance societies applied both formal and informal measures to mitigate problems regarding adverse selection (Emery, 1994, 1996, 2008; Gottlieb, 2007; Guinnane and Streb, 2011; Murray, 2007). They had, for example, formal rules in their charters that discriminated against expected high risks (Andersson and Eriksson, 2019; Cordery, 2003; Murray, 2008). Societies usually only accepted new members on the recommendation of current members, which illustrates an informal selection mechanism favouring healthy and reliable individuals (Andersson and Eriksson, 2017; Witt, 2011). This indicates that the asymmetries were two-sided, yet these could be handled effectively in the past.

Societies imposed restrictions based on several observable risk factors. A common measure was to put restrictions on age, through either age-related initiation fees or age limits to discourage older (less healthy) workers from joining (Emery, 1994; Murray, 2003). There is some quantitative evidence documenting age-membership patterns. When studying a sample of workers in late nineteenth century US manufacturing, Gottlieb (2007) found a positive association between younger age and membership in benefit aid societies that turned negative at a higher age (> 40). Karlsson and Stanfors (2018) found a positive impact of age and of age-related factors, such as tenure and marriage, on the likelihood of membership among cigar workers and compositors in Sweden's manufacturing industry at the turn of the twentieth century. Horrell and Oxley (2000) also found a positive association, based on late nineteenth century UK household budget surveys, between age and health insurance society membership. They also found that workers in high-risk industries, such as metal and mining, were more likely to seek health insurance than were other workers.

One of the controversies in the extant literature is whether adverse selection was effectively balanced by the interest among the societies' current members in protecting their savings. In a comparative study of European voluntary and compulsory health insurance, Murray (2003) argues that workers in poor health were more likely to apply for membership, and that voluntary societies were faced with higher morbidity due to adverse selection. Unless members were willing to accept a higher premium to cover this eventuality, the departure of

low-risk workers was a major threat which could send premiums soaring in a vicious circle known as the "death spiral" (Thomasson, 2004). There is, however, limited evidence of these spirals in mutual health insurance societies (Emery, 1996). In contrast, it has been suggested that the societies managed adverse selection well because they were well-informed about their members (Gottlieb, 2007).

Hemenway (1990) contests the adverse selection argument and argues that propitious selection was able to operate in insurance markets. This argument is based on the notion that risk-averse individuals are more likely to both avoid risk and purchase insurance. This implies that risk-averse, prudent, healthy, and well-established individuals joined health insurance societies, thus promoting their respectability (Cordery, 1995). Siegelman (2004) argues too that adverse selection in health insurance markets is exaggerated. Selection could imply "cream-skimming" in that current members were familiar with the risk profile of prospective members and/or could recommend for membership individuals with certain desirable characteristics.

Granovetter and Tilly (1988) argue that compulsory societies also tended to select desirable members. They offered insurance to better paid, tenured workers who were important to the employer and difficult to replace. Membership was designed to encourage loyalty and avoid turnover. Compulsory membership seems to have been most prevalent among large and highly mechanized factory-based firms, often with risk of accidents, where employers had a stronger incentive to either impose greater control over or curb the accident compensation cost as part of a wage settlement (Moses, 2019).

## 3.    Context

Sweden was not among the earliest countries to experience industrialization. Its development lagged the UK and Northwestern Europe but was ahead of Southern Europe, and it benefited from favourable resource endowments and the advantage of the latecomer with respect to technological and organizational advances made elsewhere. Innovations, new technologies, new machinery, and new materials were brought in throughout the last half of the nineteenth century, which culminated in electrification, capital-intensive industry, mass production and the emergence of big business in the early twentieth century (Schön, 2010). By 1900, manufacturing employed 20 per cent of the total labour force.

From around 1880, concern about social and economic issues and the conditions of the growing working classes prompted governments in Europe and the United States to

undertake surveys. In Sweden, the Workers' Insurance Committee (*Arbetareförsäkringskomitén*) was appointed in 1884 to survey working conditions and recommend to the government ways of addressing workers' protection against income loss due to workplace accidents, illness, and old age.

At the turn of the last century, the Swedish Board of Commerce instigated statistical surveys of workers' conditions across industries, including tobacco, printing, and mechanical engineering. There were several reasons why these industries were surveyed, and some were related to working conditions and workers' well-being. The working environments in the tobacco and printing industries were known to be particularly unhealthy, and mechanical engineering symbolized the new and highly important industries that posed new accident risks. The geographical location of these industries (which were concentrated in cities) facilitated the undertaking of the surveys. The person in charge was a statistician, Henning Elmquist, who was sent out with his agents to ask detailed questions of all employers and employees in the industries,[8] and separate questionnaires were filled in by representatives of the most common health insurance societies in the same.[9]

At the time of the surveys (1898-1903), the industries considered here – tobacco, printing, and mechanical engineering – were all in factory-based manufacturing. They differed regarding skill requirements, organization, and technology. Tobacco manufacturing was a crafts industry which was not yet mechanized (Lindbom and Kuhm, p. 82). The printing industry was undergoing modernization and rationalization, which changed both the nature of workers' tasks and the production process. Mechanical engineering would become the backbone of Swedish manufacturing, but around 1900 it was a heterogeneous industry in which old-fashioned general works co-existed with modern, more specialized factories. The progress made in this industry thanks to its new factories constituted a second industrial revolution: it was highly capital-intensive and largely electrified, and it both employed and produced technologically advanced machinery. Between 1890 and 1910, Swedish mechanical engineering grew on average by more than 10 per cent per annum (Schön, 2010, p. 197) and was, according to Elmquist: 'fully modern and by necessity compelled to remain at the

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[8] Unfortunately, the only surviving questionnaires targeted at employers are those for tobacco and printing. Because the surveys covered all workers, we can retrieve firm-level information on workforce characteristics such as number of workers while distinguishing, for example, between men and women in different occupational groups.

[9] The content of these questionnaires reflects the official statistics on health insurance societies, including year of establishment, membership conditions, the wording of the statutes and economic situation. We used information indicating whether membership was voluntary or compulsory in the workplace.

vanguard of development' (1901, p. 12). Of the three industries in our study, mechanical engineering was the most dynamic in terms of employment growth. Employment tripled between 1870 and 1900 (which can be contrasted with 70 per cent in the tobacco industry).[10] Recruiting, training, and retaining workers were major challenges for employers, and especially so in mechanical engineering.

