*Essays in Economic & Business History*
2024, 42 (1): 116-151
Published April 17, 2025

# A New Benchmark for Industrial Wages in Mid-1880s Sweden

Jesper Hamark, University of Borås jesper.hamark@hb.se, Kristoffer Collin, University of Gothenburg, kristoffer.collin@gu.se, and Svante Prado (corresponding author), University of Gothenburg, svante.prado@econhist.gu.se

**Abstract**

Most researchers interested in Swedish wages during early industrialization have depended on the first of two parts of *Wages in Sweden*, published in 1933. Whereas we have reasons to believe that the series presented in *Wages in Sweden* tracks well the movements of wages over time, we have grounds for doubts whether levels of wages across industries represent an accurate account of the wage structure. This questionable attribute of *Wages in Sweden* is problematic because, lacking other sources, we also depend on this source for comparisons across industries, regions and other countries. Based on hitherto-unused source material from a large, nationwide public inquiry, we have estimated industrial wages in the mid-1880s. The population consists of industrial workers with different levels of experience, skills, and workplace categories. The new figures we present in this article include industry-specific wages as well as an average wage for manufacturing at large, weighted by employment. Whereas our new average for manufacturing at large is relatively close to that of *Wages in Sweden*, the wage levels of several industries are very different. In addition, the wage structure of our investigation is much more compressed. Our findings caution against the use of *Wages in Sweden* for industry-specific wage levels.

**JEL Classifications**: N33, N63.

**Keywords**: wage benchmark; manufacturing; Sweden mid-1880s; *Wages in Sweden*; Arbetareförsäkringskomitén.



ISSN 2376-9459 (online) LCC 79-91616 HC12.E2
http://creativecommons.org/licenses/by/4.0/

## Introduction

The two parts of *Wages in Sweden 1860-1930* by Gösta Bagge, Erik Lundberg and Ingvar Svennilson have had an enduring influence on research in Swedish economic history ever since they were published in the 1930s.[1] In particular, the first of these parts, henceforth referred to as *Wages in Sweden* or Bagge et al. interchangeably, has remained a pillar on which many studies depend. It offered new estimates of wages in manufacturing pre-1913, before the publication of official wage statistics in 1913, to circumvent the scarcity of published wage records pre-1913. The authors of *Wages in Sweden* collected previously unused archival sources comprising payrolls for about 160 firms in the manufacturing sector. These sources were employed to provide a series of hourly and annual wages for manufacturing as well as series of hourly wages for seven groups of industries. Much of what we know about the wage structure, growth rate of wages over time, average wage level, and differences across sex and skills, derives from the information conveyed in *Wages in Sweden*.[2]

Doubt has been cast on the reliability of *Wages in Sweden*. Whereas the evidence of wage growth before 1913 has remained little discussed, the relative wages across groups of industries have been much debated.[3] The reason for this concern over the evidence for wage levels hinges on the methodological approach used to track wages over time. Realizing that the sample of firms was rather small and unbalanced across industries, rendering it difficult to establish wages of the average worker consistently over a longer time span, the main priority of Bagge et al. was to track the movement of wages over time for a typical worker. In the parlance of Arthur L. Bowley, their method could be described as kinetic, meaning that it was designed to capture the yearly changes in wages for a worker who is representative of a particular industry.[4] This method, as the authors made plain, can make no pretence to establish accurately the relative wage levels across industries or the average wage level of all workers at any point in time. Similar considerations have also been put forward by other prominent scholars, including Charles Feinstein and Lawrence Officer, who attempted to process wage data lacking inter-temporal homogeneity across industries and worker characteristics.[5] Being aware of the potential problem of over-estimation, the authors of *Wages in Sweden* attempted to assess the size of the presumed upward bias in wage levels and considered their wage levels to be about five percent too high.

Several in-depth studies with a focus on one or a few industries have also revealed that the wage levels in *Wages in Sweden* appear significantly off the mark.[6] Apparently, the over-estimation of industry-specific wage levels had to do with the choice of typical worker, which conformed rather well to a permanently employed worker but not so well to a temporary worker. Despite these critical remarks on the wage levels for specific industries, the average wage level in manufacturing given in *Wages in Sweden* for 1913 squares quite well with the average wage level from the official wage statistics for the same year. This congruence becomes apparent in *Wages in Sweden* since it also offers a prolongation, based on the official wage statistics, of the series for manufacturing until 1930. This agreement is reassuring, as these official statistics are based on a large sample of establishments in manufacturing. The only previous large-scale investigation into manufacturing wages pre-1913 is that of Kristoffer Collin, drawing on the enquiry of the Tariff Commission (1882). He, however, focused on the

[1] Bagge et al. (1933, 1935). For an account of the background to the project, see Benny Carlsson (1982).

[2] Jörgen Björklund and Hans Stenlund 1995; Christer Lundh, Lennart Schön and Lars Svensson 2005; Svante Prado 2010a.

[3] Bengt Berglund 1982; Lars Cornell 1982; Bo Gustafsson 1965; Christina Johansson 1988.

[4] Bowley 1900.

[5] Feinstein 1990; Officer 2009.

[6] Berglund 1982; Cornell 1982; Gustafsson 1965; Johansson 1988.

wage structure rather than the average of manufacturing at large.[7] Besides, the response rate of firms in that investigation was rather low (19 percent), which led to overrepresentation in some industries and underrepresentation in others. The validity of the estimated wage levels by industry can, therefore, be called into question.[8] Hence, what the previous research has failed to provide thus far is a pre-1913 benchmark of wage levels based on a sample of establishments that rivals the broad coverage of the official wage statistics of 1913. Such a benchmark would pave the way for an improved understanding of the relative and absolute levels of the wage information contained in *Wages in Sweden*.

The objective of this article is to offer such a pre-1913 benchmark of average wages in the mid-1880s, for manufacturing at large as well as for seven groups of industries. We have drawn on previously unused source material—the original returns from a large public inquiry conducted in 1885 by the *Commission of Workmen's Compensation and Insurance against Industrial Accidents* (Arbetareförsäkringskomitén)—henceforth referred to as the Commission or AFK.[9] The Commission sent out a questionnaire containing questions regarding work-related accidents to more than 15,000 firms. The response rate was 82 percent. 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 that reflects the real labor market conditions. In this regard, the survey comes close to the coverage and representativity of the official wage statistics of 1913.[10] We have focused on male workers' wages because they were over-represented, although we also examined the wages of female workers and wages of the underaged. For aggregation into groups of industries and manufacturing at large, wages are combined using employment weights for the economy as a whole.

To our surprise, the average wage level for manufacturing based on the Commission square quite well with that of *Wages in Sweden*. The deviation is within the five-percent range considered by Bagge et al. based on their cross-check for a single year. However, the similar averages arrived at in *Wages in Sweden* and by us obscure the fact that the wage structures revealed by the two investigations are very different. As one might expect given the quite limited sample of wages in *Wages in Sweden*, most industries have levels that are off the mark by a large margin. This incongruity reveals the fallacy that the average is more important than the constituent parts. Moreover, we find that the spread of wages across industries is much too high in *Wages in Sweden*, a result that calls for a substantial revision of the wage structure in manufacturing, a conclusion consistent with Collin's investigation of the wage data from the Tariff Commission (1882).[11] He found that the spread of wages was much smaller than previously held, and that result is reinforced by our investigation.

Our mid-1880s benchmark coincides with the acceleration of industrialization. Sweden belonged to the second wave of industrialization that swept across several countries in the fourth quarter of the nineteenth century. At first, the technologies that supported this rise of manufacturing were inherited from the First Industrial Revolution, such as the steam engine and mechanization devices used in the textile industry. As the century ended, manufacturing was transformed by the technologies of the Second Industrial Revolution, such as electric motors and innovations within steel production and the chemical industry. These technologies were a perfect match with Swedish endowments, and growth rates surged ahead accordingly. Our benchmark hence coincides with the pinnacle of industrialization centered on steam

[7] Kristoffer Collin 2016, 161-191.

