A Helicopter Tour of Competing Theories of Wage Rigidity,
As Applied to the Great Depression

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"Nominal wages and prices came down by half between 1929 and 1933. Why would anyone look at a period like that and say that the difficult problem would be to explain rigid wages? I don't understand it."
-- Robert Lucas[1]

"Why is it that, when mass unemployment exists, unemployed workers and profit-seeking firms do not immediately arrange employment at lower wages than the prevailing ones, thus forcing the market to quickly find equilibrium? Answering the question does not seem difficult, except perhaps for economists who have acquired through their education an intellectual apparatus that they tend to apply everywhere and, therefore, sometimes in the wrong place: such behavior by firms and unemployed workers would go against social norms and would, therefore, often turn out not to be mutually advantageous."
-- Edmond Malinvaud (1984, p. 20)

I.   INTRODUCTION

The Great Depression, as the ultimate example of a persistent labor market disequilibrium in American macroeconomic history, is inevitably seen by many as the ultimate case of sticky wages. Whether one views wage stickiness as a cause or merely a symptom of the mass unemployment of the 1930s, the failure of that unemployment to exert greater downward pressure on wages is striking. The downward rigidity of wages in the Great Contraction of 1929-33, which will be this paper's primary focus, is all the more so because of the relatively "unfettered" state of the labor market at that time -- unions were weak or non-existent, and government interventions such as minimum-wage laws and unemployment insurance were notably absent. While much has changed in American labor markets since the 1930s, wages remain downwardly rigid. Modern economic theory offers a multiplicity of competing explanations of wage stickiness, and the Great Depression arguably offers a reasonable testing ground for these explanations.

That wages were sticky in the Great Contraction of 1929-33 is beyond dispute. Many large companies did not make their first nominal wage cut until mid-1931. From 1929 to June 1931, nominal

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[1] Quoted in Klamer, 1983, p. 46. "Came down by half" is, of course, an exaggeration.

average hourly earnings (AHE, the closest approximation to average wage rates that we have for that period) fell only 4.7%, despite an 11.7% drop in consumer prices and a 19.5% drop in factory wholesale prices and a rise in the nonfarm unemployment rate to 25% (for data sources, see appendix. See Table 1 for an industry-level breakdown of these changes). Even including the final two years of the Contraction, in which real wages actually did fall, the drop in nominal AHE from 1929 to their nadir in June 1933 was 23.6%, still less than the drop in either consumer prices (25.9%) or factory wholesale prices (27.0%). While such aggregates may be somewhat distorted by compositional effects, such as the supposed tendency for firms to lay off their low-paid unskilled workers first, Dighe (1997b) has demonstrated that the net effect of these various compositional biases was small, so that movements in AHE during that time do give a fair approximation of movements in actual wage rates; the picture that emerges is indeed one of sticky wages.

Of the scores of theoretical explanations of wage rigidity, this paper evaluates five general types: (1) institutional impediments to downward wage adjustments; (2) market-clearing models of the labor market (Lucas and Rapping, 1969; Bernanke, 1986); (3) efficiency wages; (4) implicit contracts; and (5) insider-outsider models. Normally the economist's preferred arena for testing competing theories is multiple regression analysis, but this approach is manifestly inadequate for testing explanations of wage stickiness, since so many of these theories do not fit neatly, and in some cases do not fit at all, into a regression framework. Examples include Keynesian relative-wage explanations, near-rationality or menu costs in wage setting, and implicit contract models that stress long-term effects on worker morale. As a result, such theories are rarely tested at all. Nevertheless, using a cross-section of 25 manufacturing industries, I have regressed the 1929-31 percent change in AHE, as well as the 1929 level of AHE, on several industry factors that bear on some, though not all, of the theories under consideration. The results are mixed but show a tendency for wages to be both higher and stickier in industries that relied heavily on short workweeks to "spread the work" -- a result that offers some support for Bernanke's 1986 model

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and implicit contract theories -- and in the two printing industries in the sample, both of which had strong unions. We also see a strong tendency for wages to be stickier in industries with more concentrated product markets. Because the regression results are *not* the heart of this paper -- with such highly aggregated data and so few degrees of freedom, and a pattern of poor fits or fragile results for the wage-changes regressions (which bear more directly on theories of cyclical wage stickiness than do the wage-levels regressions), one rightly hesitates to draw strong conclusions from them -- I have relegated them, along with some brief words on their specifications and data sources, to the appendix.

Arguably, a more thorough evaluation of these theories as they apply to the Great Depression requires making use of whatever evidence, both quantitative and qualitative, is available. Section II represents my attempt to do so. Of necessity, the data sources are far-flung. Data on hourly earnings and wage-rate changes are available from regular and special surveys by the U.S. Bureau of Labor Statistics (BLS; *Monthly Labor Review*, various issues) and the private National Industrial Conference Board (NICB, 1932, 1935, 1940; Beney, 1936). The NICB data provide further disaggregation of workers' wages, hours, and employment into three distinct occupational groups (unskilled males, skilled and semi-skilled males, females); as we shall see, this information proves helpful in evaluating certain theories. Survey evidence of company and worker motivations appear in key NICB reports on salary and wage policy (1932, 1935) and in Bakke's (1940) ethnographic study. Basic figures on union membership, strikes, and turnover are available from Wolman (1936), the BLS (1937), and Woytinsky (1942). The accounts of contemporary business consultants (e.g., *Babson's Reports* and the Taylor Society's *Bulletin*), labor publications, and researchers shed some light on these issues as well. Company archive data -- including internal correspondence of Du Pont officials and of the Special Conference Committee, an extraordinary group of a dozen of the country's largest corporations that met secretly and regularly to discuss labor issues -- provide important glimpses into what businessmen of the time were saying

privately.[2] Finally, several recent studies (Colin Gordon, 1994; Wright, 1986; Schatz 1983) provide

useful background on industry practices and policies in that era.

II.   EVIDENCE BEARING ON THEORIES OF WAGE RIGIDITY

II.A.   Institutional barriers to wage adjustment

Institutional impediments to downward wage adjustments include the usual suspects of unions,

contracts, minimum wages, and unemployment insurance, all of which have been variously cited as

important sources of wage rigidity in the modern era. All of these institutions came into great

prominence in the U.S. during the Great Depression, but only *after* the 1929-33 contraction. An

institutional force that *was* prominent in the Great Contraction, at least in the rhetoric of business leaders,

was a shift in business ideology toward avoiding nominal wage cuts because of their supposedly adverse

effect on consumer purchasing power (see O'Brien, 1989). This explanation will receive due

consideration as well.

Since the great mass of factory workers did not belong to a union, the traditional opposition of

organized labor to nominal wage cuts was irrelevant to most workers' actions. Only about one of every

ten factory workers in 1929 belonged to a union, and the Great Contraction brought union power to a

historic low by mid-1933 (Wolman, 1936, p. 227). With a few exceptions (e.g., the printing unions), the

few workers who were unionized received little more protection from wage cuts than did their

unorganized counterparts. In the NICB's 1932 survey of salary and wage policies, wage-rate reductions

were nearly as prevalent in union plants (72.7 percent of plants) as in nonunion plants (76.7 percent of

plants). The weighted average reduction was actually slightly higher in the union plants than in the

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[2] Information on the Special Conference Committee -- whose member companies were AT&T, Bethlehem Steel,
Du Pont, General Electric, General Motors, Goodyear, International Harvester, Irving Trust, Standard Oil,
Westinghouse, U.S. Rubber, and U.S. Steel -- became public only after a Congressional subpoena in the late
1930s. Ozanne (1967, 1968), Gitelman (1991), and Colin Gordon (1994) provide further details on this group.

nonunion plants (NICB, 1932a, pp. 28-29). It seems plausible that even in the effectively nonunion 1929-33 period, many employers nevertheless regarded the *threat* of unionization as a serious factor -- especially in view of the unions' rapid gains during World War I, barely a decade earlier -- and avoided wage cuts and any other behavior that might have prodded their employees into forming unions. Still, we can safely conclude that the direct effects of unions during the Great Contraction were negligible. Likewise, explicit contracts played an equally negligible role in the rigidity of wages in 1929-33, since nonunion factory workers, then as today, virtually never worked under contracts that guaranteed their wage rates over a specific duration. Thus the fixed-nominal-wage contract theories of Fischer (1977) and Taylor (1980), which have lately been invoked by Bordo, Erceg, and Evans (1997) as part of a general-equilibrium model in which sticky wages transmitted monetary shocks into the Great Depression, do not offer a plausible explanation of why wages were sticky in the first place.

Minimum wages and public unemployment insurance played even less of a role in the Great Contraction. The federal government did not impose even a temporary wage floor until the National Recovery Administration (NRA) of mid-1933 to mid-1935, and did not impose a permanent one until the Fair Labor Standards Act of 1938. The seven state minimum-wage laws during the Depression covered only women, who were only about 15-16 percent of the factory work force, and children; moreover, firms very likely violated those laws with impunity, mindful of the Supreme Court's 1923 declaration that state minimum-wage laws were unconstitutional. (The Court made the same declaration in 1936.) Unemployment insurance, which Benjamin and Kochin (1979) have cited as a cause of both high unemployment and downward wage rigidity in interwar Britain, did not exist in the U.S., even at the state level, until 1937.

In sum, the source of the wage rigidity of 1929-31 almost surely lies not in outside institutional forces, but in the individual participants in the labor market -- workers, firms, or both. O'Brien (1989) offers a novel, "behavioral" explanation of companies' reluctance to cut nominal wages in that period.

Many business spokesmen of the time rationalized downward nominal wage stickiness as a deliberate policy intended to uphold the purchasing power of worker-consumers. O'Brien is relatively unique among economists and historians in taking that purchasing-power rhetoric at face value. Working within a framework of bounded rationality, in which firms are assumed to "satisfice" rather than optimize, he contends that the severe postwar depression of 1920-22 jolted firms into adopting new policies. Wage cuts had been prompt and severe in that depression (although they were still proportionally smaller than the reduction in wholesale prices), yet profits still plummeted and business failures were rampant. In the aftermath of the postwar contraction, firms reversed course and generally adopted rigid-wage policies, with the belief that such policies, by maintaining the purchasing power of workers, would prevent or at least mitigate future depressions.

What are we to make of business support for "high wage" doctrines? I would argue that their public endorsements of purchasing-power theory were more a matter of convenience than conviction. Since the theory was a popular one, the purchasing-power explanation of rigid-wage policies had a ready audience. Alternative explanations, such as the desire to avoid price wars or preempt unions, would arguably have been poor public relations. The situation may be analogous to Henry Ford's famous decision in 1914 to raise his workers' wages to five dollars a day. Ford's equally famous rationalization -- "If they can't buy cars, I can't sell them" -- has subsequently been belied by evidence that the real intention of the pay increase was to forestall unionization (Raff, 1988). Ford, in fact, was one of the purchasing-power theory's "most articulate champions," according to Krooss (1970), who adds, "It seems likely ... that businessmen didn't really believe in the purchasing power theory" (pp. 339-340). Likewise, Soule (1947, p. 220) described business support for the high-wage doctrine as "in large measure a rationalization after the event," the event being the dramatic jump in real wages that occurred in the 1920-22 depression, when wholesale price deflation outpaced wage deflation by a considerable margin.

