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Data, source and methods

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Industrial wages in mid-1880s Sweden: estimations beyond Bagge's *Wages in Sweden*. Data, source and methods*

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Abstract: Most researchers interested in Swedish wages during early industrialization have used the seminal work Wages in Sweden from the 1930s as their point of departure. Whereas the material in Wages in Sweden solidly tracks the movements of wages, it is not suitable for comparisons across industries or counties at a specific point in time. Nor should *Wages in Sweden* be used to estimate wages in absolute levels. Based on hitherto-unused source material from a large, nationwide public inquiry, we estimate industrial wages in the mid-1880s. The population consists of industrial workers with different experience, skills and firm attachment. Our estimations include a national wage as well as inter-industry and inter-regional wages in both absolute and relative terms, weighted by employment. The findings call for a substantial revision of relative wages across industries. They also indicate that the wage dispersion across industries and counties was lower than previously thought. We estimate the national wage for women as being half the size of that of men.

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1. Introduction

In the historiography of economic history, wages are crucial in discussions about living standards, GDP, industrialization patterns and regional development (Scholliers 1989; Enflo et al. 2014; Collin 2016). One prominent example of the relevance of real wages in economic history research is the debate on the evolution of the standard of living of the British working class during the Industrial Revolution. Wages have also traditionally been employed in studies of income distribution and of the relationship between unemployment and wages. Furthermore, issues of convergence and divergence across geographical and political lines, as well as across industrial sectors and different categories of workers, have commonly been addressed using wage data.

We present wages for men – in absolute and relative terms – according to county and industrial branch in mid-1880s Sweden. Additionally, we calculate a national wage for women as well as for the underaged. Our estimations are based on hitherto-unused source material, the original returns from a large public inquiry by the *Commission of Workmen's Compensation and Insurance against Industrial Accidents*, Arbetareförsäkringskomitén (1888a) – henceforth referred to as the Commission or AFK.[1]

The Commission sent out a questionnaire containing questions regarding work-related accidents to more than 15,000 firms. The response rate was 82 per cent. The returned questionnaires give, inter alia, information on the wages of individual workers. Our wage estimations are based on more than 2,000 workers, with a spread in individual characteristics reflecting the real labour market conditions.

There is a scarcity of knowledge on industrial wages during early industrialization in Sweden. The main source is *Wages in Sweden 1860–1930* by the prominent economists Gösta Bagge, Erik Lundberg and Ingvar Svennilson (Bagge et al. 1933, 1935). Bagge et al. made an excellent job of tracking the *movements* of wages. The wage material in *Wages in Sweden* is, however, suitable for estimating neither absolute wage levels nor relative wages across industries or regions at specific times. The basic problem is that Bagge et al. were interested in the typical, not the average (a feature that will be discussed below). In contrast, the broad coverage of our wage material makes it appropriate for making precisely these estimations.

Our work aligns well with the growing interest among economic historians over the last decade in wages during early industrialization (Prado 2008, 2010a, 2010b; Collin 2016; Ericsson and Molinder 2017; Collin and Hamark 2017). The increasing attention is well founded. The debate on convergence/divergence across industries and regions rests on accurate estimates of

[1] The English translation of *Arbetareförsäkringskomitén* is from Bagge et al. (1933, p.5).

relative wages. In addition, whereas the rate of change in living standards across countries is certainly of interest, the international debate is mostly – and for good reasons – concerned with comparisons in absolute terms (see e.g. Williamson 1995). Then, of course, we need wages in absolute terms.

Our findings call for a substantial revision of relative wages across industries. They also indicate that the wage dispersion across industries and counties was lower than previously thought. We estimate the national wage for women as being half the size of that of men. The underaged earned about 50 per cent of the wages of adults.

After a discussion about the earlier empirical research, we delve into the material and the methods used. Finally, we present the results. With the intention of giving the reader a somewhat easier journey, we make ample use of appendices.

2. Earlier empirical research on Swedish wages during early industrialization

Agricultural wages, based on market price sales, are available from the eighteenth century, and the Swedish official statistics contain agricultural wages from the second half of the nineteenth century. Information regarding industrial wages for the nineteenth century is quite another matter. The source material is scarce, in comparison with wages in both Sweden in the twentieth-century and countries like Norway, the UK and the US in the nineteenth century (Prado 2010b, pp.482–483).

Official industrial wages were first published in 1919. The authorities made information on wages available retrospectively back to 1913 but omitted 1914 and 1915 because of a lack of data (Sveriges officiella statistic, SOS, 1919). From 1921 onwards, the official wage statistics are considered to be reliable (Prado 2010b, pp.488–489).

Instead, scholars who are interested in the long-term development of industrial wages during early industrialization have – up until very recently – relied on the large-scale and highly ambitious project *Wages in Sweden*.[2]

2.1. The standard work: Wages in Sweden

Wages in Sweden is the single most important contribution to our knowledge about industrial wages prior to the First World War. Therefore, we address this work in detail. The wage series that Bagge et al. constructed for 1860–1913 rely on payroll records from 160 firms. From each firm, typical (or representative) workers in typical (or representative) occupations were chosen. The criteria for choosing particular workers included variation in age and employment exceeding

[2] All further references to *Wages in Sweden* in this paper regard its treatment of manufacturing, including mining, in Bagge et al. (1933). The project also investigated government, municipal service, agriculture and forestry work; see Bagge et al. (1935).

eleven months. Further, workers were substituted after a limited amount of years (5–10) to avoid letting age influence the movement of wages (Bagge et al. 1933, pp.27–30). The selection of occupations was based on an effort to capture both skilled and unskilled workers as well as to collect information on the same or similar occupations across firms within a given industry or industrial branch (Bagge et al. 1933, p.26). After computing the average occupational wages at the level of firms, the authors combined and weighted the averages to create industry-specific time series (Bagge et al. 1933, pp.37–45).

The method used by Bagge et al. is called kinetic (from the Greek work *kineticos,* meaning "of motion"), since it captures the *movements* of wages better than the actual *levels* of all workers in a given industry. They explained that they were

> studying not the wages themselves, but their rates of change; i.e. [the aim was] to "study the proportionate changes of wages period by period, whenever we can obtain a sequence of figures, and combine the figures which indicate these rates of change independently of the actual rate of wages at any time or place".(Bagge et al. 1933, p.11, quoting Bowley 1900, p.3)

In accordance with this statement, the authors continued:

> … by such a "kinetic" method comparisons between wages in different industries or in different geographical areas at any specific time will as a rule give very uncertain results. (Bagge et al. 1993, p.20)

In short, the series presented in *Wages in Sweden* track the movements of wages over time, but they do not produce accurate estimations of absolute wage levels or comparisons across industries or regions at any specific time. Let us probe into why this is the case.

First, the wage series in Bagge et al. refer to permanently employed workers; casual workers were left out of the series. The problem is that permanently employed workers "represented an insignificant minority" in the labour market (Gustafsson 1996, p.225). In addition, as pointed out by Gårdlund (1942, pp.356–357), skilled workers are overrepresented. *Wages in Sweden* thus overstates the absolute level of wages, at least if we are to say something about workers in general and not only about the skilled and permanently employed.

Furthermore, the bias is not equal across industrial branches, which obstructs comparisons. In metal and engineering, "unskilled workers are … poorly represented", and the same appears to be true for chemicals (Bagge et al. 1933, pp.115, 555). Food and beverages, on the other hand, seem to be much more diversified with regard to the level of skills (Bagge et al. 1933, pp.194–195, 503).

In a sense, Bagge et al. addressed the issue of selection bias. To check validity, they undertook cross-sectional studies for three benchmark years. The studies embraced *all* workers in the selected occupations at certain firms (how many firms is not apparent). The wages of their typical, picked-out workers were *on average* about 5 per cent higher than the wages of all workers (Bagge et al. 1933, pp.30–32). The direction (plus) makes perfect sense, given that the typical workers included in *Wages in Sweden* were not hired temporarily and therefore, on average, were more experienced. Nevertheless, the average difference tells us nothing about the dispersion across firms or industries. Given that the share of casual workers varied across firms and industries, there is every reason to suspect that the wage differences between "typicals" and all workers also varied.

Further, it is worth noting that, even given an equal distribution of casual work across industries, and assuming that we ignore other problems connected to the kinetic method, deducting 5 per cent from the wage series of Bagge et al. does *not* give unbiased estimates of absolute wages at the branch level (and Bagge et al. themselves made no such claim). Given these restrictive assumptions, we would only produce unbiased measures for the *selected occupations* within an industrial branch – not for the branch itself. Again, Bagge et al. were interested in the typical, not the average (Bagge et al. 1933, p.20).

Wages in Sweden is based on source material from larger companies only (Bagge et al. 1933, pp.8, 24). Given the aim of the project, it makes perfect sense. Larger companies survive for a longer period of time than smaller ones, and larger companies more often keep records. However, if the interest lies in levels and not in movements, then the exclusion of smaller companies is disturbing. There is a positive correlation between the wages and the number of employees at the firm level, and omitting smaller companies will bias wages upwards (Brown and Medoff 1989; see also Gustafsson 1965, pp.118–120, for the Swedish saw milling industry in a time period close to ours, and, for a recent theoretical explanation of the phenomenon, consult Weil 2014).

Bagge et al. offered detailed accounts of the quality of wages, not only at the aggregate but also at the firm level. There was variation at the firm level, but in general the quality was assessed as good. Nevertheless, there were problems. For two main industrial branches[3] – the leather, hair and rubber industry and the stone, clay and glass industry – no weighted wage series were presented, since the underlying sources were judged to be too unreliable.

Regarding the aggregate wage series for mining, it was stated in *Wages in Sweden* that "the material is extremely scanty" and that "the wage data collected […] is very incomplete" and hence

[3] According to the IS classification; see below.