[8] For a discussion of the representativity, see Suvi Heikkuri, Prado and Yoshihiro Sato (2025) and Collin (2016, 198-200).

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

[10] Prado 2010a.

[11] Collin 2016, 161-194.

before it started to yield to electricity.[12] It thus offers a yardstick of Swedish wage levels for manufacturing relative to those of other countries that also stood on the brink of industrialization. In addition, it also coincides with the peak of Swedish mass emigration to the New World. Previous research has pointed to the Swedish-US wage gap as one of the foremost determinants of that cross-Atlantic flow of migrants.[13]

We conclude the article by bringing our results to bear on the standard of living relative to other countries and the determinants of emigration. In short, despite our downgrade in the average wage level of manufacturing, Swedish wages seem to have been rather high from an international perspective. They continue to convey a more optimistic message about standards of living than GDP per capita levels do.

## *Wages in Sweden* and its Critics

The epochal status of *Wages in Sweden* is best understood in relation to the paucity of wage information on sectors other than agriculture before World War One. Agricultural wages, based on market price scales, are available from the eighteenth century, and the Swedish official statistics contain agricultural wages from the second half of the nineteenth century. They form the basis of part two of *Wages in Sweden*, which, besides agriculture, also offers wages for government, municipal service, and forestry work. Information regarding manufacturing wages for the nineteenth century is quite another matter. The source material is scarce, in comparison with wages in Sweden in the twentieth century and countries like Norway, the UK and the US in the nineteenth century.[14] Official wage statistics 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. The quality of the official wage statistics improved from 1921 onwards.[15]

The wage series that the authors of *Wages in Sweden* constructed for 1860-1913 built 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 eleven months. Further, workers were substituted after a limited number of years (5-10) to avoid age having an influence on the movement of wages.[16] The selection of occupations was based on the wish 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.[17] After computing the average occupational wages at the level of firms, the authors combined and weighted the averages to create industry-specific time series.[18]

The method used in *Wages in Sweden* is described as 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. The authors explained that they studied 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[19]

[12] Prado 2014.
[13] Anna-Maria Eurenius and Jan Bohlin 2010.
[14] Prado 2010a, 482-483.
[15] Ibid., 488-489.
[16] Bagge et al. 1933, 27-30.
[17] Ibid., 26.
[18] Ibid., 37-45.
[19] Ibid., 11, quoting Bowley (1900, 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.[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 examine why this is the case. Most importantly, the wage series in *Wages in Sweden* refer to permanently employed workers; casual workers were omitted from the series. The problem is that permanently employed workers "represented an insignificant minority" in the labor market, in Bo Gustafsson's words.[21] In addition, as pointed out by Torsten Gårdlund, skilled workers are overrepresented.[22] *Wages in Sweden* thus overstates the absolute level of wages, at least if we wish 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.[23] Food and beverages, on the other hand, seem to be much more diversified with regard to the level of skills.[24]

Giving a balanced account of this weakness, the authors 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, selected workers were *on average* about five percent higher than the wages of all workers.[25] The direction of this deviation (positive) 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. Therefore, deducting five percent from the wage series in *Wages in Sweden* does not yield an unbiased estimate of absolute wages at the branch level (and Bagge et al. made no such claim themselves). This would require us to assume heroically that there is an equal distribution of casual work across industries. Given these complexities, we would only produce unbiased measures for the selected occupations within an industrial branch and not for the branch itself. Again, the authors were interested in the typical, not the average.[26]

The authors' firm selection bias also produces an over-estimation of wage levels. *Wages in Sweden* is based solely on source material from larger companies.[27] Large firms survive for a longer period of time than smaller ones, and larger firms keep payroll records of high quality more often.[28] However, if the interest lies in levels rather than movements, then the exclusion of smaller companies is disturbing. There is a positive correlation between the wages and the

[20] Bagge et al. 1933, 20.
[21] Gustafsson 1996, 225.
[22] Gårdlund 1942, 356-357.
[23] Bagge et al. 1933, 115, 555.
[24] Ibid., 194-195, 503.
[25] Ibid., 30-32.
[26] Ibid., 20.
[27] Ibid., 8, 24.
[28] Thor Berger and Vincent Ostermeyer 2025.

number of employees at the firm level, and omitting smaller companies will bias wage estimates upwards.[29]

As to the quality of sources, Bagge et al. offered detailed accounts, 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, problems loomed. For two main industrial branches—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, the authors admitted that "the material is extremely scanty"; "the wage data collected […] is very incomplete"; and "the averages […] are very unreliable".[30] We have due respect for such critical evaluation of the material, but it also highlights the problem of using *Wages in Sweden* for cross-sectional comparisons of wage levels.

The weighting method employed in *Wages in Sweden* takes into account firm attributes such as size and the quality of the information.[31] Gustafsson reviewed the method and concluded that it "to a certain, but unfortunately unknown, extent must have rested on completely subjective considerations".[32] Using employment weights systematically, Prado downgrades the growth rate significantly owing to the large weight of sawmills that displayed a sluggish growth rate from the mid-1870 onwards.[33]

Benefits in kind were a non-negligible part of labor income by the end of the nineteenth century. Such benefits could include free potato land, medicine, pensions, subsidized food and, most importantly, free housing. Bagge et al. discussed the matter at length and decided not to include benefits in kind in general. The exception was ironworking, for which free housing was included.[34] *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. From a cross-sectional perspective, the ambiguous inclusion of benefits in kind is disturbing. Since free housing and other benefits were included in some industries but not in others, comparisons across industries are problematic. It should also be said that the inclusion of free housing in ironworking certainly improved these estimations as a measure of living standards. In addition, the treatment of benefits in kind probably did not have a major impact on the rate of change in different industries.

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".[35] The number of series also differed widely across industries and branches of industry. In the mid-1880s, there were around 60 "active" series in ironworking; hence, the estimation of the average wage level in ironworking 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*).

As this brief review of the empirical basis of *Wages in Sweden* has highlighted, there is an urgent need to establish a cross-check of the wage levels in manufacturing at large and in the individual industry series underlying that aggregate. In the next section, we therefore offer

[29] Charles Brown and James Medoff 1989. See Gustafsson (1965, 118-120) for the Swedish sawmilling industry in a time period close to ours, and, for a recent theoretical explanation of the phenomenon, consult David Weil (2014).

[30] Bagge et al. 1933, 108.

[31] Ibid., 37.

[32] Gustafsson 1965, 141; our translation.

[33] Prado 2010a.

[34] Bagge et al. 1933, 33-37, 85-90.

[35] Ibid., 28.

an in-depth discussion of a hitherto-unused source containing data on wages in manufacturing for a benchmark year.

## The Source Material and Methodological Considerations

In October 1884, the AFK was assigned to investigate the extent of work-related accidents.[36] In addition, it was asked to propose measures to mitigate hazardous working conditions. At the time, few such studies had been conducted. One exception was a German inquiry from 1881, which the AFK used as a source of inspiration. The AFK's inquiry covered a full year, from September 1, 1884 to August 31, 1885. To facilitate the administration of the original survey returns and to address the fact that certain industries were subject to seasonal variation, the investigation period was split into two sub-periods of equal length.

The inquiry covered a large part of the labor market. It included manufacturing and handicrafts, 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 cause of the accident as well as its consequence: fatality, duration of absence (if any), and whether the worker was permanently incapacitated (fully or partially). Employers were also asked to report the number of employees for every month, broken down by sex and age group (adult or underaged). Whereas all employers reported employment figures, only employers who had experienced work-related accidents reported information on individuals. Since this factor introduced a possible bias into the estimation of wages, we will discuss it at length later.

