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Abstract
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Keywords
unemployment, industry, labor market, Great Britain, economics

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Comments
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New Estimates of British Unemployment, 1870-1913

GEORGE R. BOYER AND TIMOTHY J. HATTON

We present new estimates of the British industrial unemployment rate for 1870-1913, which improve on the Board of Trade's prior estimates. We use similar sources, but our series includes additional industrial sectors, allows for short-time working, and aggregates the various sectors using appropriate labor-force weights from the census. The resulting index suggests a rate of industrial unemployment that was generally higher, but less volatile, than the board's index. We then adjust our series to an economywide basis, and construct a consistent time series of overall unemployment for 1870-1999.

The Board of Trade's unemployment series 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. However, many contemporaries and historians have noted that the index has serious shortcomings that limit its usefulness as a measure of unemployment at any point in time. The Board of Trade index was constructed from data reported by trade unions that administered benefit schemes for their unemployed members. It was based on a relatively small, nonrandom sample of industrial workers, and it excluded those in sectors of the economy that were not unionized or in which unions did not offer unemployment benefits. Moreover, in constructing an aggregate unemployment rate the Board of Trade weighted the individual unions included

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in the index by their membership rather than by the size of the labor force in the industries they represented.

In this article we provide a new index of unemployment. Our index relies chiefly on trade-union records, but it 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 component trades with appropriate labor-force weights obtained from the decennial census. We construct versions of the index that include a measure of unemployment for unskilled general laborers, and also a measure of the loss of employment through short-time working, which was common in certain major industries. Finally, we use post-1919 data to adjust our unemployment series, which covers only the industrial sector, to an economywide basis. On this basis we derive a consistent unemployment series for the entire period 1870-1999. Our results support the views of critics who maintained that the Board of Trade series underestimated the level of unemployment in industry.[1] The results also support another criticism of the board's index: that it exaggerates the extent of fluctuations in unemployment. In this respect our results parallel those of Christina Romer and David Weir, who have found that the American labor market was more stable in this era than previous estimates suggested.[2]

THE EXISTING INDEX OF UNEMPLOYMENT

In 1888 the Labour Bureau of the Board of Trade began reporting a monthly (and annual) unemployment index, calculated from information supplied to it by trade unions. Several additional unions were included in the index in 1893 by the newly formed Labour Department, and the monthly estimates were published in the *Labour Gazette,* This annual unemployment series was extended back to 1860 in *British and Foreign Trade and Industrial Conditions* (1905).

Two types of data were used in constructing the index. For those unions that reported the number of members in receipt of unemployment benefits 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.[3]

[1] See Hobson, *Problem of the Unemployed,* ch. 2; and Keir Hardie, quoted in Llewellyn Smith, "Memorandum on a Recent Estimate of the Number of Unemployed," Board of Trade Memo, 8 January 1895, p. 1 (PRO CAB 37/38/2).

[2] See Romer, "Spurious Volatility"; and Weir, "Century."

[3] 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 average each member was unemployed two weeks and the annual unemployment rate was (20/10)/52 = 0.0385, i.e., 3.85 percent. See Board of Trade, "British and Foreign Trade," *Pari Papers* (1905, LXXXIV), pp. 97-98.

For most of the nineteenth century, the Board of Trade's unemployment index was 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.[4] These numbers represented 2.4 percent of Great Britain's male industrial labor force in 1882, 4.3 percent in 1893, and 8.7 percent in 1912.[5] 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.[6]

A number of questions have been raised concerning 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, do these biases in the unemployment index change over time? Finally, does the index accurately reflect movements in unemployment for the economy as a whole?

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 unemployment benefits, and in some unions benefits could be collected only for a certain number of weeks per calendar year. 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 might tend to underestimate the true percentage unemployed, especially in years of high unemployment. William Beveridge maintained that the possible underestimation of unemployment was "almost certainly inconsiderable," because most unions set the maximum duration of benefits high enough so that at any time only a very small share of their unemployed members had exhausted their benefits. In addition, most unions required members who had exhausted their benefits to continue to register daily with their branch office—and it was in their interests to do so, because the branch office functioned as a labor exchange.[7]

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

[5] Data on the number of male industrial workers in Britain in census years were obtained from Lee, *British Regional Employment Statistics.* We interpolated between censuses to fill in the labor-force numbers for other years.

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

[7] Beveridge, *Unemployment*^. 19.

With regard to the second question, the Board of Trade maintained that for most industries the available trade-union unemployment rate was an accurate measure of unemployment throughout the industry. Llewellyn Smith, the Commissioner of Labour in the Board of Trade, 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."[8]

In some industries, however, the union data were not representative. 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. 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 underestimated fluctuations in employment

The major shortcoming of the trade-union index, as is widely acknowledged, is that the unions included 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, whereas industries in which few workers were union members—or whose unions did not provide unemployment benefits—were underrepresented (or, in some cases, not represented at all). In practice, this meant that unions in engineering, shipbuilding, and metals were highly overrepresented in the index; they accounted for about 60 percent of the membership of reporting unions in the 1870s, though falling to 39 percent in 1913.[9] These were among the most cyclically volatile of all trades, so it is no accident that most unions in these trades provided unemployment benefits to their members. On the other hand, textiles, clothing and footwear, and railway service were underrepresented, at least in the years

[8] S. C. on Distress from Want of Employment, Third Report, minutes of evidence, *Pari Papers* (1895, IX), Q. 4557, 4564, pp. 50-51. It is of course possible that unionized craftsmen were either more or less susceptible to unemployment than nonunionized craftsmen in the same trade. In her questioning of Wilson Fox before the Royal Commission on the Poor Laws, Beatrice Webb suggested that union members had more regular employment than nonunion workers. Wilson Fox replied that because nonunion workers might accept work at lower wages than would union members, nonunion craftsmen might have lower unemployment rates than unionized craftsmen. He concluded that it was not possible to determine whether unionized craftsmen were more or less susceptible to unemployment than were nonunionized craftsmen. See Royal Commission on the Poor Laws and Relief of Distress, *Pari Papers* (1910, XLVIII), Q. 98862-98867, p.447.

[9] Board of Trade, "British and Foreign Trade and Industrial Conditions," pp. 97-98; Garside, *Measurement,* p. 13.

TABLE 1
SECTORAL WEIGHTS IN THE BOARD OF TRADE INDEX
(percentages)

Sector	1894	1908	1913
Building trades	21.0	9.4	8.3
Woodworking		5.4	5.1
Coal mining	19.0	19.5	18.5
Engineering	46.0	25.2	24.1
Shipbuilding		9.0	8.1
Other metals		4.9	7.1
Printing & bookbinding	10.0	8.7	7.1
Textiles	3.0	14.5	14.1
Miscellaneous	1.0	3.4	7.6
Total	100.0	100.0	100.0

Sources: Beveridge, *Unemployment,* pp. 20,425; Board of Trade, *Labour Gazette* (1913), p. 41.

before 1895. The sectoral weights in the Board of Trade index for 1894, 1908, and 1913 are reported in Table 1.

