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Meanwhile, negotiations had been proceeding with the engine and train service organizations. A strike vote was taken which authorized the executives of the brotherhoods to call a strike in the event that the negotiations failed to produce a satisfactory solution. Mediation was proffered by the National Mediation Board on August 25th, and an agreement was finally closed on October 3rd . . . (retroactive to October 1).

Hardly had these wage increases been placed in effect than a severe business recession set in during the fall and winter of 1937."

Indeed, by March 1937 railroad traffic began to decline, and by June railroad employment had reached its peak; the recession in general business activity is dated from May 1937. Thus increases in wage rates, demanded at the peak in traffic and 3 months before the decline in employment, became effective 2 to 4 months after the peak of employment and 5 to 7 months after the falling off of rail traffic.

This process seems to have hardened with the passage of the Railway Labor Act in 1926 which formalized the collective bargaining procedures and federal mediation, reducing sensitivity to pressures for downward adjustments. Thus, the reduction of wage rates in the first major depression was initiated 17 months after the peak in business activity while the first reductions in the Great Depression were not instituted until 31 months after the high point of the preceding boom.[17] Moreover, the severe but short-lived contraction of 1937-38 caused merely a leveling off, not a reduction, in railroad wage rates.

This experience in the railroad industry suggests that as changes in manufacturing rates become more and more subject to collective bargaining the lags may become even longer.

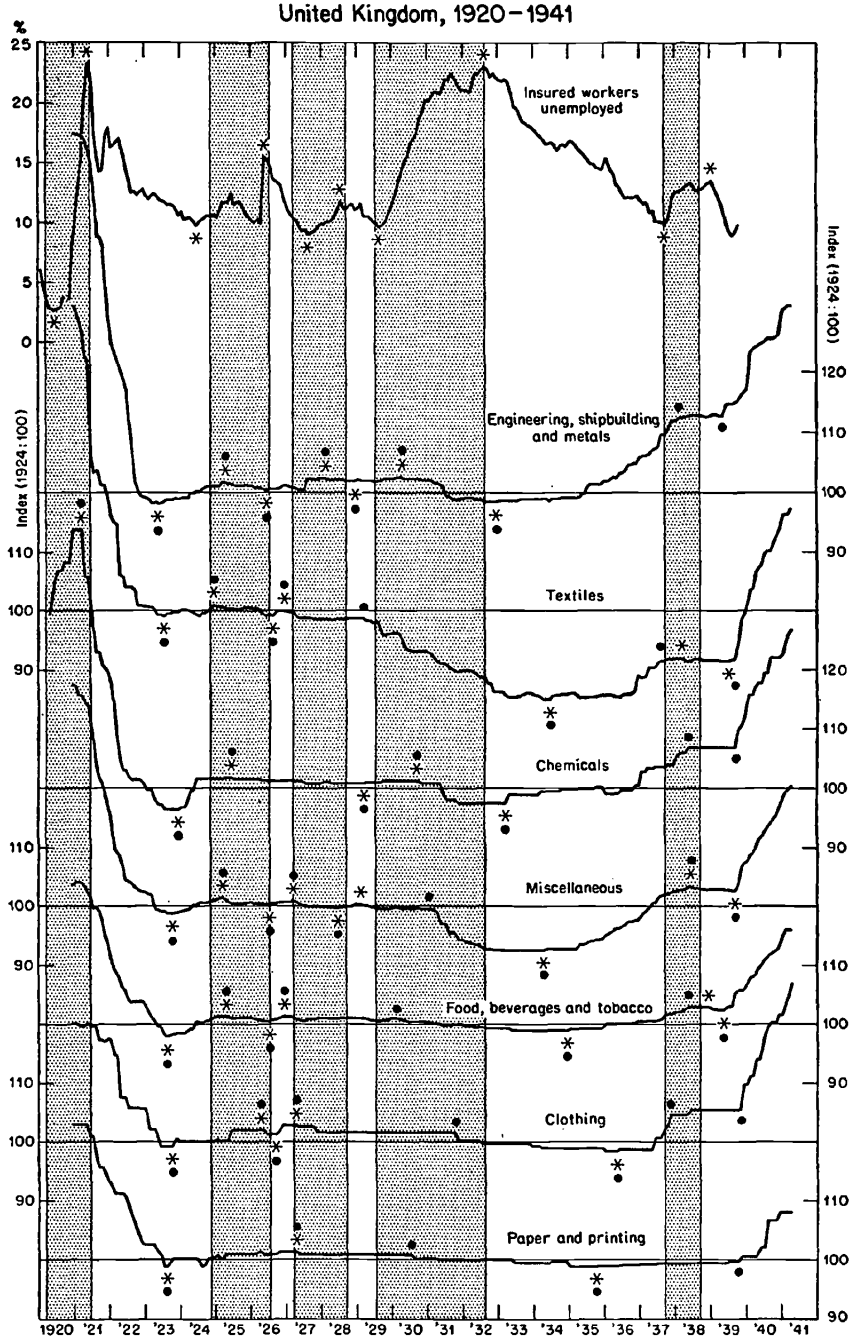
5 *Lags also in British Manufacturing Industries*