Tracking firms in the most comprehensive way, the AFK used the records of the Board of Trade (*Kommerskollegium*), verified and supplemented by various minor sources, such as records of the sawmill owners' association.[37] The Board of Trade was responsible for the collection and production of industrial statistics, which in principle should include industrial enterprises but not handicraft enterprises—although the distinction between them was anything but clear-cut, as Lennart Jörberg pointed out.[38] This has importance for the choice of employment weights for the aggregation of wages, which will be discussed later. Inevitably 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 half-year periods were sent out jointly. The average return rate for both periods was 82 percent. The response rate varied across industries.[39] First, there were differences between the three main sectors: (A) raw materials, processing and manufacturing, 83 percent; (B) sea and land transportation, 79 percent; and (C) public administration (state and municipal), 100 percent. Second, the variation was larger within sectors. For instance, within sector (A), the highest response rate was 96 percent (sawmilling) and the lowest was 55 percent (clothing). The published report contains many summary tables but no data for individual firms. Since we want to utilize individual data, we use the original returns. We delimit our study to sector (A) and the industrial branches, excluding agriculture.

The AFK noted that no adequate industrial classification existed in Sweden at the time.[40] Instead, the AFK followed the classification used in the 1881 German inquiry into work-related accidents. This classification used workplaces rather than occupations as its base. This principle implied that all workers employed by an engineering company were classified as

[36] AFK 1888a.

[37] Ibid., 1-2, 8.

[38] Jörberg 1961, 372. See also Berger and Ostermeyer (2025) and Jesper Hamark and Svante Prado (2025).

[39] AFK 1888a, 8-9.

[40] Ibid., 11.

workers in the machine industry, even though their actual professional roles, such as boilerman, carpenter, machine operator, sheet metal worker, or filer, ranged widely. While mainly following the German system, the AFK made a few changes. The German statistics lumped together the paper industry and the leather industry, while the AFK separated them. Because of the importance of sawmills for Sweden, the AFK separated sawmills from wood industries.

In the first step of our estimation procedure, we have accorded to each firm an industry classification based on firm name. In most cases, the firm name is sufficient for classification, but in a few hundred cases, online resources were used to establish correct affiliation. We include only adult males (minimum 18 years of age) in the bulk of our analysis, but we also estimate a national wage for women and for the underaged (under 18). We have classified wages of individuals according to two different schemes. The first is that used by the AFK, inspired by the earlier German classification. The second is that used by the Swedish official wage statistics, published since 1919 (although it presented wages retrospectively from 1913 onwards). There are two reasons for using both classifications. First, researchers who want to compare wages in the 1880s with those in the twentieth century may want to use the classification of the official wage statistics. Second, those who are interested in the early industrialization period per se may prefer the AFK classification because some of the industries, such as building, were included in the AFK study but omitted from the official wage statistics. There are several other differences between the AFK and the wage statistics. For a detailed description of main branches and sub-branches according to the two nomenclatures, as well as for a comparison between them, we direct the reader to Appendix A. We build most of our estimates on the classification of the official wage statistics but also present male wages by industrial branch according to the classification of the AFK.

On the unit of labor input, the AFK presented daily wages. The reason was straightforward: wages were often paid by the day at that time. There are estimations of the length of the working day in the 1880s.[41] In several cases, we could, probably with reasonable accuracy, have transformed daily wages into hourly wages, but since there were also several cases in which we could not have done so, we have generally chosen not to present hourly wages. We make one exception: for the benefit of comparison with *Wages in Sweden*, we have estimated a national hourly wage level for male workers (see Table 10). Two different methods were used, both based on the AFK. First, we have divided our national daily wage by 11.1, which was the employment-weighted average of the number of working hours per day according to the Commission.[42] All branches and sub-branches were thus assumed to have working days of 11.1 hours. An additional caveat is that mining was excluded from the Commission's average. Second, we have used the information on the length of the working day at the sub-branch level, subsequently aggregating it to higher levels using employment weights. In cases where data for the sub-branch level were lacking, we used the branch average. The sub-branches connected to mining constituted a special problem. The AFK inquiry omitted mining because this sector contained too few observations and had questionable quality. Although the AFK concluded that the working day was shorter in mining, it refrained from making a guess about the number of hours.[43] We have instead included mining, assuming the working day was a full hour shorter than the industrial average.[44] We

[41] AFK 1888b; Kommerskollegium 1911.

[42] AFK 1888b, 3-4, 42-44.

[43] Ibid., 10-11.

[44] By coincidence, the methods yield the same 3-digit hourly wage, SEK 0.189, for our default option. Assuming instead, for instance, 10.6 and 9.6 hours per day in mining would give a national hourly wage of SEK 0.188 and SEK 0.190, respectively.

estimated the hourly wage for manufacturing at large by both methods, and the difference turned out to be inconsequential.

On a few occasions, we also excluded individuals from our database when their wages were recorded. In a couple of cases, we did so because the individuals performed penitentiary work; more commonly, though, our exclusion was based on a judgement of what constitutes a reasonable wage level. For instance, a person earning SEK 6.60 per day was excluded, since that wage level grossly deviated from the average. In such cases, we assumed that typing errors had occurred. These omitted cases have had no impact on the aggregate, which is based on about 2,000 cases, but they might have affected some branches with relatively few observations.

We will now briefly consider positive and negative aspects of the AFK inquiry. One positive aspect is that it includes 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*. Second, it is based on many 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 given the long time period covered by Bagge et al., but it is warranted because of the frequent use of *Wages in Sweden* to examine wage levels for industries or for manufacturing at large (discussed in the penultimate section). Third, in contrast to *Wages in Sweden,* which excluded casual workers, it captures all workers regardless of experience, skills or workplace category. The AFK material, furthermore, included apprentices, day laborers, helpers and others. The inclusion of these groups brings down the average wage level and produces more accurate estimations of the general conditions in the labor market. Fourth, it comprises both small and large firms.[45] 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.

As for the downsides of the AFK-investigation, the first concerns the unclear status of benefits in kind. The Commission included in its questionnaire a back page with instruction on wages according to which “Income from work is understood as [money] wage as well as benefits in kind in the form of food, housing, wood fire and other things.”[46] It is important to recognize that it was an *instruction*; whether the reports on wage levels actually included benefits in kind remains unclear. The Commission commented only on the quality of the reports concerning benefits in kind for agricultural workers and seamen. It concluded that “benefits in kind are not always taken into account for agricultural workers and they are almost never taken into account for sailors”.[47] This conclusion *may,* on the one hand, indicate that the Commission considered benefits in kind satisfactorily reported for other occupational groups. On the other hand, our comparisons of wage sources for sawmilling and transportation, both of which excluded benefits in kind, cast serious doubt on whether the Commission really succeeded in including benefits in kind systematically (see Appendix D). We assume, with some caution, that the returns probably indicate money wages.

The second downside is that the Commission provides few observations of female wages, as shown by Table 1. The material contains fewer than 50 female wages. The number of observations regarding adult women is even smaller. To a certain extent, this shortage can be explained by the fact that fewer women worked in high-risk industries (the inquiry captured

[45] In the Industrial Statistics post-1912, a small firm employs fewer than ten people (Hamark and Prado 2025).

[46] “Med inkomst af arbete förstås såväl lön som naturaförmåner af kost, bostad, vedbrand och annat.” Riksarkivet, SE/RA/310507/HIa. The information on the back page was missed by Collin and Hamark (2019).

[47] AFK 1888a, 85. The treatment of benefits in kind for agricultural workers and seamen is not interesting in itself since neither occupational group is part of our study.

*accidents* and not, for instance, repetitive strain injuries). In addition, we believe that there was systematic under-reporting of women who were involved in accidents. The few observations of women mean that female wages can only be measured at relatively high levels of aggregation.

