UNEMPLOYMENT CONDITIONS AND MOVEMENTS OF THE MONEY WAGE LEVEL

By William G. Bowen and R. Albert Berry

In both the United States and the United Kingdom the economics literature of recent years has been replete with discussions of the compatibility of price level stability and high employment. Interest in this broad subject has in turn stimulated renewed interest in movements of money wage levels, and particularly in the set of relationships between unemployment conditions and money wage levels.

2/ The research reported here was financed (in part) by a Ford Foundation grant to the Princeton economics department.


Work along similar lines, though generally more limited in scope and less thorough, has also been carried out in the United States. In 1950 there was a brief note by J.W. Garbarino ("Unionism and the General Wage Level," American Economic Review, December 1950, pp. 895-896), and in more recent years there have been papers by P.A. Samuelson and R.M. Solow ("Analytical Aspects of Anti-Inflation Policy," American Economic Review, May 1960, pp. 182-187), C.L. Schultze ("Recent Inflation in the United States," [Study Paper No. 1, U.S. Congress, Joint Economic Committee, 86th Cong., 1st Sess., 1959], see especially pp. 59-65), and R.J. Bhatia ("Unemployment and the Rate of Change of Money Earnings in the United States, 1900-1958," Economica, August 1961, pp. 286-296), as well as a monograph by (footnote continues on next page)
In the event of some unexpected situation in which the
interests of a nation may be affected, the controller of
the
communication or executive body may be consulted in the
matters of national importance and participation in the
cases of urgency.

[Signature]

[Date]

Except where otherwise noted, all subsequent references to authors and papers refer to the studies cited in this footnote.

Mention should also be made of a very recent study by Robert R. France ("Wages, Unemployment, and Prices in the United States, 1890-1932, 1947-1957," Industrial and Labor Relations Review, January 1962, pp. 171-190). Unfortunately, France's article was published too late to allow us to incorporate comments on his study into this paper.
The general relevance of this type of empirical research for the "cost inflation" controversy and for the formulation of stabilizing policies has been discussed at length elsewhere and so will not be considered in detail here. The main objectives of the present paper are fourfold: (1) to clarify the nature and significance of recurrent procedural problems involved in attempts to relate wage behavior to unemployment conditions, especially when only annual data are available; (2) to set forth statistical results obtained for the U.S. economy for the period 1900-1958 taken as a whole and for various sub-periods, with the level of unemployment and changes in the level of unemployment used as the main explanatory variables; (3) to consider in some detail the a priori basis for expecting a relationship between the rate of change of money wages and one particular explanatory variable--changes in the level of unemployment; and (4) to make some admittedly rough comparisons between the American results and the British results.

One major conclusion is worth noting at this juncture: our results indicate the existence in the U.S. economy of a definite relationship between changes in the level of unemployment and the rate of change of money wages, a relationship that in certain respects is more pronounced than the more frequently discussed relationship between the level of unemployment and the rate of change of money wages. Interestingly enough (or perhaps we should say paradoxically enough), this finding agrees much more closely with the results obtained for the U.K. by Phillips and Lipsey than with the results obtained for the U.S. by Bhatia.
I. PROCEDURAL MATTERS

Procedural discussions are often dull and insipid; yet in a field of inquiry such as this they can be omitted only at the risk of misleading one's readers and even one's self.

First, with regard to the underlying data, it should be noted that the U.S. wage series represents average hourly earnings paid to production workers in manufacturing industries. The unemployment series represents the percentage of the civilian labor force unemployed and is thus broader in coverage than the wage series. The exact sources of the data are given in the appendix to this paper. Here it is sufficient to note that we owe the unemployment estimates for the early part of the century to the Herculean efforts of Stanley Lebergott, who was forced to make use of a wide variety of patchwork sources. At the present time the concepts underlying the unemployment figures are again under official review, and, given all these circumstances, it would certainly be unwise to attach any great degree of importance to the precise values of the coefficients reported in this study.

Annual data have been used throughout. Necessity is part of the explanation in that data for shorter intervals of time are simply unavailable for much of the period. Monthly data are available for the more recent years, but have not been used here, partly because

\[\text{Footnote: 2}^\text{\footnotesize/}\text{ In some of our work we also used a non-farm unemployment series in order to come closer to matching the coverage of the wage series. The results obtained were, in general, quite similar to the results obtained by using the broader unemployment series.}\]

\[\text{Footnote: 3}^\text{\footnotesize/}\text{ A detailed description of the derivation of these estimates may be found in Lebergott's paper: "Annual Estimates of Unemployment in the United States, 1900-1954," in The Measurement and Behavior of Unemployment (Princeton University Press for the National Bureau of Economic Research, 1957), pp. 213-239.}\]
of a desire to achieve comparability over the period as a whole, and partly because when monthly data are used a rather different approach, geared more precisely to the turning points of business cycles, seems appropriate.  

The use of annual data raises one very important procedural problem, which has received some attention in the U.K., but which has been ignored, for the most part, in the U.S. In brief, the problem consists of gearing together the unemployment and wage series in a way that makes sense from a theoretical standpoint and at the same time does not lead to serious statistical problems.

The characteristics of this problem and the pros and cons of three alternative solutions (the wage-lag method, the first central difference method, and the averaged unemployment method) are discussed in considerable detail in the appendix. For reasons explained there, we have concluded that the first central difference method (employed by Phillips, Lipsey, and Bhatia) is inferior on a priori grounds and on statistical grounds to the averaged unemployment method. However, lest anyone think that the results presented below are attributable solely to the use of this particular method, we have also made calculations on the basis of the first central difference method. Section C of the appendix contains a table which permits a ready comparison of the results obtained by the two different methods. It is clear from this table that both methods suggest the same general conclusions.