In addition, a potential free-rider problem looms large in O'Brien's story, as he himself

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acknowledges: a wage cut at an individual firm will in all likelihood have a negligible impact on product demand at that firm, so why not cut wages and rely on the wage-maintenance policies of other firms to maintain aggregate demand? Indeed, one contemporary researcher sardonically wrote, "The thinking of the employer group during the 'twenties might be summarized by saying that they believed strongly in other employers paying high wages" (Lescohier, 1935, p. 91). O'Brien addresses this problem by appealing to the enforcement mechanisms of public opinion (which was against wage cuts), the efforts of some large corporations to coordinate their labor policies through the Special Conference Committee, and a possible "efficiency wage" relationship between relative wages and productivity (see section II.D). Only the second of those factors, however, relates directly to the idea that companies believed that they could maintain purchasing power by maintaining wage rates; the other two are closer to morale- and reputation-based explanations of wage rigidity, such as Baily's (see section II.E). Furthermore, qualitative evidence suggests that preempting unions, rather than upholding worker purchasing power, was at the top of the Special Conference Committee's agenda and may have been the rationale for its members' rigid-wage policies in the first two years of the Great Contraction (see Gitelman, 1991, and 1992, p. 24n).

Another weakness in O'Brien's story is that vastly different economic episodes preceded the two depressions. The wage and price explosion of World War I and its immediate aftermath bore little resemblance to the remarkable wage stability of the 1923-29 period. The differing perceptions among businessmen of the need to reduce wages in the two downturns may have had less to do with a change in policy than simply a change in economic conditions. As Hicks has written, "The principal reason why wages came down so easily in the earlier case was that the rise in 1920 had been so fast that it was not believed in" (1974, p. 68). Moreover, as noted by Slichter (1929, pp. 400-401) and others, despite the widespread cutting of nominal wages in 1920-22, real product wages still rose sharply in that depression.

II.B.   Market-clearing models of the labor market: Lucas and Rapping

Market-clearing models of employment fluctuations, of which Lucas and Rapping's (1969) has

probably been the most influential, appear particularly ill suited to the Great Depression. In Lucas and

Rapping's model, labor supply is a positive function of the real wage rate, as compared with the "normal"

real wage rate that workers expect, and the expected real interest rate. A temporary fall in the real wage

or real interest rate will lead to a reduction in the quantity of labor supplied and hence a reduction in

employment. Rigidity of wages enters the picture because "our model postulate[s] lags in the adjustment

of price-wage expectations as the *only* source of 'rigidity' or of the persistence of unemployment" (Lucas

and Rapping, 1972, p. 190). Even in periods of rising real wages, such as 1929-31, workers may

misperceive that their real wage has fallen relative to its "normal" level and withdraw their labor

accordingly. (For this reason the Lucas and Rapping model is often referred to as the "misperceptions"

model.) That withdrawal of labor corresponds to a leftward shift of the labor supply curve and causes

real wages to rise, which will be observationally equivalent to wage stickiness, in the sense that nominal

wages fall less than prices.

Lucas and Rapping tested their model with data for 1930-65 but did not explicitly mention the

Great Depression until their 1972 paper, which was essentially a reply to Rees's (1970) criticism that

their model carried "monstrous" implications for the Great Depression.[3] The two authors conceded that

their model did not provide a good explanation for the labor market patterns of the 1934-40 period, when

nominal wages and prices and returned to their pre-Depression levels, but they claimed success for the

1929-33 contraction.

Taking their model and regression estimates at face value, however, one would conclude that

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[3] Lucas and Rapping countered that they believed "the assumption that the labor market has cleared has no
implications, in itself, for cyclical policy." Somewhat startlingly, in view of Lucas's later reputation, they also
wrote: "The only aggregative economic policy implications we see for events like the Great Depression are the
standard ones: if possible, avoid the aggregate-demand shifts which cause them; failing this, pursue corrective
demand policies to make them as brief as possible" (1970, p. 187).

unemployment and real wages rose in the 1929-33 period because workers supplied less labor but that their withdrawal of their labor had nothing to do with misperceptions of the real wage. They provide a table of wage, price, and unemployment rates during the depression and state that "money wages and prices fell noticeably below their 'normal' levels in 1930, fell further below in subsequent years, and remained below through 1933" (1972, p. 189), but they fail to note that the ratio of actual to "normal" real wage rates, both of which rose, was essentially unchanged during the 1929-33 period. (This point follows up a suggestion made in Rees's [1972] second rejoinder). In fact, that ratio was slightly higher in 1930 and 1931 than in 1929; plugging the numbers from their table into their estimated regression equation, as they do, the predicted increase in the unemployment rate comes solely from the changes in the price level. In fact, the cumulative effect of workers' errors in estimating the "normal" real wage is to *lower* the predicted unemployment rate in 1933 by about 1.5 percentage points.

That leaves workers' misperceptions of the real interest rate as the reason for the leftward shift in the labor-supply curve. According to Lucas and Rapping's estimates of the "normal" price level, which were generated according to an adaptive expectations model and with a Koyck transformation, workers overestimated the "normal" (and hence the future) price level and therefore underestimated the real interest rate. Even if one accepts Lucas and Rapping's unusually high estimates of the elasticity of the supply of labor with respect to the real interest rate, the likelihood that workers failed to perceive the drastic price deflation of the Great Contraction seems scant. *Ex post* real interest rates in that period, as Bernanke (1986, p. 81) points out, were the highest of the century. From simple models of price expectations, Cecchetti (1992) has concluded that the deflation of that period could have been anticipated.[4]

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[4] The same criticism applies with nearly equal force to Darby's (1976) attempted resurrection of the Lucas-Rapping model for the 1930s. By substituting annual FTE earnings for hourly earnings as the measure of the wage, Darby obtains a regression result for 1930-41 that he says vindicates the Lucas-Rapping model. But once again virtually all of the variation in unemployment is due to variations in the real interest rate. The coefficient on the real-interest-rate regressor (log P/P*, where P* is the "normal" level of prices expected to prevail in the

Lucas and Rapping's emphasis on the notion that the money wage fell below its "normal" level from 1930-33 seems more consistent with Lucas's "islands" model (1972), in which agents misperceive changes in the absolute price level as changes in their relative prices, than with the Lucas and Rapping model, in which workers do know the current real wage. Could workers have simply mistaken the 1929-33 decline in money wages for a decline in real wages? Any claim that they did requires that workers be even more mistake-prone than in the adaptive-expectations structure in Lucas and Rapping's 1969 paper, in which the estimated "normal" real wage tracks the actual real wage quite closely.

The most controversial aspect of Lucas and Rapping's model is of course its very assumption that workers voluntarily withdrew their labor. Lucas and Rapping stated that they did not consider the distinction between voluntary and involuntary employment to be important (1969, p. 724n); that non-distinction is akin to some other market-clearing models of the labor market, which treat quits and layoffs as equivalent, under the assumption that a laid-off worker could keep his job if he accepted or offered to work at a lower wage. Thus the high layoff rates and extremely low quit rates of the early 1930s would not necessarily refute such models. But these assumptions are grossly at odds with the abundant anecdotal accounts of involuntary separations and sustained job search (see, for example, Terkel, 1970). Moreover, Bakke's (1940) ethnographic evidence on unemployed workers in the 1930s directly contradicts Lucas and Rapping's story that unemployed workers had left their jobs to search for better-paying jobs or had left the labor force altogether. "At the 6-months period half of the skilled workers and two fifths of the others had definitely decided they would have to be satisfied with lower wages. After the passage of 12 months 85 of every 100 of the workers unemployed this long had decided they would have to 'take anything'... " (Bakke, p.239).

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future) is more than eight times that of the wage regressor (log W/W*), which is not even statistically significant (t=0.48).

II.C.   Bernanke's "reservation level of utility" model

Like Lucas and Rapping, Bernanke (1986) attributes the 1929-31 rise in real wages to the supply

side of the labor market.[5] In Bernanke's model, fluctuations in output and employment are partly

exogenous to the labor market, yet the labor market "clears" in the sense that workers receive their

reservation level of utility, which depends positively on real weekly earnings and negatively on the

number of hours worked.[6] (Note that, since weekly earnings is the product of hourly earnings and

weekly hours, we could equivalently state that utility depends positively on both weekly earnings and

hourly earnings.) The number of employees and the length of the workweek enter Bernanke's production

function as separate inputs, because "employers are not indifferent between receiving one hour of work

from eight different workers and receiving eight hours from one worker" (p. 91). Diminished product

demand will typically necessitate both layoffs and reductions in the length of the workweek. Except at

very high levels of weekly earnings, the elasticity of labor supply with respect to weekly earnings is less

than one, so employers will be unable to cut weekly wages in proportion to the fall in weekly hours. The

result is that real hourly wages rise. Real wages need not be countercyclical all the time in Bernanke's

model, however, because unemployment and declining outside opportunities for work -- i.e., in the

"secondary sector" -- will lower the equilibrium reservation utility level.

Thus Bernanke explains the rise in real hourly wages in 1929-31 as follows: Firms responded to

declining demand by laying off workers and shortening the work week. In reducing their payrolls they

faced a labor-supply constraint, in that they could not have reduced weekly wages in proportion to the

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[5] Bernanke says in a footnote, however, that he does not attribute the record unemployment of the Great
Depression to labor-supply fluctuations (p. 83n). Specifically, he says his view is that "it was the monetary and
financial collapse of 1930-33 that gave the depression its unusually severe character" (p. 84).

[6] A semantic aside: The assumption that workers are compensated according to their reservation wage or
reservation utility level does not necessarily mean that all of the unemployment is voluntary. If workers have
identical utility functions and there is a decrease in labor demand, the unemployed workers would be willing to
work at the equilibrium reservation level of utility, thus they are involuntarily unemployed. This point is
analogous to the discussion of flat-labor-supply-curve theories in Rees (1970).

reduction in weekly hours and still managed to attract enough workers. (Although Bernanke assumes workers are heterogeneous in their preferences, he also assumes that their individual reservation utilities are unknown to the firms and that their productivities are identical, with the result that the firm must make the same offer to all workers.) The high and rising unemployment of that period provided downward wage pressure on the hourly wage, but that pressure was evidently not strong enough to offset completely the upward wage pressure of lower weekly earnings. So, by Bernanke's model, real hourly earnings rose in 1929-31 precisely *because* real weekly earnings fell. Conversely, the decline in real wages from mid-1931 to mid-1933 must have meant that the downward pressure of unemployment had become relatively stronger.

Bernanke's model has much to recommend it. The assumption that workers are not free to vary their weekly hours in response to changes in the real wage is institutionally realistic. The corollary assumption that workers are more concerned with weekly wages than with hourly wages also seems true-to-life. As *Babson's Reports* stated at the time, "What concerns the worker today is not his paper wage rate, but how much money he gets in his pay envelope" (April 27, 1931, p. 2). Among the NICB's 25 manufacturing industries, the variation in the 1929-31 decline in weekly earnings is much smaller than the variation in the decline in hourly earnings. The coefficient of variation of the decline in weekly earnings from 1929 to June 1931 was 57 percent, whereas the corresponding figure for the hourly earnings decline was 121 percent. Firms that had sharply reduced weekly hours found it harder to reduce hourly wages, and vice versa. The negative correlation between the 1929-31 percent changes in weekly hours and nominal AHE is considerably larger in magnitude (-.35) than the correlation between the 1929-31 percent changes in nominal AHE and employment (-.003) or total man-hours (-.14), suggesting that there was more to the tendency of work-sharing and sticky-wage policies to be mutually reinforcing than just the usual inverse relation between wages and the quantity of labor demanded. In fact, among the 16 NICB industries for which data on wholesale prices were available for this period, we actually observe a

positive, albeit statistically insignificant, relation between the 1929-31 percent changes in real product AHE and the percent change in any of the following measures of labor input: total man-hours, employment, or average weekly hours. While wage stickiness probably did exacerbate employment losses at the industry level, its effect appears to have been swamped by others, especially that of varying product-demand declines by industry (see Table 2).