Industrial work was, around the turn of the twentieth century, associated with occupational health and safety risks related to exposure to chemicals or dust or natural substances (such as lead or nicotine in the printing and tobacco industries), and to workplace accidents (such as tripping up, slipping, or being caught in moving machinery in mechanical engineering). Most male workers were family breadwinners. Workers were largely unprotected, however, yet they faced the real financial risk of income loss due to workplace accident or illness. To mediate such risk before the introduction of statutory provisions and social insurance, they could join health insurance societies. In the industries in our study, membership was higher than the national average. In 1899, 90 per cent of all workers in mechanical engineering were members (compared to 70 per cent in 1884); in 1902/3, the ratio was 70 per cent in printing (compared to 46 percent in 1884); and in 1898, it was 69 per cent in tobacco (compared to only 36 per cent in 1884) (Arbetareförsäkringskomitén, 1888; Elmquist, 1899, 1901, 1909).

Around 1900, there was a rapid expansion of small local health insurance societies with connections to either occupation (*yrkeskassor*) or the workplace (*fabrikskassor*). Some societies were connected to trade unions.[11] Workplace-based insurance societies requiring compulsory membership were more common in mechanical engineering than in the other two industries. Although mutual health insurance societies were based on the idea of help-to-self-help and were self-regulated by members, many societies (not only those requiring compulsory membership) had been established and were subsidized by employers. Membership based on occupation, workplace or locality meant excluding members who had left the trade or workplace or moved outside the area in which members claiming sickness benefit were monitored or visited (Andersson and Eriksson, 2017). Members could exit as they wished but were not entitled to recover any of their membership contributions. It was not until the early twentieth century, when the Health Insurance Act of 1910 promoted the

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[10] Own calculations based on data from *Bidrag till Sveriges officiella statistik. D, Kommerskollegii underdåniga berättelse för år ...* (1859–1912). Information on employment in the printing industry is not available for the period 1870-1900.
[11] The Typographers' Union had its own sickness fund as of 1890, though membership in this fund was voluntary.

emergence of larger nationwide societies, that workers could change employer without exiting the society to which they belonged (Andersson et al., 2022).

The operation of these societies, including the enrolment of new members, was governed by a set of formal rules (charters) agreed upon by members (Lindeberg, 1949). Annual fees were not determined by actuarial principles and were thus unrelated to age. To regulate the entry of new members, each society commonly imposed formal restrictions on age, sex, and occupation to qualify for a certain kind of membership. Age restrictions typically applied a lower boundary of 14-18 years and an upper boundary of 40-55.[12]

The main health insurance societies in the three industries supplied aggregate information on membership to the Board of Commerce. For printing and mechanical engineering there is information on average number of sick days per member by age, which is of interest for this study given previous findings on members' ages (i.e., Gottlieb, 2007).[13] Figure 1 shows that the average number differed little by age for workers aged 20-40 years, while members aged over 40 showed higher morbidity. The average number of sick days was higher in mechanical engineering compared to printing, especially for those aged over 50.


Figure 1 about here


Compulsory membership may explain why membership was higher in some industries than in others. Further reasons why membership differed across industries were the risks regarding workers' health and safety, such as exposure to illness and workplace accidents, and also the degree to which employers were engaged in their workers' welfare.[14] Figures on workplace accidents from the Workers' Insurance Committee in 1884/85 (including all accidents irrespective of cause or insurance protection) showed an average risk of 1.6 per 100 workers in manufacturing suffering a workplace accident, meaning a loss of over three working days. The average risk in mechanical engineering was 3.0 accidents per 100 workers, while the

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[12] Among the 101 most common health insurance societies in the three industries we investigated, 56 had an upper age limit for membership (Elmquist, 1899, p. 340; Elmquist, 1901, p. 316; Elmquist, 1909, p. 170).

[13] Average number of sick days was not reported by age in the case of the tobacco industry.

[14] In the late nineteenth century, employers were only responsible for compensating workers for severe accidents, as based on tort law. The Worker's Insurance Committee conducted a survey of workplace accidents in 1884/85, which led to the Workers' Compensation Act of 1901. This offered limited protection for workers and was aimed primarily at protecting workers who had been invalided due to workplace accidents and the widows of victims of workplace casualties. Edebalk (1996) argues that the 1901 act provided Swedish workers with less adequate protection against workplace accidents than existed in other countries. Hence, mutual health insurance societies remained important for most wage workers as a protection against income loss as a result.

equivalent in tobacco and printing was 0.4 and 0.5 accidents per 100 workers respectively (Arbetareförsäkringskomitén, 1888). In the more risk-exposed industry of mechanical engineering, more employer-sponsored welfare schemes were introduced than in the other industries. It was also more common for employers in mechanical engineering to subsidise health insurance for employees, although this did occur in the tobacco and printing industries too. While over 90 per cent of employers in mechanical engineering made contributions to health insurance schemes (Elmquist, 1901, p. 147), the equivalent shares in tobacco and printing were only 13 and 6 per cent (Elmquist, 1899, p. 128; 1909, p. 143).[15]

## 4.      Data and methods

To investigate the determinants of health insurance society membership among male workers in Swedish manufacturing, we exploited cross-sectional data covering three industries, sourced from investigations conducted by the Board of Commerce around 1900. These industries were surveyed nationwide in 1898 (tobacco), 1899 (mechanical engineering)[16] and 1903 (printing).

Information was collected from 4,380 workers employed in the tobacco industry; 7,855 workers in the printing industry; and 12,060 workers in mechanical engineering. All workers present were interviewed in accordance with a pre-printed, detailed questionnaire covering a range of issues from personal characteristics to occupation, earnings, and membership in a trade union and/or health insurance society. The agents also collected information from the employers, including workplace and firm characteristics. We can link this rich information in an employer-employee matched dataset.

### 4.1   Sample

We carried out separate analyses for male workers based on in the industry they were in, allowing for different scenarios in each industry regarding workplace risks (exposure to nicotine, dust, and lead in tobacco and printing, and occupational hazards such as cuts or being crushed or even fatal injuries in mechanical engineering) and regarding employer support for membership in the relevant health insurance societies (support which was more

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[15] The same proportion of employers in mechanical engineering made contributions to accident insurance (see supra), a practice which was rare in both tobacco and printing.
[16] The 1899 survey of mechanical engineering, as used in this paper, focused on large factories with varied production. A follow-up survey of the same industry in 1901 included smaller and specialized firms.

prevalent in mechanical engineering). Because some societies applied age restrictions, we restricted samples to workers aged 18-60.[17] We excluded those in factories employing fewer than ten workers because very small firms most likely had informal practices governing workers' health and safety that differed from the formal strategies considered in the surveys. We dropped observations where we lacked information on any of the variables used in the analysis. These iterations reduced our sample to 12,157 workers across 272 firms (906 workers in 53 firms in the tobacco industry; 2,686 workers in 179 printing firms; and 8,565 workers in 31 mechanical engineering firms). Descriptive statistics of the three samples are presented in Table 1.