**Table 1**

Number of Observations by Gender and Age

| Classification | Girls (< 18) | Women | Boys (< 18) | Men |
|---|---|---|---|---|
| AFK | 11 | 36 | 178 | 2,132 |
| Industrial Statistics | 11 | 36 | 178 | 1,964 |

The third downside is that it only contains individual information on people who were involved in accidents. Making inferences from them to the industrial labor market in general, we must assume that workers involved in accidents constitute a random sample. In other words, controlling for workers' attributes, there should be no systematic wage difference between injured and uninjured people. One could—and neoclassical economists often do—hypothesize that people have different attitudes towards risk; some individuals might be reckless at work, whereas others might be risk averse. Assuming furthermore that recklessness (and hence the risk of being injured) correlates negatively with productivity, the AFK material would perhaps yield estimates of wages that are biased on the low side. It is far from clear, however, that a "reckless" person would also have low productivity; one could easily imagine the opposite—that she or he performs better.

Furthermore, previous research on work-related accidents has indicated that younger people tended to be injured more often than older people. This age bias may affect our estimates of wages, since age is positively correlated with wages. Table 2 illustrates this correlation showing that the older group in our sample earns 22 percent more than the younger group. To make sure that we do not underestimate wages, we need to examine whether our material includes a disproportionally large share of younger individuals. It turns out, however, that the difference between the AFK sample and the labor market (as measured) is small. Therefore—and because of the methodological difficulties associated with the procedure to correct for age—we have chosen not to standardize wages by age in our final estimates. We discuss the issue at length in Appendix E in which we also present wages for the main branches standardized by age.

**Table 2**

Male Wage by Age Group, AFK Classification. Daily Wages 1884/1885

| Age group (years) | Wage (SEK) | Number of individuals |
|---|---|---|
| 18-24 | 1.87 | 481 |
| 25-74 | 2.28 | 1,474 |

Note: Excluding individuals for whom age is missing.

## From Firms to the Manufacturing Industry

We have weighed each wage observation by number of workers to compute means for branches and manufacturing at large. The principles for calculating mean wages by weighing apply because we have a sample of wages. Weighing would be redundant if we instead had wages and labor inputs for the entire population. We apply a bottom-up procedure, weighing

at firm-level first, then at sub-branch level, and finally at branch level to arrive at manufacturing as a whole. Since we have daily wages, the natural procedure would be to employ the number of days worked as weights. In the absence of this particular piece of data, we have instead resorted to the number of workers.

There are three principal ways to establish the mean wages of industrial sub-branches: first, use the mean wage of individuals within the sub-branch; second, use the unweighted mean wage of firms within the sub-branch; and third, use the weighted mean wage of firms within the sub-branch. The first method is preferable to the second, since it retains more information. Neither of the first two, however, considers differences in the size of firms. It is reasonable that wages in small firms should have less weight than wages in large firms. Firm size may be measured in various ways, but in this context the number of employees is the most appropriate. We use information from the original returns and weighted wages according to the firm's average number of employees during the twelve-month period. As discussed above, in general, larger firms offer higher wages. This relationship also holds for our material, as Table 3 shows.

**Table 3**

Wage by Firm Size

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

Note: Not weighted by firm size. Classification of AFK.

To calculate main branch wages, we use sub-branch employment numbers as a weighting factor. Our primary source is the industrial statistics.[48] They are furthermore supplemented by published and unpublished calculations by Prado, based on the industrial statistics combined with Swedish historical national accounts.[49] For a full account of the sources used to weight the sub-branches, see Appendix C. The employment weights relate to factories and exclude handicrafts (as the AFK did not reach out to firms in the handicrafts sector). In the case of refined wood products in particular, this distinction has an important impact. According to Prado, on whose figures we depend, approximately 20,000 people were employed in this industry, yet only 2,300 of them worked in factories or workplaces resembling factories. Thus, we use this latter, lower figure as weight.

Our employment weights include men and women. The reason for using the total employment is to achieve correspondence between the industrial statistics and Prado's figures, because he did not differentiate employment by sex. When these sources are insufficient, we use the AFK's figures, which need to be adjusted to reflect the response rates of the sub-branches. As elaborated further below, we use the AFK's figures for sawmills. The response rate within sawmilling was 96 percent. Assuming that the non-respondents did not differ from the respondents regarding the number of employees, we estimated the total employment within sawmilling by multiplying the AFK-figure by factor 1.04 (1/0.96).[50] 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. This means that the subgroup of sawmills constitutes the main branch of forestry and

[48] Bidrag till Sveriges officiella statistik (BiSOS) [Contributions to Swedish Official Statistics].

[49] Prado 2008, 2010a; Karl G. Jungenfelt 1959; Schön 1988.

[50] Generally: Estimated employment sub-branch X = Employment, AFK sub-branch X*(1+[1-Response rate sub-branch X]).

sawmilling (AFK classification). This is less of a problem in the industrial statistics since forestry is not included at all.

Unlike the German classification scheme, the AFK differentiated between sawmills and wood industries. The reason for that differentiation was the sheer magnitude of Swedish sawmilling. How important was sawmilling in employment terms? The industrial statistics do not give any data prior to 1896. Scholars have therefore relied on indirect measurements deriving employment from either output or population census. The most recent attempt is made by Prado. According to his estimate, approximately 37,000 people were employed in sawmilling in the mid-1880s.[51] The returns of the AFK inquiry, however, indicate a much lower figure. With a 96-percent response rate among the sawmills, employment landed slightly above 15,000. If we adjust this figure by multiplying by 1.04, the result is still well below 16,000. It is true that the AFK was not aware of 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 significant mills. Other evidence is inconclusive. The 1890 census of population indicated that the AFK was right, whereas the figure from the industrial statistics in 1896 supported Prado. Only future research can resolve the issue of the quantitative importance of sawmilling.[52] The AFK's figure is our default option. Nonetheless, in Table 10 and in Appendix F, we also show the results of weighting based on Prado.

To calculate a national wage, we weighted the main branches by number of employees. A decision is needed on whether to include employment numbers for 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 engineering branch contains five sub-branches, two of which we do not have wages for: cartwrighting and instruments. Theoretically, we have a situation like that shown in Table 4. Let us say that we want to calculate an aggregated wage level from two branches. Further, we assume that employment numbers are 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)).

**Table 4**

Example: The Estimation of a National Wage Using Different Weighting Methods

| Industrial branch | Wage | Employment | Weight (1) | Weight (2) |
|---|---|---|---|---|
| Branch 1 | | 8,000 | 8,000/13,000 = 61.5% | 6,000/11,000 = 54.5% |
| Sub-branch A | Yes | 4,000 | | |
| Sub-branch B | Yes | 2,000 | | |
| Sub-branch C | No | 2,000 | | |
| Branch 2 | | 5,000 | 5,000/13,000 = 38.5% | 5,000/11,000 = 45.5% |
| Sub-branch X | Yes | 3,000 | | |
| Sub-branch Y | Yes | 2,000 | | |

Note: Subgroup C excluded for weight (2).

[51] Prado 2008, 206-207; Schön 1988.

[52] BiSOS A 1890, III, 53, Table 12; BiSOS D 1896, 5, Table 1.