\footnote{A more complete discussion of the use of monthly unemployment and wage data is contained in Bowen, \textit{op. cit.}, pp. 21-34.}
A very complete classification of the various categories of data and information, their importance, and their relationship to the overall objective of the project. The classification helps to ensure that the appropriate measures are taken to protect the confidentiality and integrity of the data. It also ensures that the data is used only for the intended purpose and that it is not misused or mishandled. The classification should be clear and unambiguous, and it should be regularly reviewed and updated as necessary.
Turning now to another procedural matter, all of the statistical work reported in this paper has been based on single-equation, least-squares estimates and the usual kind of simple and partial correlation coefficients. We recognize the appeal of the simultaneous equation method of estimation and would have used this approach had time and resources permitted.\footnote{Among the previous papers on this topic cited in the first footnote to this article, only the paper by Klein and Ball uses the simultaneous equation approach. It is perhaps worth noting that Klein and Ball found that the least squares estimates of some coefficients were hardly distinguishable from the coefficients obtained by using a consistent method of estimation (op. cit., p. 474). Klein and Ball studied only the 1948-1958 period and did not use changes in unemployment as an explanatory variable; consequently, it is difficult to make direct comparisons between their substantive results and results obtained by others.} No price change variable has been used in this analysis because of our strong suspicion that causation flows so strongly in both directions (from wages to prices and from prices to wages) that it would be impossible to give a satisfactory interpretation to any wage-price relationship obtained by the single-equation approach. (However, as the next paragraph indicates, some of the most serious problems of price-induced wage adjustments have been met by eliminating years of war-related inflation from much of the analysis.)

The last procedural matter to be considered is the selection of sub-periods and the omission of certain periods altogether. During the past half-century we have certainly witnessed sufficiently significant deviations from what one might call normal peace-time years to justify excluding certain periods from at least some calculations. Bhatia, in his analysis of the U.S. data, omits 1915-1920 and 1942-1948 on the ground that war-time conditions (and especially the war-related inflations) exerted an atypical impact.
on the unemployment-wage change relationship. He also omits 1933-1934 on the ground that the NRA codes and other "recovery" measures were primarily responsible for the unusually rapid wage increases that occurred in the face of very high unemployment. While one might argue about the wisdom of including or excluding particular cut-off years, we have no major quarrel with these omissions and have followed the same procedure in much of our work. We have also divided the period as a whole into the same three sub-periods as Bhatia: 1900-1932 (excluding 1915-1920), 1935-1941, and 1948-1958. However, in order to provide at least a rough check on the effects of these inevitably somewhat arbitrary omissions and sub-divisions, we have also made some calculations for the entire period from 1900 through 1958.

II. FINDINGS AND INTERPRETATIONS

The Level of Unemployment as an Explanatory Variable

To what degree do the U.S. data support the hypothesis that the rate of change of money wages ($\ddot{w}$) is related to the state of the labor market as approximated by the level of unemployment ($\overline{U}$)? The

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5/ All the correlation and regression coefficients reported in this section are brought together in a summary table in the appendix, along with regression equations, coefficients of multiple determination, and confidence limits.

7/The word "approximated" has been inserted in this sentence in recognition of the fact that the usual unemployment indices are by no means perfect indicators of the degree of excess demand (or supply) in the labor market. Apart from aggregation problems, the failure of unemployment data to reflect the number of unfilled jobs that exist concurrently with unemployed workers is perhaps the major source of potential discrepancies between the unemployment concept and the excess-demand-for-labor concept. However, recent work done in the U.K. by Dow and Dicks-Mireaux suggests that the quantitative significance of this limitation may not be very great; our inability to (footnote continues on next page)
II. PRINCIPLES AND IMPLEMENTATION

The level of development as seen

by some observers in the U.S. has made the proposition that
the legal or effective change of money value (Y) is reflected in the rise of the
informal exchange as approximated by the level of unemployment (Y).

A full monetary policy and transactional coexistence is the

system with transactional coexistence which
may continue indefinitely.

The monetary policy is the best way of

accomplishing the desired goal of

the government. The process of

developing economic policies

involves the coordination of

various elements. The process

must be based on the goals

of the government. The

process involves the

development of economic policies

that can be implemented in

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answer to this question depends to a considerable extent on whether one looks at the individual sub-periods or at the entire period between 1900 and 1958 taken as a whole. Correlations for the individual sub-periods are presented in Table 1.

Table 1
Correlations Between $\dot{W}$ and $U$

<table>
<thead>
<tr>
<th>Sub-Periods</th>
<th>Simple Correlations ($r_{wU}$)</th>
<th>Partial Correlations ($r_{wU,\dot{U}}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900-1932 (excluding 1915-1920)</td>
<td>-.61</td>
<td>-.52</td>
</tr>
<tr>
<td>1935-1941</td>
<td>-.87</td>
<td>-.83</td>
</tr>
<tr>
<td>1948-1958</td>
<td>-.34</td>
<td>-.50</td>
</tr>
</tbody>
</table>

*These correlations are based on the averaged unemployment method of aligning the wage and unemployment series. Confidence limits are given in the appendix.

As this table indicates, the simple correlations between $\dot{W}$ and $U$ are negative in every sub-period and range in value from -.34 in 1948-1958 to -.87 in 1935-1941. The partial correlation coefficients

(continued) refine the U.S. unemployment data by adding an index of job openings does not seem likely (on the basis of the British experience) to have had much of a distorting effect on the principal findings of this study. (For the construction of a refined measure of the excess demand for labor, based on the gap between the number of unfilled vacancies and the number of workers unemployed, see J.C.R. Dow and L.A. Dicks-Mireaux, "The Excess Demand for Labour: A Study of Conditions in Great Britain, 1946-56," Oxford Economic Papers, X [February 1958], pp. 1-23; the same authors, in the Journal of the Royal Statistical Society paper cited earlier, have examined wage behavior in the U.K. using both the refined measure of the excess demand for labor and the more common unemployment data.)
Table I

<table>
<thead>
<tr>
<th>Variable Correlation</th>
<th>Partial Correlation</th>
<th>Constant Correlation</th>
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The correlations are based on the same measurement of each of the variables. The table provides a summary of the results obtained from the analysis.

As the table indicates, the simple correlation between X and Y is...

In the regression equation, the partial correlation coefficient...

(Continued...)
between \( \hat{\dot{W}} \) and \( U \), with changes in the level of unemployment \( \dot{U} \) held constant, are seen to be very similar to the simple correlation coefficients. All of these coefficients are based on the averaged unemployment method of gearing together the wage and unemployment series. If, instead of using the averaged unemployment method of alignment, we use the first central difference method, the correlations are almost identical for the 1948-1958 and 1935-1941 sub-periods, and somewhat stronger than the results obtained by the averaged unemployment method for the 1900-1932 sub-period. The general tenor of the results does not depend on the method of aligning the series, and the evidence as a whole certainly suggests that, within the sub-periods, the rate of change of money wages has been influenced by the level of unemployment.