### 4.2   Analytical strategy

The empirical analysis consists of two parts: one purely descriptive, focusing on selection patterns among members and non-members across industries, and one multivariate, focusing on the role of individual and firm-specific determinants of health insurance society membership. In the multivariate analysis, we applied linear probability models to analyse these determinants. Membership in a health insurance society ($M_i$) was modelled as a function of age, family status, experience, other personal characteristics ($\mathbf{X}_i$), and occupation ($Z_i$) within firms by allowing a firm-fixed effect account for unobserved heterogeneity across firms, thus capturing organizational practices, employer attitudes, and group dynamics among the workforce ($G_{ij}$):

$$M_i = \alpha_0 + \beta_1 \mathbf{X}_i + \beta_2 Z_i + G_{ij} + \varepsilon_i \tag{1}$$

In some specifications, we modelled membership as a function of personal characteristics and occupation but excluded the firm-fixed effect to distinguish instead between different firm-level factors of potential importance, such as firm size and location.

We estimated all models with and without income to establish if and how income was associated with membership. In our baseline regressions, we did not differentiate between workplaces in terms of compulsory or voluntary health insurance society membership. As a robustness check, we dropped observations of workplaces requiring compulsory membership

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[17] All health insurance societies admitted members over the age of 18, and none excluded members based on a certain age (although some would not accept new members after a certain age). We applied an upper age limit because the societies increased in number during the latter decades of the nineteenth century. This affected the chances of those (of prime working age) in different cohorts joining.

(this applied mostly to mechanical engineering). Results are surprisingly robust in terms of both model specification with and without income and sampling on firms where membership was voluntary.

## 5.    Results

### *5.1    Descriptive results*

Table 1 summarizes sample characteristics across industries. Most adult male workers were, irrespective of industry, members of a health insurance society, with levels ranging from 70 per cent in tobacco and printing to 90 per cent in mechanical engineering. There was, however, variation in membership between factories: some had made it compulsory. In tobacco and printing, this covered about 11 per cent of the workers, while in mechanical engineering, it was more common and covered over 50 per cent. Those who were not core workers and who instead had inconsistent work, low income, and high turnover, such as errand boys and helpers, were not required to insure themselves (Lindeberg, 1949). In mechanical engineering, the membership rate was 92 and 87 per cent in compulsory and voluntary health insurance societies respectively.

As for individual characteristics of relevance for membership, the typical male worker was in his early to mid-thirties with not only considerable work experience but also a long working life ahead. About half of the workers were married, and a similar (or somewhat lower) proportion had dependent children in the household. Most workers lived and worked somewhere other than where they were born, indicating that they were internal migrants. Migration experience was most common in mechanical engineering, where over two thirds of the workers were born in a different location than the workplace. Most workers in tobacco, printing and mechanical engineering declared their health status to be 'good'. Workers in tobacco and printing had on average more experience in their industry than had workers in mechanical engineering. Despite this, the experience gained with their employer (i.e., firm) varied less across industries, with workers' job tenure averaging 7-10 years. Union membership varied across industries, being much more common in printing than in tobacco and mechanical engineering. Membership in temperance organizations averaged about 10 per cent of the workers sampled. Workers in printing earned significantly more per week than did those in tobacco and mechanical engineering, who on average had quite similar incomes.

Table 1 about here

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Figure 2 illustrates the relationship between age and membership across industries. For tobacco and printing, membership increased with age, from including less than 30 per cent of workers under 20 years to about 60 per cent or more of workers aged 20-30. Membership plateaued at 80 per cent among workers aged 30-50 years and was somewhat lower among workers aged 50-60. In mechanical engineering, a high share of members (75 per cent) had already joined when young, and was at most around 95 per cent among workers aged 30-50.[18] Although there were level differences in health insurance society membership between tobacco and printing on the one hand and mechanical engineering on the other, Figure 2 shows that most workers had joined well before they reached the average age when morbidity began to affect their work capacity.

Figure 2 about here

Returning to Table 1 and observable workplace characteristics, average workplace size differed considerably between tobacco and printing on the one hand and mechanical engineering on the other. The average worker in tobacco or printing had a little over 100 colleagues, whereas in mechanical engineering he had almost 600. Mechanical engineering also differed from the other industries in that it was more widespread across the country and less concentrated in the big cities of Stockholm, Gothenburg, and Malmoe. While 60 per cent of workers in mechanical engineering were employed outside the three big cities, the equivalent shares of tobacco and printing workers were only 39 and 37 per cent respectively.

Table 2 compares worker's individual characteristics by members and non-members. It demonstrates that workers with health insurance society membership were on average older than non-members, especially in tobacco. Members were also more likely to be married and the main breadwinner with a wife and dependent children. Moreover, they had considerably more experience of working in both the industry and firm in question and were more likely to be union members. Also, because they were older than non-members, the experience they had might have been equal to age, but their tenure was longer even net of age. In line with these productivity-related differences, members had a higher weekly income than did non-members. Descriptive statistics indicate positive – not negative – selection into health insurance societies in Swedish manufacturing circa 1900. It should, however, be remembered that data are cross-sectional, and thus the average differences between members and non-

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[18] These shares refer to all workers, but the patterns were very similar among workers at factories requiring compulsory membership.

members reflect to some extent stayer bias in that those who had at some point joined a health insurance society remained members when older. Differences between members and non-members needed to be netted out through multivariate analysis. Those who were members more commonly worked in a large workplace located in Stockholm, Gothenburg, or Malmoe. The fact that membership varied with firm-level characteristics suggested sorting, though this remained to be explored in the multivariate analysis.

Table 2 about here

### 5.2    Multivariate results

5.2.1    Individual-level factors

Turning to the multivariate results from model specifications where variables were added stepwise, we started by focusing on the associations between individual-level characteristics and occupation and health insurance society membership (Models 1 and 2). We then explored the role of firm-level characteristics in terms of size and location (Models 3 and 4). Finally, we looked at associations within firms (Models 5 and 6), controlling away for unobserved characteristics, including workplace interaction and practices across firms, that were not captured by observables such as size and location but may have mattered for membership. Results are presented by industry in Tables 3a-c.