"the averages […] are very unreliable" (Bagge et al. 1933, p.108). The greatest respect is due for such critical evaluations of one's own material, yet it only highlights the problem of using *Wages in Sweden* for cross-sectional comparisons or estimations of absolute wage levels.

The weighting method applied in *Wages in Sweden* is a mix of the quality of the series and various quantitative aspects, including firm size (Bagge et al. 1933, p.37). Gustafsson (1965, pp.125, 140–142) reviewed the method and concluded that it "to a certain, but unfortunately unknown, extent must have rested on completely subjective considerations" (Gustafsson 1965, p.141; our translation).

Benefits in kind were a non-negligible part of labour income by the end of the nineteenth century. Benefits consisted, among other things, of free potato land and medicine, pensions, subsidized food and, most importantly, free housing. Bagge et al. discussed the matter at length and ultimately decided, in general, not to include benefits. The major exception was iron works, for which free housing was included (Bagge et al. 1933, pp.33–37, 85–90). *Wages in Sweden* revealed, however, that free housing and other benefits were also common in the textile and paper mill industries, although it is far from easy to discern whether these were included in the earnings or not. Prado did not exaggerate when he stated that the authors "approached [the matter of benefits in kind] ambiguously" (Prado 2010b, p.485).

Again, from a kinetic point of view, the ambiguous inclusion of benefits in kind does not disturb the results. However, from a cross-sectional perspective, the situation appears different (cf. Bagge et al. 1933, p.20). On the one hand, the inclusion of free housing in the iron works certainly made these estimations better as a measure of living standards. On the other hand, since free housing and other benefits were generally not included in other industries, comparisons across industries became biased.

Another limitation is that *Wages in Sweden* was almost exclusively concerned with male wages. There are a few female wage series in textiles and food products – "the branches of industry in which women are employed to any great extent" (Bagge et al. 1933, p.59), but, when the authors presented aggregated series on industrial branches, women were left out entirely (Bagge et al. 1933, p.59 and Tables 1, 2 and 5).

Finally, the number of workers included in each series – typical workers in typical occupations – differed, but "four workers may be regarded as the most usual number" (Bagge et al. 1933, p.28). The number of series themselves differed widely across industries and branches of industries. In the mid-1880s, there were around 60 "active" series in iron works; hence, the estimation of the average wage level in iron works was based on about 240 observations. However, most of the branch averages were based on far fewer observations, 4 of them in the

span 8–15 (see Appendix B for a quantitative comparison between our material and that of *Wages in Sweden*).

2.2. Post-Bagge research based on Bagge

A few wage studies on specific branches or firms during the industrial breakthrough have not taken *Wages in Sweden* as their point of departure (e.g. Gustafsson 1965; Johansson 1988). However, research on the broader picture – such as cross-industry, cross-region and cross-country wage differences – has depended heavily on Bagge et al. At the same time, most Swedish scholars engaged with *Wages in Sweden* have supplemented, rearranged and developed its wage series.

To study labour market integration, Lundh et al. (2004) created industrial wages for nine regions in 1861–1913. The wage series were mainly based on the material in Bagge et al., and the authors noted that "surprisingly, no attempt is made in *Wages in Sweden* to construct regional series of average wages" (Lundh et al. 2004, p.46). However, considering what Bagge et al. had to say about the validity of such constructions, their non-attempt should come as no surprise. Nonetheless, the work of Lundh et al. was a step forward: until then, studies on regional pre-WW1 wages had focused exclusively on agriculture (Collin 2016, p.14).

International comparative studies including Sweden unambiguously leaned against Bagge et al.; renowned examples are those by Phelps Brown (1968) and Mitchell (1975).[4] Zamagni (1989) discussed methodological issues with regard to wage comparisons across countries. He also presented a few results, such as a comparison of absolute industrial wages in 1905, for seven countries, including Sweden (Zamagni 1989, pp.118–119, which in fact was an extended version of what Phelps Brown 1968, p.46 had already presented). Interestingly enough, he did not comment on the methodological difficulties connected with the use of *Wages in Sweden* for such a purpose. Williamson (1995) discussed wage convergence since 1830 across seventeen countries. Sweden was included in the sample, and Williamson used series from Bagge et al. to create wages for unskilled Swedish workers. Prado (2010a) argued that Williamson – by choosing certain wage series and not others – had grossly overestimated the rate at which Sweden's real wages approached those in the US and Britain. Prado recalculated the Sweden/US and Sweden/UK wage ratios for 1860–1913, using different wages series from Bagge et al. from Williamson. In addition, Prado made use of better employment weights than Bagge et al. did, thereby improving their estimations.

[4] Mitchell is an exception among the scholars discussed here. He used Bagge et al.'s work solely for comparisons in relative terms.

Björklund and Stenlund (1995) established wage series for manufacturing workers in six branches for 1870–1950. For the pre-WWI period, they used, without further elaboration, wage series from Bagge et al. (1933). Prado (2010b) presented relative wages across industries over time, starting in 1860 and ending in modern times. Again, he leaned against Bagge et al., albeit with the upgraded weighting scheme and additional improvements in a few other respects.

Each of the studies above contributed to our accumulated knowledge. Still, since they all depended on the wage material in *Wages in Sweden*, they shared a common limitation. Given the tasks that the studies set out to solve, there is a risk that they, again in the words of Bagge et al., "as a rule give very uncertain results".

2.3. The latest approach: new sources

In the most recent years, scholars have been circumventing *Wages in Sweden* all together. Based on previously unused archival material, Collin (2016) established relative wages across industries (1860–1879) and regions (1860–2009). Ongoing projects that have also used new wage sources are those by Ericsson and Molinder (2017), who inspected the wages of construction workers to study regional wage divergence/convergence in the closing decades of the nineteenth century, and Collin and Hamark (2017), who used the wages in this paper to analyse compensating wage differentials prior to unionization and extensive labour law regulations. Furthermore, a project on income inequality based on wages – stretching back in time to 1862 – received funding in spring 2018,[5] and one of the present authors is currently seeking funds for employing wage material from the Social Board for the years 1910–1912. Mirroring the increasing attention from scholars, the last two national economic history meetings in Sweden (Umeå 2015 and Stockholm 2017) have held special sessions on historical wages.

Of all this recent research, the work of Collin (2016) aligns closest with the present paper. Based on wage material from a survey by the Tariff Commission (*Tullkommisionen*) in 1880, Collin's results for the years 1860–1879 indicate that research based on *Wages in Sweden* has made too high estimates of the wage spread across branches (cf. Björklund and Stenlund 1995; Prado 2010b). The small sample of wage observations in Bagge et al. has inevitably led to overestimation of the dispersion (Collin 2016, p.165). Collin's material includes workers with various degrees of training/education and with different employment relationships. In contrast, as discussed above, the series in Bagge et al. suffer from skill bias across branches, which probably inflates the measured dispersion.

[5] "The Swedish transition to equality: income inequality with new micro data, 1862–1970", funded by Jan Wallanders och Tom Hedelius stiftelse samt Tore Browaldhs stiftelse. PI: Erik Bengtsson, Lund University.

County-level wages do not appear in the official statistics until the early 1930s. To shed new light on regional industrialization patterns, Collin (2016) also estimated wages at the county level. While the period – 1860 onwards – coincides with that of Lundh et al. (2004), the sources (the Tariff Commission instead of Bagge et al.) and the analytical units (twenty-five counties instead of nine regions) do not. While the two studies are not directly comparable, they show relatively rapid county/regional wage convergence between 1860 and 1910.

How reliable is the Tariff Commission as a source? Its wage material was built on an 1880 survey in which companies were asked to report information not only regarding 1879 but also retrospectively, two decades back in time. Retrospection always induces uncertainty.

The response rate was low, 18.5 per cent – a disturbing fact towards which the Commission, however, showed a carefree attitude. The lack of proper statistics prohibited most attempts to assess the representativeness of the firms answering the survey. Nonetheless, Collin was able to show that the number of workers in the Commission's material corresponded to 19.8 per cent of total manufacturing employment, close enough to the response rate (Collin 2016, pp.198–200). Still, while such an aggregate may indicate representativeness, only a stable relationship between the response rate and the employment share *across branches* would offer clear support.

Collin's estimations after 1879 are less stable. Between 1879 and 1931, there are no annual wage data; in this interval, Collin's time series rests on extrapolation from only two points in time, 1910–1912 and 1922 (the insecurity is further enhanced by the fact that the wages in 1910–1912 are based solely on the mechanical engineering industry). For this period in particular, we need research based on new sources.

3. Material: the AFK inquiry

In October 1884, the AFK was assigned to investigate the extent of work-related accidents (Arbetareförsäkringskomitén 1888a). In addition, it was requested to propose measures against hazardous working conditions. At the time, few studies of work-related accidents had been conducted. One exception is a German inquiry from 1881, which the AFK used as a source of inspiration.

The AFK's inquiry covers a full year, from 1 September 1884 to 31 August 1885. To facilitate the administration of the original returns and to address the fact that certain industries were seasonally based, the investigation period was split into two sub-periods of equal length.

The inquiry covered a large part of the labour market, including manufacturing and handcrafts, agriculture and ancillaries, mining, shipping and transportation as well as public administration. The survey contained questions regarding the date of the accident and the workers' occupation, sex, year of birth and daily wages. Employers were asked to describe the

course of the accident as well as its consequence – fatal or not, duration of absence (if any) and whether the worker became permanently incapable (fully or partially). Employers were also asked to report the number of employees for every month, separated by sex and by the underaged (boys and girls). All employers reported figures concerning employment (i.e. among those answering; with the exception of a few cases in which the returns were left blank). Importantly, though, only employers who had experienced accidents at their firm reported data on individuals. Since this introduced a possible bias into the estimation of wages, we will address it thoroughly later.