In 1905 the Board of Trade produced a "corrected" index in which the engineering, shipbuilding, and metal trades were given a weight of 50 percent for the entire period 1860-1903. The unions in this group were each assigned a weight determined by their membership, as were the unions in the corresponding group labeled "all other trades." The unions in engineering, shipbuilding, and metals were still given far more weight in this corrected index than the trades they represented had in the census, and we agree with Garside 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."[10]

With respect to the third question, both of the unemployment series 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 index. The Board of Trade attempted to allay fears about the effects of such compositional changes by calculating an unemployment index for 1873-1907 based on the returns from 16 trade unions for which continuous data were available.[11] While the resulting un-

[10] Garside, *Measurement,* p. 21. Officials at the Board of Trade admitted that the engineering, shipbuilding, and metals trades were overrepresented in their index. Llewellyn Smith recalculated the unemployment rate for November 1894 by reweighting groups of trades by their labor force in the 1891 census, rather than by union membership. The adjusted unemployment rate was 4.2 percent, as compared to the Board of Trade estimate of 7.0 percent. See Llewellyn Smith, "Unemployed," Board of Trade Memo., 23 January 1895, p. 9 (PRO CAB 37/38/10).

[11] This index was originally reported for the years 1873-1903 in Board of Trade, "British and Foreign Trade and Industrial Conditions," *Pari Papers* (1905, LXXXIV), p. 93. It was extended to 1907 in Royal Commission on the Poor Laws and Relief of Distress, Appendix XXI (B), *Pari Papers* (1910,XLDC),p.599.

employment series looks similar to the original series, this is largely because the 16 included unions were weighted by membership.[12]

Despite the known flaws in the composition of the unemployment index, the Board of Trade 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." He held that the trade-union unemployment series did just that, affording "a very sensitive barometer" of cyclical fluctuations in the labor market, although "the fluctuations … would be exaggerated in our index number."[13]

The most authoritative version of the trade-union unemployment index was constructed by Charles Feinstein in 1972, although he too expressed serious reservations about its representativeness.[14] For the period 1870-1913 Feinstein combined three different versions of the trade-union index. For 1870-1880 he used the "corrected" series—in which engineering, shipbuilding, and metals were given a constant weight of 50 percent—constructed by the Board of Trade in 1904. After 1880 the corrected series is very similar to the original series, and so Feinstein used the original series for 1881-1911. Finally, for 1912/13 he used an "adjusted" trade-union series constructed in 1923 by John Hilton, Director of Statistics in the Ministry of Labour.[15]

NEW SERIES BASED ON TRADE-UNION DATA

We begin by dividing the industrial workforce into 13 broad sectors. Trade-union data were used to construct unemployment series for nine of them: 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

[12] In 1912 Arthur Bowley ("Measurement") constructed two alternative unemployment indices: one based on qualitative summaries of the state of employment for individual industries reported each month in the *Labour Gazette,* and one that combined trade-union unemployment data with information on employment trends in other sectors. He concluded that the board's series was a reliable measure of trends in unemployment, if not of the level of unemployment at any point in time.

[13] S. C. on Distress from Want of Employment, Third Report, minutes of evidence, *Pari Papers* (1895, IX), Q. 4562,4563, p. 50.

[14] Feinstein *(National Income,* p. 225) observed that "for most of the period it does not appear to be possible to make any statistical assessment of the possible under- or overstatement 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."

[15] The series is presented in Feinstein, *National Income,* table 57, pp. T125-26.

not available or were unrepresentative of the sector as a whole. Our estimates for these industries are described in the next section.

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 *Seventeenth Abstract of Labour Statistics* (1915) reported time series of unemployment rates for 11 major unions.[16] We also 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 six additional unions: the Operative Bricklayers, the Operative Plasterers, the Amalgamated Brassworkers and Metal Mechanics, the Amalgamated Cabinet Makers, the Boot and Shoe Operatives, and the Amalgamated Tailors. For these unions, we constructed unemployment series using data on benefit per member and benchmark unemployment rates.[17]

We constructed sectoral unemployment rates by combining the individual unions' unemployment series using fixed weights. For example, the weight given to the Amalgamated Engineers in the engineering series 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 where it was not possible to determine appropriate labor-force weights (such as woodworking and furnishing), we assigned weights to each union based on its 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 1870-1913. As a result, our index includes unemployment series for only 22 unions. Although this is far smaller than the number of unions included in the Board of Trade index after 1892, the number of workers represented by our unions is 60-75 percent or more of the number represented by the Board of Trade series. For example, in 1900 the official series included 138 unions with 525,000 members, whereas our 22 unions included 398,000 members; in 1912, the Board of Trade series included 390

[16] We also obtained union data from several other Board of Trade publications, in particular the *Third Report on Trade Unions* (1889), the *Seventh Report on Trade Unions* (1893), and the *Labour Gazette*, which contains monthly unemployment estimates for several unions over the years 1905-1913. The Appendix indicates where we used these sources.

[17] As noted previously, the Board of Trade also used expenditures per member on unemployment benefits to construct unemployment rates. The usefulness ofbenefit data as a measure of unemployment was demonstrated by Wood, "Trade Union Expenditure"; and Hartley, "Trade Union Expenditure."

unions with 834,000 members, whereas our unions represented 524,000 workers.[18]

A detailed discussion of the construction of the trade-union unemployment series for each of these nine sectors is given in Appendix 1. Here we shall only comment briefly on two of them. 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 carpenters and joiners and, from 1902 on, plumbers. However, many critics of the board's index maintained that bricklayers and plasterers 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 traveling in search of work.[19] Although it is not possible to construct an unemployment rate from these data, so long as the benefit policies did not change, a time series of expenditures should yield a good measure of *changes* in the level of unemployment. For both unions we benchmarked the unemployment rate at 5.0 percent in 1911 (i.e., at the unemployment rate for carpenters, joiners, and plumbers).

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, was 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.[20] Our series for clothing therefore almost certainly underestimates the unemployment rate for the industry as a whole.

NEW SERIES BASED ON NONUNION SOURCES

There are three important sectors for which trade-union data are either unavailable or unrepresentative of the sector as a whole: mining, textiles, and transport. For each sector we used series for (or closely related to) employment to infer unemployment rates. Each of these sectors also exhibited

[18] In 1912 the 22 unions included in our index had on average 23,818 members; the 368 unions included in the Board of Trade index but not in our index had on average 842 members. Furthermore, it should be noted that we use trade-union data to estimate unemployment for only nine 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. Our sectoral unemployment rates, generated from a small number of large unions, are quite similar to those reported by the Board of Trade from a much larger number of unions (see footnote 50).

[19] The Operative Bricklayers paid Is. 6d. per day (9s. per week) to unemployed members traveling in search of work. The maximum duration of benefits was eight weeks. The Operative Plasterers also paid Is. 6d. per day in traveling benefits, though for a maximum duration of 14 weeks.

[20] Clegg, Fox, and Thompson, *History*, p. 33.

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 used a simple model to generate a series for the labor force, and then used these two series to derive an unemployment series.[21] We generated a labor-force series using the following model

logL, = *a* + jSlogZ^ + (1- *P)\o%E*$_t$ (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

log(£/Z), = - *a* + AAlog *E*$_t$ + *\oz(EIL)*$_{t\_x}$) (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 *a* and /?. The parameter /? represents the degree of persistence in the labor force; for a given /?, tf determines the long-run average unemployment rate. Based on indirect estimates for outmigration of agricultural laborers, we assumed a value of/?= 0.67 for each sector in the calculations that follow.[22] We experimented with different values for *a* for each sector we chose a value for *a* which yielded unemployment rates for 1912/13 that corresponded to unemployment rates obtained from the *Labour Gazette*.

Mining and Quarrying

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

[21] While it would be 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.

