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ABSTRACT

New Estimates of British Unemployment, 1870–1913*

Existing estimates of the annual unemployment rate from 1870 to 1913 were constructed by the Board of Trade, initially in 1888, and updated thereafter. This is still the series, which is widely used and cited. It is based on records of the number unemployed in various trade unions and it has a number of well known flaws. The index is weighted by membership of reporting unions and is heavily skewed towards engineering and the metal trades. Some important sectors are largely omitted. We reconstruct sectoral unemployment rates based on union records and supplement this with (crude) estimates for certain other sectors based on proxies for employment. These are weighted according to labour force shares but the index still excludes agriculture and services. The basic cyclical pattern is preserved but the new series has a higher mean and a lower standard deviation than the Board of Trade index. The wide swings in unemployment during the 1870s are confirmed but the amplitude of fluctuations in the 1880s and 1890s is smaller in the new index than in the old. More tentatively, unemployment increases over time in the new index relative to the old.

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NON-TECHNICAL SUMMARY

The unemployment rate index from 1870 to 1913 has been widely used as an indicator of conditions in the labour market. It was originally produced by the Board of Trade and has been incorporated into Feinstein's authoritative estimates of employment and unemployment with only marginal modification. As Feinstein notes, however, and as contemporaries often observed, the index has serious shortcomings as a measure of industrial unemployment. Principal among these is that the labour force weights used are the membership of reporting unions. As a result, some trades are underweighted or excluded altogether and these weights change over time. The problem is especially acute before the 1890s when unions in metals, engineering and shipbuilding formed the majority of the membership of reporting unions. Other shortcomings include the lack of any allowance for short-time working and the absence in the index of any measure of unemployment among the unskilled.

This paper represents our attempt to provide a more representative index of industrial unemployment. Our index relies chiefly on data from trade unions but for several important trades where there are no adequate union sources, we develop proxies based on other sources. Using a simple model of labour force fluctuations (in response to employment changes) we construct unemployment measures for transport, textiles and mining. For textiles and mining we also make an allowance for short-time. Finally, we also include a proxy for unskilled unemployment by using data on males receiving poor relief in workhouses. We weight our 13 sectors together using labour force weights from the census. We present four versions of our index: including and excluding unskilled labour; and including and excluding short-time working.

Our index exhibits similarities to, and differences from, the Board of Trade's index. The main results are as follows:

1) The average unemployment rate in our index is higher than of the Board of Trade. For the most comprehensive version of the index (including short-time and unskilled), the mean for 1870–1913 is 6.6% as compared with 4.5% for the Board of Trade index. The least comprehensive version (excluding short-time and unskilled) is still somewhat higher, although not by much – 5.0% rather then 4.5%.

2) All versions of our index suggest lower volatility in unemployment that does the Board of Trade index. The standard deviations are lower, especially when unskilled labour is included. The coefficient of variation of our indices falls in the range 0.31 to 0.35 compared to 0.55 for the Board of Trade index.

3) The years of peaks and troughs in unemployment are essentially the same or differ only marginally from the Board of Trade. Interestingly, the amplitude in our index is broadly the same as the Board of Trade in the 1870s but is lower in the 1880s and 1890s. From 1900 the amplitude is again roughly the same but (unlike earlier years) the level of unemployment in our indices is uniformly higher.

4) More tentatively, there appears to be a tendency for the average unemployment rate to increase over time. Comparing the period 1870 to 1891 with the period 1892 to 1913, the average unemployment rates in the Board of Trade index are virtually identical. By contrast, the average rises from 6.1% to 7.1% in our most comprehensive index and from 4.7% to 5.3% in our least comprehensive index.

Introduction

The Board of Trade's time series of trade union unemployment for the period 1860-1913 has been widely used by economists and economic historians to evaluate the labor market implications of economic fluctuations in the half century before the First World War. Charles Feinstein (1972) incorporated the series into his authoritative estimates of employment and unemployment for 1855-1913. However, as Feinstein and other contemporaries and historians have noted, the Board of Trade index has serious shortcomings which limit its usefulness as a measure of the level of unemployment at any point in time. These shortcomings were well known to the officials of the Labour Department. For example, Llewellyn Smith, the Commissioner of Labour in the Board of Trade, stated in his testimony before the Committee on Distress from Want of Employment in 1895 that it would be "quite illegitimate" to assume that the trade union unemployment rate accurately measured the "proportion of persons . . . out of work in the country as a whole."[1]

The Board of Trade index was constructed from data reported by trade unions who administered benefit schemes for their unemployed members. There are two principal deficiencies with the index. First, it is based on a relatively small, non-random sample of industrial workers. Those sectors of the economy that were not unionized or in which unions did not offer unemployment benefits were not included in the index. Second, the aggregate unemployment rates constructed by the Board of Trade were weighted by the membership of the reporting unions rather than by labor force weights of the trades or industries they represent. This problem is especially acute before the 1890s, when trade unions in engineering, metals, and shipbuilding formed the majority of the membership of the reporting unions.

[1] S. C. on Distress from Want of Employment, Third Report, minutes of evidence, *Parl. Papers* (1895, IX), Q.4564, pp. 50-1.

This paper presents our attempt to provide a new index of unemployment. Our index relies chiefly on trade union records but also incorporates other information where possible, in order to include sectors of the economy for which trade union unemployment data are not available. It reweights the individual trades included in the index with appropriate labor force weights obtained from the decennial census. We construct four versions of the index, which enable us to confront two controversial issues: whether to include a measure of unemployment for unskilled general laborers; and, for those industries that resorted to short time rather than layoffs in response to declines in labor demand, whether to take the loss of employment from short time work into account when constructing unemployment rates.

Our results support the comments of critics, such as John Hobson and Kier Hardie, who maintained that the Board of Trade series underestimated the level of unemployment.[2] We find that the average unemployment rate for 1870-1913 was slightly higher than that given by the Board of Trade series, even when general laborers are excluded and workers on short time are counted as being fully employed. When general laborers are included and employment loss from short time work is taken into account, we estimate that the average unemployment rate for 1870-1913 was 6.6%, compared with the Board of Trade's average of 4.5%. Our results also support another criticism of the Board of Trade index made by contemporary observers and historians, that it exaggerates the extent of fluctuations over time in the unemployment rate. Each of our four unemployment series has a smaller standard deviation and coefficient of variation than does the Board of Trade series, as adjusted by Feinstein. In this respect our results parallel those of

[2] Hobson, *Problem of the Unemployed*, Chapter 2, maintained that unemployment was higher for non-unionists than for union members within a trade, it was higher in unorganized trades than in organized trades, and it was significantly higher among unskilled and casual laborers than among skilled workers. He concluded that the true unemployment rate was "very much underrepresented" by the trade union unemployment rate. Hardie agreed that the unemployment rate among skilled workers was "considerably under that of the unskilled." In the fall of 1894, when the trade union unemployment rate was 7%, Hardie estimated that the true rate was 10%. [Quoted in L. Smith, "Memorandum on a Recent Estimate of the Number of Unemployed," Board of Trade Memo, Jan. 8, 1895, p. 1].

Christina Romer for the United States. Her revisions of Lebergott's pre-1930 unemployment series yield lower volatility in unemployment (but not a higher mean) for the period 1890-1913.[3]

The Existing Index of Unemployment

A Labour Bureau within the Board of Trade was formed in 1886, and issued its first *Report on Trade Unions* in 1887. The report contained data on the expenditures of 18 unions, 14 of whom provided some form of unemployment benefits. Unemployment rates were provided for eight unions, although no attempt was made to estimate an aggregate unemployment rate. The third Report, published in 1889, contained unemployment expenditure data for 67 unions and unemployment rates for 24 unions. In 1888 the Labour Bureau began reporting a monthly (and annual) unemployment index, calculated from the information supplied to it by trade unions. Several additional trade unions were included in the index in 1893 by the newly-formed Labour Department, and the monthly estimates were published in the *Labour Gazette*. The Board of Trade extended the annual unemployment series back to 1860 in *British and Foreign Trade and Industrial Conditions* (1905).

Two types of data were used in the construction of the unemployment index. For those unions that reported the number of members in receipt of unemployment benefits in each month, an unemployment rate was calculated by dividing the number receiving benefits by the total number of union members. Some unions, particularly before 1888, reported only annual expenditures on unemployment benefits. For these unions, the Board of Trade calculated the average unemployment rate over the year using the expenditure on unemployment benefits per member of the union. As an illustration, if the benefit paid to unemployed members was 10s. per week and the union spent 20s. per member on unemployment benefits for the year, then on

[3] Romer, "Spurious Volatility"; Romer, "New Estimates." See also Weir, "The Reliability of Historical Macroeconomic Data."

average each member was unemployed two weeks and the annual unemployment rate was (20/10)/52 = 0.0385, i. e. 3.85%.[4]

For most of the 19th century, the Board of Trade's unemployment index is based on information covering a relatively small number of workers. The total union membership included in the index was about 100,000 in 1872, increasing to 151,000 in 1882, 329,000 in 1893, 525,000 in 1900, and 834,000 in 1912.[5] These numbers represented 25% of male union members in Great Britain in 1893 and 28% in 1912.[6] The number of unions included in the index was almost certainly less than 20 in the 1870s, and remained quite low until the formation of the Labour Department in 1893. It was 30 in June 1893, 86 in June 1895, 138 in June 1900, 271 in June 1905, and 390 in June 1912.[7]

A number of questions have been raised in discussions of the reliability of the Board of Trade's index. First, do the unemployment rates reported for individual trade unions accurately reflect the extent of unemployment among their members? Second, do union unemployment rates accurately reflect unemployment rates more broadly in the trades they are taken to represent? Third, does the overall index accurately reflect movements in unemployment for the economy as a whole? Finally, do the biases in the unemployment index change over time?

The answer to the first question varies somewhat across trade unions. For most unions, there was a maximum number of consecutive weeks that an unemployed member could collect

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[4] As a test of the accuracy of this method of computing unemployment rates, the Board of Trade used it to calculate the annual unemployment rate for the Amalgamated Carpenters and Joiners for the years 1860-1888. The resulting estimated unemployment rate was very close to that reported by the union. See Board of Trade, "British and Foreign Trade and Industrial Conditions," *Parl. Papers* (1905, LXXXIV), pp. 97-8.

[5] The estimate of the number of union members included in the index in 1872 is from Hilton, "Statistics of Unemployment," p. 180. The number of union members included in later years are reported in Board of Trade, *Eighteenth Abstract of Labour Statistics* (1927, p. 94).

[6] Data on union membership for Great Britain are from Bain and Price, *Union Growth*, p. 39. For 1892, we assumed that the share of union members who were male was the same as in 1896, the first year for which membership is broken down into males and females.

[7] Data on the number of unions included in the index from 1893 are from the monthly returns in the *Labour Gazette*.

unemployment benefits, and in some benefits could be collected only for a certain number of weeks within a calendar year. In 1892, an unemployed member of the Amalgamated Engineers could collect benefits for 104 consecutive weeks. In contrast, the maximum duration of unemployment benefits was 24 weeks for members of the Amalgamated Carpenters and Joiners, 16 weeks for members of the London Society of Compositors, and 8 weeks for members of the Amalgamated Smiths and Strikers.[8] In unions with limited availability of benefits members who suffered prolonged spells of unemployment would cease to be eligible for assistance, and might not be included in the unions' reported number of unemployed members. In such unions the reported unemployment rate therefore might tend to underestimate the true percentage unemployed, especially in years of high unemployment. The Board of Trade was aware of this potential problem. Llewellyn Smith stated to the Committee on Distress from Want of Employment that "we add in those who have run out of unemployed benefit wherever we can ascertain the number; but in most of the unions that give us returns, the numbers are practically identical."[9] William Beveridge maintained that the possible underestimate of unemployment was "almost certainly inconsiderable," for two reasons. First, most unions set the maximum duration of benefits high enough so that at any point in time only a very small share of their unemployed members had exhausted their benefits. Second, most unions required members who had exhausted their benefits to continue to register daily with their branch office, and it was in the members' interests to do so, since the branch office functioned as a labor exchange.[10] It

[8] Information on the administration of unemployment benefits by individual trade unions is given in Royal Commission on Labour, "Rules of Associations of Employers and of Employed," *Parl. Papers* (1892, XXXVI) , pp. 31-2, 45-6, 84-5, 157-8.
[9] S. C. on Distress from Want of Employment, Third Report, minutes of evidence, *Parl. Papers* (1895, IX), Q.4568, p. 51.
[10] Beveridge, *Unemployment*, p. 19.

seems reasonable to conclude that for the vast majority of unions the reported unemployment rates were an accurate measure of actual unemployment.

With regard to the second question, the Board of Trade maintained that for most industries the available trade union unemployment rates were an accurate measure of unemployment throughout the industry. Llewellyn Smith gave the opinion that "you do not need to cover a very large proportion of a trade in order to get a fairly representative [unemployment] figure, provided, of course, your sample is chosen at random, and that there are not any peculiarities about your sample that mark it off from the rest of the trade." He concluded that "within the limits of the particular industry to which the percentage applies with certain reservations, I think it is a good measure."[11] Other observers were somewhat less sanguine. Arthur Bowley agreed that "where trade unions, paying unemployed benefit, are strong in an industry, it seems probable that the percentage shown as unemployed is nearly that of the industry as a whole." In some industries, however, the available union data were not representative. In particular, the trade unions of coal miners and textile operatives that supplied data to the Board of Trade were "not typical of the main branches of their industries."[12] Moreover, Bowley and Wilson Fox of the Board of Trade agreed that the available data for the building trades underestimated the industry's unemployment rate because it came only from unions of carpenters and plumbers, whose unemployment rates probably were less than those of bricklayers, masons, and painters.[13]

Coal mining and textiles present special problems. In both industries declines in labor demand typically were met by short-time working rather than by layoffs. Data for 1906 show

[11] S. C. on Distress from Want of Employment, Third Report, minutes of evidence, *Parl. Papers* (1895, IX), Q. 4557, 4564, pp. 50-1.
[12] Bowley, "Measurement of Unemployment," pp. 796-7.
[13] Bowley, "Measurement of Unemployment," p. 796; Royal Commission on the Poor Laws and Relief of Distress, Appendix volume VIII, *Parl. Papers* (1910, XLVIII), Q. 98850, p. 446.

that only 44% of organized workers in coal mining were in unions that paid some form of unemployment benefits, and in many of those unions benefits were paid only when workers were unemployed due to fires, explosions, stoppages or breakdowns of machinery.[14] Similarly, a majority of organized workers in cotton textiles were entitled to benefits only when unemployed due to mill stoppages, breakdowns, or fires. Workers on short time seldom were eligible for benefits, and would not be counted as unemployed by those unions that reported numbers receiving benefits to the Board of Trade. The recorded unemployment rates for coal miners and textile workers therefore significantly underestimate the fluctuations in employment, so that the Board of Trade estimates for these industries are not accurate measures of unemployment. As we shall see, the use of short time also poses problems for any attempt to revise the unemployment index.