To track firms in the most comprehensive way, the AFK used the records of the National Board of Trades (*Kommerskollegium*), verified and supplemented by various minor sources, such as records of the sawmill owners' association (Arbetareförsäkringskomitén 1888a, pp.1–2, 8). The National Board of Trades was responsible for the collection and production of industrial statistics, which in principle should include industrial enterprises but not handicraft enterprises – although, as pointed out by Jörberg (1961, p.372), the distinction between them was anything but clear-cut. (This has importance for the choice of employment weights for the aggregation of wages, which will be discussed later.) It is perhaps needless to say that some industrial firms must have evaded the attention of the AFK. It is safe to assume, however, that *very* few larger firms escaped the bureaucrats' consideration.

In January 1885, the survey was sent to 15,089 firms (*rörelser).* Forms regarding both periods were sent together. The average return rate for both half-year periods was 82 per cent. While the two periods showed the same response pattern, different industrial branches did not (Arbetareförsäkringskomitén 1888a, pp.8–9). First, there was difference between the three main sectors: A. Raw materials, processing and manufacturing, 83 per cent; B. Sea and land transportation, 79 per cent; and C. Public administration (state and municipal), 100 per cent. Second, the variation was even larger within sectors. For instance, within sector A, the highest response rate was 96 per cent (sawmilling) and the lowest was 55 per cent (clothing).

The published report contains many summary tables but no data on individuals. Since we want to utilize individual data, we use the original returns. We delimit our project to sector A and the industrial branches, excluding agriculture.

With respect to the structuring of the returns, the AFK noted that no adequate industrial classification existed in Sweden (Arbetareförsäkringskomitén 1888a, p.11). Instead, the AFK followed the German classification used in the 1881 inquiry into work-related accidents and in the 1875 occupational census. The classification had workplaces and not occupations as its base. This means, for instance, that all the workers employed by an engineering company were

classified as belonging to the machine industry, regardless of the fact that the working staff ranged from boilermen and carpenters over machine operators to sheet metal workers and filers. While mainly following the German system, the AFK made a few deviations. The German statistics lumped together the paper industry and the leather industry, while the AFK distinguished between them. Because of the importance of sawmills for Sweden, the AFK separated sawmills from wood industries.

Let us briefly consider the pros and cons of the AFK inquiry for the purpose of wage estimation, especially in relation to Bagge et al.

- Many industrial branches

The richness and extent of the AFK inquiry give us the opportunity to estimate wages for a somewhat broader spectrum of industrial branches than research based on *Wages in Sweden*.

- Large number of observations

In relation to *Wages in Sweden*, the AFK material offers a substantially larger number of wage observations for the mid-1880s (see Appendix B). The comparison is not entirely fair (since Bagge et al. dealt with such a long period of time) but is relevant nonetheless, as *Wages in Sweden* has been used repeatedly to produce the kind of estimates that we present here.

- Few female wages

The material contains fewer than 50 female wages. The number of observations regarding adult women is even smaller, 36. To a certain extent, this can be explained by the fact that fewer women worked in high-risk industries (the inquiry captured *accidents* and not, for instance, repetitive strain injuries). In addition, we believe that there was systematic underreporting of women being involved in accidents. The few observations on women mean that female wages can only be measured at relatively high levels of aggregation.

- All workers regardless of experience, skills or firm attachment

As noted, *Wages in Sweden* excluded casual workers. The AFK material, on the other hand, included apprentices, day labourers, helpers and others. The inclusion of these groups brings down the average wage level(s) and produces more accurate estimations of the general state of affairs in the labour market.

- Firm size and firm employment

The AFK material included both small and large firms.[6] This is an advantage, since firm size and wages tend to correlate. In addition, we can use employment at the firm level to weight wages.

[6] In the Swedish official statistics, a small firm employs fewer than ten people.

- County-level wages

Wages at the county level do not appear in the official statistics until 1931. For earlier times, the only attempt to estimate county-level wages is that by Collin (2016). As argued above, however, his estimation for the years 1879–1931 was delimited by uncertainty. Here we add to our much-limited knowledge about county-level wages.

- Wage data only from people involved in accidents

A principal weakness of our wage material is that it contains individual information only on people who were involved in accidents. To make inferences for the industrial labour market in general, we must assume that there are no systematic differences between the people who were involved in accidents and those who were not. In other words, after controlling for other factors, there should be no systematic wage difference between injured and non-injured people.

One could – and neoclassical economists often do – hypothesize that people have different attitudes towards risk, that some are reckless at work whereas other are not and so on. By further assuming that, on the individual level, recklessness (and hence the risk of being injured) correlates negatively with productivity, the AFK material would inevitable produce downwardly biased wages. Even though it is far from clear that a "reckless" person would also have low productivity – one could easily imagine the opposite: that she or he performs better – it would be comforting to compare the AFK wages with other wage sources, also covering the non-injured. We deal with this issue empirically in Appendix D.

4. Methods

The first step is the labelling of firms according to previous classifications (see section 4.1). The labelling is based on the firm name. In the majority of cases, the firm name reveals which industry the firm was operating in, but, in a few hundred cases, we are forced to use online resources to establish the correct industrial affiliation.

We include only male adults (minimum 18 years of age) in the main bulk of our analysis. However, we also estimate a national wage for women as well as for the underaged.

4.1. Classification

We classify the wages of individuals according to two previous industrial classifications. The first is the one used by the AFK, inspired by the earlier German classification. Second, we follow the Swedish official statistics expressed in the Industrial Statistics (IS). The IS was first published in 1919, although it presented wages retrospectively from 1913 onwards.

The reasons for using both classifications are as follows. Researchers who want to compare 1880s wages with those in the twentieth century have the main benefit of the IS arrangement.

Those who are interested in the early industrialization period in its own right may prefer the AFK classification, not least considering the fact that some of the industries, such as building, were included in the AFK but omitted from the IS.

There are several differences between the AFK and the IS. The most notable is that the main industrial branch, no. 1, in the IS basically includes four of the main industrial branches in the AFK. For detailed descriptions of the main branches and sub-branches according to the two classifications, as well as a comparison between them, see Appendix A. We build most of our estimations on the IS classification, but see Table 7 for male wages by industrial branch according to the classification of the AFK.

4.2. Daily and hourly wages

The AFK presented daily wages. The reason is straightforward: wages were often paid by the day. There are estimations of the length of the working day in the 1880s (Arbetareförsäkringskomitén 1888b; Kommerskollegium 1911). In several cases, we could, probably with reasonable accuracy, transform daily wages into hourly wages, yet, since there are also a number of cases in which we could not, we choose not to present hourly wages, as this would only induce further uncertainty.

Nonetheless, we make one exception. For the benefit of comparison with Bagge et al., we estimate a national hourly wage level for men (see Table 13. In fact, we offer two estimations; see section 4.5.2.1 below). Two different methods are used, both based on the AFK (Arbetareförsäkringskomitén 1888b).

First, we divide our national daily wage by 11.1, which, according to the Committee, was the employment-weighted average number of working hours per day (Arbetareförsäkringskomitén 1888b, pp.3–4, 42–44). All branches and sub-branches are thus assumed to have working days of 11.1 hours. An additional caveat is that mining was excluded from the Committee's average.

Second, we use the information on the length of the working day at the sub-branch level, subsequently aggregating to higher levels using employment weights. Where there are no data on the sub-branch level, we use the branch average. The sub-branches connected to mining constitute a special problem. The AFK left out mining because of too few observations and questionable quality. Nevertheless, it came to the conclusion (well founded, as it seems) that the working day was shorter in mining, but it refrained from making a guess about the magnitude (Arbetareförsäkringskomitén 1888b, pp.10–11). We make the assumption that the working day was a full hour shorter than the industrial average, that is, 10.1 hours per day. The arguments put forward by the AFK indicate that our assumption is not far off the mark.

In Table 13, we transform daily wages into hourly wages following the second method, but the two methods produce very similar results. (By coincidence, the methods yield the same 3-digit hourly wage, 0.189 SEK, for our default option.[7])

4.3. The treatment of outliers

On a few occasions, we excluded individuals from our database, despite the fact that their wages were recorded. In a couple of cases because the individuals performed penitentiary work, but more commonly based on our judgement of what constitutes a reasonable wage in comparison with others in the same branch or in the same occupation. For instance, a person earning 6.60 SEK a day was excluded, since the wage grossly deviated from the average within the particular occupation. In such cases, we assumed that typing errors had occurred. With some 2000 individuals, the exclusions have no impact at the highest aggregated level, but, within branches with relatively few observations, they definitely can.

4.4. Age differences between the AFK inquiry and the labour market

Again, the wage material from the AFK inquiry was not randomly drawn from the industrial labour market. It contained people involved in accidents. As indicated in the literature on work-related accidents, younger people tend to be injured more often than older people. We also know that age, up to a certain point, is positively correlated with wages. In our material, it can be shown as in Table 1.

Table 1 Wage by age group, AFK classification. Daily wages 1884/1885. Men*

Age group (years)	Wage (SEK)	Number of individuals
18-24	1.87	481
25-74	2.28	1474

* Excluding individuals for whom age is missing.

The older group earns 22 per cent more than the younger group. To avoid underestimating wages, we need to investigate whether our material includes a disproportionally large share of younger individuals – and if so to correct for it. It turns out, however, that the difference between the AFK and the labour market (as measured) is small. Therefore – and because of the methodological difficulties associated with the procedure for correcting for age – we generally

[7] Assuming instead, for instance, 10.6 and 9.6 hours per day in mining would give a national hourly wage of 0.188 SEK and 0.190 SEK, respectively.

choose not to standardize wages by age. We discuss the issue at length in Appendix E, in which we also present wages by the main branches standardized by age.