[22] Equation 1 can be transformed into a simple migration model by rearranging as follows

m$_t$ = log(V4-,) = «//?+ (1- *P)ip\og(E*$_t$*IL*$_t$*)*

where migration *m* reflects the change in the labor force and is driven by the employment rate, E/L. Thus the rate of growth of the labor force depends on the "Todaro" elasticity (1 - *ft) I (5*. We have no direct estimates of this elasticity, but indirect estimates of rural-urban migration suggest that it is of the order of 0.2 to 0.3 (Boyer and Hatton, "Migration and Labour Market Integration," p. 722). Intersectoral migration among nonagricultural sectors would be considerably higher than this; we therefore adopt a value for (1 - *ft)/J3of* 0.5, which implies *ft-* 0.67.

number of wage earners "ordinarily employed."[23] In order to generate an unemployment series we set the parameters at #= 0.035 and *j3*= 0.67, and the starting value for unemployment in the simulation at 3.4 percent in 1860. This gives an average unemployment rate of 5.9 percent for the period 1870-1913. The model generates extreme values for the unemployment rate of less than 1 percent in the boom years of 1872-1874 and 1891/92, and over 10 percent in the slump of 1877-1880. Over the last 20 years of the period the fluctuations are somewhat milder, with unemployment ranging between 2.5 percent in 1908 and 8.9 percent in 1897. Our estimates of the labor force, particularly during the wide swings of the 1870s, are consistent with the qualitative literature.[24] Fluctuations in unemployment would have been massively exaggerated if the labor force had been derived from the simple interpolation of census benchmarks.[25]

Mining was one of the industries where wide fluctuations in demand for labor were accommodated largely by short-time working.[26] In order to take account of short time, we used the Board of Trade's figures for the average number of days per week the mines were open for 1895-1913, and extrapolated 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.[27] 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.

[23] Mitchell, *Economic Development,* pp. 103-04. These figures most likely reflect the numbers employed on the last payday of the year—typically a period of peak employment. 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 percent.

[24] For example, Mitchell *(Economic Development,* p. 119) 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."

[25] For comparison we constructed an alternative unemployment rate (excluding short time) using a labor-force estimate interpolated between census benchmarks, and setting the minimum unemployment rate (in 1874) to zero. This gives unemployment rates of 17.7 percent in 1870,1.8 percent in 1875, and 16.7 percent in 1880. By contrast our unemployment rate is 6.6 percent in 1870,4.4 percent in 1875, and 10.5 percent in 1880.

We also conducted some sensitivity tests, using different values of/?, and adjusting tf such that the unemployment rate was always the same value in 1913. Setting/?to 0.75 and 0.85 respectively yielded mean unemployment rates of 6.6 percent and 8.1 percent and coefficients of variation of 0.60 and 0.60, as compared to the mean of 5.9 percent and coefficient of variation of 0.55 using our favored parameter of 0.67. Naturally, greater persistence leads to slightly higher volatility. But in both of these alternative cases, three of the unemployment values were negative. Hence feasible values of *J3* are somewhat constrained by the combination of the endpoint value and ensuring positive values of unemployment. The exception is 1872, which always gives a negative value, even for a value of/?as low as 0.5.

[26] For example, see *Labour Gazette,* October 1895, p. 308.

[27] The average number of days worked per week was equal to or greater than 5.5 in six years: 1870-1873,1907,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.

Textiles: Cotton, Woolen, and Worsted

Most textile unions offered little in the way of unemployment benefits, largely because of the practice of short-time working.[28] 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.[29]

Given the practice of short-time working, fluctuations in employment should have been less than proportional to fluctuations in raw-material consumption. Data for both employment and raw-material consumption exist for the years 1904-1913, which allow us to estimate the relationship

$$\text{Alog£, } = y\text{£}Ao\%Q_t \qquad (3)$$

where Q is raw material consumption.[30] The regressions yielded coefficients for y of 0.2 for cotton and 0.3 for woolen and worsted, which we used to construct Alog E in Equation 2 above; a *is* set to 0.01 for cotton and 0.015 for woolen and worsted, and $(5 = 0.67$ in both cases. This gives average unemployment rates of 2.2 percent for cotton and 3.8 percent for woolen and worsted.[31] Based on evidence from S. J. Chapman and H. M. Hallsworth, we assume that including short-time work raises unemployment in cotton by a factor of three, and in woolen and worsted by a factor of two.[32] This implies that in both sectors the elasticity of hours with respect to raw-material consumption would be about 0.6.

Transport

We developed proxies for unemployment for two of the three main transport sectors, namely railways and docks.[33] For railways there are several

[28] One union, the Amalgamated Cotton Spinners, reported a benefit series for the period 1879-1913. Spinning represented only one section of the trade, the fluctuations of which were not necessarily closely correlated with other sections such as weaving. An unemployment series derived from expenditures per member on unemployment benefits for the Cotton Spinners yields an average unemployment rate for 1879-1913 of 2.1 percent, compared with 2.4 percent for our series derived from cotton consumption data.

[29] Annual estimates of raw cotton consumption are from Mitchell and Deane, *Abstract,* p. 179. Estimates of raw wool consumption were calculated from data on domestic and imported wool reported in ibid., pp. 190-94.

[30] Employment data for cotton and woolen and worsted were obtained from monthly issues of the *Labour Gazette.*

[31] Here again we experimented with values of/?, adjusting df such that the unemployment rate was always the same in 1913. For cotton textiles, setting /3at 0.75 and 0.85 yields mean unemployment rates of 2.4 percent and 2.4 percent, and coefficients of variation of 0.53 and 0.63, as compared with the mean of 2.2 percent and coefficient of variation of 0.47 in our preferred specification. As in other cases, higher values of /?tend to produce negative unemployment rates for some years, which constrains the range of feasible values of /3 for a given endpoint unemployment rate.

[32] Chapman and Hallsworth, *Unemployment,* pp. 47,54.

[33] No data are available to estimate unemployment rates for road workers.

measures of activity but no direct measures of employment.[34] The best proxy for movements in employment is the aggregate mileage of passenger trains and freight trains. 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 generate an employment series using a variant of equation 3, including aggregate train mileage instead of raw-material consumption, and setting $y = 0.4$.[35] We set $a = 0.015$ and $/? = 0.67$, which gives an unemployment series with relatively mild fluctuations, as might be expected, with an average unemployment rate of 2.5 percent.

The docks represent a classic example of casual employment. Given the methods of engagement, we assume that short-run fluctuations in dock and wharf employment were directly proportional to the total tonnage entered and cleared. As before, we set $J3 = 0.67$ and we chose a value for tf of 0.075. This gives an average unemployment rate of 14.5 percent for 1870-1913. The average unemployment rate (determined by the parameter *a)* 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.[36] Following this approach the average ratio of annual mean to maximum weekly employment on the London docks and wharves (excluding Tilbury) reported in the *Labour Gazette* for 1908-1913 is 86.7 percent, which suggests an average unemployment rate of 13.3 percent, as compared with 14.0 percent for the same years in our calculation.

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. Several contemporaries maintained that unemployment rates were significantly higher among unskilled workers, and especially general laborers, than among skilled workers. Beveridge maintained that the trade-union unemployment series needed to be supplemented by the returns of urban distress committees and by pauperism statistics. The returns of distress committees represented a lower stratum of workers than did the trade-union data, reflect-

[34] Data on expenditures per member on unemployment benefits are available for the Amalgamated Railway Servants from the early 1870s onwards. However, Bagwell *(Railwaymen,* p. 62) described the union's unemployment benefit scheme as "ill-defined," and the data were not used by the Board of Trade. This suggests that the benefit series is a poor proxy for movements in unemployment, so we chose not to use it.