In addition, the model gives a reasonable, though likely incomplete, explanation of why firms resorted to work-sharing as well as layoffs. Bernanke's explanation of work-sharing is that it was done on "static efficiency grounds" (Bernanke, 1985, p. 15). But Feldstein (1967), whose production function Bernanke cites as a forerunner of his own, estimated that the elasticity of output with respect to hours was not only greater than the elasticity of output with respect to employment, but was also greater than one. In other words, by Feldstein's estimates, reductions in weekly hours would be damaging to productivity, and more so than layoffs would. In addition, institutional factors seem to have played an important role in the rise of work-sharing policies. Although such policies had been a feature of previous downturns, firms relied on them to a greater extent in 1929-33 than before. For example, in the 1920-22 depression the decline in employment was faster, and the decline in weekly hours slower, than in the Great Depression (Beney, 1936, pp. 44-46). "Share-the-work ... became a low-key employer crusade" in the early 1930s (Bernstein, 1960, p. 479) and commanded the support of many labor and citizen's groups as well. Bernanke admits that simulations of his model fail to predict the unusually great extent of work-sharing in the automobile and steel industries in 1932 (1986, p. 102). In his 1989 paper with Parkinson, he says firms at that time may have feared that excessive layoffs might have brought "pressure for some sort of company-sponsored unemployment compensation" (p. 213).

On the minus side, as with Lucas and Rapping's model, Bernanke's seems at odds with the mass of anecdotal evidence of legions of unemployed who said they would work for next to nothing. Even if such statements were exaggerated, it is hard to believe that the firms could not have reduced nominal

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hourly wages by an extra ten percent (which, at any point in the Contraction, would have brought the real

hourly wage below its 1929 level) and still attracted the desired number of workers. There had to be

some reason why employers didn't cut wages and hire people from the crowds of workers standing

outside the factories each morning, and Bernanke doesn't provide one. Bernanke assumes that workers'

reservation utilities do not reflect any differentials in productivity -- in fact, in his model all workers are

equally productive -- so adverse-selection considerations (as in Weiss's model of efficiency wages) do

not come into play here.

More concretely, the assumption that workers were receiving their reservation level of utility --

and were therefore indifferent between working in the primary and secondary sectors -- seems

inconsistent with the large numbers of strikes in response to wage cuts. Why would workers bother to

strike over wage cuts instead of just quitting? Wage cuts triggered more than 1,200 strikes, involving

over 425,000 workers, in 1929-33 (U.S. BLS, 1937, pp. 61-62), whereas if there were any instances of

quits due to wage cuts, they do not seem to have been reported anywhere. Quit rates during the 1930s

were the lowest of this century, and many recorded quits were not even truly voluntary. As Woytinsky

(1942) explained:

> "It should be kept in mind that the quit rate includes, in addition to voluntary quits in the exact sense of
> this term, miscellaneous separations caused by death, superannuation or sickness, shifts from an
> employee to an independent status, or withdrawals of married women from the labor market.... Together
> with separations caused by sickness, family conditions, etc., the total monthly rate of 'miscellaneous'
> separations may be conservatively estimated at from 0.5 to 0.6 per cent of the working force.... *This
> means that there was practically no voluntary turnover of labor in 1932 and only a feeble trace of it in
> 1931 and from 1933 to 1935"* (p. 54; emphasis added).

The fact that so many workers incurred the costs of striking instead of just picking up and leaving when

firms announced wage cuts suggests a revealed preference for their primary-sector jobs, i.e. these workers

were not indifferent between the two sectors, and they were being compensated above their reservation

utilities.

The variation across industries is more than the model can explain, as is evident from the results

of two-stages least squares regressions that Bernanke performs in support of his model. He estimates

labor supply (or "earnings") equations and labor demand equations for each of eight NICB industries for

the 1923-39 period. One somewhat puzzling result is that the estimated elasticities (of both employment

and hours) in his earnings equations show considerable variation across industries. (That result is

consistent with the fact that workers in some industries clearly fared better during the 1929-31 period

than those in other sectors. Average weekly earnings fell less, and average weekly hours more, in the

meat packing and leather tanning and finishing industries than in the boot and shoe industry, even though

the decline in employment, which tends to force the equilibrium reservation utility level down, was

slightly greater for meat and leather workers than for shoe workers. Among all 25 NICB industries, there

are many more such cases in which the decline in weekly earnings was smaller and the decline in weekly

hours greater for the average worker in one industry than for the average worker in another industry,

despite similar or smaller employment declines in the second industry.) Why is the supply of labor so

much more elastic in some industries than in others?

Some of the variation may arise from differences in work conditions. One would expect the

supply of labor to be less elastic in industries where the marginal disutility of work is particularly high

(due to heat, risk of injury, etc.), since a greater increase in wages would presumably be necessary to

attract additional workers or induce existing workers to work longer hours. Another possibility, which to

me seems more promising, is that workers were typically *not* on their labor supply curves (i.e.,

unemployment was involuntary and the labor supply curve was not flat) and that what appear to be

differences in labor supply elasticities in fact represent differences in industry wage policies. Bernanke

in fact makes a suggestion along these lines for the automobile industry, whose estimated labor supply

elasticities are the farthest apart from the others (1986, pp. 100-101).

Thus Bernanke's model, as Bernanke himself admits, fails to offer explanations for "such

phenomena as the long queues at employment offices and the extreme reluctance of the employed to

leave their jobs" (1986, p. 87n). Bernanke notes in a footnote that combining his model with a general

efficiency wage hypothesis could remedy those defects. While such a hybrid model would still be

dangerously close to a voluntary-unemployment explanation, Bernanke's idea that worker utility depends

on weekly, not just hourly, earnings seems a useful addition to any theory of 1930s labor markets.

II.D.   Efficiency wages

II.D.1. General comments

At first glance, the applicability of efficiency wage theories to Depression labor markets seems

rather limited. Most theories of efficiency wages offer explanations of why real wages are set above

market-clearing levels (and thus offer an explanation of classical unemployment), but they do not require

that real wages be rigid in the face of rising unemployment or declining consumer prices. In the

"shirking" model proposed by Shapiro and Stiglitz (1984), for example, unemployment acts as a worker-

discipline device, so a cyclical increase in unemployment provides an extra measure of discipline and

causes the equilibrium real wage to fall. Likewise, in Salop's (1979) turnover model and Weiss's (1990)

adverse-selection model, quit rates fall when labor-market conditions slacken, also causing the

equilibrium real wage to fall.[7] Even if we assume that workers' propensities to shirk or quit are wholly

independent of labor-market conditions, we still need a rationale for that assumption, which economic

theories of efficiency wages -- that is, the shirking, turnover, and adverse-selection models -- do not

provide. Sociological or "normative" theories of efficiency wages, such as Akerlof's gift-exchange

model (1982, 1984), seem better equipped to explain such behavior. In addition, efficiency wage theories

deal with real wages, not nominal wages, whereas nominal as well as real wage rigidity seems to have

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[7] Weiss's original model (1980) does not directly address the issue of how the efficiency wage would change in
response to changes in labor-market conditions, but as long as workers' potential earnings in the nonindustrial
sector vary at all with the state of the economy, then so will the efficiency wage paid by firms in the industrial
sector.

been present in the 1929-33 period. We need to be able to explain why so many firms kept hourly money-wage rates unchanged through mid-1931 despite steadily falling consumer prices.

Stiglitz (1986) notes two ways in which nominal wage rigidity could be an implication of efficiency wage models. Both are special cases that seem to violate the New Keynesian dictum that all actions be grounded in optimizing behavior; still, if they accurately describe and predict labor-market outcomes, that ought to be enough to elevate them into the first rank of competing theories of wage rigidity. The first involves a situation in which worker effort depends on the relative, not absolute, level of the real wage. The inspiration is, of course, Keynes's (1936) assertion that workers are more concerned with their relative wages than with their real wages, and therefore more attentive to money-wage changes than to real-wage changes. Any of the canonical efficiency wage theories -- shirking, turnover, adverse selection, or morale -- could easily be combined with the relative-wage assumption. Summers (1988) and Layard, Nickell and Jackman (1991, 1994) provide examples of such models. In the face of a general decrease in the demand for labor, even if accompanied by a drop in consumer prices, so long as "each firm believes that all others are going to leave money wages unchanged, it would not pay any firm to change its (money) wage" (Stiglitz, p. 192). In a decentralized system of wage setting, such an outcome would appear highly probable. I evaluate this theory in light of the available facts on Depression-era labor markets later in this section.

The second way in which nominal wage rigidity could be a by-product of efficiency wages, according to Stiglitz, relates to considerations of morale, as in Akerlof's gift-exchange theories and earlier explanations by Slichter (1929) and Dunlop (1938). If workers tend to be fixated on money wage rates rather than real wage rates, even if that fixation is irrational, "it pays for firms to reflect those irrationalities in their wage-setting policies" (Stiglitz, p. 192). That is, they should not cut wages if the payroll savings of a prospective wage cut are smaller than the expected loss arising from reduced productivity and other adverse effects.

A third possibility, not mentioned by Stiglitz, is that nominal wage rigidity could arise from "near-rationality" in wage setting, when the efficiency wage under normal conditions is the interior solution to an optimization problem (Akerlof and Yellen, 1985). In that setup the loss to firms from failing to adjust wages in response to aggregate demand shocks is sufficiently small that many do not bother to do so. If there are adjustment costs (analogous to "menu costs") of changing wages, then even fewer firms will change wages in response to demand shocks. These three possibilities will be considered in turn.

Before diving into an assessment of efficiency wage theories in the context of the Great Contraction, we should recall that even as real hourly earnings rose in that period, real *weekly* earnings fell, on account of work-sharing policies that sharply reduced the length of the workweek. Real weekly earnings began declining almost immediately after the stock-market crash of 1929; from the spring of 1930 through mid-1932, they fell fairly continuously, bottoming out at about 70 percent of their 1929 level and not returning to their 1929 level until well after the Great Contraction (see Figure 1). In fact, as is clear from Figure 1, variations in real weekly earnings moved almost in lock-step with variations in weekly hours and hardly at all with variations in real hourly earnings. If, as seems likely, workers were more concerned with their real weekly wages than their real hourly wages, then the focus of efficiency wage models on "the real wage" needs to be modified somewhat to reflect the divergence between hourly and weekly earnings, as in Bernanke's labor-supply model.[8] The near-continuous decline in real weekly earnings during 1929-33 suggests that the steadily worsening economic conditions *did* force the (weekly) efficiency wage downward, and rather quickly at that. The key questions then become: Why were the work-sharing policies adopted in the first place? Did they create an obstacle to nominal wage stickiness,

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[8] The cyclical divergence of real hourly earnings and real weekly earnings is not really an issue in the post-World War II United States, since the phenomenon of work-sharing has largely disappeared. Carter and Sutch (1992, p. 11) speculate that the demise of work-sharing policies is traceable to the advent of government-provided unemployment insurance.

and how big an obstacle was it? And, as before, why didn't the dismal economic conditions drive down weekly and hourly wages even further?