4.5. Procedures for aggregating

When calculating a national variable from various branches of the economy, it is standard procedure to take into account the variation in branch size. Branches in their turn are comprised of sub-branches, which are constituted by firms. In each step, we need to attach weights. Since we are dealing with wages, the most natural candidate to use as weight is employment.

In the first five sub-sections, we deal exclusively with men. Women and underaged boys are discussed at the end.

4.5.1. FROM FIRMS TO INDUSTRIAL SUB-BRANCHES

There are three principal ways to establish industrial sub-branch mean wages.

1) The mean wage of individuals within the sub-branch.
2) The unweighted mean wage of firms within the sub-branch.
3) The weighted mean wage of firms within the sub-branch.

The first method is preferable to the second, since it keeps more information. Neither of the first two, however, takes into account the difference in firm size. It is reasonable that wages in small firms should have less weight than wages in large firms. Firm size could be measured in various ways, but in this context employment is the most appropriate. We use information from the original returns and weighted wages according to the average firm employment during the twelve-month period. As discussed above, in general, larger firms offer higher wages. This relationship also holds for our material:

Table 2 Wage by firm size, AFK classification.
Daily wages 1884/1885. Men

Firm size (number of employees)	Wage (SEK)*
1-10	1.72
>10	2.20

* Not weighted by firm size.

4.5.2. FROM INDUSTRIAL SUB-BRANCHES TO INDUSTRIAL MAIN BRANCHES

To calculate main branch wages, we use sub-branch employment as weights.

Our primary source is the Bidrag till Sveriges officiella statistik (BiSOS) (Contributions to Swedish Official Statistics). The BiSOS is further supplemented by published (Prado 2008, 2010b) and unpublished calculations by Prado, based on the BiSOS and the works of Jungenfeld (1959) and Schön (1988). For a full account of the sources used to weight the sub-branches, consult Appendix C.

The employment weights relate to factory work and do not include handicrafts (the reason, of course, being that the AFK did not reach out to firms within handicrafts). Especially in the case of refined wood products, the distinction has a huge impact. According to unpublished figures by Prado, whom we rely on this case, approximately 20,000 people were employed within the industry, yet only 2,300 of these worked in factories or workplaces resembling factories. Hence, we use this latter, lower estimate as a weight.

As weights we use the *total* employment, that is, the employment of men and women. In practice, this has few implications, though theoretically only men would be preferable. The reason for using the total employment is to enable correspondence between the BiSOS and Prado: whereas the BiSOS discriminates between men and women, Prado only presents the total employment.

When the BiSOS and Prado are not enough, we use the AFK (1888a). The employment figures given by the AFK must, however, be adjusted according to the response rate in the specific sub-branch. As elaborated further below, we use the AFK's figures regarding sawmills. The response rate within sawmilling was 96 per cent. Assuming that the dropouts did not differ from the participants, we simply add 4 per cent to estimate the total employment within sawmilling.[8]

In a few cases, it is impossible to attach weights to sub-branches. This is the case regarding forestry and lumber yards. Hence, we exclude the wages in these categories from our calculations. Specifically, it means that the subgroup sawmills alone constitutes the main branch of forestry and sawmilling (AFK classification). This is less of a problem in the IS, since forestry is not included at all.

4.5.2.1 A SPECIFIC PROBLEM: SAWMILLS

As mentioned, the AFK deviated from its German role model in so far as it separated sawmills from wood industries, the reason being the magnitude of Swedish sawmilling, but just how important was sawmilling in employment terms?

[8] Generally: Estimated employment $_{\text{sub-branch X}}$ =
Employment, AFK $_{\text{sub-branch X}}$ · (1+[1-Response rate $_{\text{sub-branch X}}$]).

The BiSOS does not give any data prior to 1896. Therefore, scholars have relied on indirect measurements, trying to derive employment from output. The latest is Prado's (2008), based on the BiSOS and supplemented by Schön (1988). According to this estimation, approximately 37,000 people were employed in sawmilling in the mid-1880s (Prado 2008, pp.206–207).

The returns of the AFK inquiry, however, indicate a much lower figure. With a 96 per cent response rate among the sawmills, employment landed slightly above 15,000. If we adjust the figure by multiplying it by 1.04, the figure is still well below 16,000. It is true that the AFK did not have knowledge about every single sawmill – and unknown sawmills obviously fall outside any response rate. However, as argued above, it does not seem plausible that the AFK missed any of the more important ones.

Other evidence is inconclusive. The 1890 census of population indicated that the AFK was right (BiSOS A 1890, III, Table 12, p.153), whereas the BiSOS (1896, Table 1, p. 5) supported Prado. Only future research can resolve the issue of the quantitative importance of sawmilling.

As the default option, we choose the AFK's figure; it is a *direct* measure of employment and we cannot find any reason to disregard it. Nonetheless, in Table 13 and in Appendix F, we also show the results of weighting based on Prado.

4.5.3 FROM THE INDUSTRIAL MAIN BRANCHES TO THE NATIONAL LEVEL

To calculate a national wage, we weight the main branches, again with figures on employment. A principle decision is whether to include the employment of all the sub-branches within a particular branch or only those sub-branches for which we have wages. For instance, according to the AFK classification, the branch engineering contains five sub-branches, two of which we do not have wages for, cartwrighting and manufacturing of instruments. Theoretically, we have a situation like that shown in Table 3.

Table 3 Example: The estimation of a national wage using different weighting methods

Industrial branch	Wage	Employment	Weight (1)	Weight (2)*
Branch 1		8000	8000/13000 = 61,5%	6000/11000 = 54,5%
Sub-branch A	Yes	4000		
Sub-branch B	Yes	2000		
Sub-branch B	No	2000		
Branch 2		5000	5000/13000 = 38,5%	5000/11000 = 45,5%
Sub-branch X	Yes	3000		
Sub-branch Y	Yes	2000		

* Subgroup C excluded.

Let us say that we want to calculate an aggregated wage level from two branches. Further, we assume that employment is known for all sub-branches and wages for all but Sub-branch C. In the first scenario, we construct weights based on all the sub-branches (see column *Weights (1)*), and, in the second, we drop Sub-branch C (see column *Weights (2)*).

At first, it may seem reasonable to include Sub-branch C, since otherwise the employment in Branch 1 will be underestimated (and, correspondingly, the influence of Branch 2 will be inflated). However, the inclusion of Sub-branch C implicitly suggests that the wages in Sub-branch C in a substantial way do not change the (weighted) mean wages of Branch 1. To put it another way, for the inclusion to be meaningful, the variance of wages should be less *within* branches than *between* branches. Nothing of the kind seems to be true, and we therefore drop the sub-branches for which information regarding wages is lacking.

For the sake of transparency, we include the employment weights in Table 6 (as well as in Tables 7–10). Future research will probably produce new estimations for employment in various branches; its weights could be compared with ours.

4.5.4. FROM FIRMS TO COUNTIES

The aggregation from firms to counties is made by weighting the wages within a specific county according to the average firm employment. This is a good enough procedure, albeit not perfect. Ideally, it should be a two-step procedure in which wages are weighted first according to firm size and second according to county-specific branch employment. We judge that the ideal method is too time consuming and therefore out of reach for the present project. It should be noted, however, that, even if the latter procedure theoretically outperforms the former, practice has

shown otherwise. Collin (2016) estimated county wages with both methods and found neither substantial nor statistically significant differences.

4.5.5. FROM COUNTIES TO THE NATIONAL LEVEL

To calculate a national wage, we weight the counties with figures on county-specific industrial employment from 1880, constructed by Enflo et al. (2014, Appendix B, Table B2). Ideally, this should yield the same result as when we aggregate from industrial branches to the national level. See further the comments in Table 10.

4.5.6. WOMEN

Because of the few observations, we present mean wages, according to the IS classification, for only three branches along with a "rest" group in which we merge the other five branches. In addition, a national wage is estimated. Our aggregating procedure follows a different path from that of men, regrettably not for the better. As in the case of men, firm employment is used to aggregate wages, although here we are forced to aggregate directly to branches.

Branch employment is used as weights for estimating the national wage. Using the total employment, that is, women and men, would clearly be inappropriate. Metal and mining (IS classification), for instance, employed more than 30 per cent of the industrial labour force, but few employees were women. Instead, we rely on Karlsson (1996) and BiSOS D to generate female employment. Karlsson already performed the work of aggregating employment to the branch level. In one important respect, she deviated from the IS. Karlsson merged matches with wood, whereas in the IS matches belonged to the chemical industry. We revise Karlsson's figures on this point. Since the sawmilling industry does not appear in the BiSOS until 1896, we use the AFK's figure for sawmilling, with the additional – and arbitrary – assumption that 5 per cent of the employees were women.

Again, it is worth mentioning that the estimated wages apply to workers in factories (or the like) only. This is even more relevant when it comes to women, since female homework was an important source of employment – and generally not included in the BiSOS (Karlsson 1996, p.7).

4.5.7. UNDERAGED BOYS

Only eleven observations regard underaged girls, and hence we exclude them. The aggregation procedure for boys is the same as for male adults, and we use the same employment weights.

5. Descriptive statistics and wage estimations

This section presents some descriptive statistics along with various wage estimations. In most cases, the tables are self-explanatory.

Table 4 Number of observations by gender and age

Classification	Girls	Women	Boys	Men
AFK	11	36	178	2132
IS	11	36	178	1964

The number of observations differs mainly because the construction branch (containing 163 workers) was included in the AFK but not in the IS. Among male adults, the daily wage varies from 0.65 SEK earned by an 18-year-old machine worker at Vargöns paper pulp factory to 6.00 SEK earned by a 40-year-old, highly skilled worker at Damsjö distillery. More general aspects of dispersion can be seen in Table 5.