To capture possible non-linear relationships between age and membership, we entered age as a categorical variable with workers in their twenties as the reference group.[19] Considering that workers in the youngest age group (<20 years) had not necessarily finished their training or developed a strong occupational identity, we expected that they were less likely to have been members; and considering the correlation between age and morbidity as discussed above, we expected that workers in their thirties and older were more likely to be so. Tables 3a-c almost invariably reported negative coefficients for the youngest age group, especially for workers in tobacco and printing. Of note, we find little difference between workers over 30 and the reference group.

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[19] We also tried specifications using age and age squared, as did Gottlieb (2007). In some of these, the age coefficients were positive while their squared terms were very small or statistically insignificant.

Being married was positively associated with health insurance society membership across all three industries, though this association was stronger in tobacco and printing than in mechanical engineering[20]. Self-declared health status did not matter for membership. Experience did not matter for it either, though this may be due to a high correlation with age. That said, tenure was positively related to membership across industries, which is what we would expect because sometimes membership required a minimum period spent with a certain employer.[21]

Tables 3a-c about here

Income is correlated with age, experience, and tenure as well as with occupation. Mature workers earn more than younger, less experienced peers, especially when working in the same firm in a context where wages are highly related to individual productivity rather than determined by collective agreement. Income is, nevertheless, relevant for our study because it indicates access to resources and informs us whether health insurance society membership was related to lack of income. Income also indicates what the individual might lose in the case of injury or poor health. For these reasons, we estimated models with and without income. Income is consistently positively associated with membership, net of other factors, especially in mechanical engineering. In Model 2, adding income suppressed some coefficients such as age in relation to Model 1 estimates, which is in line with older workers earning more.

In sum, the individual-level factors important for health insurance society membership around 1900 were primarily age and family responsibilities. These findings largely hold across industries, between firms, and independent of income. The results for mechanical engineering are somewhat different (i.e., weaker) than those for tobacco and printing. This reflects the fact that the industries were different in terms of both production and management and risks – which was of relevance for workers considering membership.

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[20] This is potentially related to the fact that for many workers in mechanical engineering membership was compulsory. Given the high correlation between marriage and fatherhood, there was no additional impact from having dependent children, though fathers (especially those with young children) were more likely to insure themselves against sickness and accident.

[21] Based on the same reasoning, we would have expected a negative impact of the squared term of tenure, but this is not the case. There is nothing like a threshold effect stemming from a specified period of employment required for membership in a (factory-based) sickness fund, and after that the length of time spent with a particular employer should not be seen as important.

## 5.2.2 Firm-level factors

As for firm-level factors, we explored two observable characteristics of potential importance for health insurance society membership: the firm's size and its location (see Tables 3a-c Models 3 and 4). Regarding size, we expected a positive association with membership based on the view that smaller firms tend to take an informal approach to personnel matters and welfare provision. Economies of scale may also imply that relatively large firms have better opportunities to offer insurance to workers. However, we expected size effect to taper off at a certain level, given what are often decreasing returns. Our expectations were partly fulfilled. In tobacco and printing (Tables 3a-b), workers in larger firms were more likely to be members, net of individual-level characteristics. In mechanical engineering (Table 3c), the association between firm size and membership was bell-shaped.

Regarding workplace location, we expected a positive association between health insurance society membership and the three big cities. We found no such association in the cases of tobacco and printing. For mechanical engineering, Gothenburg and Malmoe were significant, but it is notable that Stockholm – the capital and the largest city – does not stand out as a city having particularly high levels of membership compared to the rest of the country. Controlling for observable differences between firms, such as size and location, does not really alter the estimates from models that only control for individual-level factors. There are, however, indications that some firms paid more than others, which is factored in regardless of their size and location.

Since we are interested in an unbiased estimation of individual-specific characteristics for health insurance society membership, we added firm-fixed effects to some models (Tables 3a-c Models 5 and 6) to control for unobserved heterogeneity between firms. Such heterogeneity may have arisen from the recruitment of different kinds of labour but may also have stemmed from unobserved management practices affecting workplace dynamics of relevance for membership. Controlling for unobserved differences between firms in tobacco, printing and mechanical engineering adjusts the estimates from models (3-4) that control for some basic observable differences between firms. Patterns stay the same but estimates for age and marital status are adjusted downwards, indicating that firm-level practices mattered for membership.

A potentially important firm-level variable, particularly in mechanical engineering, was whether the factory maintained a health insurance society requiring compulsory membership. As mentioned, this applied to about half of the workers in mechanical

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engineering. Table 4 shows estimates for all firms and for those offering only voluntary membership and reveals some differences between the samples. Of note, the positive association between being married and having membership was much stronger in the sample which only considered firms offering voluntary membership. Moreover, the association between tenure and membership is also stronger where membership was voluntary. Sorting is the likely explanation for these features as well as for the positive relationship between income and membership among all firms disappearing when we only consider firms where membership was voluntary. The results indicate no problems regarding adverse selection even where membership was voluntary.

Table 4 about here

The literature on health insurance society membership in the past points to balancing forces between individual and group-level factors. To explore this, we analysed the extent to which social interaction in the workplace related to membership. Although there was reason to expect a social interaction effect, i.e., that co-workers influenced each other in terms of values and behaviour, it was difficult to identify this in cross-sectional data. There is an endogeneity problem in that group behaviour may influence individual agents who in turn contribute to group behaviour (Manski, 2000). One way of overcoming this problem is to impose exclusion restrictions, assuming certain directions of influence. In line with Sorensen (2006), we assumed that senior (older) workers influenced junior (younger) workers but not vice-versa regarding membership. Senior workers had already made their decision whether or not to join a society and did not need to seek information on the costs and benefits of membership, and for those who were members it was just a matter of whether to continue paying the fees. Senior workers also had an interest in encouraging junior workers to join (though only those who were healthy and reliable), because that would bring in members who would possibly make fewer sickness claims and would improve the health insurance society's cash flow.

We analysed the role of group dynamics, our point of departure being that workers at a particular workplace were clustered in one or more health insurance societies. We constructed a measure based on the number of members among senior workers (i.e., older than 40 years) at each workplace. We then restricted the samples to workers younger than 40 and estimated the independent impact of the share of members among senior co-workers on the likelihood of the younger ones joining, controlling for the same set of variables as in Model 4 (Table 3a-c).