[35] We have no time series for railway employment before 1914, but a regression of employment on train miles for 1922-1939 yields a coefficient for p of 0.39 *(t* = 1.9).

[36] See Booth, "Inaugural Address," pp. 532-36; and Howarth and Wilson, *West Ham,* pp. 224-26.

ing unemployment among general laborers and the semiskilled; the data on pauperism represented "a third and still lower stratum of society."[37]

Mary MacKinnon has concluded from her study of poor-relief statistics that for the poorest decile of adult males the rate of 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 "bottom of the social hierarchy"; they applied for relief when their family incomes fell to the point where they could no longer subsist. 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."[38]

The returns of distress committees become available only in 1905 with the passage of the Unemployed Workmen Act, and therefore cannot be included in our unemployment series.[39] Poor relief data, however, are available for the entire period 1870-1913; hence we use time-series data for male able-bodied indoor paupers as a share of the male population aged 15-64 to construct an unemployment series for general unskilled laborers.[40] In order to turn the pauperism series into an unemployment series, it was necessary to benchmark the unemployment rate for some year. The lack of data means that our estimate of the level of unemployment at any point in time will be somewhat arbitrary. However, one can gain an idea of the relationship between unemployment rates for skilled and unskilled workers by examining data for the interwar period. Mark Thomas has calculated that in 1931 the unemployment rate for skilled and semiskilled manual workers was 12.0 percent, while for unskilled manual workers it was 21.5 percent.[41] That is, the unemployment rate for unskilled workers was nearly 80 percent higher than that for skilled and semiskilled workers. We benchmarked the unemployment rate at 5.0 percent 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

[37] Beveridge, *Unemployment,* pp. 16,21.

[38] MacKinnon, "Poor Law Policy," pp. 305,330-34.

[39] Data exist from 1905/06 for the number of workers assisted by distress committees, but it is not possible to determine the relevant labor force in order to construct an unemployment rate. Moreover, the number of distress committees for which data are available changed over time. Harris *{Unemployment and Politics,* p. 377) reports that the numbers relieved per 1,000 population in areas covered by distress committees increased from 1.7 in 1905/06 to 3.1 in 1908/09, then declined to 1.0 in 1912/13. The trend is similar to that obtained from the poor law data, although the magnitude of fluctuations in numbers assisted is much larger for the distress-committee data.

[40] For 1891-1913 we used data for able-bodied men "in health" relieved in workhouses, as a percentage 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. 306-07. Workers attached a stigma to applying for indoor relief, but those at the bottom of the income distribution were so poor that on average the lag between becoming unemployed and applying for relief must have been relatively short—certainly far less than one year.

[41] Thomas, "Labour Market Structure," p. 123.

yields an average unemployment rate of 9.5 percent for 1870-1913, which gives a ratio of unskilled to skilled and semiskilled unemployment rates similar to that estimated by Thomas for the interwar period.

SECTORAL WEIGHTS

We now combine the sectoral unemployment series to form an aggregate series, using labor-force weights based on C. H. Lee's reworked census totals for males in industry.[42] We exclude agriculture and all services except transport from our index. Within the manufacturing sector, we exclude Lee's categories of 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 made these adjustments to Lee's sectoral labor-force estimates for each census year from 1861 to 1911, and interpolated 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. We also calculated the weights excluding the sector "Other and Undefined."[43] The total number of workers employed in the sectors included in our index in 1871 was 4,335,900, i.e. 53 percent of Lee's total for the male labor force in Great Britain that year, and 75 percent of the number of males employed in manufacturing and transport. In 1911 the number of workers represented by our index was 7,321,000, i.e., 57 percent of Lee's total for the male labor force, and 75 percent of the total employed in manufacturing and transport.[44]

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, 1908, and 1913 given in Table 1. In our index engineering, shipbuilding, and metals combined have a weight of 18.4 percent in 1871, 18.9 percent in 1891, and 22.2 percent in 1911, while in the original Board of Trade index these same sectors assumed a weight of 46 percent in 1894

[42] Lee, *British Regional Employment Statistics*.

[43] When general unskilled labor is included, it is given a weight reflecting half the number reported by Lee for "Other and Undefined." Thus the weight we give to general laborers averages 10 percent, consistent with MacKinnon's observation noted above. It is important to note that this weight reflects general unskilled labor rather than the segment of the unskilled which is classified to individual industries, where the unemployment rate is assumed to move with that of the relevant industry rather than with the general unskilled labor market. This assumption probably imparts some downward bias to the unemployment rates for individual industries, and this is reflected in the comparison made below with the unemployment-insurance data for the interwar years.

[44] 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 2
SECTORAL WEIGHTS, 1871-1911
(percentages)

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
Total	100.0	100.0	100.0

Sources: See the text.

and39.3 percent in 1913. Construction has a weight of 16.9 percent in 1911 in our index, as compared to 8.3 percent in 1913 in the Board of Trade index. The transport sector is not included at all in the Board of Trade index, whereas in our index it has a weight of 8.4 percent in 1871,12.0percentin 1891, and 11.8 percent in 1911.[45]

RESULTS AND COMPARISON WITH THE BOARD OF TRADE INDEX

The unemployment series for each of the sectors in our index (except general unskilled labor) are presented in Figure 1,[46] The series reported for mining and textiles include 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 1872-1874 were a period of very low unemployment—eight sectors had unemployment rates below 2 percent during these years. In contrast, most sectors experienced sharp increases in unemployment in 1878/79—six sectors had unemployment rates of 9.5 percent or above in 1879. The early 1880s was another boom period for most sec-

[45] 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 percent from 1891 to 1911. Despite this, the weight assigned to textiles in the Board of Trade index increases from 3 percent in 1894 to 14.1 percent in 1913. In our index textiles has a weight of 10.6 percent in 1891 and 8.7 percent 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.

[46] The unemployment series for the individual sectors are available in numerical form from the authors.