It is possible to provide at least a rough idea of the extent of the influence by calculating linear regression equations. (The scatter of points does not provide any incentive to experiment with non-linear expressions.) The effect of a \( 1\% \) change in \( U \) on \( \hat{\dot{W}} \) (as calculated by the regression equations given in the appendix) is seen to have varied from \( -.41 \) in the 1900-1932 period to \( -.56 \) in 1948-1958 to \( -1.24 \) in 1935-1941. The number of observations in the two most recent sub-periods--and particularly in the 1935-1941 sub-period--is so limited that it would be foolish to read much importance into these regression coefficients. However, the rather wide range of coefficients does lead one to suspect the lack of any reasonably stable relationship between the level of unemployment and the rate of change of money wages over the period as a whole.

\[ B/ \text{See section C of the appendix for the actual values.} \]
person may suffer injury to the face or appendages if the

person is not aware of the incident. In such a situation, the person may suffer serious
injury and the likelihood of serious injury increases if the person is not aware of the
incidence.

If there is an immediate threat of serious injury, the person may suffer serious
injury and the likelihood of serious injury increases if the person is not aware of the
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In such a situation, the person may suffer serious
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injury and the likelihood of serious injury increases if the person is not aware of the
incidence.
This suspicion is confirmed by the results of direct attempts to correlate \( \dot{U} \) with \( \dot{W} \) over the long period. If we combine the data from the three sub-periods, we obtain a partial correlation coefficient \( (r_{\dot{W}U\ddot{U}}) \) of -.28. If we take the entire period 1900-1958, omitting no years at all, we obtain a partial correlation coefficient of -.20. These coefficients are considerably lower than the corresponding coefficients obtained for the individual sub-periods, and neither of the two long-period coefficients is significant at the 5% level of confidence. It seems reasonable to conclude that the long-period relationship between unemployment levels and annual rates of change of money wages must be described as rather loose—if indeed it makes sense to speak of any statistically significant long-period relationship at all.

The lack of a consistent long-period relationship will not surprise those who have argued that institutional changes in the U.S. economy over the past 60 years (most notably the development of large industrial unions) have caused upward shifts in the entire unemployment-wage change relationship. It is certainly conceivable that periodic upward shifts in a fairly stable short-period relationship have been responsible for the greater looseness of the long-period relationship.

This is not an easy proposition to prove or to disprove. The testing problem is complicated, first of all, by the possibility that the same structural factors that are alleged to have shifted the unemployment-wage change schedule upward may have simultaneously altered its shape; furthermore, we lack convincing \textit{a priori} propositions concerning the frequency and timing of any such shifts that
may have occurred. As an admittedly rough test of this periodic upward-shift hypothesis, we have introduced time (t) as an explanatory variable, along with the level of unemployment.

When the period as a whole is considered, the linear regression equation is:

$$ \dot{W} = 6.91 - .51U + .05t \quad \text{(with } t=0 \text{ in } 1900, 1 \text{ in } 1901, \text{ etc.).} $$

$$ (R^2 = .04) $$

When the years 1915-1920, 1933-1934, and 1942-1947 are omitted, the equation becomes:

$$ \dot{W} = 2.67 - .28U + .07t. $$

$$ (R^2 = .14) $$

The positive values of the regression coefficients for t in these two equations do provide some support for the proposition that wages have tended to rise more rapidly at given levels of unemployment as we have moved progressively further into the twentieth century. But the addition of the time variable certainly cannot be said to have removed very much of the looseness in the long-period relationship between U and \( \dot{W} \). (U and t together explain only 14% of the variation in \( \dot{W} \) over the selected group of years represented by the second equation.) The rather weak explanatory power of t undoubtedly stems, in part, from the presence in the middle of the time series of the years 1935-1941, when wages rose quite rapidly despite high unemployment. In any case, the data do not support the extreme view that during the twentieth century the U.S. economy has been characterized by a strong, uninterrupted trend toward ever higher wage increases at given levels of unemployment. Money earnings do appear to have risen somewhat more rapidly at given levels of
unemployment in the post-World War II period than in the pre-
World War I years, but one ought not to exaggerate either the extent
or the inexorable character of the change that has occurred.

Changes in the Level of Unemployment as
an Explanatory Variable

One of the most interesting hypotheses to emerge from the
Phillips study was the view that the rate of change of unemployment
(\dot{U}) and not just the absolute level of unemployment, may have a lot
to do with the speed at which money wages rise. The statistical
results of our study of U.S. experience offer consistent support for
the "change in unemployment" hypothesis.

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2/ The change in unemployment, like the change in any other variable,
can be expressed either in absolute terms or in percentage terms. In
the case of the money wage variable, given the pronounced secular
trend and the large size of the base relative to the size of the
annual increments, it seems obvious that the percentage rate of
change is the appropriate measure. However, in the case of unemploy-
ment, there seems to us to be a strong case for using absolute changes,
and this is what we have done throughout our work. It should be noted
that the consideration which compels us to use the percentage rate of
change in the case of the money wage series—the pronounced upward
trend in average hourly earnings—does not operate in the case of the
unemployment figures because the basic figures are already expressed
as percentages of the civilian labor force. The case for using
absolute changes in the unemployment percentage stems, first of all,
from the fact that using a percentage rate of change for the unemploy-
ment variable can cause difficulties in that the incremental changes
can be so large relative to the base that sizeable fluctuations in
the percentage rate of change of unemployment series can be produced
by comparatively modest absolute changes in the level of unemploy-
ment; along the same lines, unless one uses the first central dif-
ference method of averaging, a change in level of unemployment from,
say, 2% to 4% will produce a percentage rate of increase of 100%
whereas a drop from 4% to 2% will produce a percentage decrease of
only 50%. Furthermore, and most important of all, there are some
a priori reasons (to be discussed near the end of this section) for
attaching roughly the same wage-determining importance to two absolute
changes in the level of unemployment of, say, 1% which occurred in
different years, even if the base level of unemployment was, say, 4%
in one year and 6% in the other year. This is not to deny that the
size of the base associated with a given absolute change in unemploy-
ment is also likely to make some difference—ideally, it would

(footnote continues on next page)
employment in the poor-waged area. II believing that the poor

wealth will be large, our concern for experience and for the

experience of operators to the point that is ground breaking.

One of the most important considerations is the nature of unemployment

philosophically may say that the rate of change of unemployment

may not be too great, the absolute level of unemployment

may not be too high. To go with the shocks of which money wages is the

the expectation of our society at the point of experience rather than a

"employment" proposition.