The preceding paragraph is not meant to imply that weekly wages should be the sole focus of discussion, for it is clear that nominal hourly wages figured prominently in the thinking of workers and firms as well. When industrial and banking leaders debated the desirability of wage cuts in the early 1930s, they were referring to hourly wages, not weekly wages, which had already been cut. The BLS and *Babson's Reports* published monthly tables of hourly wage-rate changes, while not bothering to report changes in weekly hours, at the establishment level. Strike data from 1929-33 suggest that workers accepted the inevitability of cuts in weekly wages but had a decided preference that those cuts be accomplished through work-sharing rather than through wage-rate reductions (just as in Bernanke's model, in which reductions in work time partially compensate for reductions in weekly wages. In addition, work-sharing policies, unlike wage cuts, did not involve an obvious transfer from worker to employer). While strikes over wage cuts were not uncommon, strikes in protest of shortened workweeks either did not occur at all or occurred too infrequently to attract attention. A BLS tabulation (1937, p. 61) found that "Hour decrease" was the cause of only 16 of 1,291 wage and hour strikes in 1930-32; moreover, if past experience, such as the campaign for the eight-hour day, was any guide, many if not most of those strikes were *for* shorter hours in firms where workweeks remained long, not against shorter hours in firms that had cut them. The NICB, in a report on *Shorter Work Periods in Industry*, said the shorter work schedules had not aroused "general protest, either because curtailment was recognized as unavoidable or because it was understood that the shorter work schedule would make possible the employment of some who were without jobs or income" (1932b, p. 7).

II.D.2. The Relative-Wage Variant of Efficiency Wages

As noted above, the relative-wage assumption provides a means by which economic theories of

efficiency wages (e.g., shirking, turnover, adverse-selection) can yield nominal wage rigidity. Unfortunately, however, the relative-wage assumption is at odds with some key empirical regularities of American labor markets in the first third of this century. First, not only were industry-level hourly wage differentials in 1929 much wider than can seemingly be explained by compensating differentials or human capital differences (refer to the wage-levels regressions in the appendix), but those differentials widened, at least for factory workers, in 1929-31 and 1929-33. If workers resisted cuts in their wages relative to workers in other industries, that resistance was unsuccessful for a great many of them.

Second, the belief that workers do not resist (or notice?) real wage reductions due to inflation finds little empirical support. Patterns of strike activity and union strength and decline indicate that workers were very attentive to changes in the cost of living and were willing to fight for cost-of-living increases. While it is possible that workers respond asymmetrically to real wage reductions due to *modest* rates of inflation and reductions due to *modest* nominal wage cuts, wage strikes and union growth during World War I and its immediate aftermath provide evidence that workers strongly resisted the erosion of their real wages by rapid price increases. Even the relatively moderate inflation of 1933-37, in which consumer prices rose at an annual rate of just 2.6 percent, apparently provoked a number of strikes for wage increases, independent of the explosion of strikes for union recognition at that time (U.S. Bureau of the Census, 1975, Series E 135; U.S. BLS, 1937, p. 61). The union growth in World War I and the mid-1930s seems to have been aided by the inflations of those periods: Cooper (1932) drew a line of causation from "substantial increases in the cost of living" to the growth of unions and claimed, "It had been this spur in past experiences more than any other which induced wage earners to turn to labor organization as a means of more rapidly overtaking mounting living expenses." Cooper added that the weakness of the labor movement in the prosperous 1920s resulted in large part from the near-perfect stability of consumer prices, which combined with modest increases in nominal wage rates to yield higher real wages (p. 648). Several other researchers -- notably Perlman and Taft (1935, p. 581,

Woytinsky et al. (1953, p. 286) and Bernstein (1960, p. 89) -- have echoed that assessment. A final point to consider is that, even in the mildest of inflations, surely *some* workers receive cost-of-living increases -- if relative wages are the issue here, why wouldn't the workers whose nominal wages are unchanged agitate for a cost-of-living increase in their wages, so as to maintain their relative wages?

II.D.3. Morale-Based Models of Efficiency Wages

Like other efficiency wage models, gift-exchange theories and other morale-based models of efficiency wages do not offer an independent explanation of cyclical or nominal wage rigidity. Even if the efficiency wage is invariant to labor market conditions, as in Solow (1979) or Akerlof and Yellen (1990), declining consumer prices such as those of 1929-31 should result in nominal wage reductions. "Plausibly, however, the level of nominal wages perceived to be fair does not rapidly change in proportion to shifts in nominal aggregate demand" (Akerlof and Yellen, 1990, p. 281); likewise, the perceived "fair wage" may react sluggishly to changes in the price level. If we expand the model so that workers are concerned not only with fairness but also with their standard of living, then the nominal hourly wage rate that is perceived to be fair may adjust even more sluggishly to declining outside opportunities and declining prices. If employers respond to a decline in demand by cutting back weekly hours to the point that real weekly pay falls, then workers will tend to view nominal wage cuts as not only unfair but also as a further diminution of their standard of living. If the pronouncements of organized labor were at all reflective of the thinking of ordinary workers on this issue, then this view seems close to the mark. In an editorial opposing wage cuts, the *American Labor Legislative Review* wrote in September 1931, "Labor officials claim that although there has been a decrease in the cost of living this advantage to the laborers has been more than offset through losses due to unemployment and part time work" (p. 362). Of course, we still need an explanation for the hours cutbacks, which are *not* among the predictions of efficiency wage theories. For now, however, let us compare the predictions that

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morale-based models of efficiency wage models do make against the experience of the Great Depression.

Akerlof and Yellen (1990) claim that their fair wage-effort model explains two empirical regularities of modern-day labor markets: wage compression, by which low-skill workers earn more relative to high-skill workers than they would under perfect competition (and consequently have higher unemployment rates), and the strong positive correlation between industry profits and industry wage levels. Those regularities seem to have been present in the interwar era as well. Among the NICB's 25 manufacturing industries, pairwise correlations between the 1929 AHE levels of the different occupational groups (skilled and semi-skilled males, unskilled males, and females) are positive and at least weakly significant in all cases (see Table 3). If we drop the three industries in which the skilled and semi-skilled workers were unionized and apparently commanded union wage premiums, the correlation between the AHE of unskilled males and skilled-and-semi-skilled males is .76, which is significant at a one percent error level; the correlation between the AHE of females and skilled-and-semi-skilled males drops somewhat, but remains significant at a 10 percent error level. Thus we find some support for the prediction that wage premiums for skilled workers in an industry carry over to less-skilled workers in that industry. The prediction that more profitable industries pay higher wages seems to be borne out as well. In the wage-levels regressions in table A-2, in four different specifications, the coefficient on "margin," a variable that provides a rough proxy for industry profit rates (as well as capital intensity), is consistently positive and significant.

Also in keeping with the predictions of the fair wage-effort model, companies seem to have tried not to upset the established wage differentials within their establishments. In that model selective wage cuts would be damaging to workers' notions of internal wage equity and hence to their work effort. By contrast, turnover models of efficiency wages and implicit contracts (e.g., Okun's "toll" model -- see section II.E) imply that the wages of skilled and semi-skilled workers' should have been more resistant to cuts than those of unskilled workers, who were, by definition, instantly replaceable, in the sense that their

jobs required no training. Yet when wage cuts did come in the early 1930s, they tended to be general

reductions affecting all or almost all wage earners in a company. Among plants that made reductions, the

average proportion of employees affected was 97.5 percent, according to the NICB's survey (1932a, pp.

15, 48). Moreover, across-the-board reductions of a constant proportion seem to have been most

common. "The popular thing seems to be ... a flat reduction of 10%," noted *Babson's Reports*

(September 7, 1931, p. 1). Judging from the NICB's rhetoric, morale considerations seem to have been

paramount in the tendency to make flat-rate wage reductions. In a later survey they commented, "When

reductions in compensation scales were being made very generally, the flat percentage policy was widely

used because it created an appearance of impartiality and sharing alike in the effects of a necessary but

unpopular policy" (1935, p. 17).

Reductions in executive salaries tended to precede and be somewhat larger than general wage

cuts. The Conference Board proudly stated:

> "The attitude of management during this depression seems to have been, not what compensation
> reduction can most easily be made, but rather how can necessary payroll economies be accomplished
> with the least hardship for all concerned. Evidence seems to indicate that this attitude of management
> has been recognized and understood by the employed personnel, and that probably never before has the
> lowering of compensation scales been accompanied by so little resentment and feeling of injustice."
> (NICB, 1932a, pp. 38, 48.)

Although those claims may have been somewhat exaggerated, since wage earners, who were typically

paid on an hourly or piece-rate basis, had already experienced reductions in real weekly wages due to

shorter workweeks, salary reductions probably sent an important signal to the workers that the firm was

under severe cost pressure and made wage cuts more palatable.[9] *Babson's* echoed this view, stating that

"there has been less serious industrial strife during the present depression than in any previous one"

(January 11, 1932, p.1).

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[9] Companies appear to have been mindful of this caveat. For example, an internal Du Pont memo, stamped May
23, 1933, acknowledged that wage earners had suffered more than salaried workers had: "At all plants and to
some extent in the main offices salaried employes realize that wage employes have had both wage reductions and
reduced working schedules and therefore have been harder hit than salaried employes" (memo from William B.
Foster to Willis Harrington, Hagley Library, Accession 1813, Box 15).

The NICB data on average hourly earnings offer some support for the generalization that wage cuts tended to be flat-rate reductions. As noted in Dighe (1997b), at the aggregate level the percent changes in the AHE of the three individual occupational groups in the Conference Board wage series -- skilled and semi-skilled males, unskilled males, and females -- were approximately the same in the 1929-33 contraction, as well as in the 1933-37 recovery and the 1937-39 recession. The percent changes in the three groups' AHE were especially close in the two years from June 1931 to June 1933, "when reductions in compensation scales were being made very generally," just as the NICB claimed.

The industry-level data offer more mixed support for the claim that wage reductions tended to be flat-rate reductions. The 1929-33 declines in the AHE of the two male groups were within five percentage points of each other in 18 of the 25 NICB industries. On the other hand, there was little tendency for the AHE declines of male and female workers to be close to each other. In the 22 NICB industries that employed female workers, the AHE decline of females was within five percentage points of the corresponding decline for skilled-and-semi-skilled males in 14 cases and within five percentage points of the decline for unskilled males in 10 cases. Still, many of the exceptions to the flat-rate-reductions policy seem to be "exceptions that prove the rule." As Jacoby (1985, p. 217) writes:

> "Not all firms made across-the-board reductions. Rather, at the behest of top management, companies in the automobile, tire, and other industries made selective cuts, giving concessions to key groups (usually skilled workers) and seriously upsetting customary wage differentials. Though done to minimize the risk of labor disturbances, *this move left less skilled workers feeling that wage cuts had been carried out inequitably, a charge that would return to haunt management in later years.*" [Emphasis added.]