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There is no obvious way of defining senior and junior workers respectively. We chose the age of 40 to distinguish between them based on the relationship between age and morbidity observed in Figure 1.[22] When restricting the samples to junior workers we lost observations relating to both individuals and firms. The tobacco industry, which grew little in terms of employment in the years before the survey, had a mature workforce and relatively few young workers. In printing and mechanical engineering, which were growing industries that had recruited more workers in the years preceding the survey, the workforce was younger, meaning we had more junior workers and firms to analyse.

Table 5 summarizes the coefficients for senior members (40 years or older) on the probability of junior workers (18 to 39 years) enrolling, based on regressions on each of the three industries. In the case of mechanical engineering, we analysed all firms and a sample excluding firms requiring compulsory membership. A greater number of senior members in the workplace was positively associated with membership among junior workers in both tobacco and printing. Though the coefficients are small, they are meaningful. The magnitude of the effect is similar in both industries, with a difference in the number of senior members equivalent to a +/- one standard deviation being associated with a 6-8 per cent increase in the likelihood of membership among junior workers. In mechanical engineering, the impact of senior workers was insignificant regardless of whether we analysed all firms or only those offering voluntary membership. This is not surprising considering the very high shares of members and the small amount of variation in the dataset.


Table 5 about here


To conclude, we find no evidence of junior workers opting out of health insurance society membership in a workplace with a high number of senior members. Rather, we see the opposite; junior workers were more likely to join if their senior co-workers were already members. This suggests that social interaction and group dynamics at the workplace level offset the potential consequences of asymmetric information.

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[22] As an alternative to age, we also used tenure (longer or shorter than seven years) to distinguish between senior and junior workers at the same firm, with similar results.

## 6.     Concluding discussion

In the late nineteenth century, mutual health insurance societies emerged as a major financial vehicle for protection against loss of labour income among workers. In this paper we used unique matched data from around 1900 and covering three Swedish industries – tobacco, printing, and mechanical engineering – to investigate the determinants of health insurance society membership.

Three findings from the present study are striking and important in relation to previous research. We find remarkably high rates of health insurance society membership, especially in mechanical engineering, in the years before the first statutory attempts to improve working conditions for the industrial workforce. We also find an association between membership and age, and this is mainly a difference between younger and older workers. We find no support for the argument that the egalitarian pricing of membership meant that younger workers deferred enrolment until they were older (and faced higher morbidity). In the printing and tobacco industries, we find a positive association between membership among older workers and enrolment among younger workers.

The high accident risks in mechanical engineering are a likely reason why enrolment was remarkably high (87 percent) across the industry - both in workplaces with compulsory membership and in workplaces not requiring it. While workplace accident risk gave workers and employers in mechanical engineering an incentive to insure the workforce, the lower risk exposure played down such an incentive in the printing and tobacco industries. Other factors seem to have had greater importance.

One of the key individual characteristics of the demand for insurance was age or age-related factors. Concerning age, we found clear differences between the youngest workers and those in their twenties, but only small differences between workers in their twenties and those who were older. In this regard, our findings do not suggest that workers waited to insure themselves until they approached an age when they experienced a greater risk of sickness. Those workers who waited too long would not be able to insure themselves at all. The workers in our study behaved differently: age mattered for membership, but mainly for reasons of occupational identity, not increased morbidity. It was not so much the occupational specialty but rather the identity of belonging to a certain branch of industry which often determined the organization of health insurance societies. As 18–19-year-olds, workers might not yet have reached a position of deciding upon their future career path and were therefore less interested in the variety of health insurance societies that were more or less closely

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associated with an industry. It was when they established themselves in a trade during their twenties that they in many cases joined a health insurance society.

Given that older members faced higher morbidity, one might expect that high enrolment among senior workers would make younger workers less willing to follow suit, since the average risk would increase as well as the price of insurance (Chiappori and Gollier, 2006; Marquis and Long 1995). However, our study shows that senior workers with a long-term tenure usually had a positive influence on the willingness of workers with a shorter tenure to enrol. By the same token, younger workers who had only a few senior co-workers were much less likely to follow suit.

The positive social interaction effect we observe may reflect an incentive among incumbent members to enrol younger workers with a lower likelihood of claiming benefits, to protect accumulated savings and avoid negative aging effects on net benefits in the future. Selecting young and desirable members may be seen as a kind of "cream-skimming". Such an interpretation finds support from qualitative evidence showing the interest among societies with aging members in recruiting younger ones (Lindeberg, 1949). Furthermore, the peer effect may reflect the fact that the societies bestowed the social power of respectability by enabling a kind of collective self-help independent of external control by employer or municipality.

In sum, our examination of individual-level factors does not support the idea that workers deferred membership until a higher age due to non-actuarial pricing schemes, as has been claimed in previous research. For the printing and the tobacco industry, our examination of group-level factors shows a positive relationship between membership rates among older workers and the enrolment of younger workers. This finding is consistent with qualitative evidence suggesting that older members could attract younger ones posing a more 'desirable' risk by offering them 'respectability' and social networks in addition to financial support. Overall, the three industries investigated here provide evidence of how Swedish mutual health insurance societies were able to overcome the problem of asymmetric information in the years before sickness insurance became integrated in welfare state provision.

## Acknowledgements

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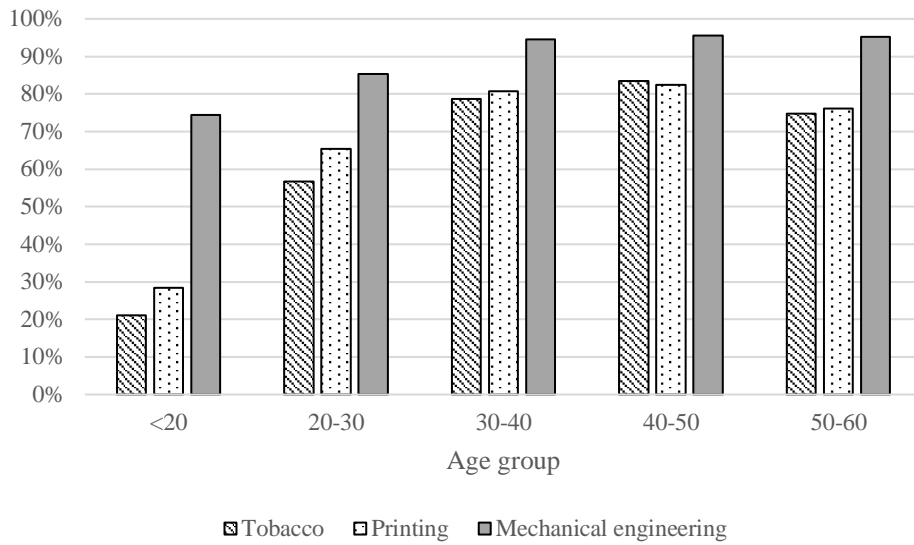
Appendix: Figures