Table 5 Wage dispersion. Daily wages 1884/1885 (SEK). Men*

Classification	p10	p25	p50	p75	p90	Mean	Stand. dev.	Obs.
AFK	1.40	1.61	2.00	2.50	3.10	2.17	0.77	2132
IS	1.33	1.60	2.00	2.50	3.15	2.16	0.79	1964

* Wages are unweighted.

Table 6 Wages by industrial branch, IS classification.
1884/1885. Daily wages (SEK). Men

Industrial main branch	Wage	No of obs.	Weight
Metal and mining	2.14	1216	0.36
Stone, clay and glass	2.17	157	0.09
Wood	2.39	337	0.14
Paper, pulp and printing	1.89	65	0.06
Food and beverage	1.97	109	0.18
Textile and clothing	1.99	29	0.12
Leather, hair and rubber	1.81	14	0.01
Chemical	1.60	21	0.04
Electricity, gas and water services	3.00	16	0.00
National	2.09	1964	

The relative wages according to the IS classification are shown in Tables 11–12, in which we make comparisons with earlier research, as well as in Appendix F, in which we present the results obtained from altering the weights.

The national wage is higher in Table 7 than in Table 6. The reason is that wages of relatively well-paid construction workers are included only in the AFK classification.

Table 7 Wages by industrial branch, AFK classification. 1884/1885. Daily wages (SEK). Men

	Wage			
Industrial main branch	Absolute	Relative	No of obs.	Weight
Mining	1.91	89	206	0.07
Metal processing	2.29	107	497	0.14
Metal	2.34	110	47	0.01
Machine	2.22	104	495	0.10
Forestry and sawmilling	2.40	112	284	0.11
Manufacture of wooden products	2.31	108	58	0.02
Stone, clay and glass	2.12	99	128	0.06
Construction	2.41	112	163	0.14
Power and lightingworks	3.00	140	16	0.00
Chemical	1.58	74	28	0.04
Textile	1.93	90	22	0.10
Tanneries etc	1.81	85	14	0.01
Food and beverage	1.98	93	109	0.15
Paper and pulp	1.58	74	56	0.03
Printing	2.35	110	9	0.02
National	2.14	100	2132	

Table 8 Wages by industrial branch, IS classification.
1884/1885. Daily wages (SEK). Women

Industrial main branch	Wage	No of obs.	Weight
Food and beverage	1.03	7	0.12
Textile and clothing	1.05	9	0.52
Chemical	1.30	7	0.13
Other branches*	0.83	13	0.23
National	1.03	36	

* Includes the main branches metal and mining; stone, clay and glass; wood; paper, pulp and printing, and leather, hair and rubber.

The small number of female wages allows us to calculate branch-level wages in only three cases (and each of them is based on fewer than ten observations; Table 8). The data situation with regard to underaged boys is more fortunate, even though two of the main branches are dropped due to a lack of observations (Table 9).

Table 9 Wages by industrial branch, IS classification.
1884/1885. Daily wages (SEK). Underaged boys (<18)

Industrial main branch	Wage	No of obs.	Weight
Metal and mining	1.04	79	0.46
Stone, clay and glass	0.93	8	0.05
Wood	1.16	49	0.21
Paper, pulp and printing	0.81	12	0.05
Textile and clothing	0.78	15	0.17
Chemical	1.00	11	0.06
National	1.00	174	

Note: The branches food and beverages and leather, hair and rubber contain only one observation eazch and are therefore excluded when weighting the national wage.

Table 10 shows the wages by county. The national wage (2.13 SEK) differs from that in Table 6 (2.09 SEK). Around one-third of the difference can be explained by the fact that 20 observations are dropped in Table 10 (each observation belongs to one of the three excluded counties).

Including them gives a national wage of 2.12 SEK. The remaining difference, 0.03 SEK – equivalent to 1.5 per cent – is within acceptable limits.

Table 10 Wages by county, IS classification.
1884/1885. Daily wages (SEK). Men

County	Wage	No. of obs.	Weight
Blekinge	1.72	38	0.026
Gävleborg	2.14	198	0.065
Göteborg and Bohus	1.95	87	0.067
Halland	2.10	35	0.018
Jönköping	2.20	46	0.035
Kalmar	1.83	40	0.047
Kopparberg	2.09	118	0.047
Kronoberg	1.98	34	0.024
Malmöhus	2.07	245	0.108
Norrbotten	2.51	15	0.011
Skaraborg	1.81	41	0.035
Stockholm	2.63	240	0.143
Södermanland	2.16	57	0.038
Uppsala	1.89	34	0.030
Värmland	2.51	166	0.044
Västerbotten	1.98	12	0.048
Västernorrland	2.58	74	0.014
Västmanland	2.18	100	0.039
Älvsborg	1.82	42	0.036
Örebro	2.13	221	0.046
Östergötland	1.94	99	0.079
National	2.13	1942	

Note: Three counties (Gotland, Jämtland and Kristianstad) with fewer than 10 observations are excluded.

6. Comparisons with earlier research

The rationale for this paper is the scarcity of industrial wage data during early industrialization in Sweden. It follows that the possibility to compare our result with previous research is limited. We use two points of comparison: Collin (2016) and Prado (2010b). As discussed at length above,

according to our judgement, Collin's work contains the more solid wages; on the other hand, they are from the late 1870s. Hence, even ignoring the different sources and different methods, neither of the two reference points could be expected to match our wages perfectly.

Collin (2016) argued that estimations based on *Wages in Sweden* have an upward bias with respect to wage dispersion across branches and counties (see above). For the late 1870s, Collin found a coefficient of variation of 10 per cent across branches – about half the size of what Prado had found earlier (Collin 2016, pp.176–178). Our estimation for 1884/1885 is close to Collin's for 1879, 11.6 per cent.[9]

Table 11 compares the relative wages by main branch in our study for 1884/1885 with Collin's for 1879.

Table 11 Relative wages by industrial branch, IS classification.
1879 and 1884/1885. Men. (Sweden = 100)

Industrial main branch	1884/1885*	1879**
Metal and mining	102	101
Stone, clay and glass	104	99
Wood	114	104
Paper, pulp and printing	90	122
Food and beverage	94	95
Textile and clothing	95	97
Leather, hair and rubber	86	87
Chemical	76	87

* Source: Arbetareförsäkringskomitén (1888a)
** Source: Collin (2016)
Note: In both cases, the national wage is weighted by branch employment.
For reason of comparability with Collin, we drop electricity, gas and water services.

Our estimate for wood is higher than Collin's. This is expected, as sawmilling was hit by a serious decline and a subsequent lowering of wages in early 1879, followed by an expansion in the 1880s (Bagge et al. 1933, p.137). Wages in chemicals are low in both studies, even though they are even less favourable in ours. We have no immediate explanation for the discrepancy. For instance, in both studies, the sub-branch matches is included (which is critical; see the comparison with Prado below). Furthermore, paper, pulp and printing are less advantageous in comparison with Collin.

[9] For the maximum degree of comparison, we calculate the coefficient of variation according to the IS classification, and we exclude the branch power, lighting and waterworks because it was not used in the previous estimations. Accordingly, we recalculate the average national wage, which, however, does not change much (from 2.094 to 2.091).

Even though Prado (2010b) based his estimations on *Wages in Sweden*, it is of some interest to compare his results with ours, because we can make the comparison for the same year.

Table 12 Relative wages by industrial branch, mixed classification.
1884/1885. Men. (Sweden = 100)

Industrial main branch	1884/1885*	1884/1885**
Mining	84	150
Metal	107	81
Engineering	103	100
Stone, clay and glass	101	95
Wood	112	105
Paper, pulp and printing	88	90
Food and beverage	92	105
Textile and clothing	92	88
Chemical	74	124

* Source: Arbetareförsäkringskomitén (1888a)
** Source: Prado (2010b)
Note: In both cases, the national wage is weighted by branch employment.
Prado makes a few departures from the IS classification; here we do the same in order to maximize comparability.
The relative wages based on AFK are in general lower than in Table 11. For reason of comparability with Prado, we drop electricity, gas and water services, and leather, hair and rubber. Since the latter branch is low-wage the weighted national increases, which in turn pushes relative wages down somewhat.

First, the two series are not directly comparable, since the AFK used daily wages and Prado used hourly wages.[10] That said, it could be of interest to think a little more about the two (sub-) branches in which the differences are the largest, indeed very large: mining and chemicals.

With respect to mining, recall that Bagge et al. were bluntly self-critical regarding the quality of wages. In addition, a substantial part of the relative difference can probably be explained by the inclusion of benefits in kind in the wages. For instance, at the important (with regard to weighting) Falu copper mine, we estimate that a married miner with three children increased his wage by 15 per cent when including benefits in kind (cf. Bagge et al. 1933, pp.386–388).

Neither Bagge et al.'s study nor ours has a great many observations for chemicals. Still, we have 2.5–3 times as many (see Appendix B). The small number of observations in *Wages in Sweden* obviously introduced insecurity, but the main explanation for the immense difference is another

[10] Prado relied on absolute wage levels from the 1950s, extrapolated back in time with the help of branch-specific indices from Bagge et al. and official statistics.

one: the match industry was not included in the Prado/Bagge et al. index for chemicals, but in ours it is included.

The wages in the match industry were low. This is evident in our material but also in *Wages in Sweden*. When matches appeared in the book for the first time in the early twentieth century, it is clear that the wages were far below the average in the chemical industry (Bagge et al. 1933, pp.238, 561–572). Equally importantly, the match industry is weighted heavily in chemicals. The combination of low wages and high employment thus explains the difference between the AFK and Prado.

The ratio of female-to-male national wages is 0.49 (cf. Table 6 and Table 8). Mirroring the general lack of information regarding female industrial wages in nineteenth-century Sweden, there is no study with which we could compare the result directly. We do, however, know that the ratio of female-to-male yearly income in agriculture was 0.45 in 1884/1885 (HILD, Historiska lönedatabasen). That is, the magnitude is similar.