The electrical manufacturing industry seems to provide another example. In that industry the 1929-33 declines in AHE were 17.9 percent for skilled and semi-skilled males, 13.7 percent for unskilled males, and 24.5 percent for females. The unequal reductions may have been part of what Schatz (1983) describes as the industry's "tendency to revert to crude methods of labor management" during the Depression (p.62). As a result of such policies, Schatz writes, "nearly every worker felt aggrieved for one reason or another" (p.106). Perceived inequities in wage cutting in 1929-33 by the top firms in these

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industries may well have contributed to the successful formation of unions at all of those companies in the late 1930s.

II.D.4. Menu Costs or "Near-Rationality" in Wage Setting

The menu-cost or near-rationality variant of efficiency wages predicts that wages will be sticky both downward and upward. Yet employers in the 1920s and 1930s appear to have faced little barrier to upward wage adjustments. BLS data on wage-rate changes in 1928-30 reveal an apparent 10 percent threshold for nominal wage cuts yet no corresponding threshold for nominal wage increases, many of which were under five percent (Daniel Mitchell, 1985, p. 270). The dramatic jumps in nominal hourly earnings in the summer months of 1933, which are paralleled by record numbers of wage increases reported by the BLS and *Babson's Reports*, provide another example. The minimum-wage requirements of the National Industrial Recovery Act were probably the dominant factor behind those increases, but in a 1935 NICB survey of 805 companies a substantial minority of them gave reasons other than mere compliance with the NIRA for the increases.[10] Moreover, the recovery from the 1920-22 depression, at a time when minimum wages and other government interventions were conspicuously absent, also saw a spate of wage increases. The BLS reported hundreds of wage-rate increases in the final months of 1922, and the NICB's measure of AHE rose nearly 15 percent between July 1922 and July 1923.

II.E. Implicit contracts

As with efficiency wage theories, the standard models of implicit contracts deal with real rather

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[10] Among those reasons were "Good policy to avoid unrest" (227 mentions), "Improved financial condition of company" (141 mentions), "Collective bargaining negotiation" (79 mentions), "Increased value of employees" (33 mentions), and "Good policy to pay as high wages as possible" (25 mentions). "Desire to cooperate with N.R.A." (369 mentions), which the NICB described as essentially voluntary in many instances, and "Code requirements" (359 mentions) were by far the most frequent reasons given, however. Eight hundred and five firms were surveyed. The firms were, evidently, allowed to mention more than one reason.

than nominal wage rigidity. These models have not been in vogue for several years now; Stiglitz's (1986, p. 192) declaration that the implicit contract model "has had a long, but sad, history" is typical of the type of dismissals that these models receive today. While the basic implicit contract model with risk-averse workers and risk-neutral firms explains few of the phenomena of Depression-era labor markets, with the notable exception of work-sharing, some of the more recent variants of that model, particularly those with morale as an enforcement mechanism and informational asymmetries, do a good deal better.

In the most familiar implicit contract models (Azariadis, 1975; Baily, 1974; Donald Gordon, 1974), workers are assumed to be risk-averse and firms risk-neutral. The former assumption appears to be highly realistic, the latter less so. Bakke's (1940, p. 67) survey of workers found them to be decidedly risk-averse. "Second only in importance to the amount of wages is their regularity," Bakke wrote. When asked if they would prefer high but irregular wages or lower but regular wages, 90 out of every 100 workers "voted unhesitatingly for the latter" (p.67). The industry-level data, however, do not support the key prediction of these models that firms that pay stable wages will pay wages that are lower on average. In the 1929-33 contraction, the rigid-wage industries tended to be the ones that were paying *high* wages in 1929 (see Dighe, 1997b, pp. 94-97). Whatever benefits accrued to firms that paid stable wages, lower average wage rates were not among them. As for firms' attitudes toward risk, interview evidence collected by Bewley (Chapter 7, forthcoming) indicates that modern firms behave as if they were highly risk averse. The reluctance of 1920s and early 1930s firms to produce for inventories (O'Brien, 1987, pp. 373-379) also seems to argue against the assumption of risk-neutral firms.

A common criticism of the implicit contract model is that it fails to explain why workers would prefer stable wage rates with fluctuating employment to stable employment with fluctuating wage rates. After all, a risk-averse worker should prefer a fractional cut in pay to the 100 percent cut in pay that a layoff brings (assuming realistically that neither a new job nor the "dole" is readily available and that severance pay is either minuscule or nonexistent). That criticism, however, assumes that workers

perceive that wage cuts actually *will* preserve their jobs, an assumption that does not seem warranted for the 1930s. One of the traditional arguments of English trade unions in opposition to wage cuts was that such cuts "have never been of any benefit to ... working men, for they have not increased the volume of employment" (Dunlop, 1938, p. 423). American workers, though mostly unorganized, likely held the same belief. *Babson's Reports*, which by mid-1931 (if not earlier) clearly did believe that wage cuts would preserve jobs, repeatedly cautioned employers that they must carefully explain the positive consequences of wage cuts for employment and weekly hours to their workers, who presumably were either skeptical of or oblivious to the curative effects of wage cuts. Workers' apparent disbelief that wage cuts would preserve jobs and hours appears to have been well founded, at least to the extent that such cuts would not preserve very many jobs. At the industry and firm level, declines in employment and man-hours were primarily a function of the distress level of the industry or firm, not of the degree of wage stickiness. The NICB (1932a, pp. 15-16, 51) found that employment losses between 1929 and 1932 were considerably larger -- in fact, twice as large[11] -- at firms that had cut wages than at firms that had not cut wages. Wage cuts at those firms likely prevented those employment losses from becoming even greater, but such cuts were clearly of no more than second-order importance in determining the volume of employment at those companies. Bernanke's (1986) estimations of labor-demand functions for eight of the NICB industries in 1923-39 yield a similar result. Although the estimated elasticities of employment and hours with respect to real product AHE have the expected negative sign for all but one industry, the employment elasticity is only a fraction of the industry-output elasticity in all eight

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[11] The NICB reported that the percentage decline in employment was 14.7 percent at firms that had not cut wages and 26.6 percent at all firms. Since the figure for all firms is a weighted average of the employment declines at firms that did cut wages and at those that didn't, we can compute the former by solving for X in the following equation:

$$26.6\% = 14.7\%(675,884/3,258,666) + X\%(2,582,782/3,258,666),$$

where the weights in parentheses are the respective employment shares of those two types of firms in 1929. Solving, we find that X = 29.7%.

industries and is statistically insignificant in half of them. The hours elasticity is also lower than the

industry-output elasticity in all eight industries, though not quite to the same degree.[12] Small wonder,

then, that at the industry level the simple correlations of the 1929-31 percent change in real product AHE

with the 1929-31 percent changes in employment, man-hours, and weekly hours are all positive.[13] In the

endogenous relationship between wage rates and employment, the effect of low employment levels in

compelling wage cuts is apparently much stronger than the effect of wage cuts in promoting employment.

Akerlof and Miyazaki (1980) have criticized the implicit contract model on similar grounds,

demonstrating theoretically that firms can exploit workers' risk aversion by keeping both employment

and wages stable in exchange for an even lower average wage. One could extend that criticism to show

that firms could also keep weekly hours stable in order to pay a still-lower average wage. Obversely,

firms where the "wage bill" or payroll is particularly variable must compensate by paying a higher wage.

The positive but negligible coefficient on the variability of the industry's payroll in the wage-levels

regressions in Table A-2 provides little support for that prediction. A doubling of the detrended standard

deviation of an industry's payroll from the average level is predicted to raise hourly earnings in that

industry by, at most, barely one cent.[14] My guess is that workers recognized that guarantees of

employment or total income were beyond their employers' capacity to provide. As Baily (1980, p. 129)

notes: "If a firm in durable goods manufacturing were to maintain a full-employment level of output in a

recession, it would have to cut its price to the point at which marginal revenue product was very low,

perhaps zero, perhaps even *negative*." Another possibility is that the firm could produce for inventories,

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[12] Then again, the small labor-demand elasticities may arise from the fact that the data are monthly, as Bernanke himself suggests, or from the specification of industry output as an exogenous, rather than endogenous, explanatory variable.

[13] Those correlations are, respectively, .31, .28, and .19.

[14] To be fair, the purpose of Akerlof and Miyazaki's paper was not to claim that their "wage bill argument" accurately depicted industry behavior, but rather to demolish the claim that implicit contract theories provided an explanation of layoffs.

but firms seem to have increasingly abandoned that practice in the 1920s, as mentioned earlier. Instead, some fluctuations in employment were (and still are) a virtually inevitable result of fluctuating demand, and both parties took that as a given. Valuing employment ahead of high weekly wages, workers readily accepted work-sharing policies. Skeptical that hourly wage cuts would do anything but reduce their weekly wages further, they opposed such cuts. Thus the focus of implicit contract models on wage rates seems appropriate.

Implicit contract models rarely mention work sharing (and, when they do, often assume it away), perhaps because work sharing is so uncommon in the postwar United States, yet work sharing as a response to cyclical slumps is in fact a logical result of these models (Stiglitz, 1986, p. 178), as long as firms are sufficiently risk-averse that they will want to reduce their payrolls when demand slackens, and is one important aspect of the Great Depression that these models do a particularly good job of explaining. Risk-averse workers should prefer short-time work schedules to the risk of being laid off altogether. As mentioned in the previous section, work-sharing policies in the Depression did not arouse general protest, as workers apparently believed that such policies lived up to their name. The results of simple regressions of the 1929-31 percentage change in employment on the 1929-31 percent changes in physical output, average weekly hours, and either nominal or real product AHE[15] in the NICB industries provide some limited support for that belief. The estimated relation between the percent changes in weekly hours and employment is negative, albeit statistically insignificant (see Table 2). It is still considerably larger than the near-zero coefficient on the percent change in AHE, suggesting that work sharing did more to stanch the flow of layoffs than did wage cuts. Granted, all three of those explanatory variables are endogenous, a defect that is hard to remedy given the lack of available and appropriate

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[15] I replaced the percent change in real product AHE with the percent change in nominal AHE in the second specification as a crude test of the argument of some classical economists, notably Pigou, that nominal wage reductions pave the way for recovery not by causing real product wages to fall but by causing prices to fall, thereby stimulating product demand.

instruments, so we should not regard their estimated coefficients as anything more than merely suggestive. Although work-sharing policies seem to have had only modest success in stanching the flow of layoffs, those policies were popular with the general public, who may have expected more from them than they actually delivered or may simply have been grateful for the limited number of jobs that they did preserve.

Sticky-wage policies seem to have been implicit contracts in a more general sense than in the original risk-shifting model. Namely, workers and firms seem to have had an implicit understanding that wages would not be cut as a first resort during business slowdowns, and firms seem to have perceived sticky-wage policies as somehow being in their long-term interest. Whether worker opposition to wage cuts was a matter of shielding themselves from risk or simply avoiding reductions in their standard of living is not terribly important here. Since the pecuniary benefit to firms of sticky-wage policies apparently did not take the form of lower average wages, we need a theory that offers an alternative rationale for those policies. More recent theories of implicit contracts, to which we will now turn our attention, emphasize reduced turnover and improved morale. As Baily (1983, p. 59) puts it, "The basic message of contract theory is that a policy of aggressive wage cutting is not used because of its effects on morale and reputation."