*Figure 1. Average number of sick days by age among members of health insurance societies in the printing and mechanical engineering industries.*
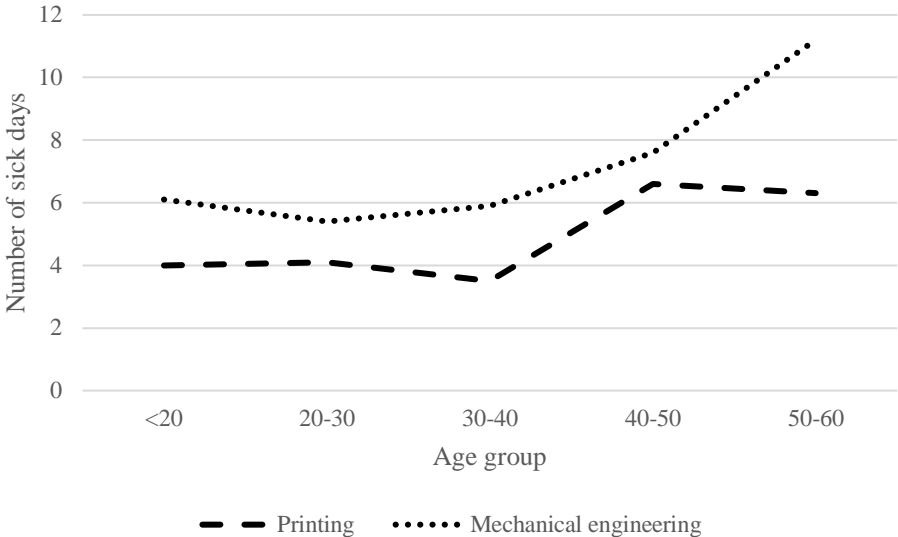


Source: Elmquist, 1901, p. 182; Elmquist, 1909, p. 239.

*Figure 2. Membership in health insurance society (per cent) by age in the tobacco, printing, and mechanical engineering industries.*



Source: See Table 1.

Appendix: Tables

*Table 1. Sample characteristics: proportions and means.*

| | Tobacco | Printing | Mechanical engineering |
|---|---|---|---|
| Member in health insurance society | 0.69 | 0.70 | 0.90 |
| Member in health insurance society at firm with compulsory membership | 0.11 | 0.07 | 0.52 |
| Age | 35.87 (11.88) | 31.24 (9.81) | 33.29 (11.68) |
| Married | 0.51 | 0.49 | 0.56 |
| Children at home | 0.47 | 0.39 | 0.49 |
| Working in birth location | 0.38 | 0.48 | 0.32 |
| Good self-rated health | 0.80 | 0.82 | 0.88 |
| Experience | 19.41 (12.06) | 15.91 (10.02) | 10.77 (9.95) |
| Tenure | 9.68 (10.30) | 8.31 (8.28) | 7.17 (8.43) |
| Union member | 0.55 | 0.87 | 0.43 |
| Member of temperance organization | 0.10 | 0.10 | 0.13 |
| Weekly income (kronor) | 15.24 (4.93) | 23.95 (8.24) | 15.39 (3.55) |
| Workplace size | | | |
| Small | 0.19 | 0.52 | 0.08 |
| Medium | 0.44 | 0.21 | 0.21 |
| Large | 0.37 | 0.28 | 0.70 |
| Workplace location | | | |
| Stockholm | 0.24 | 0.49 | 0.18 |
| Gothenburg | 0.15 | 0.10 | 0.14 |
| Malmoe | 0.22 | 0.04 | 0.08 |
| Other | 0.39 | 0.37 | 0.60 |
| | | | |
| N (workers) | 906 | 2,686 | 8,565 |
| N (firms) | 53 | 179 | 31 |

Note: Standard deviations in parentheses.
Source: Specialundersökningar Tobaksindustrien 1898, Statistiska avdelningen, HIII b:1 and HIII b:1 aa vol 1, Kommerskollegiums arkiv, National Archives (*Riksarkivet*), Stockholm; Undersökning av tryckerier m m 1903, Avdelningen för arbetsstatistik, HII a:1 vol 1-6 and HII a:2 vol 1-12, Kommerskollegiums arkiv, National Archives (*Riksarkivet*), Stockholm; Specialundersökningar Större egentliga mekaniska verkstäder 1899, Statistiska avdelningen, HIII c:1 cc vol 1-14, Kommerskollegiums arkiv, National Archives (*Riksarkivet*), Stockholm.

*Table 2. Sample characteristics: proportions and means for non-members and members.*

| | Tobacco | | Printing | | Mechanical engineering | |
|---|---|---|---|---|---|---|
| | Non-members | Members | Non-members | Members | Non-members | Members |
| Age | 30.58 (12.42) | 38.29 (10.81) | 27.95 (9.64) | 32.63 (9.55) | 26.84 (9.96) | 34.05 (11.64) |
| Married | 0.23 | 0.64 | 0.30 | 0.58 | 0.27 | 0.59 |
| Children at home | 0.21 | 0.58 | 0.24 | 0.45 | 0.22 | 0.52 |
| Working in birth location | 0.39 | 0.38 | 0.51 | 0.47 | 0.27 | 0.33 |
| Good self-rated health | 0.83 | 0.79 | 0.83 | 0.82 | 0.91 | 0.88 |
| Experience | 13.81 (12.97) | 21.97 (12.13) | 12.46 (9.63) | 17.37 (9.83) | 4.53 (6.95) | 11.50 (9.99) |
| Tenure | 5.94 (8.50) | 11.38 (10.60) | 5.34 (7.20) | 9.57 (8.39) | 1.88 (3.97) | 7.79 (8.60) |
| Union member | 0.43 | 0.60 | 0.80 | 0.89 | 0.26 | 0.45 |
| Member of temperance organization | 0.08 | 0.11 | 0.09 | 0.11 | 0.11 | 0.13 |
| Income | 13.31 (5.61) | 16.12 (4.31) | 20.18 (7.72) | 25.54 (7.92) | 12.68 (3.43) | 15.71 (3.42) |
| Workplace size | | | | | | |
| Small | 0.91 | 0.71 | 0.58 | 0.49 | 0.48 | 0.38 |
| Medium | 0.09 | 0.17 | 0.22 | 0.20 | 0.07 | 0.17 |
| Large | 0.04 | 0.12 | 0.20 | 0.31 | 0.45 | 0.45 |
| Workplace location | | | | | | |
| Stockholm | 0.19 | 0.26 | 0.49 | 0.48 | 0.15 | 0.19 |
| Gothenburg | 0.20 | 0.13 | 0.12 | 0.09 | 0.07 | 0.14 |
| Malmoe | 0.15 | 0.25 | 0.04 | 0.03 | 0.00 | 0.09 |
| Other location | 0.46 | 0.36 | 0.35 | 0.40 | 0.78 | 0.58 |
| | | | | | | |
| N (workers) | 284 | 622 | 798 | 1,888 | 898 | 7,667 |