The major shortcoming of the trade union unemployment index, as is widely acknowledged, is that the unions included in the index did not provide a representative sample of the industrial workforce. In the original series produced by the Board of Trade the implicit labor force weights were those of the membership of the reporting unions. Industries in which a large share of the workforce were members of trade unions that provided unemployment benefits were overrepresented in the index, while industries in which few workers were union members or unions did not provide unemployment benefits were underrepresented or, in some cases, not represented at all. One significant result from this method of weighting was that unions in engineering, shipbuilding, and metals were highly overrepresented in the index; they accounted

[14] Data on the share of miners eligible for unemployment benefits are from Royal Commission on the Poor Laws and Relief of Distress, Appendix XXI (C), *Parl. Papers* (1910, XLIX), p. 614. Information on the conditions under which miners could be paid benefits are given in "Rules and Expenditure of Trade Unions in respect of Unemployment Benefits," *Parl. Papers* (1911, LXXIII).

for about 60% of the membership of reporting unions in the 1870s, falling to 39% in 1913.[15] These were among the most cyclically volatile of all trades, and it is no accident that most unions in these trades provided unemployment benefits to their members. In the words of Beveridge, "the greater the fluctuations the more will the need for unemployment benefit be felt by the trade unions, . . . [and] the more likely are they to figure in the Board of Trade returns."[16] On the other hand, textiles and clothing and footwear are, at least in the years before 1895, underrepresented in the index, and railway service, one of the most stable industries, is not represented at all.

Officials of the Board of Trade admitted that the trade union unemployment index was dominated by unions in cyclically volatile trades. Llewellyn Smith stated before the Committee on Distress from Want of Employment that the overrepresentation of engineering, shipbuilding, and metals raised the overall level of unemployment. He concluded that "there is not necessarily any error in the percentage [unemployed] in any particular trade; but the general percentage is distorted, because the trades are not represented in their right proportion."[17] In an attempt to measure the size of this distortion, he recalculated the unemployment rate for November 1894 by reweighting groups of trades by their labor force totals in the census, rather than by union membership. The adjusted unemployment rate was 4.2%, as compared to the Board of Trade estimate of 7.0%.[18]

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[15] Board of Trade, "British and Foreign Trade and Industrial Conditions," pp. 97-8; Garside, *Measurement*, p. 13. The series for engineering, shipbuilding, and metals was dominated by two unions, the Amalgamated Society of Engineers and the United Society of Boilermakers and Iron and Steel Shipbuilders. The membership of these two unions represented 40-50% of the total membership of unions included in the Board of Trade unemployment index throughout the 1870s and 1880s; as late as 1892, the year before the index was expanded to include additional unions, these two unions made up 47% of the 234,000 union members included in the index. Data on membership of unions included in the Board of Trade index for 1881 to 1913 are reported in Board of Trade, *Eighteenth Abstract of Labour Statistics* (1927, p. 94).

[16] Beveridge, *Unemployment*, p. 20.

[17] S. C. on Distress from Want of Employment, Third Report, minutes of evidence, *Parl. Papers* (1895, IX), Q.4566, p. 51.

[18] Llewellyn Smith, "The Unemployed," Unpublished Board of Trade Memo., Jan. 23, 1895, p. 9.

In 1905 the Board of Trade produced a "corrected" unemployment index in which the engineering, shipbuilding, and metal trades were given a weight of 50% throughout the entire period from 1860 to 1903. The constituent unions within this group—and also within the corresponding group labeled "all other trades"—were still assigned a weight determined by their membership. The corrected index exhibits somewhat smaller fluctuations in unemployment in the earlier years than did the original index, but the two indices become very similar in the 1890s as the weight assigned to engineering, shipbuilding, and metals in the original index converges toward 50%. Thus, the main effect of shifting from the original to the corrected index was to reduce the fluctuations in employment in the 1870s and early 1880s relative to those after 1888. However, the unions in engineering, shipbuilding, and metals are still given far more weight in the corrected index than the trades they represent have in the census, and we must agree with Garside's conclusion that "there is no reason to suppose that the arbitrary system of averaging which the Board of Trade adopted [in 1905] necessarily represents a more correct estimate of unemployment than the unadjusted figures."[19]

Both of the unemployment series also were influenced by the constant addition of newly reporting unions. From 1893 to 1912 the number of unions included in the index increased from fewer than 30 to nearly 400. The huge increase in unions caused significant compositional changes in the unemployment index. For example, in 1894 members of textile unions made up 3% of the total membership of reporting unions; by 1908 the addition of textile unions to the index had increased their share of total membership to 14.5% (see Table 1).[20] The Board of Trade attempted to allay fears about the effects of such compositional changes by calculating an unemployment index for 1873 to 1907 based on the returns from 16 trade unions for which

[19] Garside, *Measurement*, p. 21.
[20] From 1891 to 1911 textile workers in Great Britain declined as a share of the industrial workforce.

continuous data were available.[21] While the resulting unemployment series looks similar to the original series, this largely is because the 16 included unions are weighted by membership. The six unions in engineering, shipbuilding, and metals contain 66% of the total membership in 1873, 63% in 1893, and 52% in 1907.

Despite the known flaws in the composition of the unemployment index, the Labour Department of the Board of Trade still regarded it as a useful indicator of cyclical fluctuations in the labor market. Llewellyn Smith maintained that the Labour Department was mainly interested in finding "an index number that will always move in the right direction, that is, will always go up when employment is worse and go down when employment is better." The trade union unemployment series did that, and Llewellyn Smith maintained that it afforded "a very sensitive barometer" of cyclical fluctuations in the labour market, although "the fluctuations . . . would be exaggerated in our index number."[22] The veracity of this judgement, made in 1895, would of course depend on the degree to which those trades that either were underrepresented in the index or not represented at all had employment fluctuations which were well synchronized with the metal trades.

In 1912 Arthur Bowley undertook an interesting reexamination of the trade union unemployment series.[23] He attempted to corroborate the series in two ways. First, he took the qualitative summaries of labor market conditions reported each month in the *Labour Gazette* and converted the adjectives used to describe the state of employment for individual industries into a numerical index in a way that corresponded with available trade union unemployment data. "Very good" was scaled as 0.2% unemployed, "good" as 2.9% unemployed, "fair" as 5.6%

[21] This index was originally reported for the years 1873-1903 in Board of Trade, "British and Foreign Trade and Industrial Conditions," *Parl. Papers* (1905, LXXXIV), p. 93. It was extended to 1907 in Royal Commission on the Poor Laws and Relief of Distress, Appendix XXI (B), *Parl. Papers* (1910, XLIX), p. 599.
[22] S. C. on Distress from Want of Employment, Third Report, minutes of evidence, Q. 4562, 4563, p. 50.
[23] Bowley, "Measurement of Unemployment."

unemployed, "bad" as 8.3% unemployed, and "very bad" as 11.0% unemployed. The resulting index for 1894 to 1910 corresponded closely with the trade union index. Bowley concluded from this exercise that qualitative information on the state of the labor market could be used to extend the Board of Trade unemployment index "over industries and years for which numerical information is lacking."[24]

Second, Bowley attempted to construct an expanded employment index by combining the available trade union unemployment rates with information collected by the Board of Trade on the average number of days worked per week for mines, the average number of shifts worked in iron and steel works, the number of pig iron furnaces and tinplate mills in operation, and reports of numbers employed in textiles, boots, clothing, and other trades.[25] Altogether, Bowley constructed indices for 29 sectors; in constructing an aggregate employment index, he weighted the sectors according to labor force totals in the 1901 census. The weights are significantly different than those in the trade union unemployment index. For example, in Bowley's index the engineering, shipbuilding, and metal trades had a weight of 22%, as compared to a weight of 50% in the Board of Trade's "corrected" index.[26] His aggregate employment index moved in the same direction as the Board of Trade series in all but three years and generally gave similar results, although for the years 1897-1901 his index suggested a "perceptively better condition of trade" than did the trade union index. Bowley concluded from this that "the measurement made by the Labour Department has been singularly successful in describing the condition of trade, that any reasonable index will show the dates of the ups and downs, but that the relative amounts

[24] Bowley, "Measurement of Unemployment," p. 802.
[25] For a detailed discussion of the construction of the 29 sectoral series, see Bowley, "Measurement of Unemployment," pp. 802-13.
[26] The complete index based on all 29 component series runs only from 1906 to 1911. Bowley extended the series back to 1894 by a series of splices. For 1894 Bowley had data for only 7 of his 29 sectors; these 7 sectors comprised only 45% of the total labor force weight for 1906-11.

of the fluctuations need a widely based and properly weighted index."[27] He admitted, however, that both his index and that of the Board of Trade more closely measured "the number employed than the amount of work," and that because of the importance of short time work in several industries, "the amount of work must have wider fluctuations than the number employed."[28]

A further check on the accuracy of the trade union series was done in 1923 by John Hilton, the Director of Statistics in the Ministry of Labour. Hilton calculated a revised trade union unemployment series for 1912-22 by reweighting the union data so that it corresponded roughly with labor force estimates. He compared the "adjusted" series with the original trade union series and with the unemployment series calculated from available unemployment insurance statistics.[29] His revised series was quite similar to the original union series for 1912-20, but lower than the original series in 1921 and especially in 1922, when the unemployment rate was 15.2% in the original series and 12.8% in the adjusted series.[30] Hilton argued that the discrepancy between the two series in 1921-2 was caused by the overrepresentation of engineering and shipbuilding unions in the original index. On the other hand, for 1922 the adjusted series was remarkably similar to the unemployment insurance series. Hilton concluded that the original trade union series provided a close approximation of the actual unemployment rate "in times of good employment," but that it tended to exaggerate the true unemployment rate during serious downturns. The fact that the adjusted series was so similar to the unemployment insurance series in 1922 suggested that the trade union unemployment data for the pre-1912

[27] Bowley, "Measurement of Unemployment," p. 815.
[28] Bowley, "Measurement of Unemployment," p. 819.
[29] The National Insurance Act, part II of which established a compulsory system of unemployment insurance, was adopted in December 1911. Only a relatively small share of manual workers were included in the unemployment insurance system before the adoption of the Insurance Act of 1920, which extended compulsory unemployment insurance to virtually all workers except the self-employed and those in agriculture and domestic service.
[30] The three unemployment series for 1912-22 are presented in Hilton, "Statistics of Unemployment," pp. 190-1.

period, if properly weighted, "would be by no means a bad indication of the rate of unemployment among the wage-earning population generally."[31]

The most authoritative version of the trade union unemployment index that is currently available was constructed by Charles Feinstein in 1972.[32] For the period 1870-1913 Feinstein combines three different versions of the trade union index. For 1870-80 he uses the "corrected" series—in which engineering, shipbuilding, and metals are given a constant weight of 50%—constructed by the Board of Trade in 1904. After 1880 the corrected series is very similar to the original series, and Feinstein uses the original series for 1881-1911. Finally, for 1912-13 he uses the "adjusted" trade union series constructed by Hilton. In discussing the representativeness of the trade union index, Feinstein concludes:

> for most of the period it does not appear to be possible to make any statistical assessment of the possible under- or over-statement involved in the use of the trade union series as a measure of the general unemployment rate. In relation to such stable industries as the railways . . . it will undoubtedly be too high, in relation to unskilled and casual workers it would be too low; and the net effect—which would probably vary over different phases of the trade cycle—is uncertain.[33]

The Components of a New Index

The major criticisms of the Board of Trade unemployment index can be quickly summarized. The index omits certain important sectors of the industrial labor force, it does not appropriately weight those sectors that are included, and it does not take into account underemployment caused by short-time working. We construct a new index of unemployment which attempts to correct some of these deficiencies. While we rely heavily on the trade union data collected by the Labour Department, our index improves on the Board of Trade index in three ways. First, for mining, textiles, transport, and general unskilled labor, sectors for which

[31] Hilton, "Statistics of Unemployment," pp. 182, 185.
[32] The series is presented in Feinstein, *National Income*, Table 57, pages T125-6.
[33] Feinstein, *National Income*, p. 225.

trade union unemployment data either are not available or are believed to be unrepresentative, we construct unemployment series from other sources. Second, for those industries in which work sharing was prevalent during downturns, we construct estimates of unemployment that take into account loss of employment from short time work. Third, and perhaps most important, we reweight the individual trades included in our index using appropriate labor force weights obtained from the 1871-1911 decadal censuses. Because there is virtually no information on unemployment for non-industrial sectors—such as agriculture and domestic service—or for females, our index, like that of the Board of Trade, represents male industrial unemployment.

We begin by dividing the industrial workforce into 13 broad sectors and constructing unemployment series for each sector. Trade union data were used to construct unemployment series for nine sectors: building; metal manufacturing; engineering; shipbuilding; printing, paper, and bookbinding; woodworking and furnishing; carriage and wagon; clothing and footwear; and glass. For the remaining four sectors—mining, textiles, transport, and general unskilled labor—trade union data either were not available or were unrepresentative of the sector as a whole. We used time series data on employment of coal miners, consumption of raw cotton and wool, aggregate mileage of passenger and freight trains, and tonnage of ships entering and leaving British ports to construct unemployment series for coal mining, textiles, railways, and dock labor. We constructed an unemployment series for general unskilled labor using time series data on adult able-bodied males receiving poor relief in workhouses. We now turn to a discussion of the sectoral series, focusing first on those series constructed using trade union data, and then on those constructed using data from other sources.

Series Constructed using Trade Union data

The data used in constructing the trade union unemployment series were obtained from two types of sources: various Board of Trade publications and the annual reports of individual

trade unions. The Board of Trade's *Third Report on Trade Unions* (1889) provides time-series data on expenditures on unemployment benefits from 1888 back to the 1870s and earlier for a number of unions; the *Seventh Report on Trade Unions* (1893) extends the expenditure data up to 1893. The *Seventeenth Abstract of Labour Statistics* (1915) contains unemployment time-series up to 1913 for 11 major unions. The *Labour Gazette* contains monthly unemployment estimates for several sectors and individual unions for 1905-13.

Our second major source of data was the national records of individual trade unions. We obtained time series of unemployment rates from the annual reports of four unions: the Steam Engine Makers, the United Patternmakers, the Associated Blacksmiths and Ironworkers, and the Yorkshire Glass Bottle Makers. Time series of expenditures per member on unemployment benefits were obtained from the reports of five additional unions: the Operative Bricklayers, the Operative Plasterers, the Amalgamated Brassworkers and Metal Mechanics, the Amalgamated Cabinet Makers, and the Boot and Shoe Operatives.

For those unions which did not report unemployment rates, we have constructed unemployment series using data on benefit per member and benchmark unemployment rates. As noted above, the Board of Trade also used expenditures per member on unemployment benefits to construct unemployment rates. The usefulness of benefit data as a measure of unemployment was demonstrated in two papers by George Wood and E. L. Hartley.[34] Wood found that a series measuring the average annual benefit per member paid by 22 unions from 1869 to 1896 moved similarly to an index of trade union unemployment rates. Hartley expanded on Wood's analysis, and concluded that "the curves of unemployment, whether based upon the percentages of the

[34] Wood, "Trade Union Expenditure"; Hartley, "Trade Union Expenditure."

trade union members unemployed or upon the amount of money expended on unemployed benefit, were practically identical in the character and time of their fluctuations."[35]

We constructed sectoral unemployment rates by combining the individual unions' unemployment series using fixed weights. That is, the weight given to the Amalgamated Engineers in the series for Engineering remains constant over time, rather than fluctuating with changes in membership. In sectors where unions represented well-defined trades, such as the building trades, we assigned weights to each union based on labor force data from the 1901 census. In sectors where more than one union represented similar workers or it was not possible to determine appropriate labor force weights, such as Woodworking and Furnishing, we assigned weights to each union based on union membership in 1901.