Svensson (1995, 2004) offered corresponding figures for blue-collar workers in the twentieth century. His starting year was 1913, a time when the ratio of female-to-male national wages was 0.58 (Svensson 2004, pp.204–205). The overall gender gap diminished during the twentieth century. Given that this development is also a guide to earlier times, our lower ratio makes perfect sense.

The ratio of underaged boys-to-male national wages is 0.48 (cf. Table 6 and Table 9). Proper reference points are difficult to find. The most influential work on child labour in nineteenth-century Sweden (Olsson 1980) offered no wage data for comparison. The earliest source with which quantitative comparison is possible is the Industrial Statistics for the year 1913. The ratio of underaged-to-male national wages was 0.41 (HILD, Historiska lönedatabasen), but here girls were included among the underaged. Assuming that girls earned less than boys, it means that the pure boys-to-male ratio was higher than 0.41. Unfortunately, how much higher is not possible to say.

Table 13 compares the national hourly wage presented in *Wages in Sweden* with our two estimations.

Table 13 National wage, IS classification.*
1884/1885. Hourly wages (SEK). Men

Source material	Wage
Bagge *et al.*	0.208
AFK, lower estimate**	0.189
AFK, higher estimate***	0.193

Sources: Bagge et al. (1933, p.48); Arbetarförsäkringskomitén (1888b, pp.10–11, 42–44).

* Whereas our estimations are based on the IS classification with nine branches, Bagge et al. did not include the four branches stone, clay and glass; leather, hair and rubber; chemicals; and power, lighting and waterworks. In addition, Bagge et al. excluded mining from their national average.
** Lower estimate (AFK) of employment in sawmilling.
*** Higher estimate (Prado) of employment in sawmilling.
Compare Appendix F. For further details, see section 4.5.2.1.
The Bagge et al. wage was calculated as the arithmetic mean for 1884 (0.208) and 1885 (0.207).
Our estimations are based on the daily national wage(s) (see Table 6 and Appendix F), divided by the number of hours worked in each sub-branch and weighted by employment. For further details, see section 4.2.

The estimation of Bagge et al. is 10 per cent higher than our lower estimate (the default option; consult section 4.5.2.1). The direction is expected, given that skilled workers were overrepresented in – and casual workers were left out of – the series in *Wages in Sweden*. Bagge et al.'s inclusion of benefits in kind in the iron works should have a very small impact, although it also works in the "right" direction. Compared instead with our higher estimate, the Bagge et al. national average is still 7 per cent higher.

The difference in industrial breadth between Bagge et al. and the AFK should be duly noted. We use nine branches, whereas the national average of Bagge et al. excluded stone, clay and glass; leather, hair and rubber; chemicals; power, lighting and waterworks; and mining. If we calculate a national wage based on the same branches as used by Bagge et al., the gap diminishes to slightly more than 7 per cent (not shown in Table 13).[11] Comparing equal with equal (to a greater degree) should yield a result in that direction.

7. Summing up

Most researchers interested in wages during early Swedish industrialization have used *Wages in Sweden* as their point of departure. Nevertheless, as carefully noted by Bagge et al. themselves, the

[11] Our lower estimate increases from 0.189 SEK to 0.192 SEK.

wage material in *Wages in Sweden* is suitable for estimating neither absolute wage levels nor relative wages across industries or regions at specific times. This paper aligns with the recent trend among economic historians to use wage sources other than *Wages in Sweden*.

A notable shortcoming of the present paper is the small number of wage observations for women. Because of that, female wages by industrial branch are presented only at a high level of aggregation; female wages by county are omitted altogether. The wages of men rest on more solid ground. Our estimations of absolute wage levels can be used for cross-country comparative purposes, and the estimations of relative wages can be used by scholars who are interested in industrial and regional development.

Our wage estimations refer to only the mid-1880s – a single point in time – and their usefulness will increase as our field colleagues present their estimations for other years or periods.

Appendix A: Industrial classifications

Table A1 Industrial classification according to the Industrial Statistics, IS (Sveriges officiella statistik, SOS).

Industrial branches and sub-branches

Code	English name	Swedish name
1	**Metal and mining**	**Malmbrytning och metallindustri**
1a	Iron ore mines and processing plants	Järnmalmsgruvor och -anrikningsverk
1b	Other ore mines and processing plants	Andra malmgruvor och anrikningsverk
1c	Iron and steel mills, ferrous alloy mills	Verk for framställning av järn och stål
1d	Other basic metal plants	Verk for framställning av andra metaller
1e	Manufacture of hardware	Järn- och stålmanufaktur
1f	Engineering works and foundries	Mekaniska verkstader
1g	Shipyards	Skeppsvarv
2	**Stone, clay and glass**	**Jord- och stenindustri**
2a	Coal mines	Kolgruvor
2b	Stone quarrying	Brytning jämte grovhuggning och krossning av sten
2c	Manufacture of stone	Finare stenförädlingsindustri
2e	Chalk and lime mills	Kalk- och kritbruk
2g	Stone- and earthenware	Stengods- och lergodsfabriker
2h	Manufacture of bricks	Tegelbruk
2i	Manufacture of china and tiles	Porslins- och kakelfabriker
2k	Manufacture of glass and glass products	Glasindustri
3	**Wood**	**Träindustri**
3e	Sawmills and planning mills	Sågverk och hyvlerier
3i	Manufacture of wooden articles and furniture	Snickeri- och möbelfabriker
3k	Other wood industries etc.	Annan trävarufabrikation m.m.
4	**Paper, pulp and printing**	**Pappers- och grafisk industri**
4a	Wood pulp mills	Pappersmassefabriker
4b	Paper and cardboard mills	Pappersbruk och pappfabriker
4f	Printing	Boktryckerier
5	**Food and beverage**	**Livsmedelsindustri**
5c	Flour mills	Kvarnrörelser
5g	Raw sugar mills	Råsockerbruk
5h	Sugar refineries	Sockerraffinaderier
5i	Manufacture of choclate and sugar confectionery	Choklad- och karamellfabriker
5k	Distillery works (raw spirits)	Brannvinsbrannerier
5l	Distillery works (refined spirits)	Destilleringsverk
5m	Breweries and manufacture of malt	Bryggerier och mälterier
5n	Manufacture of other beverages	Fabriker for andra dryckesvaror

6	**Textile and clothing**	**Textil- och beklädnadsindustri**
6a	Cotton industry	Bomullsspinnerier och -väverier
6b	Linen, hemp and jute industries	Lin-, hamp- och jutespinnerier och -väverier
6c	Wool industry	Ullspinnerier och ylleväverier
6g	Manufacture of wearing apparel	Sömnadsfabriker
6i	Dyeing, bleaching and impregnating	Fargerier, blekerier och impregneringsfabriker
7	**Leather, hair and rubber**	**Läder-, hår- och gummivaruindustri**
7a	Tanneries	Garverier
8	**Chemical**	**Kemisk-teknisk industri**
8a	Manufacture of paints and varnishes	Färg- och fernissfabriker
8b	Manufacture of oils, soap, candles and perfumes	Olje-, tvål-, ljus- och parfymfabriker
8c	Manufacture of fertilizers	Konstgödningsfabriker
8e	Manufacture of explosives etc.	Krutbruk och andra sprängämnesfabriker
8f	Manufacture of matches	Tändsticksfabriker
9	**Electricity, gas and water services**	**Kraft-, belysnings- och vattenverk**
9b	Gas works	Gasverk

Note: We have only listed sub-branches that have enough observations to be included in our wage estimations. For the complete classification, consult the Industrial Statistics for 1913 (pp.71-72), available online at: https://www.scb.se/H/SOS%201911-/N%C3%A4ringsverksamhet/Industri%201911-1996/Industri-1913.pdf
The Swedish names are the ones used in IS 1913.

Table A2 Industrial classification according to the Commission* (Arbetareförsäkringskomitén, AFK).

Industrial branches and sub-branches

Code	English name	Swedish name
II	**Mining**	**Gruvdrift**
II. 1	Ore mines	Malmgruvor
II. 2	Coal mines	Stenkolsgruvor
III	**Metal processing**	**Malmförädlingsindustri**
III. 1	Iron works	Järnbruk
III. 2	Other basic metal plants	Övriga malmförädlingsverk
IV	**Metal**	**Metallindustri**
IV. 4	Manufacture of tin	Bleckslagerier
IV. 5	Manufacture of sheet metal	Plåtslagerier
IV. 6	Forges	Smedjor
IV. 7	Manufacture of metal	Manufaktursmidesfabriker
V	**Machine**	**Maskinindustri**
V. 1	Engineering works and foundries	Mekaniska verkstäder och gjuterier
V. 2	Shipyards	Skeppsbyggerier och dylikt
V. 4	Manufacture of weapons and sewing machines	Vapen- och symaskinsfabriler
VI	**Forestry and saw milling**	**Skogsafverkning och sågverksrörelse**
VI. 2	Sawmills	Sågverk
VII	**Manufacture of wooden products**	**Bearbetning af trävaror**
VII. 1	Manufacture of wooden articles and planning mills	Snickerier och hyflerier
VII. 2	Manufacture of bobbin, shoe pegs and cork	Bobin-, skopliggs- och korkfabriker
VIII	**Stone, clay and glass**	**Sten-, lergods- och glasindustri**
VIII. 1	Stone quarrying and refinement of stone	Stenhuggerier och polerverk
VIII. 2	Chalk mills and manufacture of cement	Kalkbruk och cementfabriker
VIII. 3	Manufacture of bricks	Tegelslagerier
VIII. 4	Manufacture of tiles and stenware	Kakel- och stenkärlsfabriker
VIII. 5	Manufacture of china	Porslinsfabriker
VIII. 6	Manufacture of glass and glass products	Glasbruk
IX	**Construction**	**Byggnadsindustri**
IX. 1	Construction of houses etc	Husbyggnader och dylikt
IX. 4	Road construction	Väg- och gatuläggningsarbeten
IX. 5	Construction of railway buildings	Jernvägsbyggnader
IX. 6	Port and canal construction	Hamn- och kanaliseringsarbeten
IX. 7	Lake lowering and drainage	Sjösänknings- och afdikningsarbeten
X	**Power- and lightingworks**	**Industri för bränsle och belysningsämnen**
X. 4	Gas works	Gasverk