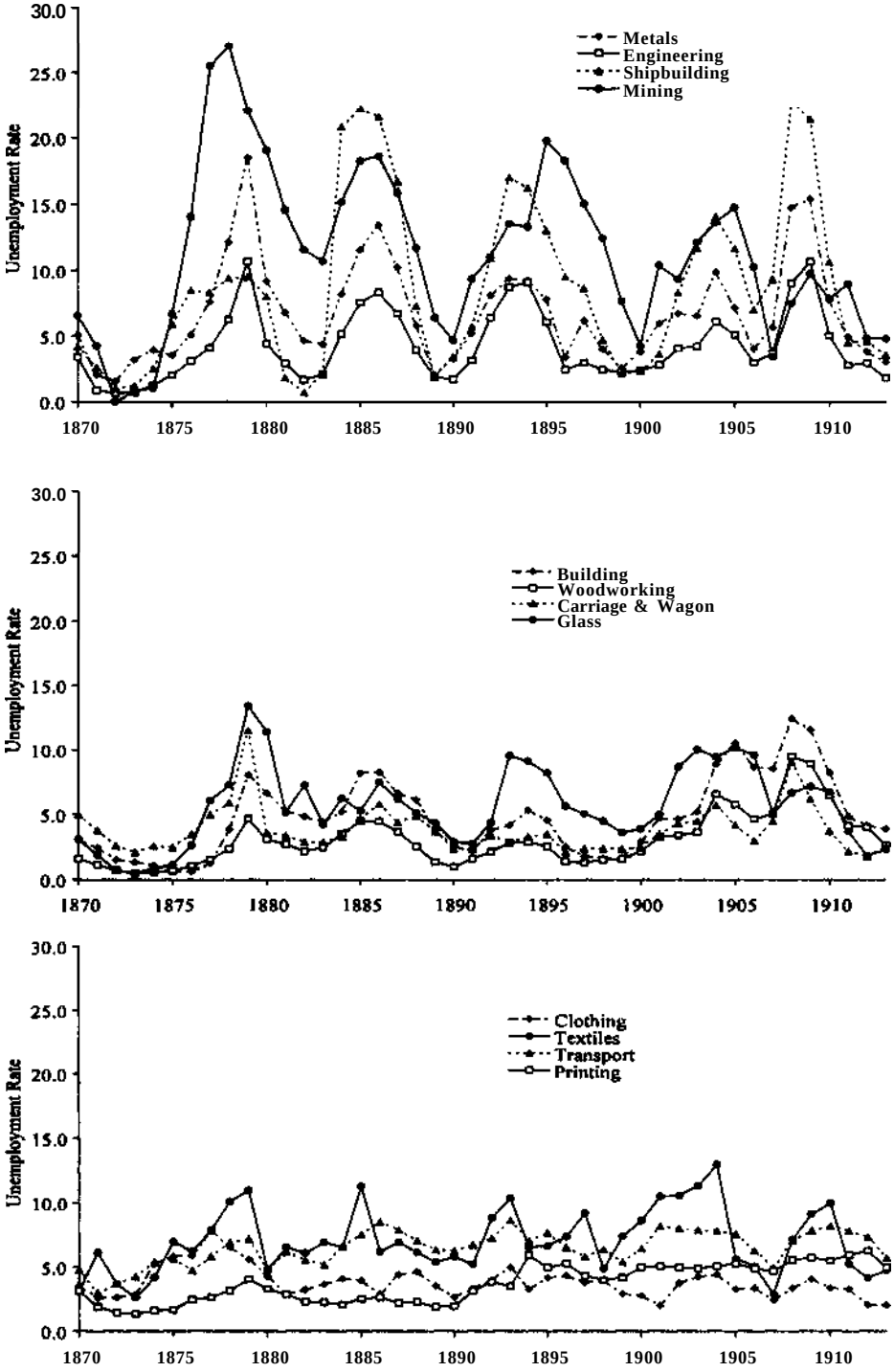

FIGURE 1
NEW BRITISH UNEMPLOYMENT SERIES, BY SECTOR, 1870-1913

Sources: See the text.

tors, followed by a slump in 1885/86 and another period of very low unemployment in 1889-1891.

Patterns of unemployment are somewhat less similar across sectors after 1891. Engineering, shipbuilding, metals, and glass experienced a slump in 1893/94, and mining slumped badly a few years later, in 1896/97. 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 unemployment rate never fell below 8.2 percent. Shipbuilding experienced double-digit unemployment in 1903-1905 and again in 1908-1910. Metals, engineering, and woodworking also slumped badly in 1908/09. On the other hand, unemployment in mining was relatively low in 1907-1910.

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 percent in every year from 1870 to 1892, then above 10 percent in all but four years from 1893-1913. For comparison purposes, Figure 2 also presents an unemployment series constructed using vagrancy data.[47] Vagrants typically were adult males under age 60. While some 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 to migrate in search of work."[48] Figure 2 shows that the unemployment series constructed using vagrancy data is quite similar to that constructed using data for male able-bodied 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.[49]

The first column of Table 3 presents average unemployment rates for each of 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

[47] 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,* pp. 332-33. 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 percent in 1875.

[48] 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." Crowther *(Workhouse System,* p. 254) also concludes that unemployment "very likely" was a cause of vagrancy.

[49] MacKinnon reached a conclusion similar to ours; see "Poor Law Policy," pp. 330-34.

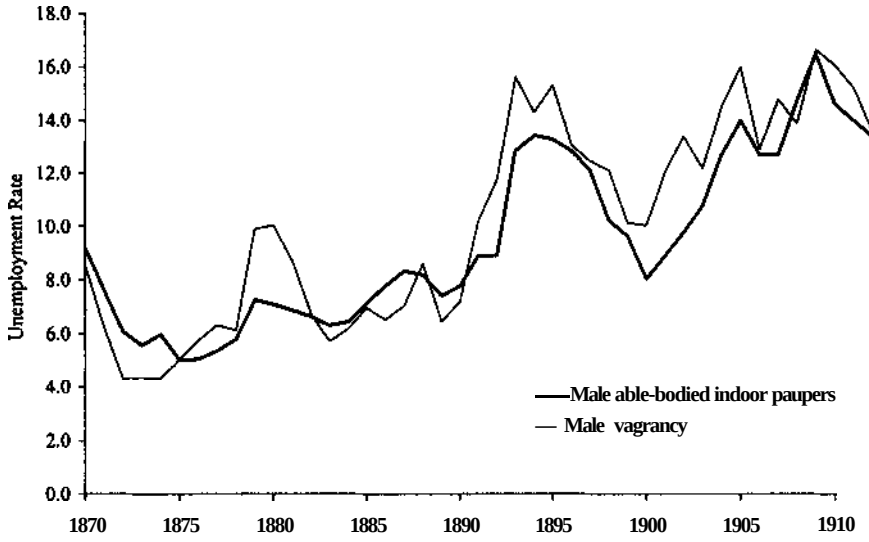

FIGURE 2
UNEMPLOYMENT RATE OF BRITISH UNSKILLED LABOR, 1870-1913

Sources: **See the text.**

time is taken into account, unemployment was highest in mining, general unskilled labor, and shipbuilding. Unemployment was lowest in woodworking, printing and bookbinding, clothing, and carriage and wagon.[50] Table 3 also compares average unemployment rates for 1870-1891 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.

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 annual time series for these four versions of the index, along with Feinstein's version of the Board of Trade index, are reported in Table 4, and are summarized in Table 5. The

[50] **The Board of Trade reported unemployment rates for certain sectors of the labor force beginning in 1888. For the engineering, shipbuilding, and metal trades, the average unemployment rate for 1888-1913 is 5.9 percent in both the Board of Trade series and in our series. For the building trades, the average rate is 4.8 percent in the Board of Trade series, and 5.4 percent in our series. For printing and bookbinding the average rate is 4.3 percent in the board's series, and 4.6 percent in our series. For woodworking and furnishing, the average rate is 3.9 percent in the board's series, and 3.6 percent in our series.**

TABLE 3
UNEMPLOYMENT RATES, BY SECTOR, 1870-1913
(mean percentage)

Sector	1870-1913	1870-1891	1892-1913
Mining	5.9	6.5	5.2
Mining (including 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 (including 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

Sources: See the text.

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. However, it supports statements by officials of the Board of Trade that their index was a good barometer of *changes* in labor market conditions.[51]

The index of ours that is closest to the Board of Trade index is the one that excludes both general unskilled labor and employment loss from short-time work. For the period 1870-1913, the average unemployment rate is 5.0 percent for our series, as opposed to 4.5 percent for Feinstein's version of the Board of Trade series. Taking account of short time raises the average unemployment rate from 5.0 percent to 6.3 percent.[52] For this version of the index unemployment is higher than in the Board of Trade index for every year from 1870 to 1913 except 1884 and 1886, although the differences are smaller before 1892.