In order to avoid the potential biases caused by changes over time in the composition of the unemployment index, we include in our series only those unions for which data are available for nearly the entire period from 1870 to 1913. As a result, our index includes unemployment series for only 22 unions. While this is far smaller than the number of unions included in the Board of Trade index after 1892, for most of the period the number of workers represented by our unions is not far below the number represented by the Board of Trade series. For example, in 1900 the official series included 138 unions with 525,000 members, while our 22 unions included 398,000 members; in 1912, the Board of Trade series included 390 unions with 834,000 members, while our unions represented 524,000 workers.[36]

A detailed discussion of the construction of the trade union unemployment series for each of the nine sectors is given in the appendix. Therefore we will only comment briefly here on

[35] Hartley, "Trade Union Expenditure," pp. 52-3.
[36] Furthermore, we use trade union data to estimate unemployment for only 9 of our 13 sectors. Several of the unions included in the Board of Trade index are in mining and textiles, sectors for which we use alternative sources to construct unemployment rates.

some of the series. The unemployment series for the building trades was constructed using data from four unions: the Amalgamated Carpenters and Joiners, the Operative Plumbers, the Operative Bricklayers, and the Operative Plasterers. The Board of Trade index included data only for the carpenters and joiners and, from 1902 on, the plumbers. It is important to include information for bricklayers and plasterers, because many critics of the Board of Trade index maintained that workers in these trades had higher seasonal unemployment rates than did carpenters and plumbers. The Operative Bricklayers and Operative Plasterers unions paid unemployment benefits only to members who were travelling in search of work.[37] Although it is not possible to construct an unemployment rate from these data, so long as the benefit policies did not change over time a time series of expenditures should yield a good measure of *changes* over time in the level of unemployment. For both unions we benchmarked the unemployment rate at 5.0% in 1911, the unemployment rate for carpenters, joiners, and plumbers.

We divided the engineering, shipbuilding, and metals group into three sectors. The unemployment series for metal manufacturing is a weighted index of two series, one for iron and steel and the other for miscellaneous metals. The series for iron and steel was constructed using data from the Friendly Society of Ironfounders and the Associated Ironmoulders (Scotland). The index for miscellaneous metals was constructed using benefit per member data from the Amalgamated Brassworkers and Metal Mechanics. The series for engineering was constructed using data from four unions: the Amalgamated Engineers, the Steam Engine Makers, the United Patternmakers, and the Associated Blacksmiths and Ironworkers. The series for shipbuilding was constructed using data from the United Boilermakers and Iron and Steel Shipbuilders.

[37] The Operative Bricklayers paid 1s. 6d. per day (9s. per week) to unemployed members travelling in search of work. The maximum duration of benefits was eight weeks. The Operative Plasterers also paid 1s. 6d. per day in travelling benefits. The maximum duration of benefits was 14 weeks.

The unemployment series for printing, paper, and bookbinding was constructed using data from the London Compositors, the Typographical Union, and the London Journeymen Bookbinders. The series for woodworking and furnishing was based on data from the Alliance Cabinet Makers/Amalgamated Furnishing Trades, the Amalgamated Cabinet Makers, and the Amalgamated Millsawyers, Wood-cutting Machinists, and Wood Turners. The series for carriage and wagon was constructed using data from the Society of Coachmakers. The series for glass was based on data from the Yorkshire Glass Bottle Makers, referred to by the *Third Report on Trade Unions* as a small but "important" union.[38]

The unemployment series for clothing and footwear was constructed using data from the Amalgamated Tailors and the Boot and Shoe Operatives. Unfortunately, the Amalgamated Tailors, while a large craft union, is representative only of employment conditions in bespoke tailoring. The majority of tailors were employed in the wholesale clothing trade, which was largely unorganized and for which no data are available.[39] Our series for clothing therefore almost certainly underestimates the unemployment rate for the industry as a whole.

Series Constructed using Non-Union sources

There are three important sectors for which trade union data either are not available or are not representative of the sector as a whole: mining, textiles, and transport. For each sector we use series for, or closely related to, employment to infer unemployment rates. Each of the sectors also exhibits some element of underemployment or short time working which should be taken into account when estimating unemployment rates.

Given a time series for employment, we use a simple model to generate a series for the labor force, and then use these two series to derive an unemployment series. While it would be

[38] Board of Trade, *Third Report on Trade Unions* (1889, p. 104).
[39] Clegg, Fox, and Thompson, *British Trade Unions*, p. 33.

possible to obtain a measure of the labor force by interpolating between census benchmarks, the census figures do not match closely with the coverage of our employment proxies. Furthermore, movements in the labor force would to some degree reflect labor market conditions and would not be well represented by simple interpolations between decadal benchmarks. We generate a labor force series using the following model:

$$\text{Log } L_t = \alpha + \beta \log L_{t-1} + (1-\beta) \log E_t \quad (1)$$

where L is the labor force and E is employment. The labor force in any given year is a geometric average of the previous year's labor force and current employment plus a constant. This can be expressed in terms of the log of the employment rate as follows:

$$\text{Log } (E/L)_t = -\alpha + \beta(\Delta \log E_t + \log (E/L)_{t-1}) \quad (2)$$

The employment rate is generated from its own lagged value and the rate of change in the number employed. This is the equation we use to generate the unemployment rate, working recursively, and making assumptions about the values of α and β. The parameter β represents the degree of persistence in the labor force; for given β, α determines the long run average unemployment rate. Based on indirect estimates for out-migration of agricultural laborers we assume a value of $\beta = 0.67$ for each sector in the calculations that follow. We experimented with different values for α; for each sector we chose a value for α which yielded unemployment rates for 1912-13 that corresponded to unemployment rates obtained from the *Labour Gazette*.

Mining and Quarrying

Mining was an important and growing sector during this period, employing over one million workers in 1911. Although coal mining was heavily unionized by the 1870s, few unions offered unemployment benefits before the 1890s. Fortunately we have another source for employment: the returns of the Inspectors of Mines on the number of wage earners "ordinarily employed." These figures most likely reflect the numbers employed on the last pay day of the

year—typically a period of peak employment.[40] Firms were not required to submit employment information until 1873. To allow for the incompleteness of the returns in the years when they were voluntary, we raise the pre-1873 figures by 20%.

The parameters to generate the unemployment rate were set at $\alpha = 0.035$ and $\beta = 0.67$ and the starting value for unemployment in the simulation was set at 3.4% in 1860. This gives an average unemployment rate of 5.9% for the period 1870-1913. The model generates extreme values for the unemployment rate of less than 1% in the boom years of 1872-4 and 1891-2 and over 10% in the slump of 1877-80. Over the last 20 years of the period the fluctuations are somewhat milder, with unemployment ranging between 2.5% in 1908 and 8.8% in 1897.

Our estimates of the labor force, particularly during the wide swings of the 1870s, are consistent with the qualitative literature. For example, Mitchell contends that "it is entirely to the boom peaking in 1873 that the large inflow of workers from outside the colliery community in the period 1871-1880 has to be attributed. In the rest of the decade, the numbers employed fell, and many of those who came into the mines went out again."[41] Our implied labor force estimate increases by 24% between 1870 and 1875, then declines gradually from 1876 to 1881. For the entire decade 1871-81 we estimate that the labor force increased by 17%, the same rate reported for mining and quarrying in the census.[42] It is clear that fluctuations in unemployment would have been massively exaggerated if the labor force had been derived from simple interpolation of census benchmarks.

Mining was one of the industries where wide fluctuations in demand for labor were accommodated largely by short time working. According to the *Labour Gazette*, "coal mining affords a good example of an industry in which the state of employment is best gauged, not by

[40] Mitchell, *British Coal Industry*, pp. 103-4.
[41] Mitchell, *British Coal Industry*, p. 119.
[42] Census data for mining and quarrying are reported in Mitchell and Deane, *British Historical Statistics*, p. 60.

the proportion of workpeople entirely unemployed, but by the average number of days per week on which work is available. . . . except in times of great depression or expansion of trade, fluctuations in demand are met rather by working more or fewer days per week, than by the engagement of more or fewer men."[43] In order to take account of short time we use the Board of Trade's figures for the average number of days per week the mines were open for 1895-1913, and extrapolate back to 1870 using a similar series for Northumberland and Durham. An index of actual days to potential days worked was obtained by dividing actual days by 5.5.[44] The index of short time was multiplied by employment and the adjusted figure divided by the labor force to give a value of unemployment including short time. It should be emphasized that the adjustment for short-time for the years before 1895 is based on somewhat fragmentary data and therefore is rather uncertain. Nevertheless, the series for employment and days worked generally move together over the cycle, as might be expected, so that the overall pattern of fluctuations in the two series is quite similar.

Textiles: Cotton, Woolen and Worsted

Although unions were established early on in the textile trades, union structure was very fragmented.[45] Moreover, most textile unions offered little in the way of unemployment benefits—largely because of the practice of using short time working to adjust to periods of slack trade. We have no direct measure of employment for either cotton or woolen textiles for the whole period, but estimates can be derived from data for raw cotton consumption and raw wool consumption.[46]

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[43] *Labour Gazette*, October 1895, p. 308.
[44] The average number of days worked per week was equal to or greater than 5.5 in six years: 1870-73, 1907, and 1913. The maximum number of days worked per week was 5.87, in 1873. The minimum number of days worked per week was 4.63, in 1877-78. For the entire period 1870-1913, the average number of days worked was 5.20.
[45] Turner, *Trade Union Growth*.
[46] Annual estimates of raw cotton consumption are from Mitchell and Deane, *British Historical Statistics*, p. 179. Estimates of raw wool consumption were calculated from data on domestic and imported wool reported in Mitchell

Given the practice of short time working, employment fluctuations would be expected to move less than in proportion to raw material consumption. The relationship between raw material consumption and employment can be estimated for the decade before the first World War. Following Bowley, we construct employment indices for cotton and for woolen and worsted from monthly data on changes in employment for samples of firms reported in the *Labour Gazette*.[47] Woolen and worsted employment series are reported separately and were combined in the proportions 0.45 and 0.55 respectively. These series do not allow for the entry and exit of firms in the *Labour Gazette*'s sample. Bowley made adjustments for trend growth of employment in cotton but not in woolen and worsted. We use the raw figures but include a time trend for cotton.

Regressing these (annual) indices of employment (E) on raw material consumption (Q) for 1904 to 1913 gives the following results ('t' statistics in parentheses):

<u>Cotton</u>: $\text{Log } E_t = 5.12 + 0.20 \log Q_t + 0.00\ t$ $\quad R^2 = 0.96,\ DW = 1.73$
(21.44) (5.51) (4.62)

<u>Woolen and Worsted</u>: $\text{Log } E_t = 5.42 + 0.28 \log Q_t$ $\quad R^2 = 0.95,\ DW = 0.95$
(16.02) (4.57)

As expected, in both sectors short-run movements in employment are less than in proportion to raw material consumption. In order to use equation (2) above to estimate unemployment we set $\Delta \log E_t = 0.2\ \Delta \log Q_t$ for cotton and $\Delta \log E_t = 0.3\ \Delta \log Q_t$ for woolen and worsted; α is set to 0.01 for cotton and 0.015 for woolen and worsted, and β is set to 0.67 in both

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and Deane, *British Historical Statistics*, pp. 190-4. Consumption of domestic wool is calculated as the domestic wool clip less exports reduced by 25% to allow for washing and waste. The net yield of imported wool is taken as the weight of imports less re-exports reduced by 50%. See Jenkins and Ponting, *British Wool Textile Industry*, pp. 202-3.

[47] Bowley, "Measurement of Unemployment," pp. 804-5. The data reported in the *Labour Gazette* are for total numbers employed whether full-time or short-time.

cases. This gives average unemployment rates of 2.2% for cotton and 3.8% for woolen and worsted.

In order to make an allowance for short time working we need the ratio of unemployment with, and unemployment without, employment loss from short time work. Based on evidence from Chapman and Hallsworth we assume that including short-time working raises unemployment in cotton by a factor of three and in woolen and worsted by a factor of two.[48] This implies that in both sectors the elasticity of hours with respect to raw material consumption would be approximately 0.6.

Transport:

We develop proxies for unemployment for two of the three main transport sectors, railways and docks.[49] Data on expenditures per member on unemployment benefits are available for the Amalgamated Railway Servants from the early 1870s onwards. However, Bagwell described the union's unemployment benefit scheme as "ill-defined," and the data were not used by the Board of Trade.[50] This suggests that the benefit series is a poor proxy for movements in unemployment, so we chose not to use it. Unions of dock workers were formed in the late 1880s but did not offer unemployment benefits.

For railways there are several measures of activity but no direct measures of employment. The best proxy for movements in employment seems to be the number of train miles—the aggregate mileage of passenger trains and freight trains. However, as with textiles, short-run employment fluctuations are likely to have been less than proportional to those in train mileage because of the fixed component of operating the railway network. We have no employment data with which to estimate the short-run relationship between train mileage and employment. We

[48] Chapman and Hallsworth, *Unemployment in Lancashire*, pp. 47, 54.
[49] No data are available to estimate unemployment rates for road workers.
[50] Bagwell, *Railwaymen*, p. 62.

choose a value of 0.4, somewhat higher than the values estimated for textiles but substantially less than one. Thus in our generating equation we set $\Delta \log E_t = 0.4\ \Delta \log Q_t$, where Q is train miles; α is set to 0.015 and, as before, $\beta = 0.67$. The simulation is started in 1869 with a beginning value for unemployment of 2.0% owing to a lack of data on train mileage for earlier years. This gives an unemployment series with relatively mild fluctuations, as might be expected, with an average unemployment rate of 2.5%, and ranging from a low of 0.2% in 1873 to a high of 5.0% in 1912, the year of the railway strike.

The docks represent a classic example of casual employment. Dock workers were hired by the day or half day from among the crowds of casual laborers assembled at the dock gates every morning. As a result employment was extremely intermittent and, apart from a minority who were regularly employed, most dock workers spent a significant proportion of the year unemployed. We have a good measure of activity at the docks, the total tonnage of ships entering and clearing UK ports as reported by the Board of Trade. Given the methods of engagement we assume that short-run fluctuations in dock and wharf employment would have been directly proportional to the total tonnage entered and cleared. As before we set β at 0.67 and we choose a value for α of 0.075. The series is generated from 1867 with a starting value for unemployment of 10%. This gives an average level of unemployment of 14.5% for 1870-1913.

The average level of unemployment (determined by the parameter α) is bound to be somewhat arbitrary because of the difficulty of gaining any order of magnitude for casual unemployment. Observers gave illustrative calculations by comparing the annual average daily numbers engaged at certain docks in London with the maximum numbers engaged in any week or day during the year.[51] Following this approach the average ratio of annual mean to maximum

[51] See Booth, *Life and Labour*; Howarth and Wilson, *West Ham*, pp. 225-6; and Beveridge, *Unemployment*, p. 93.

weekly employment on the London docks and wharves (excluding Tilbury) reported in the *Labour Gazette* for 1908-1913 is 86.7%, which suggests an average unemployment rate of 13.3%, as compared with 14.0% for the same years in our calculation. This estimate is admittedly crude and suffers from biases in both directions. On the one hand not all potential dock laborers would be employed even at peak periods; on the other hand many dock laborers would have found alternative casual employment when there was no work for them at the docks.