In Okun's (1981) "toll" model, turnover costs give rise to long-term attachments between firms and workers, enforced by an implicit contract between the two parties. In the presence of such turnover costs, decisions such as wage cuts may be profitable in the short run but not in the long run. If workers regard wage cuts as a violation of their implicit contract, then workers whose pay has been cut in a recession may desert the firm in droves when outside conditions improve. The specter of quits and hence of higher toll costs in the future tends to make the contract self-enforcing.

Okun's emphasis on turnover costs seems inappropriate for the Great Contraction, since the wages (as proxied by AHE) of unskilled workers were just as downwardly rigid as those of the harder-to-

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replace, longer-tenured skilled and semi-skilled workers. This point has already been noted in the previous section. In the wage-changes regressions in Table A-1, the coefficient on the percentage of unskilled males in a given industry consistently has the "wrong" sign, implying that wages fell *less* in industries with a high proportion of unskilled male laborers, and is statistically insignificant.   Moreover, it is unclear whether turnover of semi-skilled workers, who constituted the bulk of the factory work force, was all that costly in the first place. That issue is in fact a highly contentious one between labor historians and economic historians, with the former tending to argue that the spread of mass-production technology resulted in a "deskilling" of factory labor that made turnover costs negligible and the latter tending to argue that technological factors had the opposite effect of making human capital more firm-specific and thereby raising turnover costs. The evidence is decidedly mixed.[16]

Some other recent implicit contract theories view employee morale and effort as the means of enforcing such contracts. In the models proposed by Newbery and Stiglitz (1987) and Bull (1987), firms that renege on their implicit contracts will incur a bad reputation and be punished by withdrawals of effort by current and future workers. In contrast to efficiency wage theories in which effort depends on the wage level, effort in these models may depend on a whole range of factors, including the maintenance of nominal wage rates, and the costs of diminished effort extend beyond a single time period. Quantitative estimates of morale and effort are not available, but morale-based explanations of wage rigidity find reinforcement in a variety of qualitative data from the interwar period as well as the present. Interviews with pay setters in the U.S. (Bewley, 1995 and forthcoming; Blinder and Choi, 1990) and Britain (Kaufman, 1984) reveal a strong aversion to nominal wage cuts based on the perception that such cuts would be damaging to employee morale and effort. Both Bewley and Kaufman recount that

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[16] Wright (1987, pp. 324-327) presents a good summary of the two opposing camps and offers a partial review of the evidence. For an example of the "deskilling" point of view, see Raff (1988, pp. 390-391). For an example of the view that capital and skilled labor were complements in interwar manufacturing, see Owen (1991, pp. 112-118).

employers said workers would view pay cuts as an affront. Informational asymmetries regarding worker performance play an important role in withdrawals of effort, since monitoring is imperfect and many aspects of employee cooperation are unobservable. During the interwar period, the pioneering field studies of employers and employees by Mathewson (1931) and Bakke (1940) also found evidence that disgruntled workers could and would exact revenge on their employers. "It don't pay to be too nasty with your men," a worker told Bakke, "because when they get out from under your eye, then believe me, they do you dirt" (p. 73). Mathewson likewise found that aggrieved workers tended to restrict output, and in particular, "[w]hen they are not receiving the wage they think fair, they adjust their production to the pay received" (p. 118). In interviews with about 65 executives, a majority stated that restriction of output was not a serious problem at their plants, and executives in that group "also stated that it was not the practice of their concerns to cut rates" (p. 137). Slichter (1929, p. 432) said that managers in the mid-1920s avoided wage cuts despite a drop of more than 10 percent in nonagricultural wholesale prices in part because "of the fear that wage cuts would destroy the good will which has been built up at considerable trouble and expense." Business consultants such as Roger Babson and members of the Taylor Society -- as well as Frederick Taylor himself, the founder of the scientific management movement -- repeatedly warned that wage cuts would do long-term damage to employee morale and productivity. Internal documents of the Special Conference Committee stress the importance of the "cooperative" approach to labor-management relations and inveigh against wage cutting.

In sum, implicit contract theories, like efficiency wage theories, seem to do best when they emphasize employee morale as a force inhibiting pay cuts. The long-term focus of implicit contract models aids their applicability, since withdrawals of effort arising from a company's violation of its implicit contract by cutting wages in a recession will be relatively unimportant in the short term, when

demand is low and additional production is relatively unprofitable[17], and more damaging in the longer

term when economic conditions improve. Contract theories based on risk-shifting are contradicted by the

tendency for rigid-wage industries to pay higher hourly wages and by evidence that firms were not risk-

neutral. On the other hand, the prevalence of work-sharing in the Great Contraction is consistent with the

assumption of risk-averse workers and does not require risk neutrality on the part of firms, since work-

sharing policies, unlike policies of maintaining constant employment levels or constant payrolls, did not

pose an obvious danger to firms' financial positions.

II.F.   Insider-outsider models

Insider-outsider models attribute wage rigidity to the successful efforts of incumbent workers, or

"insiders," to maintain their wages at the expense of unemployed job seekers, or "outsiders," who would

work for less. These models are attractive in that they offer explanations not only of why companies do

not cut the pay of existing workers but also why they do not adopt two-tier wage scales. Temin (1989,

1990, 1994) has recently championed the insider-outsider model as an explanation of the surge in real

wages during the New Deal years of 1933-40. In particular, writes Temin, the 20 percent increase in

nominal wages in the NRA's first year (1933-34) reflects rent-seeking behavior by insiders and the

exclusion of outsiders from the wage-setting process (1990, pp. 302-303).

In standard insider-outsider models, the sources of the insiders' hegemony are the prohibitively

high costs of replacing them and their unwillingness to cooperate with low-paid new hires. Because of

these turnover costs and the need for their cooperation with new recruits, the insiders possess

considerable market power, which they use to set their wages above market-clearing levels. The presence

of unemployed outsiders will fail to exert downward pressure on wages because a wage cut would induce

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[17] Woytinsky et al. (1953, p. 283) note that even the total withdrawal of effort associated with a strike is not
particularly costly during a depression, since "[a]n employer who has few orders on file can afford to bide his time
until the union is exhausted."

many insiders to quit, taking their valuable firm-specific human capital with them; those that stayed would harass the new recruits. Two-tier wage scales would likewise be self-defeating for the firm, because the insiders would fear their eventual replacement by their lower-paid new co-workers and would once again withhold their cooperation. Even in a cyclical downturn, be it foreseen or unforeseen, "the insider wage may respond little, if at all, because a wage drop is not in the interest of the majority of insiders. Consequently, workers are laid off" (Lindbeck and Snower, 1988, p. 225). If insiders know that the firm will lay off workers on, say, the basis of efficiency (as survey evidence suggests was the case in the Great Contraction [NICB, 1932a; Bakke, 1940]), then a majority coalition of the more efficient workers will oppose a wage cut.

However helpful these models may be in explaining modern phenomena such as hysteresis in European unemployment, they contribute little to our understanding of the wage rigidity of the Great Depression. The historical evidence on the shaping of the NRA codes directly contradicts Temin's claim that "[u]nder the NRA wages were set to serve the interests of those already employed" (1990, p. 303). In fact, the role of incumbent workers in shaping the NRA industry codes was surprisingly minimal. Despite President Roosevelt's famous rhetoric about bringing industry, labor, and government together under the banner of the NRA, industry dominated the writing and administration of the NRA codes (Broadus Mitchell, 1947, pp. 238-243; Colin Gordon, 1994, pp. 171-178). Nonunion workers, who comprised more than 90 percent of the factory work force, had no voice in the code-making process. In industries that had no effective union -- that is, basically every manufacturing industry except printing and some lines of clothing -- "labor gains in the code were confined to the mandatory ones" -- a minimum hourly wage of 40 cents, shorter workweeks, and compensatory increases in hourly wage rates so that weekly wages would be no lower than before (Broadus Mitchell, 1947, pp. 240-241). The higher wages that the NRA brought arguably had less to do with insider power than with the government's insistence on raising "purchasing power," which was stated in the preamble of the President's

Reemployment Agreement of July 1933 (also known as the "blanket code"). In addition, some industry leaders favored minimum wages as a deterrent to price competition and as an attack on their low-wage competitors (Colin Gordon, 1994, pp. 184-186; Wright, 1986, pp. 216-221).

In addition, insider-outsider models, like the turnover-based variants of efficiency wage and implicit contract theories, hinge upon prohibitively high costs of replacing one's workforce. Thus the instantly replaceable unskilled workers should have had the least ability to maintain or raise their wages. (Granted, it is likely that not all unskilled workers were instantly replaceable, despite the NICB's definition of an unskilled occupation as one that requires no experience or on-the-job training whatsoever. Laborers of superior quality -- for example, the strongest, most reliable, and most motivated -- may have been hard to replace. Still, the unskilled workers had by far the highest turnover rates to begin with [Woytinsky, 1942, p. 23], so it is difficult to believe that their turnover was prohibitively costly in general.) Yet in the 1933-37 recovery, the AHE of unskilled males advanced at about the same rate as those of skilled and semi-skilled males. This was true in both the NRA period from July 1933 to May 1935, when the code minimums directly affected many unskilled males but hardly any skilled or semi-skilled males, and the 1935-37 period when the unions scored their most famous victories. And in the 1929-33 and 1937-38 contractions, the average nominal AHE decrease was only about one percentage point greater for unskilled males than for skilled and semi-skilled males (Beney, 1936, pp. 54-55; Sayre, 1940, p. 118). The other alleged source of insider power, their harassment of new recruits after a wage cut, is less testable but seems irrelevant to the Great Contraction. Recall from the previous section that the apparent pattern of wage cutting in the Contraction was that firms cut wages because they were in deep distress and needed to cut costs, not because they wanted to expand employment. The firms that cut wages during 1929-32 experienced greater declines in employment than the firms that did not.

III.   CONCLUSION: A MODEL FOR ALL SEASONS?

After comparing six basic explanations of downward wage rigidity, I find the least support for labor-supply and turnover-based explanations of that rigidity, and the most support for theories that emphasize worker morale. Such morale-based theories are by no means new -- Slichter (1929) described the morale-productivity link as the reason why employers avoided cutting wages in proportion to falling prices, and Hicks (1932) attributed downward wage rigidity to "employers' perception that a reduction in wage-rates is likely to impair efficiency by worsening their relations with their men" (p. 136; quoted in Hanes, 1991, p. 82). Formalizations of this insight add little value, since key concerns like morale and reciprocity are difficult to model in an optimizing framework. As Bewley (forthcoming, section 3.1) has written:

> "It is hard to imagine making a mathematical model of behavior that would capture the aspects important for wage rigidity, for these have to do with conflicting motives and inclinations, such as generosity and selfishness, purposeful self-control and giving into temporary emotion, and understanding and denial of unpleasant facts or refusal of disagreeable choices" (p. 4).

My own earlier attempts to derive a result from a formal model of the interrelationships of wage levels, wage changes, weekly hours, and employee morale and productivity proved fruitless, since any model that contains the essential elements of these interrelationships is inevitably so complex as to be unwieldy. Thus the theory that I would advance, and have advanced at more length in Dighe (1997a), is an informal one.