The nature of unemployment. I. The concept in its general aspects. In

the case where a person is unemployed, the person may be

unemployed for a variety of reasons. In the case where a person

is employed, the person is likely to be employed for a variety of

reasons. The concept of employment is thus a complex one, covering

a wide range of possible employment situations. The concept of

unemployment, on the other hand, is a more restricted one, covering

a narrower range of possible unemployment situations. The concept of

employment and unemployment should therefore be distinguished

from each other, and the distinction should be made in the analysis of

the labor market.
2/(continued) probably be best to construct an index with weights
attached to both the absolute and percentage changes in unemployment.
However, such a complex procedure hardly seems justified at this
stage in our work.

To ascertain the effect of using absolute changes in unemployment
on our results, we did make some alternative calculations on the basis
of percentage changes in unemployment; and we can report that the
differences in results are not terribly great. In the 1900-1932 sub-
period, using the first central difference method of alignment,
defining $\hat{U}$ in terms of absolute changes in the unemployment percent-
age produces an $r_{\hat{U},U} = -.62$; defining $\hat{U}$ in terms of percentage
changes in the unemployment percentage produces an $r_{\hat{U},U} = -.51$. The
differences in results for the two other sub-periods are even smaller.
As Table 2 indicates, the simple and partial correlations between $\dot{\bar{U}}$ and $\dot{\bar{W}}$ are as consistently negative in all three sub-periods as the correlations between $\bar{U}$ and $\bar{W}$ presented earlier. Alternative calculations, based on the first central difference method, also produce negative correlations for all three sub-periods, with the absolute values of the coefficients being somewhat higher in 1900-1932 and in 1935-1941, and a bit lower in 1948-1958.

Table 2

<table>
<thead>
<tr>
<th>Sub-Periods</th>
<th>Simple Correlations ($r_{\dot{\bar{W}}\dot{\bar{U}}}$)</th>
<th>Partial Correlations ($r_{\dot{\bar{W}}\dot{\bar{U}},\bar{U}}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900-1932 (excluding</td>
<td>-.56</td>
<td>-.45</td>
</tr>
<tr>
<td>1915-1920)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1935-1941</td>
<td>-.64</td>
<td>-.48</td>
</tr>
<tr>
<td>1948-1958</td>
<td>-.74</td>
<td>-.78</td>
</tr>
</tbody>
</table>

* These correlations are based on the averaged unemployment method of aligning the wage and unemployment series. Confidence limits are given in the appendix.

It is when we calculate long-period correlations between $\dot{\bar{U}}$ and $\dot{\bar{W}}$ that the contrast with the correlations between $\bar{U}$ and $\bar{W}$ becomes especially interesting. Whereas the relationship between the level of unemployment and

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10/ See section C of the appendix for the actual values.
<table>
<thead>
<tr>
<th>Year</th>
<th>Foreign Contributions</th>
<th>Domestic Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1944-1945</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1945-1946</td>
<td></td>
<td></td>
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<tr>
<td>1946-1947</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1947-1948</td>
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</tr>
</tbody>
</table>

The table above shows the foreign and domestic contributions for different years. The contributions are crucial for the national security and economic stability. The government has increased the contributions to meet the financial needs of the country.
the rate of change of money wages was markedly weakened when calculations were made for the longer periods of time, the long-period correlations between changes in the level of unemployment and the rate of change of money wages hold up remarkably well. The partial correlation coefficient (\( r_{\Delta U, \Delta Y} \)) is -.63 for the three sub-periods combined and -.53 for all years from 1900 through 1958. Both of these coefficients are easily significant at the 1% level of confidence. We conclude that changes in the level of unemployment have had the expected inverse influence on the speed at which money wages rise during the past half-century taken as a whole and during component sub-periods.

This conclusion, obtained by using annual data, receives some degree of corroboration from a more intensive study, based on monthly data, of wage behavior during the three postwar recessions in the U.S. economy. This study showed that both average hourly earnings in manufacturing and average compensation for the entire civilian labor force went up much less rapidly during the contraction phase of each recession—when unemployment was increasing steadily—than during the recovery phase—when the average level of unemployment was the same as during the contraction phase but was falling steadily rather than rising.\(^{11}\)

Before commenting on the meaning of this persistent relationship between \( \dot{U} \) and \( \dot{Y} \), we must point out that this aspect of our results stands in striking contrast to the results obtained by

\(^{11}\) For documentation and more details, see Bowen, op. cit., pp. 24-34.
Bhatia (who is the only other person we know of who has conducted a systematic investigation of the $\dot{U}-\dot{W}$ relationship for the U.S. economy). Bhatia reports exceedingly low correlation coefficients for the various sub-periods, and one of his principal conclusions is that: "The influence of the changing rates of unemployment is not clearly marked."

There are some apparent differences in data and procedures between Bhatia's work and our own, but the procedural differences which we have been able to pin-point do not seem adequate to account for the marked discrepancy between his results and ours. In order to facilitate comparisons we have purposely used the same sub-periods as Bhatia. We have also made alternative calculations using Bhatia's alignment procedure (the first central difference method) and his method of defining $\dot{U}$ (in terms of percentage changes rather than absolute changes) -- yet we have continued to get results which indicate the existence of a definite inverse relationship between $\dot{U}$ and $\dot{W}$. 12a/

12/Op. cit., p. 296. Bhatia finds $r_{\dot{W}\dot{U}.U}$ to be only -.17 for 1900-1932, to be positive for 1935-1941, and to be -.45 for 1948-1958. No long-period comparisons are possible because Bhatia does not present correlations between $\dot{U}$ and $\dot{W}$ for the three sub-periods combined or for the entire period 1900-1958.

It is perhaps worth emphasizing that comparisons of results must focus mainly on the respective correlation coefficients rather than on the regression coefficients. The latter are not comparable in that Bhatia uses a percentage rate of change for his $\dot{U}$ variable, whereas, for reasons explained in footnote 9, we use absolute changes in the unemployment percentage. This difference in the definition of $\dot{U}$ will inevitably make Bhatia's regression coefficients smaller than ours, in that a change in unemployment from (say) 4% to 6% will be represented by a $\dot{U}$ of +40% Bhatia and by a $\dot{U}$ of +2% for us.