Note: Standard deviations in parentheses. Workplace size is measured by total number of workers, the following definitions apply to the tobacco and printing industries: Small = 10-49, Medium = 59-99, Large >=100. For mechanical engineering, we use the following definitions: Small = 10-149, Medium = 150-299, Large >=300.
Source: See Table 1.

*Table 3a. Determinants of health insurance society membership in the tobacco industry 1898.*

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Age | | | | | | |
| <20 | -0.265*** | -0.201** | -0.240*** | -0.196** | -0.204** | -0.147* |
| 20-29 | ref | ref | ref | ref | ref | ref |
| 30-39 | 0.054 | 0.054 | 0.043 | 0.042 | 0.065 | 0.064 |
| 40-49 | 0.063 | 0.068 | 0.03 | 0.035 | 0.071 | 0.074 |
| 50-60 | 0.053 | 0.074 | 0.037 | 0.052 | 0.07 | 0.087 |
| Married | 0.158*** | 0.142** | 0.153** | 0.142** | 0.136** | 0.121** |
| Good self-rated health | 0.018 | 0.006 | -0.008 | -0.013 | 0.017 | 0.011 |
| Experience | 0.004 | 0.001 | 0.006 | 0.004 | 0.008 | 0.006 |
| Tenure | 0.019*** | 0.018*** | 0.018** | 0.017** | 0.016** | 0.017*** |
| Occupation | | | | | | |
| Cigar workers | ref | ref | ref | ref | ref | ref |
| Sorters | -0.058 | -0.085 | -0.023 | -0.047 | -0.055 | -0.083 |
| Preparation workers | -0.064 | -0.046 | -0.088 | -0.077 | -0.061 | -0.045 |
| Spinners | -0.066 | -0.056 | -0.067 | -0.058 | -0.062 | -0.052 |
| Snuff workers | -0.07 | -0.096 | -0.09 | -0.109 | -0.036 | -0.07 |
| Other workers | -0.116 | -0.142 | -0.165 | -0.178 | -0.141 | -0.148 |
| Income | | 0.036** | | 0.029* | | 0.032*** |
| Workplace size | | | | | | |
| Small | | | ref | ref | | |
| Medium | | | 0.063 | 0.052 | | |
| Large | | | 0.258*** | 0.248*** | | |
| Workplace location | | | | | | |
| Stockholm | | | 0.067 | 0.044 | | |
| Gothenburg | | | -0.002 | -0.021 | | |
| Malmoe | | | 0.068 | 0.056 | | |
| Other location | | | ref | ref | | |
| Firm-fixed effect | | | | | Yes | Yes |
| Constant | 0.345*** | 0.031 | 0.338** | 0.101 | 0.360*** | 0.062 |
| | | | | | | |
| N (workers | 906 | 906 | 906 | 906 | 906 | 906 |
| N (firms) | 53 | 53 | 53 | 53 | 53 | 53 |
| R-sq | 0.26 | 0.28 | 0.29 | 0.30 | | |
| R-sq within | | | | | 0.25 | 0.27 |
| R-sq between | | | | | 0.13 | 0.16 |
| R-sq overall | | | | | 0.26 | 0.27 |

Note: All models control for: dependent children at home; whether the individual had migrated (i.e., worked in birth location); the squared terms of experience and tenure, whether the individual was a union member or belonged to a temperance organization. Models 2, 4, 6 also control for the squared term of weekly income.
Standard errors clustered at factory level.
* p<0.05, ** p<0.01, *** p<0.001
Source: See Table 1.

*Table 3b. Determinants of health insurance society membership in the printing industry 1902/03.*

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Age | | | | | | |
| <20 | -0.206*** | -0.158*** | -0.207*** | -0.158*** | -0.193*** | -0.134** |
| 20-29 | ref | ref | ref | ref | ref | ref |
| 30-39 | 0.006 | 0.01 | 0.014 | 0.019 | 0.006 | 0.015 |
| 40-49 | -0.028 | -0.008 | -0.022 | 0.002 | -0.025 | 0.000 |
| 50-60 | -0.049 | -0.021 | -0.053 | -0.015 | -0.052 | -0.029 |
| Married | 0.133*** | 0.112*** | 0.141*** | 0.118*** | 0.114*** | 0.100*** |
| Good self-rated health | 0.024 | 0.016 | 0.024 | 0.014 | 0.025 | 0.015 |
| Experience | 0.004 | -0.001 | 0.003 | -0.002 | 0.007 | 0.000 |
| Tenure | 0.030*** | 0.028*** | 0.029*** | 0.026*** | 0.023*** | 0.020*** |
| Occupation | | | | | | |
| Compositors | ref | ref | ref | ref | ref | ref |
| Printers | -0.084** | -0.075** | -0.090** | -0.076** | -0.079** | -0.070** |
| Helpers | -0.105 | -0.076 | -0.117* | -0.079 | -0.142** | -0.108* |
| Bookbinders | 0.045 | 0.064 | 0.017 | 0.045 | -0.057 | -0.038 |
| Cardboard makers | 0.253*** | 0.287*** | 0.209*** | 0.247*** | 0.088 | 0.114 |
| Income | | 0.009** | | 0.009** | | 0.012*** |
| Workplace size | | | | | | |
| Small | | | ref | ref | | |
| Medium | | | 0.166** | 0.178*** | | |
| Large | | | 0.148** | 0.147*** | | |
| Workplace location | | | | | | |
| Stockholm | | | -0.011 | -0.039 | | |
| Gothenburg | | | -0.04 | -0.079 | | |
| Malmoe | | | -0.067 | -0.109 | | |
| Other location | | | ref | ref | | |
| Firm-fixed effect | | | | | Yes | Yes |
| Constant | 0.297*** | 0.175* | 0.286*** | 0.177* | 0.342*** | 0.185* |
| | | | | | | |
| N (workers | 2,686 | 2,686 | 2,686 | 2,686 | 2,686 | 2,686 |
| N (firms) | 179 | 179 | 179 | 179 | 179 | 179 |
| R-sq | 0.18 | 0.19 | 0.19 | 0.20 | | |
| R-sq within | | | | | 0.15 | 0.16 |
| R-sq between | | | | | 0.17 | 0.15 |
| R-sq overall | | | | | 0.16 | 0.17 |

Note: See Table 4a. Source: See Table 1.