General Unskilled Labor

The Board of Trade index is almost exclusively a measure of unemployment among skilled workers. Only a small share of unskilled workers were unionized, and few of these were in unions that provided unemployment benefits.[52] Several contemporaries maintained that unemployment rates were significantly higher among unskilled workers, and especially general laborers, than among skilled workers. For example, Keir Hardie estimated that the unemployment rate for general laborers in urban areas was 25% in the fall of 1894, and Chapman and Hallsworth estimated that the unemployment rate for laborers in Lancashire in November 1908 was 35%, at a time when the Board of Trade unemployment rate was 8.7%.[53]

Beveridge maintained that, in order to obtain a "fair representation" of the extent of unemployment, the trade union series needed to be supplemented by the returns of urban distress committees and by pauperism statistics. In his view, the trade union data represented the highest stratum of workers, members of skilled and organized trades. The returns of distress committees

[52] As late as 1911, of the 14 unions of general laborers, dock laborers, and building laborers with 2,000 or more members, only two of the smaller unions, the Amalgamated Society of Gasworkers, Brickmakers, and General Labourers, and the Workers' Union, provided unemployment benefits for their members. See "Rules and Expenditures of Trade Unions in respect of Unemployment Benefits," *Parl. Papers* (1911, LXXIII), pp. 18-228. It is not clear whether these unions, with a combined membership of 8,100 in 1911, were included in the Board of Trade index.

[53] Hardie's estimate is cited in "Memorandum on a Recent Estimate of the Number of Unemployed," Unpublished Board of Trade Memorandum, Jan. 8, 1895, p. 1; Chapman and Hallsworth, *Unemployment in Lancashire*, p. 43.

represented a lower stratum, consisting largely of general laborers and the semi-skilled. The returns of pauperism represented "a third and still lower stratum of society."[54] Unfortunately, the returns of distress committees become available only in 1905 with the passage of the Unemployed Workman Act, and therefore cannot be included in our unemployment series. Poor relief data, however, are available for the entire period 1870-1913.

Mary MacKinnon concluded from her study of poor relief statistics that for "the poorest decile of adult males" the rate of male able-bodied indoor pauperism provided "a much better indication of the state of the relevant labor markets" than did the trade union unemployment series. Most able-bodied male inmates of workhouses were from "the very bottom of the social hierarchy;" they applied for relief when their family incomes fell to the point where they could no longer subsist. Thus, while those in workhouses were a very small proportion of the adult male population, their numbers were very "responsive to indicators of general economic conditions."[55]

We construct an unemployment series for general unskilled laborers using time-series data for male able-bodied indoor paupers as a share of the male population aged 15-64.[56] In order to turn the pauperism series into an unemployment series, it was necessary to benchmark the unemployment rate for some year. As in the case of dock laborers, the lack of data means that our estimate of the level of unemployment at any point in time is going to be somewhat arbitrary. While contemporaries agreed that the unemployment rate among general laborers was relatively high, they did not agree on its magnitude. As noted above, Chapman and Hallsworth estimated that the unemployment rate for laborers in Lancashire was 35% in November 1908. In

[54] Beveridge, *Unemployment*, pp. 16, 21.
[55] MacKinnon, "Poor Law Policy," pp. 305, 330-4.
[56] For 1891-1913 we use data for able-bodied men "in health" relieved in workhouses as a percent of males aged 15-64. For 1870-1890 we use data for the total number of able-bodied male paupers as a share of males aged 15-64. Both series are reported in MacKinnon, "Poor Law Policy," pp. 306-7.

contrast, a Board of Trade memorandum estimated that in September 1908 the unemployment rate for unskilled workers was 10% or a bit higher.[57] One can get an idea of the relationship between unemployment rates for skilled and unskilled workers by examining data for the interwar period. Mark Thomas calculated that in 1931 the unemployment rate for skilled and semi-skilled manual workers was 12.0%, while for unskilled manual workers it was 21.5%.[58] That is, the unemployment rate for unskilled workers was nearly 80% higher than that for skilled and semi-skilled workers. We benchmarked the unemployment rate at 5.0% in 1875, the year in which male indoor pauperism was at a minimum, on the assumption that unemployment among general laborers remained reasonably high even during boom periods. This yields an average unemployment rate of 9.5% for 1870-1913. As will be seen below, our ratio of unskilled to skilled and semi-skilled unemployment rates pre-1914 is quite similar to the ratio estimated by Thomas for the interwar period.

Sectoral Weights

The sectoral unemployment series are combined to form an aggregate series using labor force weights based on C. H. Lee's reworked census totals for males in industry.[59] We exclude agriculture and all services except transport from our index. Within the manufacturing sector, we exclude Food, Drink and Tobacco, Chemicals and Allied Industries, Coal and Petroleum Products, Leather, Leather Goods and Fur, and Other Manufacturing because there are no unemployment data for these sectors. To better fit the trade groupings of our individual indices we combined or adjusted some of Lee's sectors. We combine the sectors Metal Manufacture and Metal Goods Not Elsewhere Specified because they contain a variety of closely related trades in

[57] "Report on Unemployment in the United Kingdom in September 1908," Unpublished Board of Trade Memorandum, October 10, 1908, pp. 11-12.
[58] Thomas, "Unemployment in Interwar Britain," p. 123.
[59] Lee, *Employment Statistics*.

both ferrous and non-ferrous metals. We combine the small Instrument Engineering and Electrical Engineering sectors with the much larger Mechanical Engineering sector on the assumption that the fluctuations in these sectors would be closely related. Since we have no information on brick and cement making, we transfer 60% of the numbers employed in Bricks, Pottery, Glass, and Cement to the Construction sector, on the assumption that their fluctuations would be most closely related to those in building. For Transport and Communication we have data only for railway and dock workers, so we reduce the numbers in this sector to 60% of their original totals. Finally, we include the category Other and Undefined, about two thirds of which were general laborers and factory laborers. In order to allow for the fact that some share of these workers were not in the industrial sector we reduce the numbers in this category by 50%.

We make these adjustments to Lee's sectoral labor force estimates for each census year from 1861 to 1911, and interpolate between censuses to fill in the labor force numbers for other years. Thus the weights assigned to the sectors included in our index change each year with changes in the labor force. Because some might object to the inclusion of a series for general unskilled labor, we also calculate the weights with the sector Other and Undefined excluded. The total number of workers employed in the sectors included in our index in 1871 was 4,335,900, 53% of Lee's total for the male labor force in Great Britain that year, and 75% of the number of males employed in manufacturing and transport. In 1911 the number of workers represented by our index was 7,321,000, 57% of Lee's total for the male labor force, and 75% of the total employed in manufacturing and transport.[60]

The sectoral weights for our index in 1871, 1891, and 1911 are reported in Table 2. These can be compared with the weights for the Board of Trade index in 1894 and 1913 given in

[60] We constructed a rough estimate of the number of males employed in manufacturing and transport by subtracting the numbers in agriculture, insurance, banking, finance and business services, professional and scientific services, miscellaneous services, and public administration and defense from Lee's total for the male labor force.

Table 1. In our index engineering, shipbuilding, and metals combined have a weight of 18.4% in 1871, 18.9% in 1891, and 22.2% in 1911, while in the original Board of Trade index these same sectors assumed a weight of 46% in 1894 and 39.3% in 1913. Construction has a weight of 16.9% in 1911 in our index, as compared to 8.3% in 1913 in the Board of Trade index. The transport sector is not included at all in the Board of Trade index, while in our index it has a weight of 8.4% in 1871, then rises to 12.0% in 1891 and 11.8% in 1911.

The problems associated with weighting sectors by union membership, and allowing the addition of new unions over time to the index, can clearly be seen by examining the weights for textiles. The number of males employed in textiles in Great Britain declined by 11% from 1891 to 1911. Despite this, the weight assigned to textiles in the Board of Trade index increases from 3% in 1894 to 14.1% in 1913. In our index textiles has a weight of 10.6% in 1891 and 8.7% in 1911. The method of weighting adopted by the Board of Trade causes textiles to be underrepresented in their index in 1894 and overrepresented in 1913.

Results

The unemployment series for each of the sectors in our index, except general unskilled labor, are presented in Figure 1. The series reported for mining and textiles exclude employment loss from short time work. Figure 1 shows that, while the severity of fluctuations in unemployment differed across sectors, from 1870 until the early 1890s most of the series moved in a similar pattern. The years 1872-4 were a period of very low unemployment—eight sectors had unemployment rates below 2% during these years. In contrast, most sectors experienced sharp increases in unemployment in 1878-9—six sectors had unemployment rates of 9.5% or above in 1879. The early 1880s was another boom period for most sectors, followed by a slump in 1885-6 and another period of very low unemployment in 1889-91.

The sectoral movements in unemployment are somewhat less similar after 1891. Engineering, shipbuilding, metals, and glass experienced a slump in 1893-4, and mining slumped badly a few years later, in 1896-7. Other sectors experienced less serious slumps in the mid 1890s, and in woodworking and carriage and wagon unemployment remained low throughout the decade. The building trades had very low unemployment rates in 1896-1900, then slumped from 1904 to 1910—during this period the minimum unemployment rate was 8.2%, in 1910. Shipbuilding experienced double-digit unemployment in 1903-5 and again in 1908-10. Metals, engineering, and woodworking also slumped badly in 1908-9. On the other hand, unemployment in mining was relatively low in 1907-10.

Our estimated unemployment series for general unskilled laborers is presented in Figure 2. The series follows the same cyclical pattern as did the other sectoral series. Unlike the other sectors, however, unemployment among unskilled laborers increased sharply over time—the unemployment rate was below 10% in every year from 1870 to 1892, then above 10% in all but four years from 1893 to 1913. For comparison purposes, Figure 2 also presents an unemployment series constructed using vagrancy data.[61] Vagrants were typically adult males under age 60. While some hard core tramps were not really in search of work and therefore should not be counted as unemployed, the number of vagrants increased during downturns and declined during booms, suggesting that a significant share were in fact unemployed men "forced

[61] Data on the number of vagrants on January 1 and July 1 of each year were obtained from MacKinnon, *Poverty and Policy*, pp. 118, 337, and from the Board of Trade, *Seventeenth Abstract of Labour Statistics* (1915, pp. 332-3). We constructed a vagrancy rate series by dividing the number of vagrants in each year by the male population of England and Wales. To turn the vagrancy series into an unemployment series, we benchmarked the unemployment rate at 5.0% in 1875.

to migrate in search of work."[62] Figure 2 shows that the unemployment series constructed using vagrancy data is quite similar to that constructed using data for male indoor paupers. These series indicate that employment opportunities for casual and general laborers deteriorated—both absolutely and relative to those of skilled workers—during the last two decades before the First World War.[63]

The first column of Table 3 presents average unemployment rates for the 13 sectors in our series. For mining and textiles, estimates are given both including and excluding employment loss from short time work. Average unemployment rates differed significantly across sectors. When short time is taken into account, unemployment was highest in mining, followed by general unskilled labor, shipbuilding, textiles, and metals. Unemployment was lowest in woodworking, printing and bookbinding, clothing, and carriage and wagon. Perhaps surprisingly, unemployment in engineering was relatively low, averaging only 4.2%, well below levels in shipbuilding and metals, the other sectors with which it typically was grouped. Table 3 also compares average unemployment rates for 1870-91 and 1892-1913 for each sector. Unemployment rates declined over time for three sectors, increased for nine, and remained roughly constant for one. The largest increases were in general unskilled labor, printing and bookbinding, and shipbuilding.

A few comments should be made about the individual sectors. Bowley and Wilson Fox argued that the Board of Trade's estimated unemployment rates for the building trades were too low, because they included data only for carpenters and, after 1900, plumbers. Our estimates suggest that unemployment among carpenters was indeed somewhat below that of other

[62] MacKinnon, *Poverty and Policy*, p. 117. Beveridge, *Unemployment*, p. 48, maintained that "the inmates of casual wards . . . include a certain proportion of the able-bodied unemployed or unemployables." M. A. Crowther, *Workhouse System*, p. 254, also concludes that unemployment "very likely" was a cause of vagrancy.
[63] MacKinnon reached a conclusion similar to ours; see "Poor Law Policy," pp. 330-4.

occupations in the building trades. The average unemployment rate for the Amalgamated Carpenters and Joiners for 1870-1913 was 4.3%, half a percentage point below our estimate of 4.8%. In particular, the data for the carpenters and joiners underestimates the extent of the slump in the building trades in the first decade of the twentieth century—for the years 1904-9, the average unemployment rate for the Amalgamated Carpenters and Joiners was 8.8%; our estimate of unemployment in the building trades for these years is 10.1%.

The Board of Trade reported unemployment rates for engineering, metals, and shipbuilding as a group. Within the group, it weighted each sector by union membership. This procedure led to engineering and shipbuilding being heavily overrepresented, and metals underrepresented, in the Board of Trade index. In 1908 the sector weights within the Board of Trade's group were: engineering—64.5%; shipbuilding—23.0%; other metals—12.5%. We recalculated the unemployment series for the engineering, metals, and shipbuilding group, using labor force weights from the census. For 1908 the sector weights within the group are: engineering—39.3%; shipbuilding—9.4%; metals—51.3%. Surprisingly, despite the significant differences in weights for the two series the average unemployment rate for 1870-1913 is nearly identical—6.0% for the Board of Trade index and 6.1% for our index. This is not because the unemployment rates for the three series are similar; Table 3 shows that the average unemployment rate in shipbuilding was twice as high as that in engineering. The Board of Trade overweighted both a high- and a low-unemployment sector, and on average these two errors cancel each other out.

Figure 3 presents two unemployment series for mining, one including and one excluding employment loss from short time working. By counting only those workers in receipt of trade union benefits as unemployed, the Board of Trade seriously underestimated the loss of employment in mining. When short time is taken into account, the average unemployment rate

for 1870-1913 was 11.3%, nearly twice the unemployment rate excluding short time. From 1876 to 1906, the unemployment rate was above 10% for all but four years, and peaked at 27.1% in 1878. The cyclical patterns of the two series are quite similar, indicating that those years in which relatively large numbers of miners were unemployed were also years in which short time was prevalent.

The unemployment series for cotton and woolen and worsted, both including and excluding employment loss from short time work, are presented in Figures 4 and 5. The average unemployment rate for cotton, excluding short time, was 2.2%. When short time is taken into account, the average unemployment rate was 6.7%. Figure 4 also includes the unemployment series derived from expenditures per member on unemployment benefits for the Amalgamated Cotton Spinners. The average unemployment rate for the Spinners for 1879-1913, the years for which expenditure data are available, is 2.1%, compared with 2.4% for our series. For woolen and worsted, the average unemployment rate for 1870-1913, excluding short time, was 3.8%; including short time, the average unemployment rate was 7.6%. The series for cotton and woolen and worsted do not always move together, indicating that the two sectors produced for different markets.[64] The series for textiles was constructed by giving weights of 0.67 to cotton and 0.33 to woolen and worsted. When short time is excluded, the average unemployment rate for textiles was 2.8%; the lowest of any sector in our series. When short time is included, the average unemployment rate was 7.0%.