[51] As noted previously, Llewellyn Smith claimed that the index was a "sensitive barometer" of cyclical fluctuations in the economy, one that always moved "in the right direction." 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" (Royal Commission on the Poor Laws and Relief of Distress, Appendix volume VIII, *Pari. Papers*, 1910, XLVIII, Q. 98893, p. 448).

[52] The increase in unemployment is large because mining and textiles are large sectors in which the number of "wholly unemployed" workers "substantially understated the true volume of unemployment" (Beveridge, *Full Employment*, p. 332). See also Bowley, "Measurement," pp. 795-96. More recently, this point has been stressed by Whiteside *(Bad Times*, p. 21), who wrote that "the problem was really one of underemployment among the many rather than unemployment among the few."

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TABLE 5
AGGREGATE UNEMPLOYMENT RATES, 1870-1913

Index variant	1870-1913 Mean Percentage	1870-1913 Standard deviation	1870-1913 Coefficient of variation	1870-1891 Mean Percentage	1892-1913 Mean Percentage
Excluding unskilled and short time	5.0	1.78	0.35	4.7	5.3
Excluding unskilled, including short time	6.3	2.31	0.36	6.0	6.7
Including unskilled, excluding short time	5.4	1.70	0.31	4.9	5.9
Including unskilled and short time	6.6	2.17	0.35	6.1	7.1
Board of Trade (Feinstein)	4.5	2.44	0.55	4.4	4.5

Sources: See the text.

The indices including general unskilled labor are presented in Figure 3. Taking account of unskilled labor raises the average unemployment rate to 6.6 percent when employment loss from short time is included, and 5.4 percent 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 including short time, the average unemployment rate increases from 6.1 percent in 1870-1891 to 7.1 percent in 1892-1913. For this index, there is a significant difference in trend as compared with the Board of Trade series; over the whole period 1870 to 1913 the difference in trend cumulates to 1.5 percentage points.[53]

As Figure 3 illustrates, the amplitude of fluctuations is somewhat smaller in our indices than in the Board of Trade index, particularly in the 1880s and 1890s. It is notable, however, that the boom and slump of the 1870s are just as intense in our indices as in the Board of Trade index, and hence are not simply a result of the excessive weight given to the engineering and metals sectors by the Board of Trade. For the period as a whole, the standard deviations of unemployment reported in Table 5 are lower for each of our series than for the Board of Trade series, but the differences are smaller for our indices that include short time. The coefficient of variation for each of our indices is substantially below that of the board's index, partly because the standard deviations are lower and partly because the means are higher. In sum, we conclude that the Board of Trade index understated the average level of unemployment in the industrial sector, and overstated its volatility.[54]

[53] A regression of the difference between our index (including short time) and that of the Board of Trade on a time trend gives a coefficient of 0.034 (*t* - 2.7).

[54] Our conclusion that the Board of Trade underestimated the level of unemployment is consistent with calculations done by Beveridge (*Full Employment,* pp. 73,328-37). He 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 three decades before World War I would have been about 6.0 percent, not 4.8 percent as estimated by the Board of Trade.

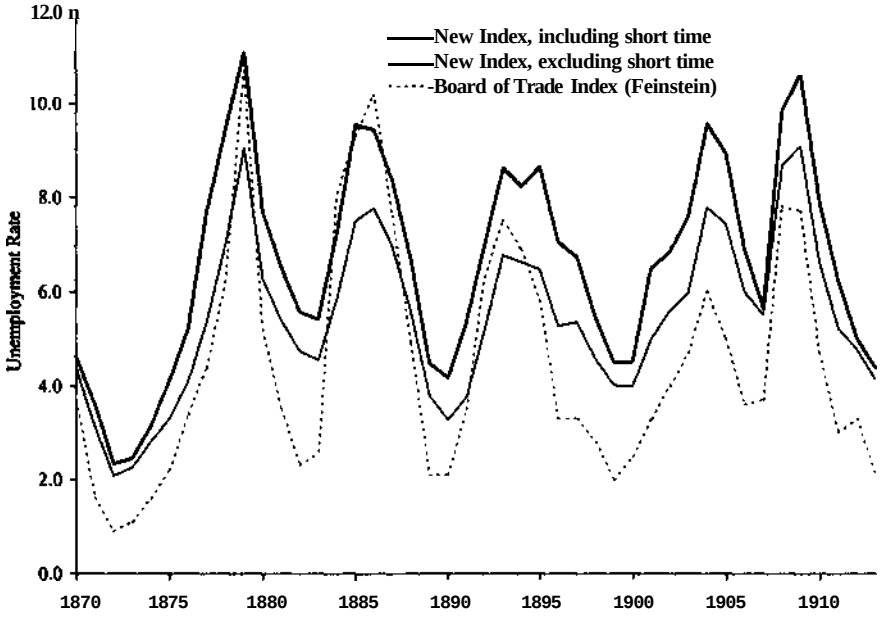

FIGURE 3
NEW BRITISH UNEMPLOYMENT INDEX, INCLUDING UNSKILLED LABOR

Sources'. **See the text.**

COMPARABILITY WITH POSTWAR DATA

While our new index is a reasonable indicator of unemployment in the industrial sector, it still covers only a little over half the labor force. It is therefore not directly comparable with measures of unemployment for later years, derived from unemployment insurance (UI) and other sources. We need to make two further adjustments to obtain greater comparability with later periods: first, an adjustment for the difference between unemployment rates measured from union and other sources and those measured *for the same sectors* by the UI system, and second, an adjustment from the sectors included in our prewar index to the whole economy.[55]

First we constructed a consistent unemployment series for 1920-1999. For this period the unemployment rate for all industries was defined as the average number unemployed during the year, divided by the midyear labor force (excluding the armed forces, employers, and the self-employed). For 1920-1938 we took the figures for unemployment and employees at work

[55] **Hilton ("Statistics of Unemployment") reweighted trade-union unemployment for 1912 to 1922 and compared his adjusted figures with the UI figures, but he did not distinguish between these two components (which cut in opposite directions) and so we have preferred not to use his figures to link across the First World War.**

from Feinstein, who made upward adjustments to the numbers for both the unemployed and the employed obtained from the UI scheme to account for the incomplete coverage of the system during the interwar period.[56] The figures for 1939 are calculated by splicing the UI figures to Feinstein's estimates of employment and unemployment for 1938. From 1948 (when the UI system became universal) to 1968, the unemployment rate is measured as the average monthly number of unemployed divided by the total number insured at midyear. Figures for 1946 and 1947 are obtained by adjusting the insurance data for these years to that for 1948.

As of 1968 our measure of employment is the official series for employees in employment (latterly called "employee jobs"), which is derived from the census of employment.[57] The official count of unemployment (now called the claimant count) has been the subject of numerous changes in the way the statistics are reported and in the rules governing eligibility for benefit. These revisions have progressively (and deliberately) reduced the claimant count since the 1970s. In order to maintain consistency, we have made a series of proportional adjustments to the claimant counts to correct for alterations in the method of counting the unemployed.[58] As a result of these cumulative adjustments, our estimate of the numbers unemployed in 1999 is 16 percent higher than the current claimant count.[59]

In order to assess the relationship between unemployment in the sectors covered by our pre-1914 index and the broader measure of unemployment after 1919, we construct an industrial unemployment rate for 1923-1939 and 1948-1971 covering only these sectors, using the unemployment insurance data.[60] For these years, we regressed the overall unemployment rate (£/), as derived above, on this narrower index *(UN)* and a dummy variable for the general strike of 1926 *(GS),* with the following result (^-statistics in parentheses)

[56] Feinstein, *National Income,* table 58, p. T128.