XI	**Chemical**	**Kemisk-teknisk industri**
XI. 1	Dyeing	Färgerier
XI. 2	Manufacture of soap	Tvål- och såpfabriker
XI. 3	Manufacture of matches	Tändsticksfabriker
XI. 4	Manufacture of explosives	Sprängämnesfabriker
XI. 5	Manufacture of fertilizers	Benmjölsfabriker och dylikt
XII	**Textile**	**Textilindustri**
XII. 1	Spinning and weaving mills	Spinnerier och väfverier
XIII	**Tanneries etc**[1]	**Garverier och dylikt**
XIV	**Clothing**[2]	**Beklädnad- och rengöringsindustri**
XV	**Food and beverage**	**Närings- och njutningsmedelsindustri**
XV. 1	Flour mills	Mjölkvarnar
XV. 3	Manufacture of sugar and choclate	Socker- och chokladfabriker
XV. 7	Breweries and manufacture of malt	Bryggerier
XV. 8	Manufacture of mineral water	Mineralvattenfabriker
XV. 9	Distillery works	Brännerier och ättiksfabriker
XVI	**Paper and pulp**	**Pappersindustri**
XVI. 1	Wood pulp mills	Pappersmassefabriker
XVI. 2	Paper mills	Pappersbruk
XVII	**Printing**	**Tryckerier**
XVII. 1	Book printing	Boktryckerier

[1] The branch has no sub-branches.

[2] We lack enough observations in this branch.

Note: We have only listed sub-branches that have enough observations to be included in our wage estimations.

For the complete classification, see Arbetarförsäkringskomitén (1888a).

The Swedish names are the ones used by the Commission.

Table A3 Comparison between the industrial classifications. Main industrial branches

Industrial Statistics, IS (Sveriges officiella statistik, SOS)	The Commission* (Arbetareförsäkringskomitén, AFK)
Metal and mining	Mining (Grufdrift)[1]
	Metal processing (Malmförädlingsindustri)
	Metal (Metallindustri)
	Machine (Maskinindustri)
Stone, clay and glass (Jord- och stenindustri)	Stone, clay and glass (Sten-, lergods- och glasindustri)
Wood (Träindustri)	Forestry and saw milling (Skogsavverkning och sågverksrörelse)[2]
	Manufacture of wooden products (Bearbetning av trävaror)
Paper, pulp and printing (Pappers- och grafisk industri)	Paper and pulp (Pappersindustri)
Food and beverage (Livsmedelsindustri)	Food and beverage (Näringsmedelsindustri)
Textile and clothing (Textil- och beklädnadsindustri)	Textile (Textilindustri)
	Clothing (Beklädnad- och rengöringsindustri)
Leather, hair and rubber (Läder-, hår- och gummivaruindustri)	Tanneries etc (Garverier och dylikt)
Chemical (Kemisk-teknisk industri)	Chemical (Kemisk-teknisk industri)[3]
Electricity, gas and water services (Kraft-, belysnings- och vattenverk)	Power- and lightingworks (Industri för bränsle och belysningsämnen)
	Printing (Tryckerier)[4]
	Construction (Byggnadsindustri)[5]

* Full name: *The Commissions of Workmen's Compensation and Insurance against Industrial Accidents*

In the notes below, we have listed only divergences that matter in our empirical setting.

[1]The subgroups coal mining and chalk are classified under stone, clay and glass in IS.

[2]Forestry is not included in IS.

[3]The subgroup färgerier och blekerier is classified under textiles in IS.

[4]Classified under paper- and graphical industry in IS.

[5]Not included in IS.

Appendix B: Number of observations

We compare, as far as possible, the number of wage observations in the main branches in the AFK and *Wages in Sweden*. Bagge et al. did not, however, present their results at the main branch level in all cases. Therefore, some of the comparisons are made at the sub-branch level (or at the level of merged sub-branches).

Sometimes, Bagge et al. explicitly stated how many observations they used in the mid-1880s; in other cases, the information is more implicit and vague. The reader may consult the following pages in Bagge et al. (1933): pp.28, 85–90, 110, 113–121, 157, 200, 232 and 553–569.

Table B1 Number of wage observations. 1884/1885. A comparison between AFK and Bagge et al.

Industrial branches*	AFK	Bagge et al.
Mining	177	20–28
Iron works	473	240
Manufacture of metal, Engineering works and foundries, and Shipyards	536	80–90
Stone, clay and glass	155	Several hundreds**
Sawmills	279	8
Paper pulp	32	None
Paper	24	8
Printing	9	Not used
Food and beverage	106	18–26
Textile and clothing	29	15
Leather, hair and rubber	14	Not used
Chemical	32	11–14
Electricity, gas and water services	16	Not used

* A mix of main and sub-branches.
** Contains no data from "the most important branch of the group, the quarrying, rough-hewing and crushing of stone" (Bagge et al. 1933, p.134).
Note: "Not used" is a shorthand for situations in which Bagge et al. had information but for various reasons chose not to use it to calculate averages.

Appendix C: Employment sources

The employment in industrial subgroups is taken from BiSOS C, Table 5, and BiSOS D, Table 6, both from 1884. The exceptions are listed in the table below.

Table C1 Additional employment sources

Industrial branches	Source
Breweries	Prado
Coal mines	Prado
Construction*	Edvinsson
Distillery works	Prado
Flour mills	Prado
Forges	AFK
Iron ore mines	BiSOS C in combination with AFK
Manufacture of metal	Prado
Manufacture of sugar and chocolate	Prado
Manufacture of tin	AFK
Manufacture of wooden products	Prado
Ore mines	BiSOS C in combination with AFK
Ore mines (other than iron)	BiSOS C in combination with AFK
Other basic metal plants	BiSOS C in combination with AFK
Printing	Prado
Sawmills	AFK
Spinning and weaving mills	Prado

* Construction is a special case. We have not found any reliable figures on employment in its sub-branches. However, we have used Rodney Edvinsson's figures on number of employees in 1884 (www.historia.se, Table O: "Number of employed in eight types of activities in Sweden 1850-2000"). According to Edvinsson the construction sector employed 14 per cent of the employment in the industrial sector (including mining). We use this number to attach a weight to construction in order to estimate a national wage (in the AFK classification). Prado's estimations are based on BiSOS supplemented by Schön (1988).

Appendix D: Validity of the AFK material as a wage source

Do our scores represent the variable – mean wage – in the way they are intended to? We see one major potential problem: the material contains information on people who were involved in accidents. *If* there are substantial differences in wages between people who were involved in accidents and those who were not, then the validity of our study is damaged. Therefore, it would be reassuring to be able to compare the AFK wages with wages from other sources, including *all* employees. If the occupational mean wages – preferably standardized by age – are the same, we have little reason to worry.

The problem, of course, is that there is little available wage material for comparison. We try to link the AFK occupational wages at the firm level with the corresponding material in Bagge et al. but without success. The matches are too few to draw robust conclusions.[12] Equally unsuccessful is our effort to tie the AFK to the records of the companies that reported the most accidents in the AFK survey (e.g. *Kockums* in Malmö and *Atlas* in Stockholm). The reading of company monographs and historical studies of specific branches proves futile – with one important exception, Cornell's (1982) study of the sawmilling industry.

D.1. Wages in the sawmilling industry

Cornell (1982) investigated various social aspects of the sawmilling industry in the Sundsvall district, situated in the county Västernorrland, in 1860–1890. The wage material is generally scanty, but, based on company pay rolls, Cornell nonetheless presented daily mean wages for 15 different occupations at the Svartvik mill in 1885 – a breadth matching that of our material.

Unfortunately, Cornell did not report how many individuals each occupational mean is based on, which prohibits the calculation of a weighted mean wage for the mill as a whole. Instead, we calculate an unweighted mean. In Table D1, we compare the Svartvik mean wage with the mean wage of sawmills in Västernorrland, based on the AFK.

[12] We also try to compare the AFK and Bagge et al. with regard to occupational wages at the branch level to increase the number of matching observations (consult Appendix B). However, the problems are immense. Mining cannot be used because of the poor data quality in *Wages in Sweden*, and iron works cannot be used since benefits in kind were included in Bagge et al.'s study but not in our figures. The manufacture of metal and so on seems the most promising, but even here matching is problematic. First, Bagge et al. often presented hourly or annual wages. The necessary transformation into daily wages induces uncertainty in a way that allows only approximate comparisons (and, of course, as long as we compare the same occupation and so on, wages *have to be* at least approximately the same). More serious is that the arbitrary weighting method in *Wages in Sweden* makes comparisons above the firm level highly suspicious.

Table D1 Mean wage in sawmilling. 1884/1885. Daily wages (SEK)

The Svartvik mill (Cornell)	Mills in Västernorrland (AFK)
2.60	2.57

Sources: Cornell 1982, p.150; Arbetareförsäkringskomitén (1888a) and our calculations.

The comparison indicates that our wages are valid. Of course, Svartvik is a single firm, so the case is not closed, yet it does not seem plausible that wages in Västernorrland's sawmills could have differed to any considerable degree; within this limited area, people could move with relative ease.