The unemployment series for railways and docks, the two groups that make up our transport sector, are presented in Figure 6. The average unemployment rate for railway workers from 1870 to 1913 was 2.5%. Figure 6 also gives the unemployment series constructed from

[64] For example, in 1881-3 the unemployment rate for woolen and worsted, including short time, was 10.9%; for cotton, it was 4.4%. In 1910, the unemployment rate was 13.5% for cotton and 2.8% for wool. On the other hand, both sectors slumped badly in 1878-9 and again in 1900-04.

benefit per member data for the Amalgamated Railway Servants. The two series move broadly together from 1875 to 1897, but follow different patterns after 1897. In particular, the Railway Servants series has peaks in unemployment in 1898 and 1912 that do not occur in our series. The average unemployment rate for the Railway Servants from 1875 to 1913 is 2.5%, as compared to 2.8% for our series.[65] The series for dock workers is much more volatile than that for railway workers. The unemployment rate varied from a low of 7.7% in 1871 to a high of 19.6% in 1886; the average for 1870-1913 was 14.5%. The unemployment series for transport was constructed by giving weights of 0.67 to railways and 0.33 to docks. The average unemployment rate for 1870-1913 was 6.5%.

We construct four versions of our aggregate unemployment index, including and excluding employment loss from short time work in mining and textiles, and including and excluding our measure of unemployment for unskilled general laborers. The four versions of the index, along with Feinstein's revision of the Board of Trade index, are presented in Figures 7 and 8 and summarized in Table 4. The pattern of cyclical fluctuations is very similar for each of the newly constructed series, and our indices move together with the Board of Trade index throughout the period 1870-1913. This is perhaps surprising, given the low weight attached to engineering, shipbuilding, and metals in our indices.

The index of ours that is closest to the Board of Trade index is the one which excludes employment loss from short time work and excludes the series for general unskilled labor. For the period 1870-1913, the average unemployment rate is 5.0% for our series, and 4.5% for Feinstein's version of the Board of Trade series. While the level of unemployment is higher in

[65] The estimated unemployment rate of 20.1% for 1912 was a result of a national coal strike in March 1912 and a 1912 dock strike. It appears that some of the expenditure for unemployment benefits in 1912 was in fact payments to railway workers who struck in support of the miners. Bagwell, *Railwaymen*, pp. 305-6, contends that in 1912 many of the railway workers wanted to "join hands with the miners."

our series, the magnitude of the fluctuations in unemployment is lower. During boom periods unemployment is always lower in the Board of Trade index than in our index; during slumps unemployment is higher in the Board of Trade index, except for the downturns of 1904-5 and 1908-9. The standard deviation of unemployment is 1.78 for our series, versus 2.44 for the Board of Trade series; the coefficient of variation is 0.35 for our series and 0.55 for the Board of Trade. The fluctuations in our series are milder because of the relatively low weights assigned to engineering and especially shipbuilding, the most volatile sector in the index, and because our index includes transport, which has very mild fluctuations in unemployment. The other major difference between the two series is the long term trend in unemployment. In the Board of Trade index, the average unemployment rate for 1892-1913 is virtually the same as that for 1870-91; in our index, the average unemployment rate increases from 4.7% in 1870-91 to 5.3% in 1892-1913. In both indices, peak unemployment occurred in 1879. However, the next most severe slump occurred in 1908-9 in our index, and in 1885-6 in the Board of Trade index.

The effect of including employment loss from short time work in mining and textiles can be seen by comparing our two indices in Figure 7. Taking account of short time raises the average unemployment rate from 5.0% to 6.3%. The increase in unemployment is large because mining and textiles are large sectors—in 1901 they account for a quarter of the workforce included in the index—in which the number of "wholly unemployed" workers "substantially under-stated the true volume of unemployment."[66] It is now the case that unemployment is higher in our index than in the Board of Trade index for every year from 1870 to 1913 except 1884 and 1886 although, as before, the differences are larger after 1892. The sharp increase in unemployment that occurs when short time work is included supports Bowley's conclusion that

[66] Beveridge, *Full Employment*, p. 332.

"nearly every measurement . . . based on the number of employed or the number unemployed, underestimates the fluctuations in the amount of employment."[67]

The indices which include general unskilled labor are presented in Figure 8. Taking account of unskilled labor raises the average unemployment rate to 6.6% when employment loss from short time is included and 5.4% when short time is excluded. While it does not affect the pattern of cyclical fluctuations, the inclusion of general unskilled labor does affect the long term trend in unemployment. For the index which includes short time, the average unemployment rate increases from 6.1% in 1870-91 to 7.1% in 1892-1913.

What conclusions can be drawn from a comparison of our unemployment series with the Board of Trade series? First, the Board of Trade series underestimates the average level of unemployment for the period 1870-1913. Contemporaries were correct in contending that the Board of Trade's method of calculating unemployment tended in some ways to understate the true unemployment rate and in other ways to overstate the unemployment rate. The Board of Trade placed too high a weight on shipbuilding and metals—two sectors with relatively high unemployment rates—in its index, and excluded information on railways, a sector with very low unemployment rates. In this way it tended to overstate the true unemployment rate. However, the magnitude of this overstatement was swamped by the understatement of unemployment caused by other choices made by the Board of Trade. There were at least three ways in which the Board of Trade underestimated the unemployment rate. First, the method of weighting by trade union membership led, on average, to a slight understatement of unemployment, not an overstatement as Llewellyn Smith had claimed in 1895.[68] Second, the Board of Trade did not

[67] Bowley, "Measurement of Unemployment," pp. 795-6. In a similar vein, Whiteside, *Bad Times*, p. 21, wrote that "the problem was really one of underemployment among many rather than unemployment among few."

[68] See above, page 8 and footnote 18. Llewellyn Smith recalculated the unemployment rate for November 1894, weighting groups of trades by their labor force totals in the census rather than by union membership. His revised unemployment rate was 4.2%, as compared to the Board of Trade estimate of 7.0%. Our estimate for 1894 as a

include measures of unemployment for dock workers or general unskilled laborers, two groups with very high unemployment rates.[69] Third, by excluding the loss of employment from short time work, the Board of Trade index significantly underestimated the unemployment rate in mining and textiles. When general unskilled labor is included and short time is taken into account, we estimate that the average unemployment rate for 1870-1913 was 6.6%, significantly higher than the Board of Trade's average of 4.5%.

Our conclusion that the Board of Trade index understates the true unemployment rate was also reached by William Beveridge in 1944. Beveridge compared the trade union unemployment rate with the unemployment insurance statistics for 1913-4, and concluded that if unemployment had been measured in the same way from 1883 to 1913 as it was from 1921 to 1938, the average unemployment rate in the two decades before the First World War would have been about 6.0%, not 4.8% as estimated by the Board of Trade. In making this calculation, Beveridge attempted to measure the loss in employment due to short time, but he did not attempt to extend the sectors covered by the index.[70] By comparison, our series that includes short time but excludes general unskilled labor has a mean unemployment rate of 6.7% for 1883-1913.

Despite the various problems with the Board of Trade index that we have identified, its pattern of cyclical fluctuations is similar to that of our unemployment indices. This clearly

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whole, excluding short time and general unskilled labor, is 5.9%, which is indeed less than the Board of Trade estimate of 6.9%. However, for the entire period 1870-1913, our estimated average unemployment rate is above the Board of Trade estimate.

[69] Some contemporaries and historians point out that the Board of Trade index also omitted stable sectors such as railways, domestic service, and agriculture, and that these stable sectors tend to cancel out the omitted volatile sectors, so that the effect on unemployment is unclear. See, for example, Feinstein, *National Income*, p. 225. While unemployment was indeed low in railways, when railways and docks are combined, as in our transport sector, the average unemployment rate for 1870-1914 was 6.5%, significantly above the average level for the Board of Trade index. We agree that agriculture did not experience major cyclical fluctuations in employment. Arable agriculture did, however, experience significant seasonal fluctuations in employment, especially during harsh winters. When seasonal unemployment and short time working are taken into account, one could argue that agriculture was not a low-unemployment sector. No data exist concerning employment or unemployment rates for domestic service.

[70] Beveridge, *Full Employment*, pp. 73, 328-37.

demonstrates that the fluctuations in the Board of Trade index are not simply a result of its overweighting of unions in engineering, shipbuilding, and metals. As can be seen in Figure 1, almost all of the sectors included in our index follow a similar cyclical pattern. Overrepresenting the volatile engineering group increases the magnitude of fluctuations slightly, but does not affect the pattern of unemployment. That is, the trade union unemployment index performs precisely the role that officials of the Board of Trade said it did. Neither Llewellyn Smith or Wilson Fox ever claimed that the Board of Trade index provided an accurate measure of the level of unemployment. Rather, Llewellyn Smith claimed that the index was a "sensitive barometer" of cyclical fluctuations in the economy, that always moved "in the right direction," and Wilson Fox stated that "our figures are an index of whether employment is going up or down, whether it is better or whether it is worse. One cannot say much more than that about our figures."[71]

Finally, our new series has significantly different implications for the long-term trend in unemployment than does the Board of Trade series. In particular, the high unemployment rates of the 1920s do not appear to be as much of an aberration when compared with our estimates for the period 1892-1913. The average unemployment rate among insured workers for 1920-9 was 11.2%.[72] In the Board of Trade index, the average unemployment rate was 4.4% for 1870-91 and 4.5% for 1892-1913. The unemployment rate for the 1920s was two and a half times greater than the unemployment rate for 1870-1913, and there was no inkling in the decades before the First World War of the increase in unemployment that occurred at the war's conclusion. The 1920s, at least in terms of unemployment, represent a sharp break from the past. Our new

[71] The quote by Llewellyn Smith is from the S. C. on Distress from Want of Employment, Third Report, minutes of evidence, *Parl. Papers* (1895, IX), Q. 4562, 4563, p. 50. The quote by Wilson Fox is from the Royal Commission on the Poor Laws and Relief of Distress, Appendix volume VIII, *Parl. Papers* (1910, XLVIII), Q. 98893, p. 448.
[72] Feinstein, *National Income*, p. T128.

unemployment indices suggest a different story. Not only is the average unemployment rate higher for 1870-1913 than in the Board of Trade index, but it increases over time. When general unskilled labor is included and short time is taken into account, the unemployment rate increases from 6.1% for 1870-91 to 7.1% for 1892-1913. If general unskilled labor is excluded, the long-term upward trend in unemployment is slightly less pronounced, but the average unemployment rate for 1892-1913 remains high, at 6.7%. Compared to our series, the unemployment rates for the 1920s look like the intensification of a trend that began in the 1890s, not a sharp break from the pre-war era. It would appear that the roots of the problems of the 1920s extended back before the First World War into the late Victorian economy.

Conclusion

For over a century contemporaries and then historians have criticized the trade union unemployment index constructed by the Labour Department of the Board of Trade. Despite this criticism, only a few minor adjustments have been made to the index, by the Board of Trade itself and by others. In this paper we present four versions of a new index of unemployment. Our index improves on the Board of Trade index in several ways. First, we use series for, or closely related to, employment to estimate unemployment rates for sectors for which trade union unemployment data either are not available or not reliable. Second, we weight the individual sectors included in the index using appropriate labor force estimates obtained from the decennial censuses rather than trade union membership. Third, we include the loss of employment from short time work. By excluding short time, the Board of Trade index significantly underestimated the unemployment rate in mining and textiles. Fourth, we include an unemployment series for general unskilled labor. The Board of Trade index includes data only for skilled workers, and assumes that trends in unemployment for skilled and unskilled workers were similar. For much of the period, however, this was not the case. Employment opportunities for general unskilled

laborers deteriorated—both absolutely and relative to those of skilled workers—from 1892 to 1913.

Economists often use the average level and volatility of unemployment as measures of macroeconomic performance. The new unemployment series reported in this paper show that the average unemployment rate was higher, but the volatility of unemployment was somewhat lower, for the period 1870-1913 than the Board of Trade series indicated. Our results can be compared with those of Romer for the United States. Her adjusted unemployment series for 1890-1913 has a coefficient of variation of 0.47 as compared with 0.64 for Lebergott's earlier series.[73] For Britain during the same years the coefficient of variation for our preferred unemployment series is 0.27, as compared with 0.42 for the Board of Trade/Feinstein series. However, it is important to stress that our downward revision of this measure of volatility largely comes from a rise in mean unemployment whereas Romer's revision chiefly is due to a fall in the standard deviation of unemployment. Our results suggest that comparisons between the pre-1914 economy and the interwar or postwar economies need to be rethought. We plan to address these issues in future work.

[73] Romer, "Spurious Volatility," p. 31.

Appendix: Data sources for series constructed using trade union data

In what follows the methods of construction of unemployment series are briefly described for each sector. The (fixed) weights assigned to each union within the sector are also reported. The type of information used is denoted as follows: UR = percentage of union members receiving unemployment benefits; BPM = unemployment benefits per member of the union.

Building Trades

An unemployment index was constructed using data from four trade unions: the Amalgamated Carpenters and Joiners, the United Operative Plumbers, the Operative Bricklayers, and the Operative Plasterers. In constructing the index, the weights assigned to each union were determined by 1901 census data.

Amalgamated Society of Carpenters and Joiners; Weight = 0.573.
1871-1913—UR from *17th Abstract of Labour Statistics*
1870—UR from Board of Trade, as reported in *Royal Commission on the Poor Laws and Relief of Distress*, Appendix No. XXI (B), p. 608.
United Operative Plumbers; Weight = 0.140.
1902-13—UR from *Labour Gazette*;
1901—UR constructed by assuming that plumbers' unemployment changed from 1901 to 1902 in the same way as carpenters' unemployment.
1870—1900 BPM, spliced to unemployment rate in 1901.
Operative Bricklayers' Society; Weight = 0.221.
1870-1911—BPM from trade union's annual reports; benchmark=5.0% in 1911.
National Association of Operative Plasterers; Weight =0.066.
1870-1911—BPM from trade union's annual reports; benchmark=5.0% in 1911.

For the years 1912-13, unemployment rate constructed from the carpenters and plumbers unions only, with weights: carpenters = .804; plumbers = .196. Unemployment rate for these years spliced to unemployment rate in 1911.

Metal Manufacturing

The unemployment index for metals in fact consists of two indices, one for iron and steel and the other for miscellaneous metals. The index for iron and steel was constructed using data from two unions, the Friendly Society of Ironfounders and the Associated Ironmoulders (Scotland). The index for miscellaneous metals was constructed using data from the *Labour Gazette* and the Amalgamated Brassworkers and Metal Mechanics. The indices were then merged to form an index for metal manufacturing.

Iron and Steel (Weight = 0.7):

The weights assigned to the two unions were determined by the number of ironworkers in England and Wales and Scotland in 1901.
Friendly Society of Ironfounders; Weight = 0.84.
1871-1913—UR from *17th Abstract of Labour Statistics*

1870—UR from Board of Trade, as reported in *Royal Poor Law Commission*, App. XXI (B), p. 607.

Associated Ironmoulders (Scotland); Weight = 0.16.