[57] This is taken from Office of National Statistics, *Economic Trends,* p. 158. The difference between employee jobs and insured employment is negligible for 1968, and so no adjustment was made to link the two.

[58] These adjustments are based on the estimates of the effects on the claimant count of major changes in the administrative rules, as given in the Dept. of Employment's *Employment Gazette* (1990, p. 608). They reflect changes that alter the status of individuals in the count without changing their labor-market status. We made these adjustments only where they were estimated to have altered the count by more than 20,000. These (cumulative) adjustments were made beginning in 1983, 1984, 1986, and 1989.

[59] We obtained an unemployment rate for 1999 of 5.8 percent, compared with the official claimant count figure of 5.0 percent (on current definitions). By comparison the unemployment rate from the Labour Force Survey, which uses the ILO definition of unemployment, is 6.0 percent.

[60] Industrial unemployment and labor-force size are taken from Dept. of Employment and Productivity, *British Labour Statistics,* pp. 210-29,312-13,334-41; and Mitchell, *British Historical Statistics,* pp. 117-18, 133-36. The UI sectors are: mining and quarrying; nonmetaliferous mining products; glass; metal manufacture, engineering, shipbuilding, and repairing; metal trades (including vehicles and precision engineering); textiles; clothing; woodworking; paper and printing; building and contracting; transport, and communication.

$$U = 0.972 + 0.603\ UN - 1.825\ GS$$
$$(10.6)\quad (71.1)\qquad (4.2)$$
$$R^2 = 0.99$$

The estimates indicate that the aggregate index varies less than proportionally with the narrower "industrial" index, and will be lower than the narrower index when the latter exceeds 3.3 percent.

The very close fit suggests that the equation can be used with some confidence to adjust the pre-1914 unemployment rate series to an economywide basis. However, an additional adjustment must be made for the difference between UI unemployment and trade-union unemployment in the trades covered by our prewar index. Trade-union unemployment data are available for only a few years in the early 1920s, but a comparison over five quarters from June 1923 to June 1924 indicates that UI unemployment was higher than union unemployment in these sectors. This comparison suggests that the prewar series should be inflated by 21.2 percent before applying the equation estimated above.[61] Having applied these adjustments to the index that includes short time and general unskilled labor, we have an unemployment series which is as comparable as possible for the whole period 1870-1999.

The new economywide unemployment series is reported in Table 6. The average unemployment rate for 1870-1913 is 5.8 percent, lower than our estimated industrial unemployment rate of 6.6 percent, but still higher than the Board of Trade's estimated unemployment rate of 4.5 percent.[62] The

[61] **This comparison is made for an aggregate that covers all our prewar sectors except transport. Over the five quarters June 1923 to June 1924, the weighted average unemployment rate was 11.44 percent among the insured, and 7.17 percent among unionists in these sectors. As might be expected, the differences are especially large in trades such as textiles and mining, where short time was reflected in the UI data but not in the union data, but it was relatively small for engineering, shipbuilding, and metals. To some degree, this is allowed for in the prewar index that includes short time and the unskilled. For 1870 to 1913 our index including short time and unskilled labor averages 6.61 percent, as compared to 5.02 percent when these are excluded. We therefore adjust the series that includes short time and unskilled general labor by (11.44/7.17) • (5.02 /6.61) = 1.212 to make it comparable with the UI figures for the same industries. This upward adjustment reflects the more comprehensive coverage of the UI statistics, especially among the unskilled and semiskilled, as well as temporary layoffs in sectors for which we have made no adjustment in the pre-1914 estimates.**

[62] **By using the estimated coefficients from the regression for 1923-1971 to construct an economywide unemployment rate for 1870-1913, we essentially assume that the structure of the economy did not change over the period. In fact, the share of the workforce employed in industry declined from 55.4 percent in 1891 to 50.4 percent in 1951, and the share employed in services increased from 32.9 percent to 44.6 percent. To get an idea of the extent of bias resulting from the assumption of no structural change, we calculated the implied average nonindustrial unemployment rate for 1870-1913 using postwar weights for industry and nonindustry, and then recalculated the average economywide unemployment rates for 1870-1913, using the average industrial and nonindustrial unemployment rates and pre-1914 weights. The calculation suggests that, if structural changes are taken into account, the average economywide unemployment rate for 1870-1913 would have been 6.0 percent, rather than our estimated 5.8 percent. Thus, our assumption of no structural change creates a downward bias in our estimated unemployment rate of about 0.3 percent. There is a possible additional bias caused by the fact that the makeup of the nonindustrial sector changed over time, as employment in services increased and**

TABLE 6
LONG-RUN CONSISTENT UNEMPLOYMENT SERIES, 1870-1999

Year	Unemployment Rate	Year	Unemployment Rate	Year	Unemployment Rate
1870	4.4	1910	6.7	1960	1.7
1871	3.6	1911	5.5	1961	1.6
1872	2.7	1912	4.6	1962	2.1
1873	2.8	1913	4.2	1963	2.6
1874	3.3			1964	1.7
1875	4.0	1920	2.1	1965	1.5
1876	4.8	1921	12.2	1966	1.6
1877	6.6	1922	10.8	1967	2.5
1878	7.9	1923	8.9	1968	2.5
1879	9.1	1924	7.9	1969	2.5
1880	6.6	1925	8.6	1970	2.6
1881	5.7	1926	9.6	1971	3.4
1882	5.0	1927	7.4	1972	3.7
1883	4.9	1928	8.2	1973	2.6
1884	6.3	1929	8.0	1974	2.6
1885	8.0	1930	12.3	1975	4.1
1886	7.9	1931	16.4	1976	5.6
1887	7.1	1932	17.0	1977	5.7
1888	5.8	1933	15.4	1978	5.6
1889	4.3	1934	12.9	1979	5.2
1890	4.0	1935	12.0	1980	6.7
1891	4.9	1936	10.2	1981	10.2
1892	6.1	1937	8.5	1982	11.9
1893	7.3	1938	10.1	1983	13.0
1894	7.0	1939	8.5	1984	14.1
1895	7.3			1985	14.5
1896	6.1	1946	2.0	1986	14.8
1897	5.9	1947	1.4	1987	13.3
1898	4.9	1948	1.6	1988	10.7
1899	4.3	1949	1.6	1989	8.3
1900	4.3	1950	1.7	1990	7.7
1901	5.7	1951	1.3	1991	10.6
1902	6.0	1952	2.2	1992	12.7
1903	6.5	1953	1.8	1993	13.4
1904	8.0	1954	1.5	1994	12.2
1905	7.5	1955	1.2	1995	10.8
1906	6.0	1956	1.3	1996	9.8
1907	5.1	1957	1.6	1997	7.4
1908	8.2	1958	2.2	1998	6.3
1909	8.7	1959	2.3	1999	5.8

Sources: See the text.

economywide unemployment rate is lower than the industrial rate because it includes services and agriculture, two relatively low-unemployment sectors. The inclusion of services and agriculture also reduces the volatility of unemployment. Over the period 1870-1913 the standard deviation of the

employment in agriculture declined. We have no way of measuring this bias, but we believe that it was small, given that both agriculture and services were low-unemployment sectors.

economywide unemployment rate is 1.61 and the coefficient of variation is 0.28—barely half that of the Board of Trade index.