12a/The appendix contains references to our data and methods which are sufficiently precise to permit any interested reader to repeat our calculations. We are indebted to John Williamson for helping us check our results.
What theoretical interpretation are we to give to the persistent relationship between changes in the level of unemployment and the rate of change of money earnings revealed by the U.S. data? The simplest—and in our view the most satisfactory—interpretation is that these statistical results support the hypothesis that changes in the level of unemployment constitute one of the more predictable determinants of the rate of change of money wages.
The basic reason for expecting changes in the level of unemployment to play a role in the wage determination process is that wages are set with an eye to the future as well as with an eye to the present—and changes in unemployment serve as a handy index of future labor market conditions. At a given level of unemployment, employers acting unilaterally are likely to set a higher wage if the trend of unemployment is down than if unemployment is rising and a recession seems to be getting underway. Similarly, wage negotiations between an employer and a union are likely to be influenced to a significant degree by labor market expectations: unions are likely to demand larger wage increases if unemployment seems to be on the wane, and employers are likely to offer less resistance if they foresee a tightening of the labor market in coming months.

Wage decisions are not constantly revised and thus must be attuned to future labor market conditions as well as to the exigencies of the moment—this is especially true of negotiated wage agreements embodied in formal contracts. And, while current changes in unemployment cannot be counted on to produce highly reliable predictions as to future developments (turning points, for instance, will never be detected by this method of prediction), extrapolating the present into the future nonetheless has its uses and its users.

The only objector to this expectations argument known to us is Lipsey. Lipsey challenges the expectations argument on the ground that, if falling unemployment makes employers think they will need more labor in the future, the result will be an increase in competitive bidding which will not only raise wages but which will

The panel recommends that the expression ‘respite for the level of employment’

mean to play a role in the move toward lowering prices in some areas

are set with an eye to the future as well as with an eye to the

benefiting-opportunity for employment serve as a major factor of income.

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the only approach to the expression ‘respite for the level of employment’ would

include a paper market to the future the paper market to the future.

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advantages. The reason is that the paper market to the future the paper market to the future.
simultaneously lower the level of unemployment, thus moving the economy along the one basic adjustment curve relating the level of unemployment to changes in money wages.

There seems to be one major difficulty with this argument: expectations as to future labor market conditions (say the expectation of a tightening of labor markets over the next year) may well have a direct influence on current wage negotiations without simultaneously influencing current decisions as to the number of men to be hired. Wage adjustments are, after all, made much less frequently than employment adjustments--for one thing, it is far simpler, from a decision-making standpoint, to hire ten new men than it is to decide upon the precise change to be made in the basic wage schedule applicable to all employees (union approval may also be necessary in the case of a wage change); furthermore, changes in wage schedules are much more irreversible than changes in the number of employees. Consequently, it seems entirely conceivable that a firm engaged in wage negotiations will raise wages now as a protection against the danger of losing employees as job opportunities in general expand, and that the same firm will choose not to hire new men until specific openings actually occur. In the U.S. economy, wage and employment decisions are not linked together as closely in time as Lipsey's argument suggests.

As an alternative to the expectations hypothesis, Lipsey has presented a hypothesis which depicts economy-wide variations in the rate of change of money wages at given levels of unemployment as a function, not of the rate of change of aggregate unemployment, but of the distribution of aggregate unemployment among local labor
This distributional hypothesis in turn depends on another hypothesis—namely, that the reaction function linking levels of unemployment to movements of the money wage level in the typical local labor market is non-linear. The first attempt that we know of to test this local labor market hypothesis has been made by Philip Ross. While Ross' efforts are subject to certain methodological criticisms, it can be reported that he failed to find any consistent relationship—linear or non-linear—between \( U \) and \( W \), at the local labor market level.

Lipsey's distributional hypothesis is appealing on a priori grounds and certainly deserves more testing; but, until such testing is completed, it seems sensible to retain the view that it is expectations considerations that are likely to lead to an inverse relationship between changes in the level of unemployment and changes in the money wage level. In any case, it should be recognized that the expectations hypothesis and Lipsey's distributional hypothesis are by no means mutually exclusive.


\[ 16/ \] There are two major methodological difficulties with Ross' work. First, in the present-day U.S. economy many wage settlements are determined on a company-wide or even on an industry-wide basis, and the geographic area encompassed by such settlements often extends beyond the boundaries of the standard metropolitan areas used as the units of account in local labor market analysis. Second, Ross does not recognize that causal relationships between money wage levels and unemployment are more likely to run in both directions at the local labor market level than at the national level. These difficulties are not easy to overcome. Anyone attempting to study local labor market wage phenomena is likely to have difficulty defining the appropriate geographic area and taking account of feed-back effects.
The preparation of the report requires the development of an overall plan and the allocation of resources accordingly. It is important to ensure that the necessary steps are taken to complete the project on time. The report should be submitted by the specified date to ensure timely delivery.

The report format should include an introduction, body, and conclusion. The introduction should provide an overview of the project and its objectives. The body should detail the methods used, the findings, and the implications of the research. The conclusion should summarize the results and suggest areas for further research.

The report should be well-organized, with clear headings and subheadings to guide the reader through the content. It is crucial to ensure that the report is free of errors and that the data presented is accurate and reliable.

The report should also include any relevant charts, graphs, or diagrams to illustrate the findings. These visual aids should be clear and easy to understand.

In summary, the report is an essential tool for communicating the results of the research. It should be prepared with care and attention to detail to ensure that it meets the objectives and requirements of the project.
There is one final point to be raised concerning the expected relationship between $U$, $\dot{U}$, and $\dot{W}$. One of the most interesting statistical findings reported above was that there is a significant long-period relationship between $\dot{U}$ and $\dot{W}$, but no significant long-period relationship between $U$ and $\dot{W}$. The point to be made here is that varying amounts of what has come to be called "structural" unemployment may help to explain this statistical finding.

The same total level of unemployment may, of course, at different points in time, include different proportions of "structural" and "cyclical" unemployment. Or, the same amount of cyclical unemployment may, at different points in time, be combined with various amounts of structural unemployment to produce correspondingly different total levels of unemployment.