1871-1913—UR from *17th Abstract of Labour Statistics*

1870—UR from Board of Trade, as reported in *Royal Poor Law Commission*, App. XXI (B), p. 607.

Miscellaneous Metal Trades (Weight = 0.3)

1905-13, UR from *Labour Gazette*

1872-1904, *National Amalgamated Brassworkers and Metal Mechanics* BPM from trade union's annual reports, spliced to UR in 1905.

1870-71, *London Operative Zinc Workers Society* BPM from *Third Report on Trade Unions* (Board of Trade), p. 160, spliced to Brassworkers series in 1872.

Engineering

An unemployment index was constructed using data from four trade unions: the Amalgamated Engineers, the Steam Engine Makers, the United Patternmakers, and the Associated Blacksmiths and Ironworkers. Data for the United Patternmakers are not available for the period 1870-77. In constructing the index, the weights assigned to each union were roughly based on the union membership in 1901.

Amalgamated Society of Engineers; Weight = 0.70.

1871-1913—UR from *17th Abstract of Labour Statistics*

1870—UR from Board of Trade, as reported in *Royal Poor Law Commission*, App. XXI (B), p. 607.

Steam Engine Makers Society; Weight = 0.10.

1870-1913—UR from trade union's annual reports.

United Patternmakers Association; Weight = 0.10.

1878-1913—UR from trade union's annual reports.

No data for 1870-77.

Associated Blacksmiths and Ironworkers Society; Weight = 0.10.

1870-1913—UR from trade union's annual reports.

For the years 1870-1877, the weights assigned to each union were as follows: Amal. Engineers—0.70; Steam Engine Makers—0.15; Assoc. Blacksmiths—0.15. The series for 1870-77 was spliced to the four-union series using data for 1878.

Shipbuilding

An unemployment index was constructed using data from the *United Society of Boilermakers and Iron and Steel Shipbuilders*.

1872-1913—UR from 17th Abstract of Labour Statistics

1870-71—BPM from *Third Report on Trade Unions* (Board of Trade), p. 85, spliced to UR data in 1872.

Printing, Paper and Bookbinding

An unemployment index was constructed using data from three unions: the London Compositors, the Typographical Union, and the London Journeymen Bookbinders. The weights assigned to each union were roughly based on the 1901 census and on union membership in 1901.

London Society of Compositors; Weight = 0.40

1871-1913—UR from *17th Abstract of Labour Statistics*

1870—UR from Board of Trade, reported in *Royal Poor Law Commission*, App. XXI (B), p. 609.

Typographical Association; Weight = 0.50.

1871-1913—UR from *17th Abstract of Labour Statistics*

1870—UR from Board of Trade, reported in *Royal Poor Law Commission*, App. XXI (B), p. 609.

London Society of Journeymen Bookbinders; Weight = 0.1.

1871-1913—UR from *17th Abstract of Labour Statistics*

1870—UR from Board of Trade, reported in *Royal Poor Law Commission*, App. XXI (B), p. 609.

Woodworking and Furnishing Trades

An unemployment index was constructed using data for three unions: the Alliance Cabinet Makers/Amalgamated Furnishing Trades, the Amalgamated Cabinet Makers, and the Amalgamated Woodsawyers. Data for the Amalgamated Woodsawyers are not available for 1870-72. The weights assigned to each union are roughly based on union membership in 1901.

Alliance Cabinet Makers Assoc./Nat. Amal. Furnishing Trades; Weight = 0.50.

1871-1913—UR from *17th Abstract of Labour Statistics*

1870—UR from Board of Trade, reported in *Royal Poor Law Commission*, App. XXI (B), p. 608.

Amalgamated Union of Cabinet Makers; Weight = 0.20.

1870-1913—BPM from trade union's annual reports; benchmark = 4.0% in 1912.

Amalgamated Soc. of Millsawyers, Wood-cutting Machinists, and Wood Turners; Weight = 0.30.

1873-1913—UR from *17th Abstract of Labour Statistics*

For the years 1870-72, the weights are as follows: Alliance Cabinet Makers—0.50; Amalgamated Cabinet Makers—0.50. The series for 1870-72 was spliced to the three-union series using data for 1873.

Carriage and Wagon

An unemployment index was constructed using data from the U.K. Society of Coachmakers.

1871-1913—UR from *17th Abstract of Labour Statistics*

1870—UR from Board of Trade, reported in *Royal Poor Law Commission*, App. XXI (B), p. 608.

Clothing Trades

An unemployment index was constructed using data from two unions: the Boot and Shoe Operatives, and the Amalgamated Tailors. Data for the Boot and Shoe Operatives are not available for 1870-76. The weights assigned to each union are based on employment figures in the 1901 Census.

National Union of Boot and Shoe Operatives; Weight = 0.60.

1910-1913—UR from *18th Abstract of Labour Statistics*

1908-09—BPM from trade union's annual reports, spliced to unemployment rate in 1910.

1902-07—unemployment rate was assumed to move in the same way as that of the Tailors. [From 1903 to 1907, the Boot and Shoe makers instituted an out of work benefit in stages. The BPM data are not comparable from year to year.]

1877-1901—BPM from trade union's annual reports, spliced to unemployment rate in 1902.

Amalgamated Society of Tailors; Weight = 0.40.

1912-13—used UR for Clothing, reported in the Labour Gazette.

1892-1911—BPM from ??, spliced to unemployment rate in 1912.

1886-91—unemployment rate was assumed to move in the same way as that of the Boot and Shoe Operatives. [movement in BPM for 1886-91 very odd, suggests that there were rule changes, perhaps in 1888 and again in 1891.]

1870-85—BPM from *Third Report on Trade Unions* (Board of Trade), p. 70, spliced to unemployment rate in 1886 using data for 1886-7.

For 1870-76, the unemployment index includes only data for the Tailors. The series is spliced to the overall series using data for 1877-8.

Glass Trades

An unemployment index was constructed using data from the *Yorkshire Glass Bottle Makers*.

1870-90—UR from *Third Report on Trade Unions* (Board of Trade), p. 104.

1891-1910—UR from trade union's annual reports, spliced to series for 1870-90 using data for 1888-90.

1911-13—UR from *Labour Gazette*, spliced to earlier series using data for 1910.

References

Official Publications

Board of Trade. *Statistical Tables and Report on Trade Unions* (1887).

Board of Trade. *Statistical Tables and Report on Trade Unions. Third Report* (1889).

Board of Trade. *Seventh Annual Report on Trade Unions (1893): with Statistical Tables* (1895).

Board of Trade. *Report on Trade Unions in 1905-1907* (1909).

Board of Trade. *Report on Trade Unions in 1908-1910* (1912).

Board of Trade. *Labour Gazette*, various issues (1893-1914).

Board of Trade. "Memorandum on a recent Estimate of the Number of the Unemployed." Unpublished Memorandum, January 8, 1895.

Board of Trade. "The Unemployed." Unpublished Memorandum, January 23, 1895.

Board of Trade. "Report on Unemployment in the United Kingdom in September 1908." Unpublished Memorandum, October 10, 1908.

Board of Trade. *Seventeenth Abstract of Labour Statistics* (1915).

Board of Trade. *Eighteenth Abstract of Labour Statistics* (1927).

Parl. Papers. *Royal Commission on Labour: Rules and Associations of Employers and of Employed* (1892, XXXVI).

Parl. Papers. *Third Report from the Select Committee on Distress from want of Employment* (1895, IX).

Parl. Papers. *British and Foreign Trade and Industrial Conditions* (1905, LXXXIV).

Parl. Papers. *Minutes of Evidence . . . of Witnesses relating chiefly to the subject of Unemployment* (Appendix volume VIII of the Royal Commission on the Poor Laws and Relief of Distress) (1910, XLVIII).

Parl. Papers. *Minutes of Evidence . . . of Witnesses further relating to the subject of Unemployment* (Appendix volume IX of the Royal Commission on the Poor Laws and Relief of Distress) (1910, XLVIX).

Parl. Papers. *Rules and Expenditures of Trade Unions in respect of Unemployment Benefits* (1911, LXXIII).

Other References

Bagwell, Philip S. *The Railwaymen: the history of the National Union of Railwaymen*. London: Allen and Unwin, 1963.

Bain, George S. and Robert Price. *Profiles of Union Growth: A Comparative Statistical Portrait of Eight Countries*. Oxford: Basil Blackwell, 1980.

Beveridge, William H. *Unemployment: A Problem of Industry*, 2nd ed. London: Longmans Green, 1931.

Beveridge, William H. *Full Employment in a Free Society*. London, 1944.

Booth, Charles. *Life and Labour of the People of London*.

Bowley, Arthur L. "The Measurement of Unemployment: An Experiment." *Journal of the Royal Statistical Society*, 75 (1912): 791-829.

Chapman, S. J. and H. M. Hallsworth. *Unemployment: The Results of an Investigation made in Lancashire*. Manchester: Manchester University Press, 1909.

Clegg, H. A., Alan Fox, and A. F. Thompson. *A History of British Trade Unions since 1889*, vol. I, 1889-1910. Oxford: Clarendon Press, 1964.

Crowther, M. A. *The Workhouse System 1834-1929: the history of an English social institution*. Athens, GA: University of Georgia Press, 1981.

Feinstein, C. H. *National Income, Expenditure and Output of the United Kingdom, 1855-1965*. Cambridge: Cambridge University Press, 1972.

Garside, W. R. *The Measurement of Unemployment*. Oxford: Basil Blackwell, 1980.

Hartley, E. L. "Trade Union Expenditure on Unemployment Benefit," *Journal of the Royal Statistical Society* (1904): 52-71.

Hilton, John. "Statistics of Unemployment Derived from the Working of the Unemployment Insurance Acts." *Journal of the Royal Statistical Society* 86 (1923): 154-93.

Hobson, J. A. *The Problem of the Unemployed*, 2nd ed. London: Methuen, 1904.

Howarth, E. G. and M. Wilson. *West Ham: A Study in Social and Industrial Problems*. London: J. M. Dent.

Jenkins, D. T. and K. G. Ponting. *The British Wool Textile Industry, 1770-1914*. London: Heinemann, 1982.

Lee, C. H. *British Regional Employment Statistics, 1841-1971*. Cambridge: Cambridge University Press, 1979.

MacKinnon, Mary. *Poverty and Policy: The English Poor Law 1860-1910*. D.Phil. Thesis, Univ. of Oxford, unpublished.

MacKinnon, Mary. "Poor Law Policy, Unemployment, and Pauperism." *Explorations in Economic History* 23 (1986): 299-336.

Mitchell, B. R. *Economic Development of the British Coal Industry, 1800-1914*. Cambridge: Cambridge University Press, 1984.

Mitchell, B. R. and Phyllis Deane. *Abstract of British Historical Statistics*. Cambridge: Cambridge University Press, 1962.

Romer, Christina, "Spurious Volatility in Historical Unemployment Data." *Journal of Political Economy* 94 (1986): 1-37.

Romer, Christina, "New Estimates of Prewar Gross National Product and Unemployment." *Journal of Economic History* 46 (1986): 341-352.

Thomas, Mark. "Labour Market Structure and the Nature of Unemployment in Interwar Britain," in Barry Eichengreen and T. J. Hatton, eds., *Interwar Unemployment in International Perspective*. Dordrecht: Kluwer Academic Publishers, 1988.

Turner, H. A. *Trade Union Growth, Structure and Policy: A Comparative Study of the Cotton Unions in England*. London: Allen and Unwin, 1962.

Weir, David R., "The Reliability of Historical Macroeconomic Data for Comparing Cyclical Stability," *Journal of Economic History* 46 (1986): 353-365.

Whiteside, Noel. *Bad Times: Unemployment in British Social and Political History*. London: Faber and Faber, 1991.

Wood, G. H. "Trade Union Expenditure on Unemployment benefit since 1860." *Journal of the Royal Statistical Society* (1900): 81-92.

Table 1: Sectoral Weights in the Board of Trade Index

Sector	Percent by Trade 1894	No. of Union Members 1908	Percent by Trade 1908	No. of Union Members 1913	Percent by Trade 1913
Building Trades	⎡21.0	61,057	9.4	73,708	8.3
Woodworking	⎣	35,200	5.4	45,248	5.1
Coal Mining	19.0	126,725	19.5	163,614	18.5
Engineering	⎡	164,088	25.2	213,493	24.1
Shipbuilding	⎨46.0	58,424	9.0	71,425	8.1
Other Metals	⎣	31,751	4.9	63,010	7.1
Printing & Bookbinding	10.0	56,376	8.7	62,850	7.1
Textiles	3.0	93,900	14.5	124,237	14.1
Miscellaneous	1.0	22,178	3.4	66,859	7.6
Total		649,699		884,444	

Table 2: Sectoral Weights: 1871, 1891, 1911

Sector	Percent by Sector		
	1871	1891	1911
Mining	12.4	13.6	16.7
Metals	12.5	11.7	11.2
Engineering	4.5	5.5	8.9
Shipbuilding	1.4	1.7	2.1
Carriage & Wagon	1.3	1.5	2.5
Textiles	13.5	10.6	8.7
Clothing & Footwear	8.9	7.3	5.9
Glass	0.9	0.8	0.8
Woodworking	4.2	3.7	3.9
Printing & Bookbinding	2.5	3.2	3.5
Building Trades	18.3	17.4	16.9
Transport	8.4	12.0	11.8
General Unskilled Labor	11.3	11.0	7.1

Table 3: Unemployment Rates by Sector

Sector	Mean % 1870-1913	Mean % 1870-1891	Mean % 1892-1913
Mining	5.9	6.5	5.2
Mining inc. short time	11.3	12.0	10.6
Metals	6.7	6.7	6.8
Engineering	4.2	3.7	4.7
Shipbuilding	8.7	7.5	9.9
Carriage & Wagon	3.8	4.0	3.6
Textiles	2.8	2.5	3.0
Textiles inc. short time	7.0	6.3	7.7
Clothing & Footwear	3.8	4.2	3.4
Glass	5.6	4.8	6.4
Woodworking	3.1	2.2	3.9
Printing & Bookbinding	3.7	2.4	5.0
Building Trades	4.8	4.0	5.7
Transport	6.5	5.9	7.1
General Unskilled Labor	9.5	6.9	12.2

Table 4: Aggregate Unemployment Rates, 1870-1913

Unemployment Index	Mean % 1870-1913	Standard Deviation 1870-1913	Coef. of Variation 1870-1913	Mean % 1870-1891	Mean % 1892-1913
Unemp Rate exc. unskilled exc. short time	5.0	1.78	0.35	4.7	5.3
Unemp Rate exc. unskilled inc. short time	6.3	2.31	0.36	6.0	6.7
Unemp Rate inc. unskilled exc. short time	5.4	1.70	0.31	4.9	5.9
Unemp Rate inc. unskilled inc. short time	6.6	2.17	0.35	6.1	7.1
Unemp Rate: Board of Trade (Feinstein)	4.5	2.44	0.55	4.4	4.5