As Cornell noted, it is difficult to make comparison with *Wages in Sweden* (Cornell 1982, p.149). Bagge et al.'s estimation for sawmilling is slightly over 3 SEK per day. This is not surprising, since they used wages from only two occupations – two of the best paid – to represent the sub-branch (Bagge et al. 1933, p.140–141; their estimate was intended to include sawmilling in the entire country, but, as noted by Gustafsson (1965, p.126), in reality, it only captured wages in the northern part of Sweden, including the county Västernorrland)

D.2. Wages at the Swedish State Railways

As briefly noted in the *Material* section, the AFK inquiry included not only the industrial sector but also, among others, land transportation. For all practical purposes, land transportation in this case means transport by train. We plan to publish the wages of railway employees in a separate paper.

Nonetheless, we employ the AFK data on the Swedish State Railways here as well, because we can compare them with the annual publications by the Swedish State Railways (SJ) itself (Statens Järnvägar 1884, 1885). This offers favourable conditions for checking validity. For a long period of time, SJ published data on its employees, among others their full name, date and year of birth, and annual wage. Since we are able to identify the same individuals in both materials, we can conclude that the SJ annual wages divided by 300 correspond to the daily wages reported by the AFK.

The richness of the SJ material makes detailed wage comparisons possible. For instance, one of the AFK returns consists of information on two injured lengthmen (*banvakter*), both 31 years old, permanently employed and working in the sixth district. We proceed by comparing their wages with the wages of the sixth district's lengthmen – of the same age and with the same terms of employment – in the SJ publication (in most cases, a single individual in the AFK can be

matched with several individuals in the SJ publication). The procedure is repeated for all lengthmen and station hands (*stationskarlar*), the two biggest occupational groups within railways in the AFK. An example of our method is provided in Table D2.

Table D2 Method of comparing wages at SJ. A real example. Yearly wages (SEK)

Individual X in AFK		*is matched with*	18 individuals in the SJ publication	
Occupation	Station hand		Occupation	Station hand
Employment position	Permanent		Employment position	Permanent
Age	29		Age	29
District	2nd		District	2nd
Wage	540		Mean wage	557

Sources: Statens Järnvägar (1885).

In the next step, each "pair" or match enters the global calculation of the mean wage of lengthmen and station hands. The result is shown in Table D3.

Table D3 Mean wage of lengthmen and station hands at SJ. 1884/1885. Comparison of individuals in the same occupation, employment position, age and district. Yearly wages (SEK)

Source material	Wage	No of obs.
AFK	537	48
Swedish State Railways, SJ	545	365

Sources: Statens Järnvägar (1884, 1885).

With non-significant wage differences in comparison with other sources in the case of both sawmills and railways, we feel confident that the AFK inquiry did not produce biased wage estimates.

Appendix E: Age distribution

Are there differences between the AFK inquiry and the industrial labour market with regards to the distribution of age? We do know the distribution of age in the AFK, but what about the labour market?

The Labour Insurance Commission produced a series of reports, one of them on living conditions – including age distribution – in different industries and occupations (Arbetareförsäkringskomitén 1889). Unfortunately, the data on age distribution rested on the 1880 clerical survey (*husförhör*), which did not give reliable estimates. The biggest problem is that the share of workers under 25 years of age was grossly underestimated (even more so for workers under 20). Often, the clerical surveys did not register young workers who were still living with their parents as holders of a particular occupation – they were "workers", "apprentices" and so on (Arbetareförsäkringskomitén 1889, p.7). To add insult to injury, there is reason to expect that the underreporting was not evenly spread across branches (Arbetareförsäkringskomitén 1889, p.9). The AFK compared its own figures with a similar but "much better" (*vida bättre*) investigation in Norway, found disturbing differences and concluded that its own estimates were defective (Arbetareförsäkringskomitén 1889, p.8).

An alternative is to use the high-quality Swedish censuses and, to estimate the age distribution in the mid-1880s, calculate the arithmetic mean values from the 1880 and the 1890 censuses (BiSOS A 1880, 1890).

Table E1 Age groups, share of people 18-74 years old. Men

Source material	18-24	25-34	35-44	45-54	55-64	65-74	Sum
Censuses	20.3%	23.2%	18.9%	16.4%	13.4%	7.8%	100%

Sources: BiSOS A (1880, 1890).

Of course, using the censuses only makes sense under the assumption that they also reflect the distribution of age in the labour market. The reflection can only be sharp within limits: very young people, as well as the elderly, cannot be assumed to participate in the labour market to a degree corresponding to their share of the population. The lower boundary constitutes no problem; we focus on adults, and, by the age of 18, people in those days were by a margin established in the labour market. The upper boundary is another matter. For instance, it seems implausible that people in their mid-60s participated in the labour market to the same (relative) extent as 30 year olds did. We need to weight down the participation rate among older people.

Whereas the AFK estimation of younger workers' participation rate clearly missed the mark, the corresponding numbers for older workers seem to be reliable. First, the rate is falling, which is intuitively appealing. Second, the figures correspond well to the aforementioned Norwegian inquiry. Therefore, we make the further assumption that people aged 55 years and upwards behave as the AFK indicated, that is, that the participation rate drops. We put the older groups in relation to the age group 30–35 (at that age, everyone had left their parental home).

Table E2 Labour market participation rate among the oldest age groups in relation to the age group 30-35. Men

Age group	Relative to age group 30-35
55-64	0.52
65-74	0.30

Sources: Arbetareförsäkringskomitén (1889).

With the use of these proportions, we recalculate the figures from Table E1. Effectively, this means that we weight down the two oldest groups and give more weight to the other four.

Table E3 Age groups, share of people 18-74 years old. Adjusted for dropping participation rate. Men

Source material	18-24	25-34	35-44	45-54	55-64	65-74	Sum
Censuses	23.0%	26.4%	21.5%	18.7%	7.9%	2.6%	100%

Sources: BiSOS A (1880, 1890); Arbetareförsäkringskomitén (1889).

Finally, the six age categories are collapsed into two (for reasons explained below) and compared with the AFK.

Table E4 Age groups, share of people 18-74 years old. Adjusted for dropping participation rate. Men

Source material	18-24	25-74
Censuses	23.0%	77.0%
AFK sample*	23.9%	76.1%

* Excluding individuals for whom age is not recorded. SOS classification
Sources: BiSOS A (1880, 1890); Arbetareförsäkringskomitén (1889); own calculations.

The relation between the censuses and the AFK material gives our weights.[13] By implication, a person younger than 25 years has her/his wage multiplied by a factor of 0.962 (23.0/23.9) and those older than 24 by 1.012 (77.0/76.1). Thus, at the highest aggregated level, the difference in age distribution – and hence also weights – is small.

However, we can move down the aggregation ladder: since we have the age distribution for each branch, we put the adjusted census distribution in relation to each of them – assuming that the adjusted census distribution is the same across industries. In effect, this means that we standardize the AFK wages by age. Each main branch will have its own unique weights: wages of youngsters in metal and mining are multiplied by a factor of 0.925 (because the share of youngsters is slightly higher than in the censuses), in stone, clay and glass by a factor of 1.261 (because the share of youngsters is clearly lower than in the censuses) and so on.

Table E5 shows the result of standardization. For the sake of convenience, the non-standardized wages from Table 6 are reproduced. We would expect the standardized wage to be slightly higher than the non-standardized wage at the national level. Actually, the national wage decreases by 0.4 per cent, from 2.094 SEK to 2.086 SEK. This is explained by the fact that the branches stone, clay and glass and food and beverages – both with a substantial employment weight (consult Table 6) – have lower standardized wages (again, because the share of youngsters is lower than in the censuses) and, at the same time, have the highest age premium.

It would be preferable to have more than just two age groups, but problems arise because of the limited number of observations: the smaller the age width, the greater the variations in weights. Strange results occur when, say, a 56-year-old glassworker has his wage multiplied by a factor of 4, because pure coincidence has it that the share of glassworkers aged 55–64 is much smaller than the census share. Obviously the problem occurs when we are dealing with sub-

[13] Individuals for whom no age is recorded are given the weight one (1). It would be possible to assume that these individuals were distributed according to the rest of the sample and attach weights accordingly. Still, since their wages differ, such a procedure would introduce more problems than it would solve.

branches with relatively few observations. We address the issue by limiting the material to only two age groups.

Our way of measuring the age distribution in the labour market is not ideal. Hence, our effort to correct for differences between the AFK inquiry and the labour market is not perfect either. However, the way we *can* do it points in the direction that bias is not a problem.

Table E5 Standardized and non-standardized wages by age, IS classification. 1884/1885. Daily wages (SEK). Men

	Wage	
Main industrial branches	non-standardized	standardized
Metal and mining	2,14	2,15
Stone, clay and glass	2,17	2,14
Wood	2,39	2,39
Paper, pulp and printing	1,89	1,97
Food and beverage	1,97	1,93
Textile and clothing	1,99	1,99
Leather, hair and rubber	1,81	1,95
Chemical	1,60	1,45
Electricity, gas and water services	3,00	3,10
National	2,09	2,09

Note: Both series are weighted by employment.

Appendix F: The impact of different weights in sawmilling

Table F1 Wages by industrial branch, IS classification. 1884/1885. Daily wages (SEK). Men

	Default weights*		Alternative weights**	
Industrial main branch	Absolute	Relative	Absolute	Relative
Metal and mining	2.14	102	2.14	100
Stone, clay and glass	2.17	103	2.17	101
Wood	2.39	114	2.40	112
Paper, pulp and printing	1.89	90	1.89	89
Food and beverage	1.97	94	1.97	92
Textile and clothing	1.99	95	1.99	93
Leather, hair and rubber	1.81	86	1.81	85
Chemical	1.60	76	1.60	75
Power-, lighting- and waterworks	3.00	143	3.00	141
National	2.09	100	2.14	100

* Lower estimate (AFK) of employment in sawmilling (default option).

** Higher estimate (Prado) of employment in sawmilling.

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