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 this sub-branch do not substantially 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. Available data suggest this is not the case, and we therefore drop the sub-branches for which information regarding wages is lacking. For the sake of transparency, Tables 6 and 7 present the employment weights. Future research will probably produce new estimates of employment numbers in various branches; if so, these weights could be compared with ours.[53]

Aggregation of female wages is different from that of men. Because there are few observations of female workers' wages, we present mean wages for only three branches along with a "rest" group in which we merge the other five branches. We use the classification scheme of the official wage statistics. In addition, a national wage is estimated. As in the case of men, the number of employees in firms was used to aggregate wages, although we had to aggregate directly to branch level. Branch employment numbers are used as weights for estimating the national wage. Using the total employment would clearly be inappropriate. Metal and mining (BiSOS C), for instance, employed more than 30 percent of the industrial labor force, but few workers were women. Instead, we have relied on Lynn Karlsson and BiSOS (D) to generate female employment.[54] Karlsson has already aggregated employment at the branch level. In one important respect, she deviated from the industrial statistics. Karlsson merged matchstick making with the wood industry, whereas in the industrial statistics, matchstick making belonged to the chemical industry. We revise Karlsson's figures on this point. Since the sawmilling industry does not appear in BiSOS (D) until 1896, we used the AFK's figure for sawmilling, with the additional—and arbitrary—assumption that five percent of the employees were women. It bears repeating that the estimated wages apply to workers in factory-like workplaces. This context is more important when it comes to women, since female homeworking was an important source of employment, and it was generally not included in BiSOS.[55] Only 11 observations pertained to girls, and we therefore excluded them. The aggregation procedure for boys was the same as for adult males, and we used the same employment weights.[56]

## A Revised Picture of Wages in Sweden for 1884/5

In this section, we first highlight some of our findings, then compare them with *Wages in Sweden*, and finally discuss the implications for the previous research that relied on this source. Looking at Table 5, the number of observations differs between the two estimates (different classifications and weighting schemes) because construction (containing 163 workers) was included in the AFK but not in the official wage statistics. Among adult males, the daily wage varied from SEK 0.65, earned by an 18-year-old machine worker at Vargöns paper pulp factory, to SEK 6.00, earned by a 40-year-old, highly skilled worker at Damsjö distillery. These are extreme cases. In general, the spread of wages was much smaller. Both

[53] The weights of Table 6 and Table 9 differ because two main branches were dropped in Table 9 (see below). Hence all remaining weights rise proportionally.

[54] Karlsson 1996.

[55] Ibid., 7.

[56] It is somewhat problematic to use the same weights for boys as for adult males, but few of our employment sources offer figures for boys (Appendix C). An alternative would be to use the sample itself to create weights for boys, but this is equally problematic because the sample may deviate from the population.

the mean and the standard deviation are very similar across the two classification schemes. Tables 6 and 7 offer daily wages by industry and include the weights. The national wage is higher in Table 7 than in Table 6 because the wages of relatively well-paid construction workers are only included in the AFK classification. This, to our knowledge, is the first time we can establish with assurance what workers in manufacturing earned per day. Excluding construction, the average daily wage was SEK 2.09. Including construction, the daily wage was SEK 2.14.

**Table 5**

Dispersion of Male Daily Wages, 1884/1885 (SEK)

| 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 | 2,132 |
| Industrial Statistics | 1.33 | 1.60 | 2.00 | 2.50 | 3.15 | 2.16 | 0.79 | 1,964 |

Note: The mean is not weighted by employment.

**Table 6**

Male Daily Wages by Industrial Branch, 1884/1885

| Industrial main branch | Wage (SEK) | No of obs. | Weight |
|---|---|---|---|
| Metal and mining | 2.14 | 1,216 | 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 | 1,964 | |

Note: Classification of the Industrial Statistics.

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 boys is more fortunate, even though two of the main branches were dropped because of the small number of observations (Table 9). The average daily wage for a female worker in manufacturing was SEK 1.03, roughly half the level of a male worker. This result is in line with the recent finding based on the Tariff Commission's Report of 1882.[57] Boys actually earned almost the same daily wage as female workers, but they were employed in a wider range of industries than female workers.[58] Two male-dominated industries, the metal

[57] Heikkuri et al. 2025.

[58] Lars Olsson 1995. The use of workers under the age of 18 was regulated in manufacturing and handicrafts in 1882.

and mining industry and the wood industry, employed 67 percent of them, but boys were also employed in the female-dominated textile and clothing industry (17 percent).

**Table 7**
Male Daily Wages by Industrial Branch, 1884/1885

| Industrial Main Branch | Wage | | No. of obs. | Weight |
|---|---|---|---|---|
| | Absolute (SEK) | Relative | | |
| 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 | 2,132 | |

Note: Classification of AFK.

**Table 8**
Female Daily Wages by Industrial Branch, 1884/1885

| Industrial main branch | Wage (SEK) | 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 | |

Note: Classification of the Industrial Statistics. Includes the main branches: metal and mining; stone, clay and glass; wood; paper, pulp and printing, and leather, hair and rubber.

**Table 9**
Daily Wages for Boys by Industrial Branch, 1884/1885

| Industrial main branch | Wage (SEK) | 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: Classification of Industrial Statistics. The branches Food and beverage, and Leather, hair and rubber contain only one observation each, and have therefore been excluded when weighing the national wage.

Table 10 compares the national hourly wage from *Wages in Sweden* with two estimates of ours for 1884 and 1885. The estimated average from *Wages in Sweden* is 10 percent higher than our lower estimate (the default option). The higher value is expected, given that skilled workers were overrepresented and casual workers were omitted from their series.[59]

**Table 10**
National Hourly Wage for Male Workers, 1884/1885

| Source Material | Hourly Wage (SEK) |
|---|---|
| Bagge et al. | 0.208 |
| AFK, lower estimate | 0.189 |
| AFK, higher estimate | 0.193 |

Note: Whereas our estimations are based on the Industrial Statistics 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. The Bagge et al. wage was calculated as the arithmetic mean for 1884 (0.208) and 1885 (0.207). Our estimates 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.
Sources: Bagge et al. 1933, 48; AFK 1888b, 42-44.

Comparing instead with our higher estimate, the national average of *Wages in Sweden* still exceeds ours by seven percent. This is indeed very close to their own assessment of the potentially problematic overrepresentation of relatively skilled and permanently employed workers, which we discussed above. They considered that this sample selection bias could

[59] It is unclear how the consideration of benefits in kind would affect the comparison and, thereby, the “true” difference. We know that Bagge et al. included benefits in kind in *some* industries, and that the AFK, in most cases, probably received information on only money wages. Thus, the overall inclusion of benefits in kind in the two sources might be about the same.

have led them to over-estimate the level of wages by about five percent. Given that so much doubt has been cast on their estimated average, it is somewhat gratifying to find out that their concerted effort yielded an average for manufacturing that falls so little off the mark for all included industries.

That said, looking at the average figure, we can also conclude that inter-industry wage differentials reveal a quite disturbing pattern. Comparing relative wage levels, we have divided all the industry-specific wages by the average for manufacturing from *Wages in Sweden* and from our new estimates based on the AFK. Table 11 illustrates that the new wage structure we have established is very different from that of *Wages in Sweden*. Two aspects warrant attention. First, the coefficient of variation for our sample is much smaller: it is less than half of that based on *Wages in Sweden*. Second, the industry-specific relative wages are very different in some specific cases. This difference in relative wages leads us to suspect that a sample selection bias has implied implausible wage levels for some industries in *Wages in Sweden*. Mining, engineering, and wood are examples of industries with large discrepancies, with the AFK sometimes giving a lower figure, sometimes higher. These divergences echo the earlier critical discussion of industry-specific wage levels. Mining in *Wages in Sweden*, for instance, covers only mines in northern Sweden for our benchmark year of 1884/1885. It is also worth recalling that Bagge et al. were furthermore explicitly self-critical regarding the quality of wage figures for miners.

**Table 11**

Comparing Relative Wages of AFK with Bagge et al. for 1884/1885 (Average = 100)

| | AFK | Bagge et al. |
|---|---|---|
| Metal and mining | 84 | 67 |
| Stone, clay and glass | 106 | 91 |
| Wood | 102 | 124 |
| Paper, pulp and printing | 110 | 131 |
| Food and beverage | 87 | 81 |
| Textile and clothing | 91 | 89 |
| Leather, hair and rubber | 91 | 76 |
| Chemical | 100 | 100 |
| Coefficient of variation | 10 | 24 |

Note: each industry-specific wage is divided by the mean of each investigation.
Sources: Bagge et al. 1933; AFK 1888b.