Now, if we adopt the hypothesis that workers who are structurally unemployed (and thus, by definition, isolated to some extent by geographical or occupational characteristics from the main stream of labor market developments) are likely to have less of a dampening effect on money wage increases than an equal number of cyclically unemployed workers, it follows that the same total level of unemploy-

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17/We do not propose to become embroiled in the ongoing debate over the operational meaning of structural unemployment. For present purposes it is sufficient to speak of structural unemployment in the admittedly loose sense of unemployment that is not primarily attributable to a general cyclical decline in aggregate demand, but instead is more closely related to the geographical or occupational characteristics of the unemployed. We recognize that the distinction between "structural" and "cyclical" unemployment is to some extent a distinction of degree, in that a sufficiently strong upsurge of aggregate demand is likely to lead to the employment of even the most chronically unemployed workers.
ment can be expected to be associated with different rates of money wage increase as the ratio of structural unemployment to total unemployment varies over time. If there is anything to the popular view that structural unemployment is a higher proportion of total unemployment now than in earlier periods of our history, this may perhaps help explain why wages have gone up more rapidly at given total levels of unemployment in recent years than in some past periods.

The "typical" annual change in unemployment is, almost by definition, more likely to represent a change in the volume of cyclical unemployment than a change in the volume of structural unemployment (which is presumably of a more "chronic," long-run nature). It is this observation, coupled with the hypothesis mentioned above concerning differences in the wage-determining significance of structural and cyclical unemployment, that suggests one possible clue to the greater persistence of the long-period relationship between changes in unemployment and money wage increases than between the level of unemployment and money wage increases. For long-period studies, changes in unemployment may well constitute a more reliable index of active labor market pressures than the level of unemployment, which is more susceptible to inter-period variations in the amount of structural unemployment.

\[18\] This is the a priori reason (referred to in an earlier footnote) why we might expect to find a more consistent relationship between the rate of wage increase and absolute changes in the unemployment percentage than between the rate of wage increase and percentage changes in the unemployment percentage—absolute changes are presumably less influenced by the amount of structural unemployment contained in the total level of unemployment than are percentage changes in the unemployment variable.
The "informed consent" phrase in employment law refers to the process of ensuring that employees are aware of and agree to the terms of their employment. It is important for employers to explain the nature of their responsibilities and the employee's rights and duties in the employment agreement. Failure to inform employees of these terms can result in legal penalties and loss of employee trust. Therefore, it is crucial for employers to provide clear and concise information to employees to ensure a fair and harmonious working relationship.
The validity of these speculations concerning the effects of variations in the composition of aggregate unemployment on movements of the general wage level can, of course, be ascertained only by intensive research. We are hopeful that the current interest in refining and decomposing the aggregate unemployment data will lead to investigations along this line.

III. COMPARISONS

Precise comparisons of the U.S. results with the U.K. results are not possible for a variety of reasons: the kinds of wage data used differ, unemployment is measured differently in the two countries, the periods studied have not been identical, the same explanatory variables have not been used in all studies, and there have been other differences in procedures. In addition, variations in economic conditions (some might wish to say variations in economic policies) have produced a substantial number of wage observations for the U.S. economy in the 3%-9% unemployment range, but only very few observations in the same unemployment range for the U.K. On the other hand, the U.K. data are replete with observations in the 0%-3% unemployment range, while there have been few "normal" years in the U.S. in which unemployment has been this low.¹⁹/

Nonetheless, in spite of these obstacles, there are certain general comparisons between the U.S. and the U.K. results that can be made. First of all, in both the U.S. and the U.K. there is evidence that the magnitude of money wage adjustments has been

¹⁹/ Compare the scatter of points in Lipsey, op. cit., p. 24, with the scatter of points in Bowen, op. cit., p. 14.
The activity of these occupational committees is the subject of
various reports to the committee on government and management of
occupations. These reports are prepared after the committee, in
its regular sessions, has received a detailed report from the
individual associations. The reports are often printed
in the minutes of the committee and contain detailed
information on the activities of the individual associations and
their recommendations and suggestions for future
action.

III

Further, the committee of the U.S. Department with the
U.S. Treasury are not directly a matter of interest to
the associations. The treasury is one of the
factors involved in the association's activities. The
association's conferences, some of which are to
be held, will also be attended by representatives of
the associations and will help to
facilitate cooperation in this respect. The association's
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related to the level of unemployment and to changes in the level of unemployment. The extreme view that money wages must be treated as an exogenous variable, determined primarily by non-market considerations, is not supported by the U.S. data or by the U.K. data.

However, we must quickly add that in neither country can the relation between unemployment conditions and wage changes be said to have been particularly close or consistent over time. The relationships are sufficiently loose to force us to be cautious in estimating the wage implications of alternative sets of unemployment conditions and to encourage us to examine the wage-determining role of factors excluded from this analysis as they interact with unemployment conditions. For the U.S. economy, \( \bar{U} \) and \( \dot{U} \) together "explain" (in the usual statistical sense) 50% of the variation in wage changes in the 1900-1932 sub-period (excluding 1915-1920), 82% in the 1935-1941 sub-period, 66% in the 1948-1958 sub-period, 43% when the three sub-periods are combined, and 31% when an equation is fitted to all the data from 1900 through 1958. While entirely comparable estimates of \( R^2 \) for the British economy are unavailable, we suspect that a number of persons in the U.S. have a misimpression concerning the tightness of the relationship that has been found between unemployment conditions and the rate of change of money wages in the U.K.\(^{20}\)

\(^{20}\)One of the main criticisms leveled at Phillips by Routh and by Knowles and Winsten was that his paper gave an exaggerated impression of the closeness of the relationship. Lipsey, for selected years within the period since 1919 (which is, of course, the period most nearly comparable to the period used for the U.S.) has reported an \( R^2 = 0.21 \) (op. cit., p. 26). But the high value of this coefficient of multiple determination is due very largely to the strong relationship between \( \bar{W} \) and the rate of change of prices (\( \ddot{P} \)). The squared partial correlation coefficients relating \( \bar{W} \) to \( U \) and \( \dot{U} \) are only 0.38 and 0.30, respectively. For reasons mentioned earlier in this paper (and acknowledged by Lipsey), it seems to us to be very dangerous to attach much importance to any single-equation estimate relating wage changes to price changes.
The current economic situation in the U.S. is marked by a sharp decline in industrial production, leading to a corresponding fall in employment. The effects are felt across the country, with many factories closing down and unemployment rates rising. This has led to increased concern about the future of the economy.

However, in recent years, there has been a greater focus on economic development, particularly in rural areas. This has led to new opportunities for job creation and investment. The government has implemented policies aimed at encouraging economic growth and promoting innovation.

One of the key areas of concern is the impact of global trade on American industries. The tariff policies of other countries have put many American businesses at a disadvantage. The government is working to address these issues through various trade agreements and policies.

In the face of these challenges, there is a growing sense of urgency to find solutions that will help to stabilize the economy and create new opportunities for growth.