Figure 1a: Component Unemployment Series

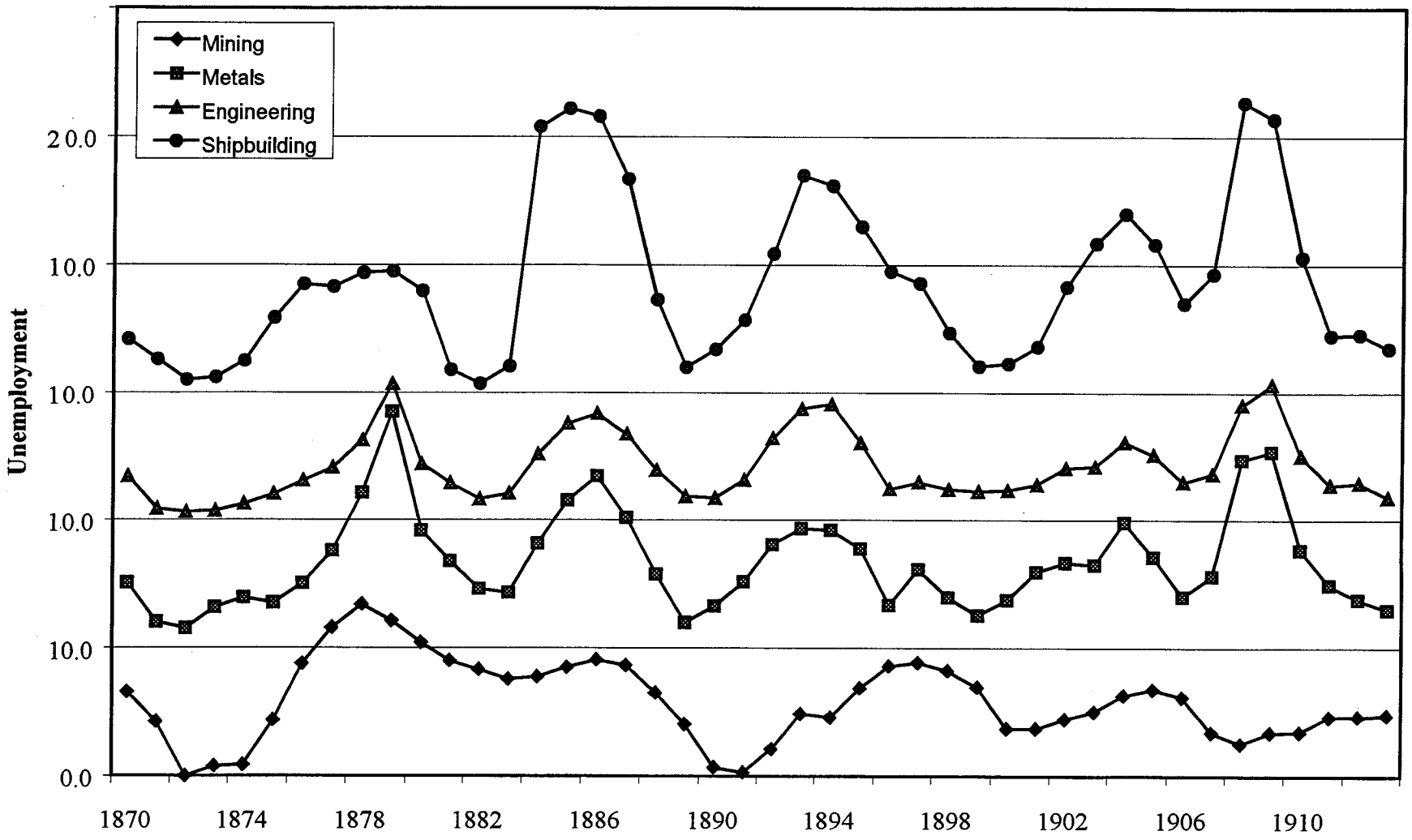

Figure 1b: Component Unemployment Series

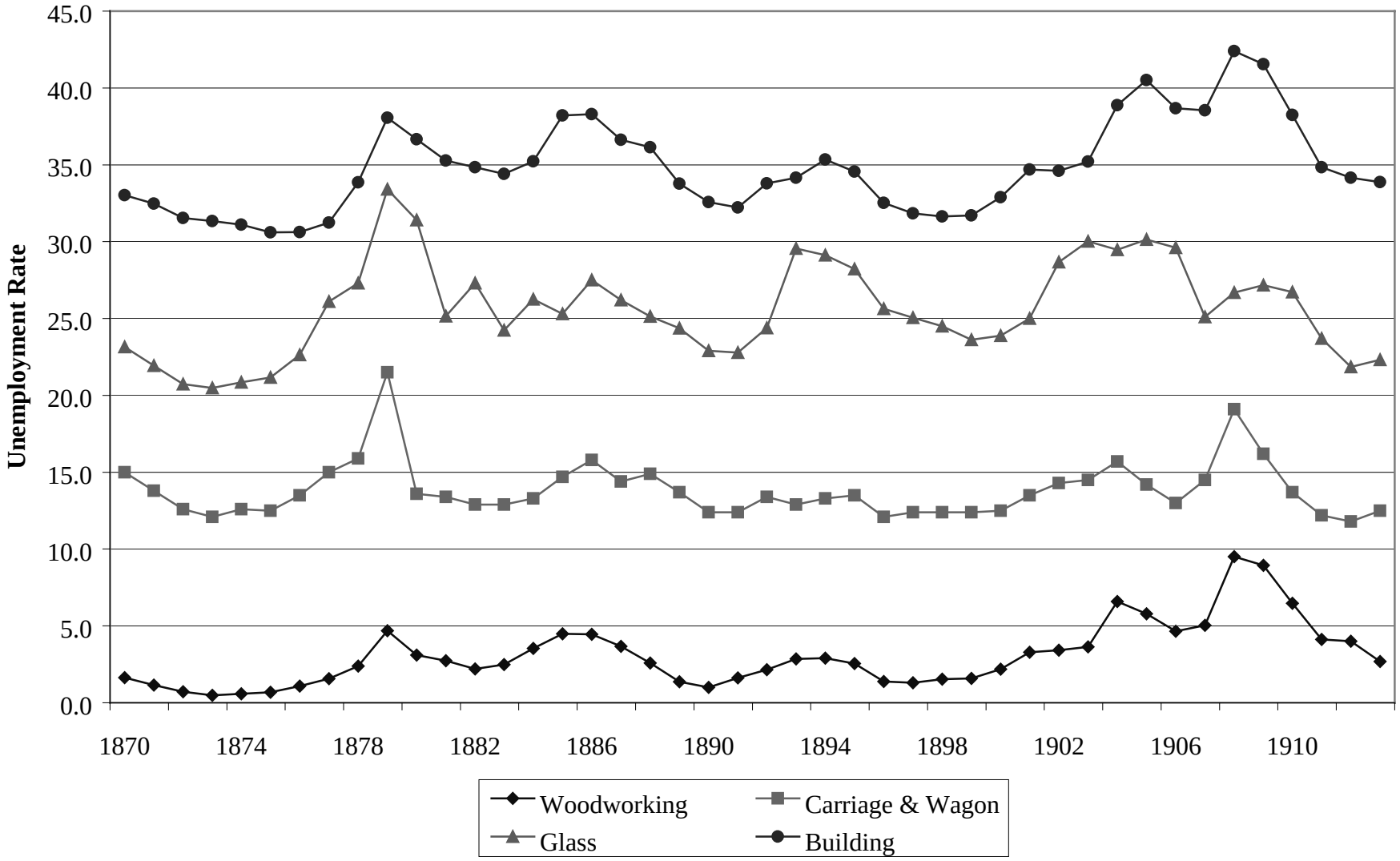

Figure 1c: Component Unemployment Series

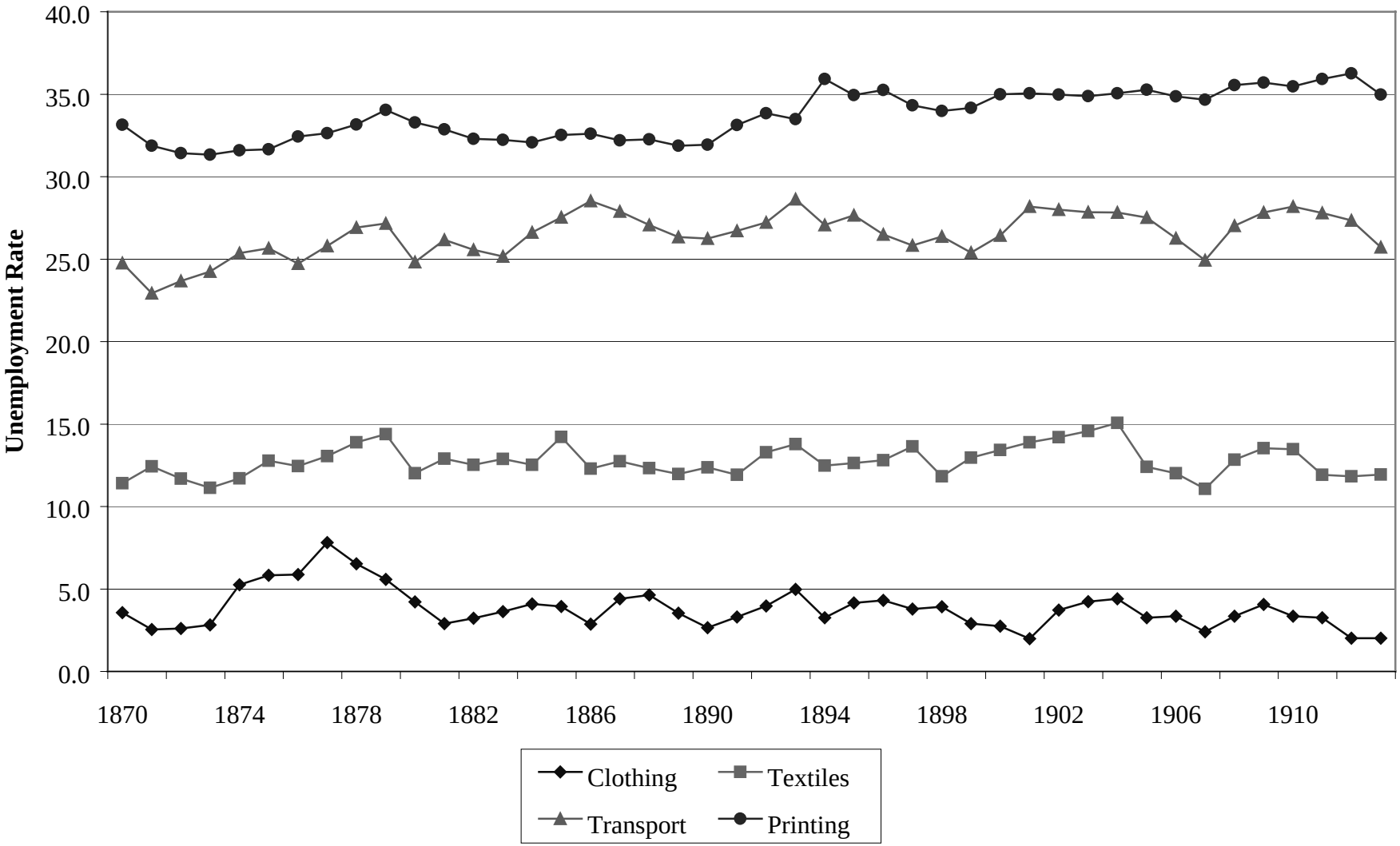

Figure 2: Unskilled Unemployment Rate

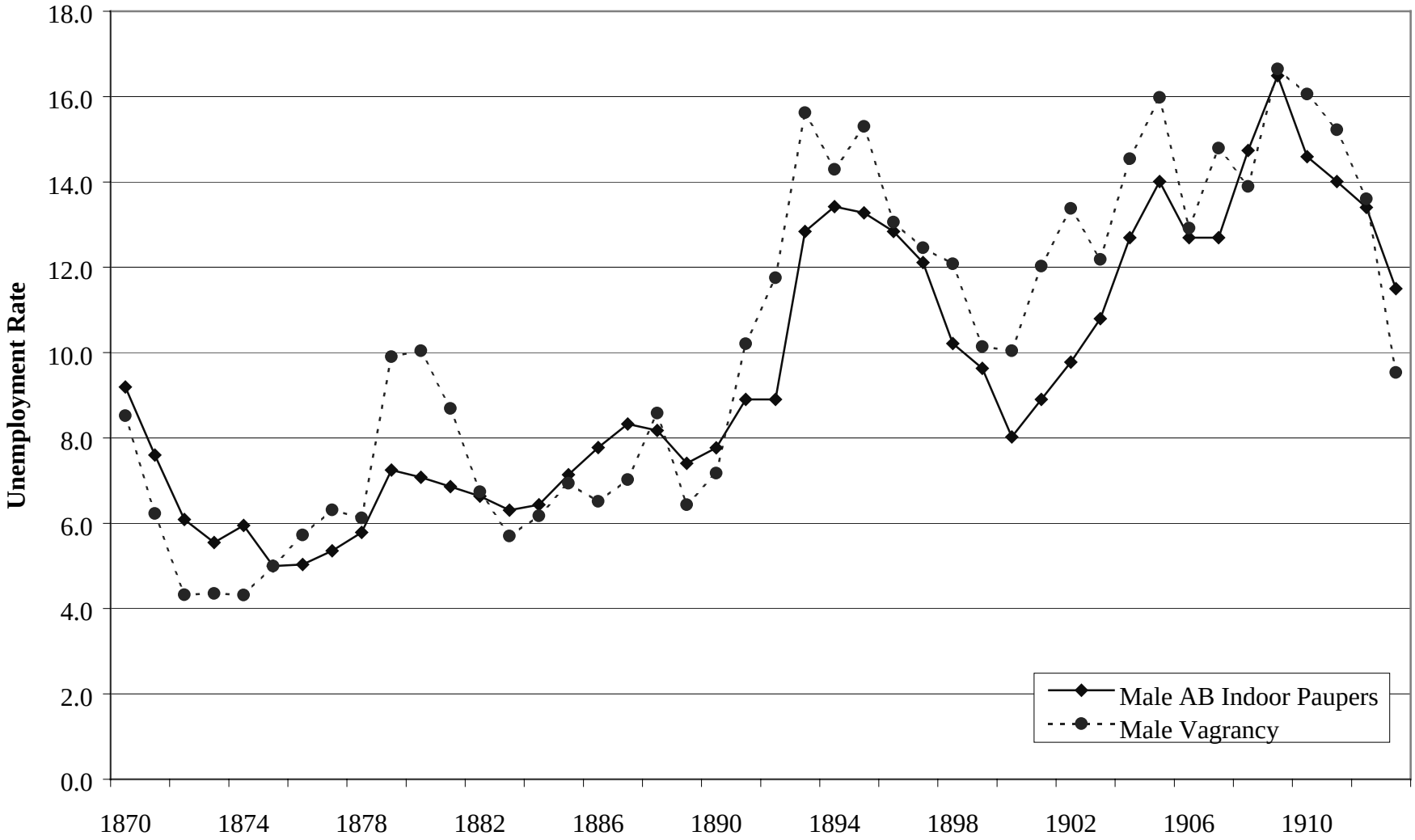

Figure 3: Unemployment in Mining

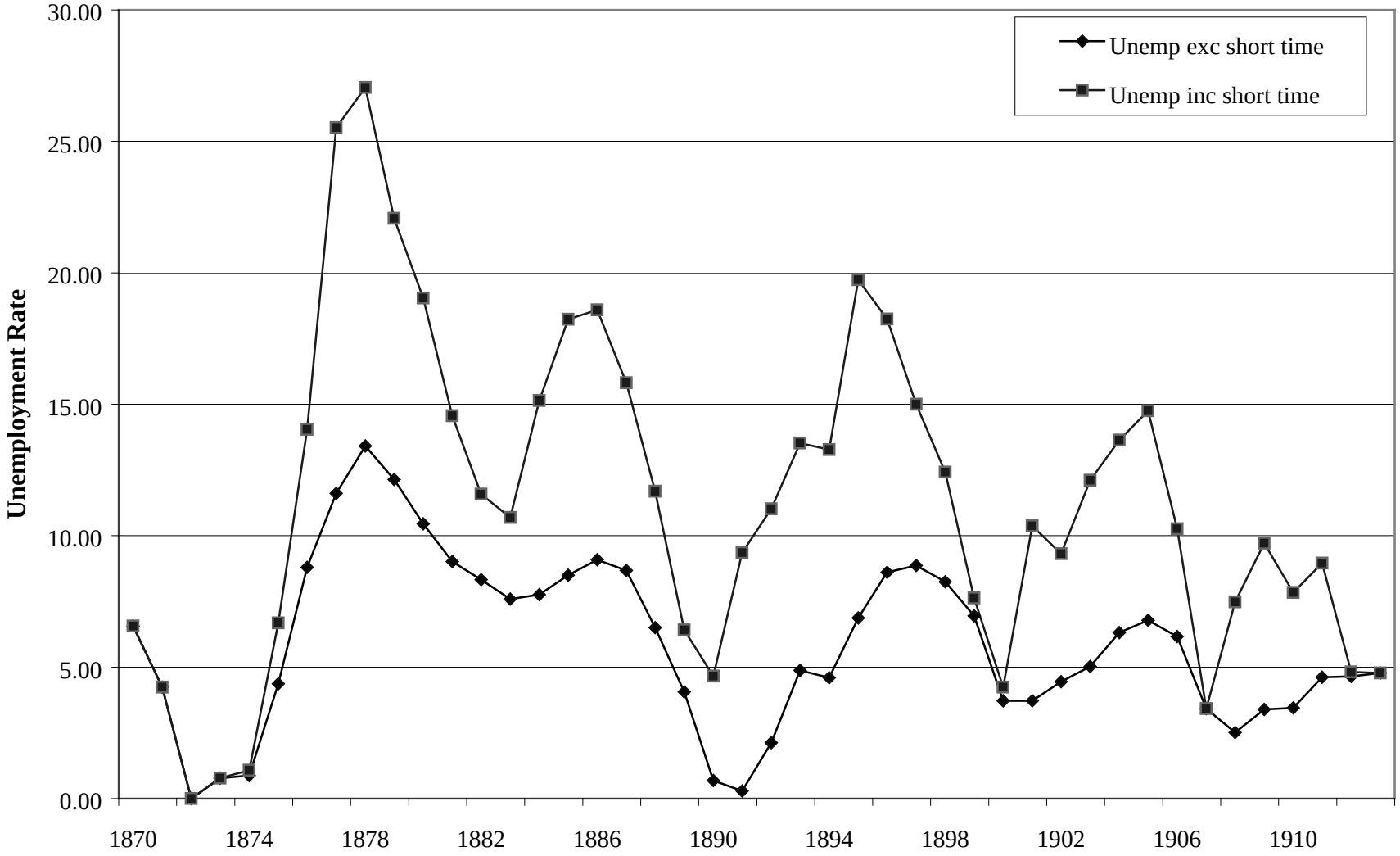