In sum, while the average wage levels of the two investigations are very similar, the constituent components are very different. It is a mere coincidence that the average wage level for manufacturing is so similar. The result cautions us against relying on the wage levels of *Wages in Sweden* for separate industries. This caution bolsters the critique of Bagge et al., discussed earlier, in which researchers repeatedly warned against the industry-specific wage levels. This result should also remind us how nebulous a concept the mean is when the distributions of two samples are very different. Comparing only means under such conditions will always risk statistical misconceptions.

This confirmation of the problematic industry-specific features of *Wages in Sweden* spills over into previous research on wage levels and wage structure that relied on its wage series.

Jungenfelt's pioneering study of the share of wages in value added depended largely on *Wages in Sweden*, as well as Björklund and Stenlund's study of six industrial branches beginning in 1870.[60] The most recent such example is the study by Prado, who offers wage levels for nine industries beginning in 1860.[61] He expanded the sample relative to Bagge et al. by also drawing on the wage material from their monographic appendix as well as on their monographic section. Several of his industry-specific wage levels are accordingly questionable at least for the early period. The coefficient of variation that he established based on these wage series is, moreover, probably too high. The high coefficient of variation was questioned by Collin, who leveraged wage data from the Tariff Commission (1882) that gave wages every fifth year from 1860 to 1879. He found that the spread of wages across industries was much lower than Prado had established based on *Wages in Sweden*.

The result of our new investigation corroborates Collin's critique of Prado.[62] Table 12 compares Collin's results with ours. Beginning with the spread of wages, the coefficients of variation for our sample for 1885 and Collin's sample for 1879 are very similar: 11.4 percent and 10.5 percent respectively. This congruence is reassuring and bolsters the view that a measure of wage structure based on Bagge et al. will inevitably over-estimate the rate of dispersion. However, some of the constituent components of the summary statistics point in different directions. Our estimate of average wage 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.[63] Wages in chemicals are low in both studies, although they are even lower in ours. We have no immediate explanation for the discrepancy, but it is worth recalling that the AFK sample has a much broader scope and coverage than the Tariff Commission's sample. Overall, our study, along with Collin's, reinforce the impression that the spread of wages was rather moderate in the 1880s.

**Table 12**

Relative Male Wages by Industrial Branch, 1879 and 1884/1885 (Average=100)

| | 1884/85<br>AFK | 1879<br>Collin |
|---|---|---|
| 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 |
| | | |
| Coefficient of variation | 11.4 | 10.5 |

Note: classification of the Industrial Statistics. Sources: Collin 2016, 241-242; AFK 1888b.

[60] Björklund and Stenlund 1995; Jungenfelt 1966.

[61] Prado 2010a. For more information on the difference between our study and that of Prado, see Collin and Hamark (2019).

[62] Collin 2016, 161-194; Prado 2010a.

[63] Bagge et al. 1933, 137.

However, our conclusions do not imply that the industry-specific growth rates of wages in *Wages in Sweden* are seriously flawed. Neither do they imply that the estimated increase for manufacturing at large is misleading. We need to recall that the aim of *Wages in Sweden* was to track the movement of wages over time rather than pinning down the average wage levels of different industries. If the labor market was well integrated, we may presume that wages increased in tandem across occupations, skills, and industries, notwithstanding episodes of divergence owing to macro-economic disturbances. To cross-check the rate of change for different industries would require a large-scale research project based on archival research, which is unlikely within the foreseeable future. As Prado has shown, the growth rate of the aggregate can be considerably improved by using a more transparent and appropriate weighting scheme than that used by Bagge et al, which has lowered the estimated growth rate of wages for manufacturing at large.[64]

Furthermore, our result has a bearing on the assessment of standards of living. Since the average wage level in manufacturing is an important component for our understanding of the living standard in Sweden relative to that of other countries, we have until recently depended on *Wages in Sweden*.[65] Drawing on the average wage level of manufacturing workers, Prado concluded that Swedish workers' wages were not far behind their British peers by the early twentieth century.[66] This small gap in relative wages contrasts with the gap implied by GDP per capita. According to the comparative figures offered by the Maddison Project, the British level was 2 to 2.5 times the Swedish in the first decade of the twentieth century.[67] Even if we lower the estimated level of average wages for manufacturing workers, we do not challenge the view that Sweden was not much behind the UK in standards of living measured by real wages, which is also confirmed by recent research comparing welfare ratios for construction workers across several countries.[68]

## Conclusion

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 wage material in their investigation is not suitable for estimating either absolute wage levels or relative wages across industries or regions at specific times. Their methodology was instead designed to track the movement of wages over time. Previous literature on Swedish wages during the late nineteenth century, based on hitherto unused archival research for some industries, levelled damning criticism against some of the wage series in *Wages in Sweden*. However, we do not yet know if these critical remarks have rendered the use of the average wage level or the relative wage levels of Bagge et al. entirely useless.

---

[64] Prado 2010a.

[65] International comparative studies, including those from Sweden, depended on *Wages in Sweden*. Renowned examples are those by Henry Phelps Brown and Margaret H. Browne (1968), Brian R. Mitchell (1975), and Vera Zamagni (1989). Jeffrey G. Williamson (1995) discussed wage convergence since 1830 across 17 countries. Sweden was included in the sample, and Williamson used series from *Wages in Sweden* to create wages for unskilled Swedish workers. Prado (2010b) 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.

[66] Prado 2010b. For a comparison with other countries based on different wage sources, see Johan Ericsson and Jakob Molinder (2020) and Molinder, Thales Pereira and Prado (2022).

[67] Jutta Bolt and Jan Luiten van Zanden 2025.

[68] Ericsson and Molinder (2020) offer welfare ratios for Swedish unskilled labourers in construction that surpass the ratios from Amsterdam, Antwerp and Paris from the mid-1870s to 1900. Workers from London are ahead by a rather small margin around the turn of the century.

This article has therefore offered new evidence on Swedish wages for all manufacturing industries for 1885 based on the large public inquiry by the *Commission of Workmen's Compensation and Insurance against Industrial Accidents* (Arbetareförsäkringskomitén). The result of our investigation into this new wage material shows that whereas the average wage in manufacturing as given by Bagge et al. appears to be acceptable, the levels of the industry-specific wage series are off the mark by a wide margin. In other words, the similarity of the means may lead users astray in the belief that also the wage levels of individual industries in *Wages in Sweden* offer an indicative account of labor market conditions in the 1880s. Our result cautions against uncritically employing their wage levels for individual industries. In addition, the spread of wages across industries is much too high in Bagge et al.

## Acknowledgements

We would like to acknowledge the feedback received from two anonymous referees. Funding was provided by: Stiftelsen Anna Ahrenbergs Fond; Helge Axson Johnsons Stiftelse; Jan Wallander och Tom Hedelius Stiftelse samt Tore Browaldhs Stiftelse (P16-0211); and the Swedish Research Council (Vetenskapsrådet, 2018-01853).

## Works Cited

### Archive

Riksarkivet [National Archive], Stockholm.

*Kommitté ang förhållandet mellan arbetsgivare och arbetare vid olycksfall i arbete samt ang ålderdomsförsäkring 1884*. Arbetare inom industri, jordbruk med binäringar, transportrörelse till lands, statens verk; vol. 1–28. Ref. code: SE/RA/310507/HIa.

### Official Publications

Arbetareförsäkringskomitén (AFK). 1888a. *Arbetareförsäkringskomiténs betänkande. 3, Statistiska undersökningar. 1, Olycksfall i arbetet*. Stockholm: Samson & Wallin.

Arbetareförsäkringskomitén (AFK). 1888b. *Arbetareförsäkringskomiténs betänkande. 3, Statistiska undersökningar. 2, Arbetstid, hygieniska förhållanden och skyddsåtgärder i fabriker m.m.* Stockholm: Samson & Wallin.