***Table 3c. Determinants of health insurance society membership in mechanical engineering 1899.***

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Age | | | | | | |
| <20 | -0.066** | 0.001 | -0.066** | -0.009 | -0.057* | -0.009 |
| 20-29 | ref | ref | ref | ref | ref | ref |
| 30-39 | 0.005 | -0.001 | 0.003 | -0.001 | 0 | -0.003 |
| 40-49 | -0.022 | -0.019 | -0.039 | -0.031 | -0.033* | -0.026 |
| 50-60 | -0.028 | -0.018 | -0.058* | -0.043 | -0.065** | -0.053* |
| Married | 0.038** | 0.030* | 0.044*** | 0.035** | 0.041*** | 0.033** |
| Good self-rated health | 0.008 | 0.003 | 0.002 | 0.000 | 0.001 | -0.001 |
| Experience | 0.006 | 0.001 | 0.004 | 0.001 | 0.006* | 0.003 |
| Tenure | 0.014*** | 0.015*** | 0.017*** | 0.017*** | 0.015** | 0.015** |
| Occupation | | | | | | |
| Cabinet makers | 0.066** | 0.031 | 0.068** | 0.043 | 0.029 | 0.013 |
| Moulders | 0.036 | 0.023 | 0.058* | 0.049 | 0.021 | 0.019 |
| Machine workers | 0.024 | 0.008 | 0.042* | 0.028 | 0.008 | 0.002 |
| Machinists | 0.054 | 0.034 | 0.069* | 0.054* | 0.034* | 0.026 |
| Painters | -0.013 | -0.045 | -0.005 | -0.03 | -0.067* | -0.078* |
| Sheet metal workers | ref | ref | ref | ref | ref | ref |
| Blacksmiths | -0.001 | -0.006 | 0.01 | 0.005 | -0.007 | -0.009 |
| Woodworkers | 0.022 | -0.006 | 0.006 | -0.018 | -0.005 | -0.026 |
| Other workers | 0.013 | 0.02 | 0.036 | 0.036 | -0.01 | -0.005 |
| Income | | 0.093* | | 0.079* | | 0.068* |
| Workplace size | | | | | | |
| Small | | | | | | |
| Medium | | | 0.099* | 0.084* | | |
| Large | | | -0.038 | -0.013 | | |
| Workplace location | | | | | | |
| Stockholm | | | 0.016 | -0.003 | | |
| Gothenburg | | | 0.142* | 0.116* | | |
| Malmoe | | | 0.147** | 0.112** | | |
| Other location | | | | | | |
| Firm-fixed effect | | | | | Yes | Yes |
| Constant | 0.716*** | -0.047 | 0.684*** | 0.035 | 0.742*** | 0.180 |
| | | | | | | |
| N (workers | 8,565 | 8,565 | 8,565 | 8,565 | 8,565 | 8,565 |
| N (firms) | 31 | 31 | 31 | 31 | 31 | 31 |
| R-sq | 0.11 | 0.14 | 0.14 | 0.16 | | |
| R-sq within | | | | | 0.12 | 0.13 |
| R-sq between | | | | | 0.01 | 0.06 |
| R-sq overall | | | | | 0.10 | 0.13 |

Note: See Table 4a.Source: See Table 1.

*Table 4. Determinants of health insurance society membership in mechanical engineering, comparing samples with and without firms with compulsory membership.*

|  | All firms | Firms with voluntary membership |
|---|---|---|
| Age |  |  |
| <20 | -0.009 | -0.051 |
| 20-29 | ref | ref |
| 30-39 | -0.003 | -0.019 |
| 40-49 | -0.026 | -0.043* |
| 50-60 | -0.053* | -0.069* |
| Married | 0.033** | 0.059** |
| Experience | 0.003 | 0.001 |
| Tenure | 0.015** | 0.021** |
| Occupation |  |  |
| Cabinet makers | 0.013 | 0.018 |
| Moulders | 0.019 | 0.007 |
| Machine workers | 0.002 | -0.03 |
| Machinists | 0.026 | 0.017 |
| Painters | -0.078* | -0.06 |
| Sheet metal workers | ref | ref |
| Blacksmiths | -0.009 | -0.045 |
| Woodworkers | -0.026 | -0.031 |
| Other workers | -0.005 | -0.036 |
| Income | 0.068* | 0.022 |
| Firm-fixed effect | Yes | Yes |
| Constant | 0.180 | 0.534 |
|  |  |  |
| N (workers | 8,565 | 4,147 |
| N (firms) | 31 | 16 |
| R-sq |  |  |
| R-sq within | 0.13 | 0.14 |
| R-sq between | 0.06 | 0.00 |
| R-sq overall | 0.13 | 0.11 |

Note: See Table 4a. Source: See Table 1.

*Table 5. The role of social interaction at the workplace. The impact of number of senior co-workers (aged 40 and older) who were members of a health insurance society on membership among workers under 40.*

| | Mean (N) | Coefficient members 40 years and older | N (workers) | N (firms) | Effect of +/- one standard deviation change |
|---|---|---|---|---|---|
| Tobacco | 10.78 (12.01) | 0.007*** | 534 | 51 | 8% |
| Printing | 8.19 (12.08) | 0.005*** | 2,136 | 179 | 6% |
| Mechanical engineering | 128.00 (84.67) | 0.000 | 5,965 | 31 | 3% |
| - only firms with voluntary membership | 131.39 (88.70) | 0.000 | 2,829 | 16 | 5% |

Note: Standard deviations in parentheses. The results presented in this table are based on samples restricted to male workers younger than 40 years. The variable 'members 40 years and older' is defined as the number of male workers in the firm who were older than 40 and members of a health insurance society. The coefficient presented is based on Model 4 in Table 3.
* $p<0.05$, ** $p<0.01$, *** $p<0.001$
Source: See Table 1.

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