Wage rates in British manufacturing industries constitute a third sample that can be analyzed for its timing behavior. A monthly index of wage rates in 64 minor industries and 12 major industry groups was prepared some years ago by Lorie Tarshis for the National Bureau of Economic Research. We have, however, confined our investigation to the 7 major industry groups that comprise

[17] As in manufactures, railroad wage rates prior to the 1920-21 contraction had increased very rapidly whereas during the 'twenties they rose little.

Chart 5

Indexes of Wage Rates in Seven Industrial Groups and Percentage of Insured Workers Unemployed United Kingdom, 1920–1941



Shaded periods are contractions in British business activity.

* Turning points according to standard method.
● Turning points according to alternate method.

British manufactures and to the years 1920-41 (Chart 5).[18] A composite index for all British manufactures is not available for these years.

There are several similarities and several differences in the movements of wage rates in British and in United States manufactures. In both, for example, wage rates declined sharply from the latter part of 1920 to 1922 or 1923, then recovered somewhat. In the United States, however, the recovery occurred earlier and was more substantial. Following this recovery, wage rates in both countries entered upon a period of stability until 1929-30 when they were appreciably reduced. Once again the recovery from the Great Depression took place earlier and more rapidly in the United States. Thereafter the period covered by the wage rate series in the two countries no longer coincides.

Another similarity appears when the plateau-like movement of wage rates in British manufactures during the stable period 1924-29 is plotted on a generous scale. It is actually composed, as in the United States, of cycles with very narrow amplitudes. In this instance too we obtain more information if we distinguish between turning points that mark off major and minor cyclical phases. Because of these minor cycles, strict adherence to the standard procedure introduces some artificiality into the selection of some of the turning points. For example, according to the standard practice, peaks in wage rates corresponding to the mid-1929 peak in British business occurred in only 3 of the 7 industry groups. However, in all 7 groups wage rates changed significantly in response to the Great Depression. In our view it is more meaningful in these circumstances to select as the turn the point marking a substantial change in the rate of movement rather than the point marking a turn. We have entered in Table 3 therefore the dates that end the plateau-like movement in 1929-30 and those that initiate or end a similar movement during the 1937-38 contraction. It is the timing based upon these turning points that we analyze.

Lag of wage rates behind turns in business activity has been a common characteristic of British manufactures also in the two

[18] Tarshis' method consisted essentially of monthly interpolations of annual indexes of wage rates prepared by E. C. Ramsbottom. His monthly interpolations, based on changes in wage rates reported in the *Ministry of Labour Gazette*, have not been published but may be consulted at the National Bureau of Economic Research.

TABLE 3

Cyclical Turning Points in British Business Activity and Wage Rates Seven Branches of British Manufactures, 1920-1939

LEVEL OF BUS. ACT.	DATE OF TURNING POINT IN			LEAD (—), LAG (+), OR COINCIDENCE (0), MONTHS Rates & activity	
	Bus. act.*	WAGE RATES SM	A	SM	A
		CHEMICALS			
Peak	3/20	3/21	3/21	+12	+12
Trough	6/21	12/23	12/23	+30	+30
Peak	11/24	6/25	6/25	+7	+7
Trough	7/26				
Peak	3/27				
Trough	9/28	3/29	3/29	+6	+6
Peak	7/29	9/30	9/30	+14	+14
Trough	8/32	3/33	3/33	+7	+7
Peak	9/37		5/38		+8
Trough	9/38		9/39		+12
Average				+12.7	+12.0
		CLOTHING			
Trough	6/21	10/23	10/23	+28	+28
Peak	11/24	4/26	4/26	+17	+17
Trough	7/26	9/26	9/26	+2	+2
Peak	3/27	4/27	4/27	+1	+1
Trough	9/28				
Peak	7/29		10/31		+27
Trough	8/32	5/36	5/36	+45	+45
Peak	9/37		11/37		+2
Trough	9/38		11/39		+14
Average				+18.6	+17.0
		ENGINEERING, SHIPBUILDING, AND METALS			
Trough	6/21	5/23	5/23	+23	+23
Peak	11/24	4/25	4/25	+5	+5
Trough	7/26	6/26	6/26	−1	−1
Peak	3/27	2/28	2/28	+11	+11
Trough	9/28	12/28	12/28	+3	+3
Peak	7/29	4/30	4/30	+9	+9
Trough	8/32	12/32	12/32	+4	+4
Peak	9/37		2/38		+5
Trough	9/38		5/39		+8
Average				+7.7	+7.4
		FOOD, BEVERAGES, AND TOBACCO			
Trough	6/21	8/23	8/23	+26	+26
Peak	11/24	4/25	4/25	+5	+5
Trough	7/26	7/26	7/26	0	0
Peak	3/27	12/26	12/26	−3	−3
Trough	9/28				
Peak	7/29		2/30		+7
Trough	8/32	12/34	12/34	+28	+28
Peak	9/37	12/38	5/38	+15	+8
Trough	9/38	5/39	5/39	+8	+8
Average				+11.3	+9.9