Arbetareförsäkringskomitén (AFK). 1889. *Arbetareförsäkringskomiténs betänkande. 3, Statistiska undersökningar, 7, Ålders- och civilståndsfördelningen samt dödlighetsförhållanden inom olika yrken.* Stockholm: Samson & Wallin.

Bidrag till Sveriges officiella statistik (BiSOS), 1880, 1890. A. Del 3. *Befolkningsstatistik*.

Bidrag till Sveriges officiella statistik (BiSOS), 1884, 1885. C. *Bergshanteringen*.

Bidrag till Sveriges officiella statistik (BiSOS), 1884, 1885. D. *Fabriker och manufakturer*.

Bidrag till Sveriges officiella statistik (BiSOS), 1884. L. *Statens järnvägstrafik*.

Kommerskollegium, 1911. *Arbetsstatistik A:10 Arbetstidens längd inom industri och hantverk i Sverige*.

Sveriges officiella statistik (SOS), Industri, 1913, 1919. 1913 issue available online at: https://www.scb.se/H/SOS%201911-/N%C3%A4ringsverksamhet/Industri%201911-1996/Industri-1913.pdf.

Statens Järnvägar, 1884, 1885. *Arvodesstat*.

### Books and Articles

Bagge, Gösta, Erik Lundberg, and Ingvar Svennilson. 1933. *Wages in Sweden 1860-1930. Part One*. London: P.S. King & Son.

Bagge, Gösta, Erik Lundberg, and Ingvar Svennilson. 1935. *Wages in Sweden 1860-1930*. *Part Two*. London: P.S. King & Son.

Berger, Thor and Vinzent Ostermeyer. 2025. "Firm Survival and the Rise of the Factory." *Economic History Review* 78 (1): 62-86.

Berglund, Bengt. 1982. *Industriarbetarklassens formering: arbete och teknisk förändring vid tre svenska fabriker under 1800-talet*. Göteborg: Ekonomisk-historiska institutionen, Göteborgs universitet.

Björklund, Jörgen and Hans Stenlund. 1995. "Real Wages in Sweden, 1870-1950: A Study of Six Industrial Branches." In *Labour's Reward*, edited by Peter Scholliers and Vera Zamagni, 151-166. Hants, UK: Elgar.

Bolt, Jutta and Jan Luiten van Zanden. 2025. "Maddison Style Estimates of the Evolution of the World Economy. A New 2023 Update." *Journal of Economic Surveys* 39 (2): 631-671.

Bowley, Arthur L. 1900. *Wages in the United Kingdom in the Nineteenth Century: Notes for the Use of Students of Social and Economic Questions*. Cambridge: Cambridge University Press.

Brown, Charles and James Medoff. 1989. "The Employer Size-Wage Effect." *Journal of Political Economy* 97 (5): 1027-1059.

Carlsson, Benny. 1982. *Bagge, Lindahl och nationalinkomsten: om "National Income of Sweden 1861-1930"*. Lund: Lunds universitet.

Collin, Kristoffer. 2016. Regional Wages and Labour Market Integration in Sweden, 1732-2009. Göteborg: Department of Economy and Society, University of Gothenburg.

Collin, Kristoffer and Jesper Hamark. 2019. "Industrial Wages in mid-1880s Sweden: Estimations Beyond Bagge's Wages in Sweden. Data, Source and Methods." Göteborg Papers in Economic History No. 24.

Cornell, Lars. 1982. *Sundsvallsdistriktets sågverksarbetare 1860-1913: arbete, levnadsförhållanden, rekrytering*. Göteborg: Ekonomisk-historiska institutionen, Göteborgs universitet.

Ericsson, Johan and Jakob Molinder. 2020. "Economic Growth and the Development of Real Wages: Swedish Construction Workers' Wages in Comparative Perspective, 1831-1900." *Journal of Economic History* 80 (3): 813-852.

Eurenius, Anna-Maria and Jan Bohlin. 2010. "Why They Moved: Emigration from the Swedish Countryside to the United States, 1881-1910." *Explorations in Economic History* 47 (4): 533-551.

Feinstein, Charles H. 1990. "New Estimates of Average Earnings in the United Kingdom, 1880-1913." *Economic History Review* 43 (4): 595-632.

Gustafsson, Bo. 1965. *Den norrländska sågverksindustrins arbetare 1890-1913: arbets- och levnadsförhållanden.* Stockholm: Almquist & Wicksell.

Gustafsson, Bo. 1996. "The Industrial Revolution in Sweden." In *The Industrial Revolution in National Context: Europe and the USA*, edited by Mikulas Teich and Roy Porter, 201-225. Cambridge: Cambridge University Press.

Gårdlund, Torsten. 1942. *Industrialismens samhälle*. Stockholm: Tidens förlag.

Hamark, Jesper and Svante Prado. 2025. "Modifying the Success Story of Sweden: Revised Output and Labour Productivity Figures for Manufacturing, 1869-1950." *Economic History Review* 78 (1): 113-151.

Heikkuri, Suvi, Svante Prado, and Yoshihiro Sato. 2025. "Women and Children in Factories: Did Mechanization Increase the Demand for Low-Cost Labor in Sweden?" Forthcoming in *Investigaciones de Historia Económica.* Special Issue on Gender.

Johansson, Christina. 1988. *Glasarbetarna 1860-1910: arbete, levnadsförhållanden och facklig verksamhet vid Kosta och andra glasbruk under industrialismens*

*genombrottsskede.* Göteborg: Ekonomisk-historiska institutionen, Göteborgs universitet.

Jungenfelt, Karl G. 1959. *Lönernas andel av nationalinkomsten: En studie över vissa sidor av inkomstfördelningens utveckling i Sverige.* Uppsala University.

Jungenfelt, Karl G. 1966. *Löneandelen och den ekonomiska utvecklingen. En empirisk-teoretisk studie*. Uppsala: Almqvist & Wicksell.

Jörberg, Lennart. 1961. *Growth and Fluctuations of Swedish Industry 1869-1912. Studies in the Process of Industrialisation*. Stockholm: Almqvist & Wicksell.

Karlsson, Lynn. 1996. "Women Workers in Figures. A Picture of Swedish Industry 1863-1912." Uppsala Papers in Economic History, Research Report 40.

Lundh, Christer, Lennart Schön, and Lars Svensson. 2005. "Regional Wages in Industry and Labour Market Integration in Sweden, 1861-1913." *Scandinavian Economic History Review* 53 (3): 71-84.

Lindahl, Erik, Einar Dahlgren, and Karin Kock. 1937. *National Income of Sweden, 1861-1930.* London: P. S. King & Son.

Mitchell, Brian R. 1975. *European Historical Statistics 1750-1970*. London: Macmillan.

Molinder, Jakob, Thales Pereira, and Svante Prado. 2022. "Poles Apart? Living Standards and Inequality by Labour Market Outcomes in Brazil and Sweden, ca. 1830-1920." In *Scandinavia and South America. A Tale of Two Capitalisms. Essays on Comparative Developments in Trade, Industrialization, and Inequality since 1850*, edited by Jorge Álvarez and Svante Prado, 245-285. Cham: Palgrave Macmillan.

Officer, Lawrence H. 2009. *Two Centuries of Compensation for U.S. Production Workers in Manufacturing*. New York: Palgrave Macmillan.

Olsson, Lars. 1995. *Då barn var lönsamma: om arbetsdelning, barnarbete och teknologiska förändringar i några svenska industrier under 1800- och början av 1900-talet*. Lund: Morgonrodnad.

Phelps Brown, Henry and Margaret H. Browne. 1968. *A Century of Pay: The Course of Pay and Production in France, Germany, Sweden, the United Kingdom and the United States of America, 1860-1960*. London: Macmillan.