Figure 4: Unemployment in Cotton Textiles

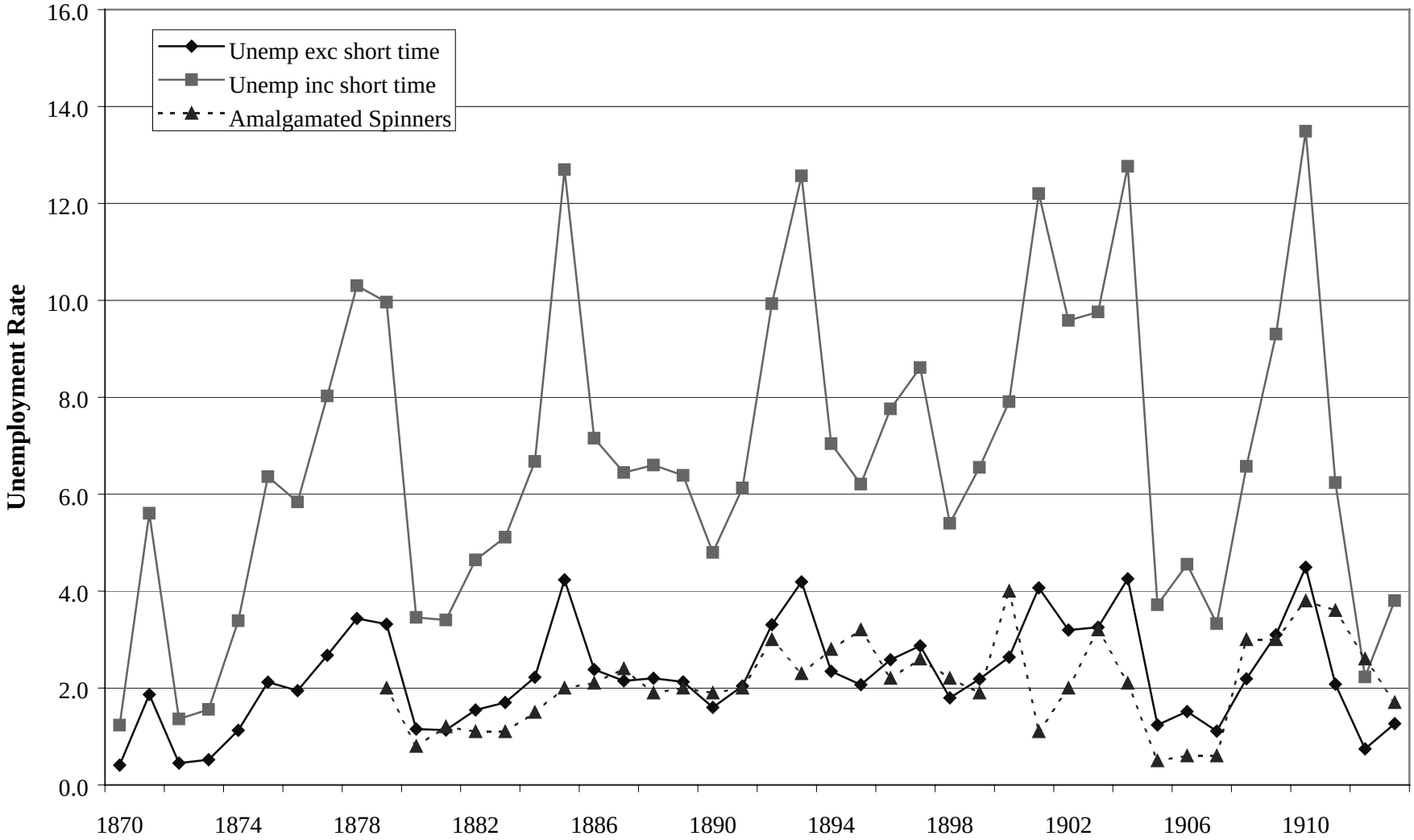

Figure 5: Unemployment in Woolen and Worsted

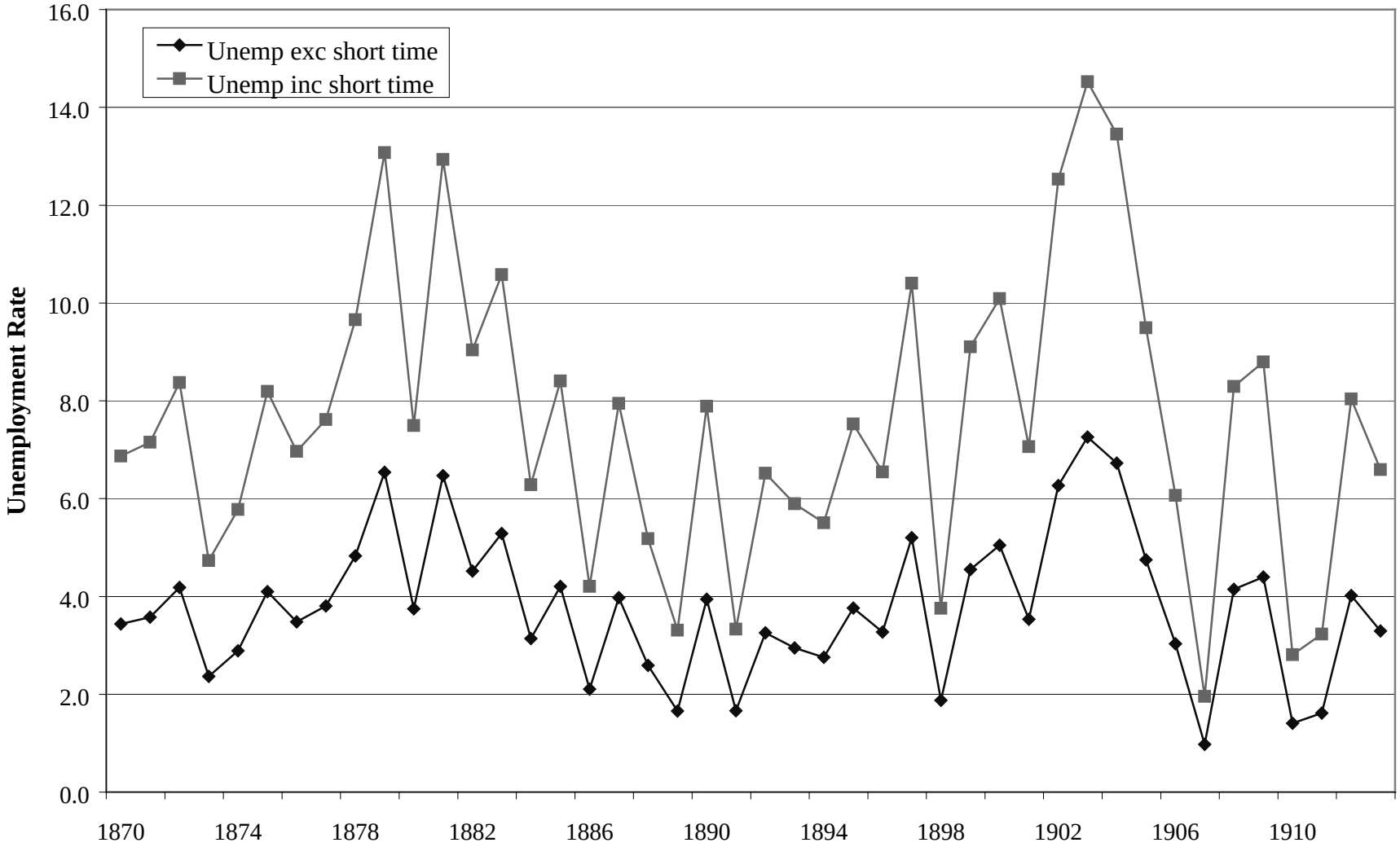

Figure 6: Unemployment on the Docks and Railways

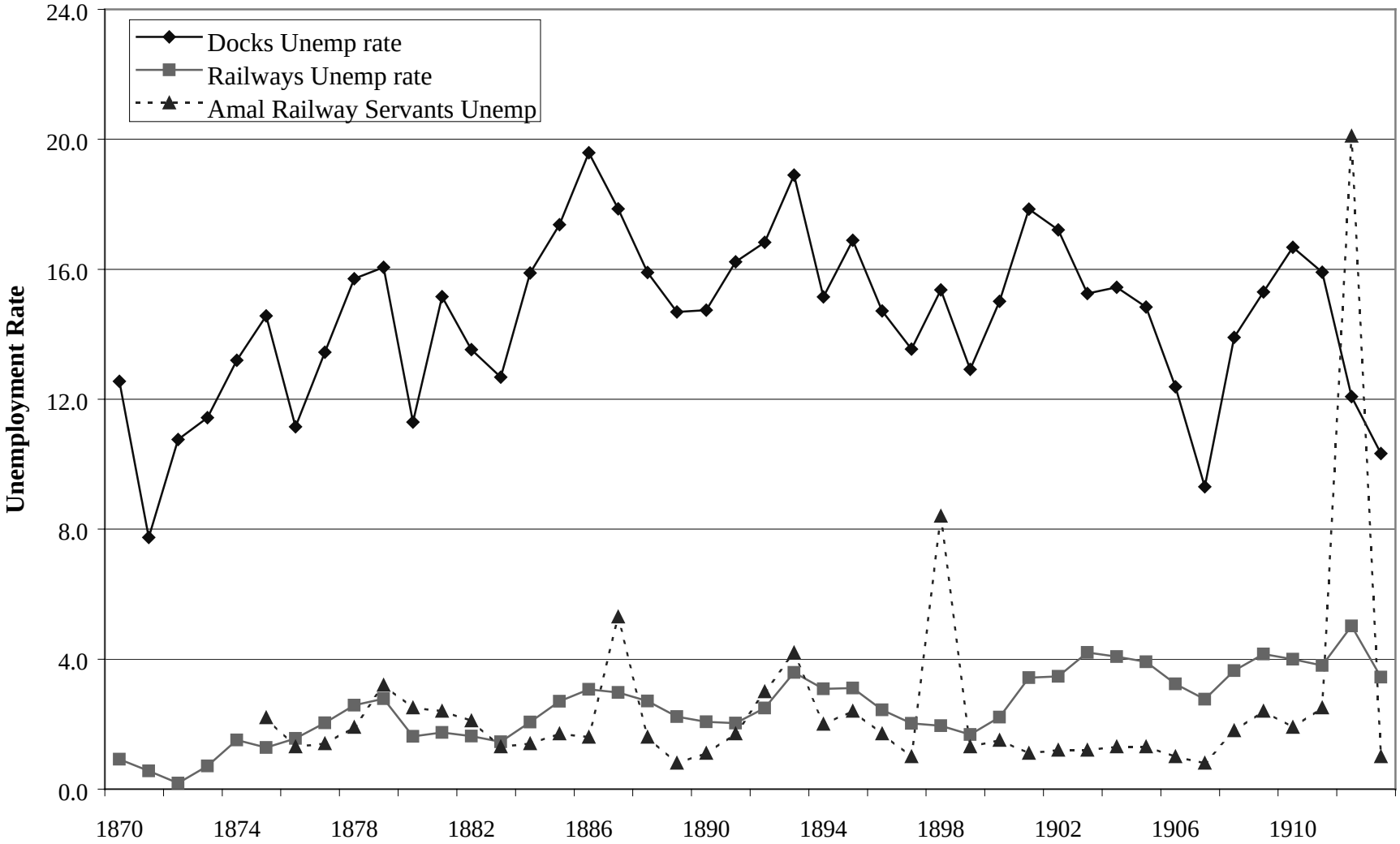

Figure 7: New Unemployment Index (excluding Unskilled Labor)

Figure 8: Unemployment Index (including Unskilled Labor)