LEVEL OF BUS. ACT.	DATE OF TURNING POINT IN			LEAD (—), LAG (+), OR COINCIDENCE (0), MONTHS Rates & activity	
	Bus. act.*	WAGE RATES SM	A	SM	A
		PAPER AND PRINTING			
Trough	6/21	8/23	8/23	+26	+26
Peak	11/24				
Trough	7/26				
Peak	3/27	4/27	4/27	+1	+1
Trough	9/28				
Peak	7/29		7/30		+12
Trough	8/32	10/35	10/35	+38	+38
Peak	9/37				
Trough	9/38		10/39		+13
Average				+21.7	+18.0
		TEXTILES			
Trough	6/21	7/23	7/23	+25	+25
Peak	11/24	12/24	12/24	+1	+1
Trough	7/26	8/26	8/26	+1	+1
Peak	3/27	12/26	12/26	−3	−3
Trough	9/28				
Peak	7/29		3/29		−4
Trough	8/32	6/34	6/34	+22	+22
Peak	9/37	3/38	8/37	+6	−1
Trough	9/38	7/39	9/39	+10	+12
Average				+8.9	+6.6
		MISCELLANEOUS			
Trough	6/21	10/23	10/23	+28	+28
Peak	11/24	3/25	3/25	+4	+4
Trough	7/26	7/26	7/26	0	0
Peak	3/27	3/27	3/27	0	0
Trough	9/28	6/28	6/28	−3	−3
Peak	7/29	2/29	1/31	−5	+18
Trough	8/32	4/34	4/34	+20	+20
Peak	9/37	6/38	6/38	+9	+9
Trough	9/38	9/39	9/39	+12	+12
Average				+7.2	+9.8
		AVERAGE FOR SEVEN INDUSTRIES			
Trough	6/21			+26.6	+26.6
Peak	11/24			+6.5	+6.5
Trough	7/26			+0.4	+0.4
Peak	3/27			+1.2	+1.2
Trough	9/28			+2.0	+2.0
Peak	7/29			+6.0	+11.9
Trough	8/32			+23.4	+23.4
Peak	9/37			+10.0	+5.2
Trough	9/38			+10.0	+11.3
All turning points in 7 industries				+11.2	+11.1

* Reference cycle dates for Great Britain from Burns and Mitchell, *Measuring Business Cycles*, pp. 512-3.

decades between the two world wars. If we count the terminal points of plateaus as turns, wage rate series for the 7 groups contained 55 turning points that corresponded with turning points in British business activity. At only 6 did turns in wage rates precede and at only 3 did the turns coincide. That is, at 84 percent of the turning points wage rates lagged behind business activity. The average lag at all corresponding turns was 11 months.

The fluctuations in wage rates, moreover, bear much the same lagged relationship to turns in factory unemployment (see Chart 5) as they did to turns in business activity, allowing, of course, for the inverted pattern of the former. Owing to the long lag, much of the deflation of wage rates after World War I coincided with a very substantial reduction in the percentage of the insured population that was unemployed; i.e., from a high of about 23 percent to a low of about 10, which level persisted until the Great Depression. Despite the continuance of substantial unemployment workers maintained their wage rates at a relatively stable level until about 1930 when wage rates began to be depressed in the face of a rising tide of unemployment which returned to the 23 percent level. And as unemployment receded to the chronic level of 9 percent wage rates recovered until 1938 when a temporary plateau was reached; meanwhile unemployment was rising moderately.

The substantial lag of wage rates behind business activity is not due merely to the averaging process. For in each of the 7 industry groups the lag was typical. In no group was the average lag as short as 6 months and in 3 groups it was as long as a year or more.