Prado, Svante. 2008. "Aspiring to a Higher Rank: Swedish Factor and Prices and Productivity in International Perspective 1860-1950." Doctoral dissertation. Göteborg: University of Gothenburg.

Prado, Svante. 2010a. "Nominal and Real Wages of Manufacturing Workers, 1860-2007." In *Exchange Rates, Prices, and Wages, 1277-2008,* edited by Rodney Edvinsson, Tor Jacobsson, and Daniel Waldenström, 479-527. Stockholm: Ekerlids förlag.

Prado, Svante. 2010b. "Fallacious Convergence? Williamson's Real Wage Comparisons under Scrutiny." *Cliometrica* 4 (2): 171-205.

Prado, Svante. 2014. "Yeast or mushrooms? Productivity Patterns Across Swedish Manufacturing Industries, 1869-1912." *Economic History Review* 67 (2): 382-408.

Schön, Lennart. 1988. *Historiska nationalräkenskaper för Sverige: industri och hantverk 1800-1980*. Lund: Lunds universitet.

Weil, David. 2014. *The Fissured Workplace: Why Work Became So Bad for So Many and What Can Be Done To Improve It.* Cambridge, MA: Harvard University Press.

Williamson, Jeffrey G. 1995. "The Evolution of Global Labour Markets since 1830: Background, Evidence and Hypotheses." *Explorations in Economic History* 32 (2): 141-196.

Zamagni, Vera. 1989. "An International Comparison of Real Industrial Wages, 1890-1913: Methodological Issues and Results." In *Real Wages in 19th and 20th Century Europe: Historical and Comparative Perspectives*, edited by Peter Scholliers, 107-139. Oxford: Berg.

## Appendix A: Industrial Classifications

**Table A1**

Industrial Classification According to the Industrial Statistics. **Industrial Branches** and Sub-branches

| Code | English Title | Swedish Title |
|---|---|---|
| **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 |

| Code | English Title | Swedish Title |
|---|---|---|
| 5h | Sugar refineries | Sockerraffinaderier |
| 5i | Manufacture of chocolate 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.[69] The Swedish titles are those used in the Industrial Statistics of 1913.

[69] Sveriges officiella statistik 1913, 71-72.

**Table A2**

Industrial Branches and Sub-branches Industrial Classification According to the Commission. **Industrial Branches** and Sub-branches

| Code | English Title | Swedish Title |
|---|---|---|
| **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 | Blecksla gerier |
| 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 sawmilling** | **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 bobbins, 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 |

| Code | English Title | Swedish Title |
|---|---|---|
| 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 AFK (1888a). The Swedish titles are those used by the Commission.

**Table A3**

Comparison between the Industrial Classifications. Main Industrial Branches

| Industrial Statistics | The Commission |
|---|---|
| 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 sawmilling (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] |

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 Industrial Statistics.

[2] Forestry is not included in Industrial Statistics.

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

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

[5] Not included in Industrial Statistics.

## 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 implicit and vague.[70]

**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, 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.

[70] Bagge et al. 1933, 28, 85-90, 110, 113-121, 157, 200, 232, 553-569.

## 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 accounted for 14 percent of 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 Lindahl et al. (1937) and Schön (1988).

## Appendix D: Cross-checking Benefits in Kind

In order to make a judgement of whether benefits in kind were included in the AFK investigation, we would like to compare with other sources. The sources should cover workers corresponding to the ones covered by the AFK. The problem, of course, is that there is little available wage material for comparison. We have tried 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.[71] Equally unsuccessful was 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 proved futile—with one important exception, Cornell's study of the sawmilling industry.[72]

### Wages in the Sawmilling Industry

Cornell 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 payrolls, Cornell nonetheless presented daily mean wages—benefits in kind *not* included—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.

**Table D1**

Mean Daily Wage in Sawmilling, 1884/1885 (SEK)

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

Sources: Cornell (1982, 150), AFK (1888a) and our calculations.

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. Since the wage levels are basically equal, and since benefits in kind are not included in Cornell's study, Table D1 suggests that benefits in kind were not included in the AFK-investigation either—at least not regarding sawmilling.

As Cornell noted, it is difficult to compare with *Wages in Sweden*.[73] 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; their

[71] Another possible way would be 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. Specifics aside, there are two general problems. 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). Second, and more serious, the arbitrary weighting method in *Wages in Sweden* makes comparisons above the firm level dubious.

[72] Cornell 1982.

[73] Ibid., 149.

estimate was intended to include sawmilling in the country, but, as noted by Gustafsson, in reality, it only captured wages in the northern part of Sweden, including the county Västernorrland.[74]

**Wages at the Swedish State Railways**

As briefly noted in our discussion of source material, 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. While transportation is outside the scope of this article, we nonetheless employ the AFK data for the Swedish State Railways here as well, because we can compare them with the annual publications by the Swedish State Railways (SJ) itself.[75] Like in the Cornell study, benefits in kind are *not* included in the SJ publications.

For a long period of time, the 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 sets of source material, 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 Yearly Wages at SJ: A Real Example.

| Individual 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 (SEK) | 540 | | Mean wage (SEK) | 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 (Table D3).

[74] Bagge et al. 1933, 140-141; Gustafsson 1965, 126.

[75] Statens Järnvägar 1884, 1885.

**Table D3**

Mean Yearly Wage of Lengthmen and Station Hands at SJ. 1884/1885.

| Source Material | Wage (SEK) | No. of obs. |
|---|---|---|
| AFK | 537 | 48 |
| Swedish State Railways, SJ | 545 | 365 |

Note: Comparison of individuals in the same occupation, employment position, age and district.
Sources: Statens Järnvägar (1884, 1885).

The wage difference is negligible. The most plausible explanation is that the AFK did not include benefits in kind for railway workers.

Since our two comparisons—sawmills and railways—suggest AFK did not include benefits in kind, it seems reasonable to assume that, overall, the AFK figures concern only money wages.

## Appendix E: Age Distribution

Are there differences between the AFK inquiry and the industrial labor market with regards to the distribution of age? We do know the distribution of age in the AFK, but what about the labor market? The Commission produced a series of reports, one of them on living conditions—including age distribution—in different industries and occupations. 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.[76] There is also reason to expect that the underreporting was not evenly spread across branches.[77] The AFK compared its own figures with a similar but "much better" (*vida bättre*) investigation in Norway. It found disturbing differences and concluded that its own estimates were defective.[78]

An alternative is to use the high-quality Swedish censuses to estimate the age distribution in the mid-1880s, and to calculate the arithmetic mean values from the 1880 and the 1890 censuses.[79]

**Table E1**

Age Groups. Share of Men, 18-74 Years Old.

| 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, 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).

[76] AFK 1889, 7.
[77] Ibid., 9.
[78] Ibid., 8.
[79] BiSOS A 1880, 1890.

**Table E2**

Labour Market Participation Rate Among the Oldest Age Groups in Relation to the Age Group 30-35

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

Sources: AFK (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% | 2.5% | 100% |

Sources: BiSOS A (1880, 1890); AFK (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); AFK (1889); own calculations.

The relation between the censuses and the AFK material gives our weights.[80] 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) and in stone, clay and glass by a

[80] 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.

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 percent, from SEK 2.094 to SEK 2.086. This is explained by the fact that the branches stone, clay and glass and food and beverages—both with a substantial employment weight (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.

**Table E5**

Standardized and Non-Standardized Male Daily Wages by Age. Classification by Industrial Statistics. 1884/1885.

| Industrial main branch | Wage (SEK) | |
|---|---|---|
| | 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.

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

## Appendix F: The Impact of Different Weights in Sawmilling

**Table F1**

Daily Male Wages by industrial branch (SEK). Classification by Industrial Statistics. 1884/1885.

| Industrial main branch | Default weights* | | Alternative weights** | |
|---|---|---|---|---|
| | 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 |
| Electricity, gas and water services | 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.