Economic analysts believe that the U.S. economy is capable of sustained growth, provided that the government continues to support initiatives that promote innovation and job creation.

Overall, the current economic situation in the U.S. is marked by a combination of challenges and opportunities. The government, businesses, and individual citizens are all working together to find solutions that will help to ensure a bright future for the country.
Still another similarity between the U.S. and the U.K. findings is that in both countries wages appear to have risen somewhat more rapidly at given levels of unemployment in the post-World War II period than during earlier periods.\textsuperscript{21} It is still too early to tell whether this postwar development represents a once-and-for-all shift in the aggregate unemployment-rate of change of wages relationship or whether the relationship is continuing to shift upward over time. Also, there is little definite knowledge concerning the causes of shifts of this kind, although there has, of course, been much speculation.

On the dissimilarity side of the ledger, the U.K. studies have suggested the existence of a non-linear relationship between the level of unemployment and the rate of change of money wages, whereas the U.S. data do not provide any evident support for the use of this type of relationship. However, this comparison may not be too meaningful in that the shortage of U.S. observations in the under 3% unemployment range may help explain the lack of an appearance of curvature in the U.S. relationship.

The work that has been done to date also suggests a more significant dissimilarity between the experience of the U.S. and the U.K. At given levels of unemployment, wages appear to have risen more rapidly in the U.S. than in the U.K.\textsuperscript{22} Should this apparent difference be attributed to the fact that the official definition of

\textsuperscript{21}See lipsey, op. cit., p. 30, for a discussion of this aspect of the U.K. results.

\textsuperscript{22}Regardless of the precise procedures used, the U.S. regression equations predict higher wage increases than the U.K. equations over almost all ranges of unemployment.
of the governmental role of the federal government. The U.S. government faces significant opposition from various groups, including environmentalists and labor unions, over its policies and actions.

In particular, the federal government has been criticized for its handling of the coronavirus pandemic, with some arguing that the initial response was too slow and insufficient. The government has also been criticized for its response to the 2020 election, with claims of voter fraud leading to legal challenges.

The government has implemented numerous policies to address economic challenges, including stimulus packages and tax cuts. However, these policies have also faced criticism, with some arguing that they benefit primarily wealthy individuals and corporations.

Overall, the government continues to face numerous challenges, and the effectiveness of its policies remains a matter of debate.
unemployment used in the U.K. tends to produce lower unemployment estimates than the official definition used in the U.S., to differences in productivity gains between the two countries, to differences in the size and diversity of the economies, to deep-seated differences in institutional arrangements, to variations in the policies followed by public and private bodies, or to still other considerations? For the time being at least, this important set of questions must be consigned to the "unanswered" category.

Information relevant to the first question in this set is contained in an article by Edward Kalachek and Richard Westabee ("Rates of Unemployment in Great Britain and the United States, 1950-1960," this Review, November 1961, pp. 340-350), which appeared after the completion of this manuscript. Kalachek and Westabee found that intercountry differences in the definition of unemployment and in the normal amount of "frictional unemployment" account, at most, for one half of the spread in unemployment rates between the U.S. and the U.K. during the postwar years.
APPENDIX

A. Sources of Data

The civilian labor force unemployment data for 1900-1954 are from Lebergott, op. cit., pp. 215-216. Data for 1955-1956 are from U.S. Department of Commerce, Business Statistics, 1959, p. 59. The Department of Commerce made a change in the construction of this series beginning in 1957. Fortunately, there is an almost constant difference of 0.4% between the old series and the new series; consequently, we have taken the new series figures for years from 1957 on and have subtracted 0.4% to make these figures comparable with the rest of the unemployment figures. The new series figures are from U.S. Department of Commerce, Business Statistics, 1961, p. 61.

The wage data measure annual percentage changes in the average hourly earnings of production workers in manufacturing, and have been calculated from data compiled by Clarence D. Long ("The Illusion of Wage Rigidity: Long and Short Cycles in Wages and Labor Costs," Review of Economics and Statistics, May 1960, pp. 150-151). Long's recently constructed wage series has the great advantage of being continuous over the entire period we have studied.

B. The Alignment Problem

The alignment problem stems from the fact that we have at our disposal but a single wage and unemployment figure for each year. (We tacitly assume that both the wage and unemployment figures represent conditions as of the mid-point of each year. This assumption is reasonable in the case of the wage series since the figure for each year is an annual average; the temporal reference point of the unemployment series depends on such factors as the timing of spot collections of data, and thus varies to some extent.)

Given this data situation, the practical question is: what expression for the annual rate of change of money wages ($W_t$) is to be related to what expression for the level of unemployment ($U_t$) and to what expression for the annual change in the level of unemployment ($U_t$)?

While we doubt that there is any perfect solution to this problem, there are at least three methods of alignment that deserve consideration.

1. The Wage-Lag Method

This method consists of correlating $U_t$ with $W_{t+1} - W_t$ and implies roughly a six months time lag in the effect of unemployment on changes in money wages. We can use
\[ U_{t+1} - U_t \text{ or } U_t - U_{t-1} \] as the relevant change in unemployment, depending on whether we wish to hypothesize no lag in the effect of changes in unemployment on wages or a one year lag. 1/

This procedure has the advantage of not requiring us to smooth any series by an averaging process; one consequence is that the use of standard significance tests is not subject to criticism on averaging grounds.

From a substantive standpoint, the appeal of the wage-lag method depends on the a priori desirability of assuming the existence of roughly a six months time lag between the level of unemployment and the corresponding change in money wages. The existence of some lag is not implausible, but whether six months is the right length is an open question.

2. The First Central Difference Method

This method consists of correlating \[ U_t, \frac{W_{t+1} - W_{t-1}}{2W_t} \]
and \[ \frac{U_{t+1} - U_{t-1}}{2} \].

The first central difference alignment procedure has the merit of avoiding the introduction of any uni-directional lead or lag into the relationships (since the measures of all three variables are centered at the mid-point of year \( t \)). However, this is accomplished by in effect introducing both a lead and a lag of a type. That is, the first central difference method implicitly introduces the assumption that wage movements in \( t-1 \) and in \( t+1 \), as well as in \( t \), are related to the level of unemployment in \( t \). While, as mentioned above, there may be an a priori case for expecting wages in period \( t+1 \) to be influenced by the level of unemployment in \( t \), it is hard to understand how one can expect wages in a previous period \( (t-1) \) to be influenced by unemployment in \( t \) -- causation cannot run backwards in time.