Despite the considerable average lags in each industry, the wage rate lag behind business activity has been merely nominal at certain turning points. For example, at the turns marking off minor cyclical phases—July 1926, March 1927, and September 1928—the lags on the average were very short, none exceeding 2 months. Indeed, the 3 coincident turns mentioned above occurred at these minor turns, as did 4 of the 6 leads. At all the turning points of major phases, on the other hand, the average lag in wage rates was substantial, ranging from 5 to 27 months. The longest lags, about 2 years, occurred at the troughs in June 1921 and August 1932, the terminal points of the severest depressions in these decades. This contrast in the length of lags in wage rates at minor and major turning points is puzzling. Apparently, wage rates in British manufactures

have been more sensitive to relatively small changes in the fortunes of British business activity than to sweeping changes. However, we must bear in mind that our procedure interprets even minute movements as cyclical fluctuations if they are appropriately timed with respect to changes in general business. The changes in wage rates in such instances may be caused by the decisions of a very few enterprises. This illustrates how unsmoothed, raw data may yield unreasonable results.

A comparison of the lags in factory wage rates behind business activity in the United States and United Kingdom is not without interest. If for the United States we use the lags of the index of wage rates for all manufactures and for the United Kingdom the average lags for the 7 industry groups, our comparison involves lags at 4 major turning points. At the 2 peaks the rise in wage rates

LEVEL OF BUSINESS ACTIVITY	DATE OF TURNING POINT IN ACTIVITY		LAG OF WAGE RATES BEHIND ACTIVITY MONTHS	
	U.K.	U.S.	U.K.	U.S.
Trough	6/21	7/21	26.6	9.0
Peak	11/24	5/23	6.5	8.0
Peak	7/29	6/29	11.9*	12.0*
Trough	8/32	3/33	23.4	2.0

* Based on alternate turning points.

in both countries halted about the same number of months after the respective peaks in business activity. After the low points in business, however, wage rates in the United States began to rise many months earlier than wage rates in the United Kingdom.

If extent of unionization were the chief determinant of the timing of turning points in wage rates, the lag of British factory wage rates behind British business activity would be longer than the comparable lags in wage rates in United States manufactures. In the United Kingdom, for example, 42.1 percent of manufacturing employees were members of trade unions in 1924, 38.4 percent in 1930, and by 1935, when business activity was still at a relatively low level, the percentage had become 27.7 of all employed workers.[19] Between 1923 and 1933, 11 to 16 percent of workers in United States factories were organized in trade unions.

[19] The percentages for 1924 and 1930 are from Leo Wolman, 'Union Membership in Great Britain and the United States', NBER *Bulletin 68,* Dec. 27, 1937, App. Table IV. The percentage for 1935 was computed. Trade union membership figures are from the *Ministry of Labour Gazette,* XLV, Oct. 1937, p. 404; employment figures from the *Annual Abstract of Statistics,* Central Statistical Office, No. 84, 1935-46, pp. 107-9 and 114-6.

As already noted, the brief wage rate record available for analysis fails to support completely the expectation of longer lags in British wage rates, for the lags at the 2 peaks in both series are of about the same length. Only at the 2 troughs does it confirm this expectation in some degree. And here, we must repeat, the unusually short lag of United States factory wage rates at the 1933 trough is attributable to the direct intervention of the federal government through the NRA.

Despite some differences, all 3 samples of wage rate data have a common pattern in the timing of cyclical change: typically wage rates lagged behind business activity by a substantial number of months.

6 *Average Hourly Earnings as Indicators of Turning Points in Wage Rates*

Two aspects of cyclical fluctuations are of special interest, their timing and amplitude. We investigate the former first. Average hourly earnings in all manufactures traced as many cycles between 1920 and 1935 as our composite index of wage rates, and the cycles in the two series correspond whether we use the standard method of selecting turning points or our alternate method. To find out whether the turning points in the 2 series occurred at about the same time we use the alternate turns whenever turns compete. For it is more meaningful to compare the dates that mark appreciable changes in rates and earnings than the dates that mark reversals in direction without regard to the magnitude of the change. Turning points in a series 2 months before or after the corresponding turning points in the other are considered roughly coincident. Of the 5 major turning points only 4 can be determined precisely and at all 4 the timing is roughly coincident.[20] At the minor turning points, however, there was not even rough coincidence.

We may conclude that in aggregate manufactures the major turning points of average hourly earnings are a reliable indicator of major turns in wage rates and these will usually correspond, with a lag, to major reversals in business activity. This should be a help-

[20] Turning points cannot be determined precisely from January through June 1922 because we do not have any data on average hourly earnings. However, since in aggregate manufactures the standing at July 1922 is the lowest recorded near the turn, the turn had to occur between December 1921 and July 1922. Were the precise turn known, it would probably coincide roughly with the turn in wage rates.