In this theory, workers oppose nominal wage cuts for (mostly) rational reasons -- namely, the adverse effect of wage cuts on their standard of living -- and firms avoid such cuts as potentially damaging in the long term to employee morale and productivity. Workers and firms are both risk-averse, so if workers perceive hours reductions as job-preserving, then firms may adopt work-sharing policies in periods of slack product demand so as to minimize effective labor costs by easing workers' concerns about their job security. If workers do not perceive wage reductions in the same light, as appears likely, they will resist cuts in nominal hourly wages. When wage cuts do occur, they occur not in response to a slack labor market but because of intense pressure on company profit margins, usually brought on by

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calamitous declines in product demand and product prices; that pressure eventually overwhelms the firm's natural risk aversion, causing it to view the benefits of a wage cut, which by this point may include the very survival of the firm, as outweighing the present value of the reduction in marginal value product associated with demoralized workers in current and future periods. The resulting shift in the firm's decision-making is analogous to the old saw, "Desperate times call for desperate measures."

Thus "a model for all seasons," in Robert Solow's memorable phrase (also quoted in O'Brien, 1989) is probably too much to hope for as an explanation of why companies are so reluctant to reduce nominal wages in periods of recession and depression. Informal morale-based theories of wage rigidity, however, do appear consistent with the behavior of wages, hours, and employment, and also with the public and private comments of contemporaries, in that quintessential episode of wage stickiness, the Great Contraction of 1929-33.

Table 1

25 Manufacturing Industries (NICB), in Ascending Order of the 1929-31 Percent Change in AHE

===========*Percent change from 1929*===========

| Industry | Nominal AHE | | Real product AHE | | Worker-hours | Weekly hours |
	June '31	June '33	June '31	June '33	June '31	June '31
Boot & shoe	-12.4%	-17.3%	-1.6%	2.8%	-6.1%	6.6%
Lumber & millwork	-12.2%	-34.0%	20.2%	-8.1%	-45.8%	-3.5%
Heavy equipment	-9.5%	-21.1%			-57.6%	-19.5%
Silk	-8.9%	-31.3%	79.8%	56.1%	-32.5%	-13.2%
Cotton (North)	-8.7%	-25.6%	33.4%	9.5%	-23.7%	-6.0%
Hosiery & knit goods	-7.9%	-37.0%	36.3%	9.5%	-19.5%	-8.6%
Leather tanning,	-6.7%	-24.6%	20.3%	14.9%	-19.4%	-1.7%
Chemical	-6.2%	-19.0%	11.3%	3.5%	-23.1%	-10.5%
Furniture	-6.2%	-35.4%	-0.7%	-16.4%	-50.2%	-21.1%
Iron & steel	-6.0%	-31.1%	6.8%	-14.2%	-48.9%	-22.4%
Printing: news.	-5.0%	-18.2%			-11.7%	-4.2%
Rubber	-4.4%	-14.7%	13.3%	15.9%	-31.2%	-0.9%
Other foundries ...	-3.9%	-22.9%			-49.3%	-28.5%
Hardware & small parts	-3.4%	-21.6%			-47.4%	-23.3%
Paint & varnish	-2.5%	-11.6%	15.7%	16.7%	-27.0%	-11.6%
Electrical manufacturing	-2.2%	-18.5%			-50.4%	-25.9%
Wool	-1.2%	-26.1%	28.3%	-5.2%	-20.2%	-6.2%
Automobiles	-0.5%	-17.1%	11.3%	0.3%	-42.8%	-17.7%
Paper & pulp	-0.3%	-24.3%	9.8%	-8.4%	-28.3%	-16.5%
Agricultural implements	-0.2%	-20.4%	4.6%	-5.3%	-77.1%	-30.6%
Machine shops	-0.1%	-16.4%			-56.6%	-25.1%
Foundries	0.6%	-23.5%			-54.9%	-30.0%
Paper products	0.8%	-17.5%			-24.2%	-5.9%
Meat packing	1.0%	-21.6%	54.5%	63.2%	-18.5%	-4.0%
Printing: book & job	4.0%	-9.5%			-19.4%	-7.6%
All 25 (weighted mean)	-4.7%	-23.6%	18.5%	4.6%	-38.3%	-14.5%
All 25 (unweighted	-4.1%	-22.4%	21.5%	8.4%	-35.4%	-13.5%
Standard deviation	4.3%	7.0%	20.7%	21.8%	17.3%	10.2%
Coefficient of variation	104%	31%	97%	259%	49%	75%

Data sources: AHE, worker-hours, weekly hours: Beney/NICB, 1936. AHE figures are with constant (1929) weights for occupational groups. Wholesale prices: BLS (see Appendix).

Table 2

Did Work-Sharing Policies Live up to Their Name?

Dependent Variable: Percent Change in Employment, 1929-June 1931

Independent variables	(1)	(2)
Percent change in physical output	0.72 (4.79)	0.71 (4.66)
Percent change in weekly hours	-0.22 (0.71)	-0.19 (0.54)
Percent change in real product hourly earnings	-0.0082 (0.08)	--
Percent change in nominal hourly earnings	--	-0.075 (0.17)
Constant	-0.085	-0.086
N	16	19
Adjusted R^2	.75	.73

t-statistics in parentheses.
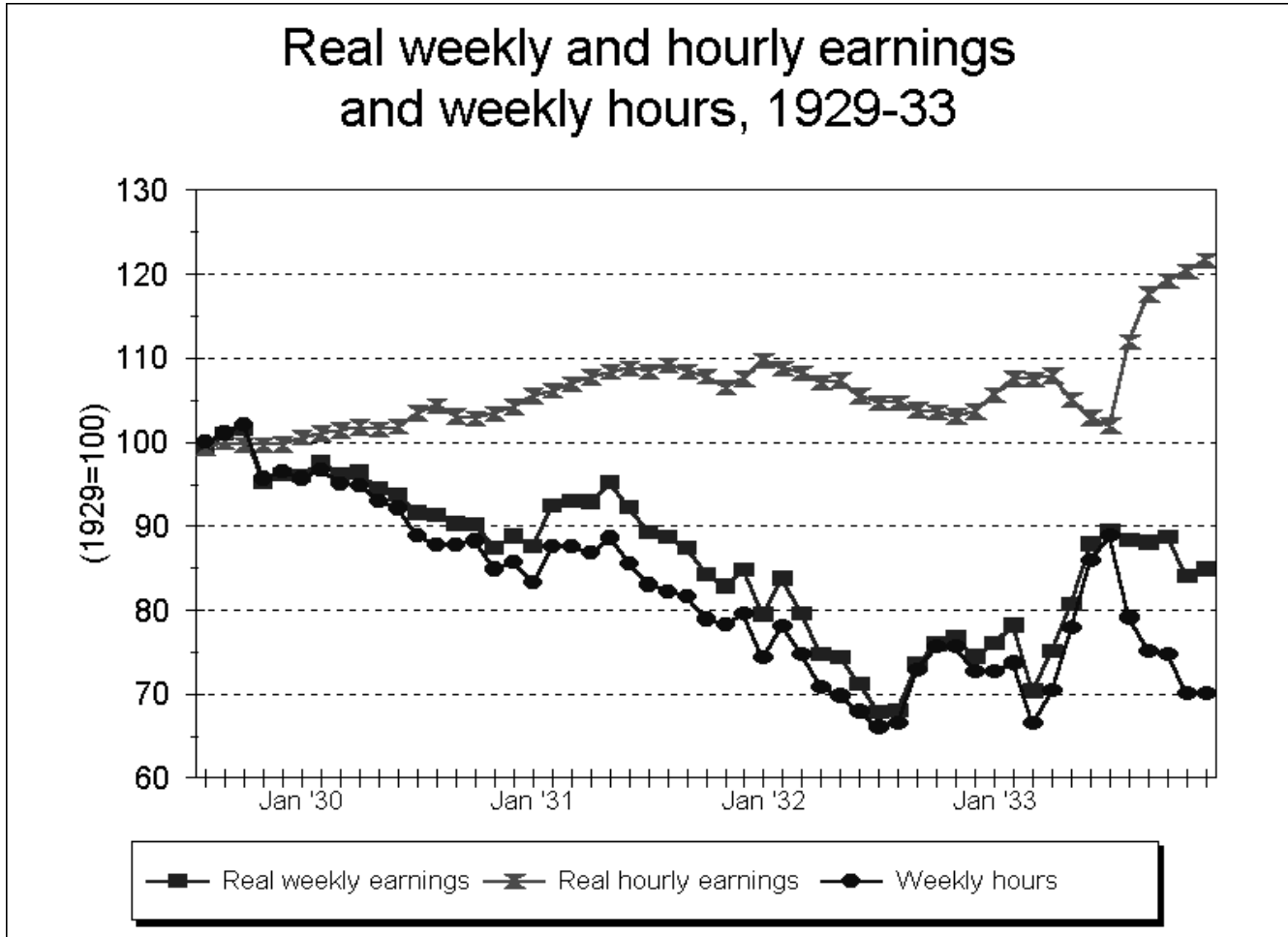
Data source: See appendix.

Table 3

Correlations Between Average Hourly Earnings of Different Occupational Groups, 1929
(t-statistics, followed by p-values, from bivariate regressions in parentheses)

	Skilled and semi-skilled males	Skilled and semi-skilled males*	Unskilled males	Females
Skilled and semi-skilled males	--	--		
Unskilled males	.24 (1.18) (.25)	.76 (5.29) (.00)	--	
Females	.50 (2.56) (.02)	.41 (1.86) (.08)	.40 (1.94) (.07)	--

* Excluding the relatively unionized printing and hosiery industries.

Data source: Beney/NICB, 1936.

Figure 1

Real weekly and hourly earnings and weekly hours, 1929-33

Sources: Earnings and hours -- Beney/NICB, 1936; CPI -- BLS with NICB interpolations.

Appendix: Data Sources and Regression Analysis

Data sources

      The **accident rate** variable was the number of accidents -- deaths plus permanent and temporary disabilities -- in 1929 for every 1,000,000 man-hours worked. The source was "Accidents in Selected Manufacturing Industries, 1926 to 1929," pp. 295-313 of U.S. BLS (1931).

      The **average company size**, defined as the number of employees per company, came from the 1929 figures in Table 2 of NICB (1932a). The sample size in this study was slightly smaller, and the companies were somewhat larger, than in the plant-level study in Beney (1936), but in general the two samples correspond fairly closely.

      Data on **wages and materials, fuel, and electrical costs as a share of value product** came from the 1929 Census of Manufactures. The industry **"margin" as a share of value product** was computed as a residual (i.e., 1 - share of wages - share of materials, et al.). I also obtained average factory sizes (workers per establishment) for each industry, but I did not use these in the final regressions. The 1929-31 decline in nominal **value added**, which I used as an instrument for the 1929-31 decline in weekly hours in two specifications, came from the Census of Manufactures as well.