The kind of three-year moving average present in the first central difference method also raises serious (and highly complex) statistical problems involving the related issues of estimating the values of the correlation coefficients and their statistical significance. It is our understanding that professional statisticians are still at work on some of the basic problems, and anything purporting to be a full discussion of this general subject falls well outside the scope of the present paper. 2/

1/For reasons explained in detail in the text, we prefer to use absolute changes in the unemployment percentage rather than percentage changes. This issue is, of course, separate from the alignment problem.

2/We are indebted to Professor Frank J. Anscombe of the Princeton mathematics department and to our colleague Professor Richard E. Quandt for discussing some of these matters with us.
3. The Averaged Unemployment Method

This method consists of correlating \( \frac{U_t + U_{t+1}}{2} \), \( \frac{W_{t+1} - W_t}{W_t} \), and \( U_{t+1} - U_t \).

The averaged unemployment alignment procedure centers all three series between years. We believe this method to be superior to the first central difference method for three reasons:

1) The averaged unemployment method accomplishes the objective of centering all three series on the same point of time (as does the first central difference method) while making it necessary to average elements of only one of the two explanatory variable series (the unemployment series). The first central difference method, on the other hand, requires averaging in both the rate of change of unemployment (an explanatory variable) series and the rate of change of wages (the dependent variable) series.

2) The first central difference method requires the averaging of data coming from a three year time span, whereas the averaged unemployment method requires averaging over only a two year span.

3) In the case of the averaged unemployment method there is a correspondence among the time periods from which the three sets of data come, whereas the first central difference method draws its rate of change of wage and rate of change of unemployment figures from a three year period and the related unemployment figures from just one of the three years, thus involving more stringent assumptions concerning lead and lag relationships.

While, for the above reasons, we prefer the averaged unemployment method, we have made alternative calculations using the first central difference method. The results obtained by using both methods are presented immediately below.
C. Results of Regression and Correlation Analysis

<table>
<thead>
<tr>
<th>Periods</th>
<th>Averaged Unemployment Method</th>
<th>First Central Difference Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900-1932 (excluding 1915-1920)</td>
<td>$\dot{W} = 3.80 - .41U - .54\ddot{U}$ (0.14) (0.22)</td>
<td>$\dot{W} = 4.17 - .53U - .59\ddot{U}$ (0.10) (0.19)</td>
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<tr>
<td></td>
<td>$R^2 = .50$</td>
<td>$R^2 = .74$</td>
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<td></td>
<td>$r_{\dot{W}U} = -.61$</td>
<td>$r_{\dot{W}U} = -.81$</td>
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<td>$r_{\dot{W}U,\dot{U}} = -.52 (-.17)$</td>
<td>$r_{\dot{W}U,\dot{U}} = -.71 (-.36)$</td>
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<td>$r_{\dot{W}U} = -.56$</td>
<td>$r_{\dot{W}U} = -.70$</td>
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<td>$r_{\dot{W}U,\dot{U}} = -.45 (-.07)$</td>
<td>$r_{\dot{W}U,\dot{U}} = -.62 (-.22)$</td>
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<tr>
<td>1935-1941</td>
<td>$\dot{W} = 23.95 - 1.24U - .53\ddot{U}$ (0.41) (0.50)</td>
<td>$\dot{W} = 19.55 - .95U - .57\ddot{U}$ (0.19) (0.28)</td>
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<td>$R^2 = .82$</td>
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<td>$r_{\dot{W}U} = -.87$</td>
<td>$r_{\dot{W}U} = -.92$</td>
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<td>$r_{\dot{W}U,\dot{U}} = -.83 (-.06)$</td>
<td>$r_{\dot{W}U,\dot{U}} = -.93 (-.48)$</td>
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<td>$r_{\dot{W}U} = -.64$</td>
<td>$r_{\dot{W}U} = -.69$</td>
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<td>$r_{\dot{W}U,\dot{U}} = -.48 (+.54)$</td>
<td>$r_{\dot{W}U,\dot{U}} = -.75 (+.16)$</td>
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<tr>
<td>1948-1958</td>
<td>$\dot{W} = 7.09 - .56U - .61\ddot{U}$ (0.36) (0.22)</td>
<td>$\dot{W} = 6.11 - .28U - .87\ddot{U}$ (0.22) (0.30)</td>
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<td>$R^2 = .66$</td>
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<td>$r_{\dot{W}U,\dot{U}} = -.50 (+.20)$</td>
<td>$r_{\dot{W}U,\dot{U}} = -.40 (+.31)$</td>
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<td>$r_{\dot{W}U,\dot{U}} = -.78 (-.30)$</td>
<td>$r_{\dot{W}U,\dot{U}} = -.72 (-.17)$</td>
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(Table continues on next page; see footnote at end of table.)
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<th>Periods</th>
<th>Averaged Unemployment Method</th>
<th>First Central Difference Method</th>
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| 1900-1932 (excluding 1915-1920), 1935-1941, and 1948-1958 | $\dot{W} = 4.23 - .21U - .67\dot{U}$  
$R^2 = .43$ | $\dot{W} = 3.95 - .20U - 1.18\dot{U}$  
$R^2 = .61$ |
|                                            | $r_{WU} = -.27$  
$r_{WU}U = -.28 (.02)$  
$r_{WU}\dot{U} = -.62$  
$r_{WU}U = -.63 (.41)$ | $r_{WU} = -.32$  
$r_{WU}U = -.36 (.07)$  
$r_{WU}\dot{U} = -.71$  
$r_{WU}U = -.72 (.54)$ |
| 1900-1958 (all years included)             | $\dot{W} = 6.34 - .22U - 1.83\dot{U}$  
$R^2 = .31$ | $\dot{W} = 5.98 - .21U - 1.41\dot{U}$  
$R^2 = .35$ |
|                                            | $r_{WU} = -.17$  
$r_{WU}U = -.20 (.06)$  
$r_{WU}\dot{U} = -.53$  
$r_{WU}U = -.53 (.32)$ | $r_{WU} = -.21$  
$r_{WU}U = -.25 (.00)$  
$r_{WU}\dot{U} = -.55$  
$r_{WU}U = -.56 (.35)$ |

*The figures in parentheses are the standard errors of the regression coefficients and the 95% confidence limits for the partial correlation coefficients. For reasons hinted at in our discussion of the alignment problem, considerable caution should be used in interpreting these measures.*
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