UNEMPLOYMENT IN FIVE ECONOMIC ERAS

In order to facilitate interpretation of these aggregate findings, we divided the data for 1870-1999 into five periods corresponding to distinct eras in British history. Summary statistics for each era are reported in Table 7. From 1920 to the present there have been three distinct unemployment regimes: the interwar period, the golden age of 1946-1973, and the post-1973 period. The high level of interwar unemployment was almost matched by that after 1973. By comparison the "golden age" stands out as a time of extraordinarily low unemployment. Including the pre-1914 periods further underscores the exceptional performance of the labor market from 1946 to 1973. The years before 1914 fall squarely halfway between the extremes of average unemployment rates in the different eras since 1920. Table 7 shows that the standard deviations of unemployment rates are generally higher when the means are higher. As a result, the coefficients of variation are more consistent across these different eras. In terms of *relative* volatility, the period 1892-1913 was the most stable, followed by the golden age of 1946-1973, while the years 1870-1891 exhibit volatility similar to that of the interwar period. It is sobering to see that in terms of both absolute and relative volatility, the most recent era has been the least stable of all.

The results of our revisions to pre-1914 unemployment statistics parallel those made by Romer and Weir for the United States, who found that the American labor market was less volatile before 1914 than the earlier unemployment estimates by Stanley Lebergott suggested.[63] Our economywide average unemployment rate for 1890-1913 is 6.0 percent—a shade higher than Weir's estimate of 5.7 percent for the U.S. civilian unemployment rate. The coefficient of variation of U.S. unemployment is 0.35 for Weir's series, as compared with 0.64 for Lebergott's series. Similarly, our economywide series gives a coefficient of variation of 0.21 for 1890-1913, as compared with 0.42 for the Board of Trade index. In both cases the new estimates suggest a level of volatility little more than half that of the old estimates.

In the interwar period the level and volatility of unemployment was significantly higher in both countries than in the preceding era. But here the similarities end. In the postwar "golden age" U.K. unemployment was strikingly lower than in 1890-1913, while in the United States it was lower by less than one percentage point at 4.8 percent. From 1974 to 1990 U.S. unemployment averaged 7.0 percent, compared with 9.1 percent in the United Kingdom. In this post-golden age era, the absolute and relative volatility of

[63] **Romer, "Spurious Volatility"; Weir, "Century"; and Lebergott, *Manpower*, pp. 512, 522.**

TABLE 7
UNEMPLOYMENT IN FIVE ERAS, 1870-1999

	1870-1891	1892-1913	1920-1939	1946-1973	1974-1999
Mean rate (percentage)	5.4	6.2	10.4	2.0	9.3
Standard deviation	1.81	1.31	3.46	0.62	3.60
Coefficient of variation	0.33	0.21	0.33	0.31	0.39

Sources: See the text.

unemployment in the United States was slightly lower than before the First World War, whereas in the United Kingdom it was significantly higher on both counts. In contrast with the United States, U.K. unemployment seems to have become progressively less stable relative to the decades before 1914.

CONCLUSION

For over a century, contemporaries and historians have expressed reservations about the trade-union unemployment index for 1860-1913 constructed by the Labour Department of the Board of Trade. Despite these criticisms, only a few minor adjustments have been made to the index. In this study we have derived a new index of industrial unemployment that meets some of these criticisms. Our index uses labor-force weights and adds additional sectors that are inadequately represented in the existing index. We also make allowances for short-time working in the sectors most affected by it, and for general unskilled labor. The resulting index suggests a higher mean unemployment rate, but lower volatility of unemployment, than does the Board of Trade index.

We also have adjusted our pre-1914 index to an economywide basis and constructed an index that, as far as possible, is consistent over the 130 years up to the present. On this basis our mean unemployment rate is lower than that for the industrial sector alone, but it remains higher than that of the Board of Trade. The effect of these adjustments is to further reduce the volatility of unemployment before the First World War. Our long-run index highlights the sharp differences in the means and in the absolute volatility of unemployment in different eras of British labor-market history. Explaining these differences is a task we shall pursue in the future.

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. We obtained the annual reports of trade unions from three libraries: the Bishopsgate Institute, London; the British Library of Political and Economic Science, London School of Economics; and the Modern Records Centre, University of Warwick.[64]

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), *Pari Papers* (1910, XLIX), p. 608.

United Operative Plumbers (weight = 0.140):
- 1902-1913: 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; benchmarked at 5.0 percent in 1911.

National Association of Operative Plasterers (weight = 0.066):
- 1870-1911: BPM from trade union's annual reports; benchmarked at 5.0 percent in 1911.

For the years 1912/13, unemployment rate constructed from the carpenters and plumbers unions only, with weights 0.804 and 0.196, respectively. 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):

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.

[64] An excellent introduction to trade-union data is Southall et al., *Nineteenth Century Trade Union Records.*

The weights assigned to the two unions were determined by the number of ironworkers in England and Wales and Scotland in 1901.

Miscellaneous Metal Trades (weight = 0.3):

1905-1913: 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 1870-1877. In constructing the index, the weights assigned to each union were roughly based on the union membership in 1901.[65]

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 1870-1877.

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 1870-1877 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.

[65] The precise membership weights for the unions in 1901 were: Amal. Soc. of Engineers, 0.844; Steam Engine Makers Soc, 0.080; United Patternmakers Assoc, 0.045; Assoc Blacksmiths and Ironworkers Soc, 0.028. We decided to reduce the weight of the Amal. Engineers somewhat because we believe that union density among fitters and turners was particularly high, and therefore that they would be overrepresented if precise membership weights were used. The average unemployment rate for 1878-1913 (the years for which data are available for all four unions) was 4.7 percent using our weights, and 4.6 percent using the precise 1901 membership weights.

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 union membership in 1901.[66]

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 = 0.10):
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 1870-1872. The weights assigned to each union are roughly based on union membership in 1901.[67]

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; benchmarked at 4.0 percent in 1912.

Amalgamated Soc. of Millsawyers, Wood-cutting Machinists, and Wood Turners/ Amalgamated Wood-cutting Machinists (weight = 0.30):
1873-1913: URfrom *17th Abstract of Labour Statistics.*

For the years 1870-1872, the weights are as follows: Alliance Cabinet Makers, 0.50; Amalgamated Cabinet Makers, 0.50. The series for 1870-1872 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.

[66] The precise membership weights for the unions in 1901 were: London Soc. of Compositors, 0.388; Typographical Assoc, 0.567; London Soc. of Journeymen Bookbinders, 0.046.

[67] The precise membership weights for the unions in 1901 were: Alliance Cabinet Makers / Nat. Amal. Furnishing Trades, 0.478; Amal. Union of Cabinet Makers, 0.189; Amal. Soc. of Millsawyers, etc. / Amal. Wood-cutting Machinists, 0.333.

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 1870-1876. 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.

1902-1907: 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 *Reports on Trade Unions* (Board of Trade 1899,1902-1904, 1908-1910), and from *Report of the Chief Registrar of Friendly Societies for 1911,* spliced to unemployment rate in 1912.

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

1870-1885: BPM from *Third Report on Trade Unions* (Board of Trade), p. 70, spliced to unemployment rate in 1886 using data for 1886/87.

For 1870-1876, the unemployment index includes only data for the Tailors. The series is spliced to the overall series using data for 1877/78.

Glass Trades

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

1911-1913: UR from *Labour Gazette,* spliced to earlier series using data for 1910.

1891-1910: UR from trade union's annual reports, spliced to series for 1870-1890 using data for 1888-1890.

1870-1890: UR from *Third Report on Trade Unions* (Board of Trade), p. 104.

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