      The ultimate source of data on **average hourly earnings, weekly hours, percent female, percent unskilled, employment, and total worker-hours** was Beney (1936), Tables 2-30. In all of the tables in this paper, I have computed the overall percent changes in AHE using constant (1929) weights for each of the NICB's three occupational groups (skilled-and-semiskilled males, unskilled males, and females) for the post-1929 data. I obtained the 1923-29 percent change in payroll, the 1929-31 percent change in weekly hours, and the average weekly hours in 1929 directly from those tables. I computed the percent unskilled males and the percent female from the AHE data in the same tables, according to the formula described in the appendix to Dighe (1997b). I computed the 1929-31 **extent of work-sharing**, defined as the proportion of the 1929-31 decline in total man-hours that was accounted for by the decline in the average workweek, by breaking down the decline in total man-hours into the decline in employment and the decline in average weekly hours, according to the equation below:

      $\log(\text{Total Man Hours}_{\text{June 1931}}) = \log(\text{Employment}_{\text{June 1931}}) * \log(\text{Average Weekly Hours}_{\text{June 1931}})$,
in which total man-hours, employment, and average weekly hours were indexes (1929 = 1). Then I divided the log of average weekly hours by the log of total man-hours to get the extent of work-sharing. For the one industry (boots and shoes) in which average weekly hours actually rose in 1929-31, I coded the extent of work-sharing as zero; its value would otherwise have been -1.0155.

      I computed the **variability of payroll** as the standard deviation of the linearly detrended index of total man-hours, during the twenty-four months of 1927 and 1928. I chose 1927-28 because it was a relatively stable period. The trend lines were calculated from OLS regressions of the monthly payroll on a monthly trend term.

      The earliest available industrial **concentration ratios** are for 1935 and were calculated by the National Resources Committee for the Roosevelt Administration. The concentration ratios cover each of the 275 industries in the Census of Manufactures. Clearly the Census industries are far more disaggregated than the 25 NICB industries, but matching the two was fairly straightforward. (The matching algorithm is available upon request.) This particular concentration ratio is the percent of value of products manufactured by the industry's eight largest producers. The source is Table II (pp. 248-259) of the National Resources Committee (1939).

      Data on **physical output** in 1929 and 1931 were available for 19 of the 25 NICB industries. For the five "Foundry and Machine Shop" industries and electrical manufacturing, these data were unavailable. The data for agricultural implements, hosiery and knit goods, and paints and varnishes came from Solomon Fabricant's *Output of Manufacturing Industries: 1899-1937* (New York: NBER, 1940). The data on the rest came from the August 1940 *Federal Reserve Bulletin*.

The **union** variable is a dummy for the two printing industries and the hosiery and knit goods industry, which were the only three of the 25 NICB manufacturing industries with any appreciable degree of unionization.

Wholesale price indexes for 16 manufacturing industries, as well as a composite index for the manufacturing sector, came from the BLS. Monthly price indexes for the following industries are from U.S. BLS (1946): manufactured products; agricultural implements; auto tires and tubes (as a proxy for rubber, since tires and tubes were by far the largest of the rubber-goods industries); cotton goods; furniture; hosiery and underwear; iron and steel; leather; lumber; meats; paint and paint materials; paper and pulp; shoes; silk; woolen and worsted goods. The price index for motor vehicles (automobiles) appeared only in annual form; following the lead of Bernanke (1986), I interpolated monthly estimates in proportion to fluctuations in the monthly wholesale price index of the "All metals and metal products" group (U.S. BLS, 1931, p. 585, and 1936, p. 680). The chemicals price index is from the two above-mentioned BLS bulletins, pp. 587 and 681, respectively.

Regression specifications

The regressions use the 25 NICB industries as their samples. The first set of regressions use the 1929-June 1931 percent change in AHE as the dependent variable, because this variable touches upon all three dimensions of wage cutting: severity, extent, and speed. Expected coefficient signs are: concentration ratio, +; wages' share of product, - (because a firm in which wages account for a high proportion of total costs will realize greater cost savings from a wage cut); materials' share of product, + (because a big drop in these costs, which was the general rule during 1929-33, would provide a materials-intensive firm with a partial financial windfall); average company size, + (according to theories that claim that workers in large firms are better able to mount collective action against wage cuts -- see Hanes, 1991); union, +; percent change in weekly hours, - (since work-sharing policies had already reduced the workers' standard of living and may therefore have stiffened workers' resistance to wage cuts); extent of work sharing, + (for the same reason); percent change in AHE, 1923-29, + (if wage setting exhibited substantial inertia and depended on past industry wage trends); percent unskilled males in 1929, - (if unskilled workers' wages were easier to cut, as turnover-based theories of wage rigidity imply).

The second set of regressions uses the 1929 level of AHE as the dependent variable. The rationale for these regressions is that (1) high-wage and rigid-wage policies appear to have had a common origin, as noted in Dighe (1997b); and (2) the cross-industry variation in wage *levels*, rather than wage *changes*, seems to bear more directly on efficiency-wage and various other theories of unemployment, which seek to explain why wages are set above market-clearing levels in the first place, not why they don't decline more in recessions. Expected coefficient signs are: wages' share of product, - (as above); average company size, + (based on a commonly observed pattern); union, +; "margin" as share of product, + (out of the belief that more profitable firms can afford to pay more and because more capital-intensive firms should have more productive workers); percent unskilled males and percent female, - (because these groups are low-paid); accident rate and variability of payroll, + (as compensating differentials).

Specifications (4), (5), and (6) in Table A-1 and specifications (3) and (4) in Table A-2 are robust regressions, to compensate for the small sample sizes. The weights used are a combination of Huber weights and biweights, as suggested by Li (1985) and written into an algorithm by Hamilton (1991). It is described in detail in Appendix 3.2 of Dighe (1997a).

Summary of regression results

Cross-sectional analysis of nominal AHE changes in 1929-31 and nominal AHE levels in 1929 suggests that some of the same factors, notably short workweeks and possibly unions, that contributed to wage stickiness in the first two years of the Great Contraction were also associated with high initial

levels of wages. In addition, wages were decidedly stickier in imperfectly competitive industries.
Theories of wage determination that emphasize rent-sharing or ability-to-pay receive mixed support: a
low share of wages in value product and a high industry "margin" are associated with higher wage levels,
though not with greater wage stickiness, and a high share of materials in value product is associated with
greater wage rigidity in the final, tightest-fitting wage-changes regression. Large companies tended to
pay higher wages but also to have exhibited a greater tendency to cut wages; the latter tendency
contradicts theories that emphasize the threat of collective action at large firms but is consistent with the
pattern of the 1890s depression, as described by Carter and Sutch. Theories emphasizing turnover costs
as a source of wage stickiness receive no support, since nominal AHE were no more flexible in industries
with a high proportion of unskilled workers -- the group whose turnover was by far the least costly --
than in other industries. The industry-level trend of wages during the preceding period of expansion does
not appear to be an important predictor of wage changes in the 1929-31 contraction.

Cross-Sectional Regressions: Nominal Wage Flexibility by Industry

Dependent Variable: Percent Change in Average Hourly Earnings, 1929-June 1931

Independent variables	(1)	(2[IV])	(3)	(4)	(5[IV])	(6)
Eight-firm concentration ratio	0.0010* (1.76)	0.0011* (1.80)	0.0014** (2.45)	0.0011 (1.72)	0.0012* (1.91)	0.0018** (3.44)
Wages as share of value of products	-0.018 (0.08)	-0.0099 (0.04)	0.15 (0.67)	-0.0077 (0.03)	0.0046 (0.02)	0.57** (2.35)
Materials as share of value of products	0.036 (0.36)	0.019 (0.17)	0.048 (0.48)	0.043 (0.38)	0.038 (0.35)	0.28** (2.23)
Average company size (no. of wage earners)	-4.44e-06 (1.17)	-4.07e-06 (1.04)	-4.98e-06 (1.33)	-4.70e-06 (1.11)	-4.80e-06 (1.22)	-8.17e-06** (2.27)
Union (0-1)	0.087* (1.88)	0.083* (1.76)	0.067 (1.50)	0.090 (1.72)	0.089* (1.88)	0.13** (2.86)
Percent change in weekly hours, 1929-June 1931	-0.18 (1.72)	-0.13 (0.84)		-0.20 (1.69)	-0.19 (1.22)	
Extent of work sharing			0.13* (1.96)			0.22** (3.34)
Percent change in AHE, 1923-29	-0.15 (0.90)	-0.14 (0.89)	-0.11 (0.69)	-0.17 (0.92)	-0.17 (1.05)	0.082 (0.48)
Percent unskilled males in 1929	0.10 (0.93)	0.12 (1.00)	0.10 (0.98)	0.10 (0.82)	0.11 (0.93)	0.026 (0.25)
Constant	-0.13	-0.13	-0.20	-0.14	-0.14	-0.44
N	25	25	25	25	25	24
F	1.31 (p=.31)	1.01 (p=.46)	1.46 (p=.25)	1.20 (p=.36)	1.28 (p=.33)	2.94* (p=.03)
Adjusted R^2	.09	.08	.13	--	--	--

t-statistics in parentheses (unless otherwise indicated).
* Significant at 10% error level. ** Significant at 5% error level.
[IV] These specifications use two-stage least squares, with instruments for the 1929-31 percent change in weekly hours (see footnote 7).
The mean values (and standard deviations) of the variables are: percent change in AHE, -0.041 (0.043); concentration ratio, 40 (24); share of wages, 0.19 (0.064); share of materials, 0.49 (0.14); size of company, 1733 (2930); Union; 0.12 (0.33); percent change in weekly hours, -0.14 (0.10); extent of work-sharing, 0.31 (0.15); percent change in AHE, 1923-29, 0.076 (0.073); percent unskilled, 0.20 (0.098).

Table A-2

Cross-Sectional Regressions: Wage Levels by Industry

Dependent Variable: Average Hourly Earnings in 1929

Independent variables	(1)	(2)	(3)	(4)
Wages as share of value of product	-0.30** (2.48)	-0.27** (2.26)	-0.31* (2.02)	-0.28** (2.13)
Average size of company (number of wage earners)	7.96e-06* (2.01)	8.07e-06** (2.43)	7.81e-06 (1.58)	8.09e-06** (2.20)
Union (0-1)	0.17** (5.28)	0.14** (4.72)	0.17** (4.28)	0.14** (4.24)
"Margin" as share of value of product	0.25** (2.29)	0.30** (3.11)	0.25* (1.84)	0.30** (2.89)
Percent unskilled males	-0.28** (2.47)	-0.19* (1.97)	-0.28* (2.04)	-0.18* (1.75)
Percent female	-0.41** (2.96)	-0.39** (5.53)	-0.41** (2.36)	-0.39** (4.98)
Accident frequency rate	0.00066 (0.54)	--	0.00068 (0.50)	--
Average weekly hours	-0.0098* (2.21)	-0.0101** (2.61)	-0.0095 (1.72)	-0.0100** (2.34)
Variability of total payroll, 1927-28	0.00083 (0.27)	0.00229 (0.80)	0.00101 (0.26)	0.00223 (0.70)
Constant	1.11	1.10	0.86	1.09
N	20	25	20	25
F	22.84**	23.40**	14.86**	19.25**
Adjusted R^2	.91	.88	--	--

t-statistics in parentheses. * Significant at 10% error level. ** Significant at 5% error level.
The means (and standard deviations) of the regression variables are: AHE, 0.59 (0.10); share of wages, 0.19 (0.064); size of company, 1733 (2930); union, 0.12 (0.33); "margin," 0.32 (0.11); percent unskilled, 0.20 (0.098); percent female, 0.17 (0.16); accident rate, 26 (per million man-hours worked; 12); average hours, 48 (2.5); variability of payroll, 4.9 (3.0). Accident rate data were available for only 20 of the 25 NICB industries.

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