Abstract: Wage inflation surged during the post-1933 recovery from the Great Depression even though unemployment rates remained very high. I consider two possible explanations. One is that monetary policy announcements and innovations, such as the dollar devaluation of 1933, raised the level of wages and prices the public expected to prevail in the long run future. In new Keynesian models such a change in expectations gives an immediate boost to current wage inflation. Another possible explanation is New Deal labor-market policies, such as those implementing the National Industrial Recovery Act (NIRA) of 1933 and the National Labor Relations Act (Wagner Act) of 1935, which imposed minimum wage rates and strengthened workers’ bargaining power. In terms of new Keynesian models, these were “wage mark-up shocks.” I see whether anomalies in wage inflation over 1933-38 were more closely coincident with the advent of new labor-market policies or with monetary policy announcements and innovations. I find that all anomalies are precisely coincident with application of minimum wages and obvious increases in workers’ bargaining power. Thus, there is no evidence that events creating expectations of a higher future wage and price level affected wage inflation in the 1930s.

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Wage inflation surged during the recovery from the 1929-33 Great Depression, even though unemployment rates remained very high and output was still far below the pre-Depression trend. In the first study applying the Phillips curve to American data, Samuelson and Solow (1960:188) observed "the years from 1933 to 1941 appear to be sui generis: money wages rose or failed to fall in the face of massive unemployment.” They briefly speculated this was due to “the workings of the New Deal (the 20 percent wage increase in 1934 must represent the NRA codes); or alternatively one could argue that by 1933 much of the unemployment had become structural, insulated from the functioning of the labor market.” Economists have continued to note that wage inflation was anomalously high starting in 1933 but have not settled on an explanation.

New Deal policies that directly affected wages and employment bargaining are an obvious one, as Samuelson and Solow said (Weinstein 1980; Gordon 1983; Mitchell 1986). Starting in 1933 the National Recovery Administration (NRA), implementing the National Industrial Recovery Act (NIRA) June 1933, set minimum wages, banned wage cuts, encouraged union formation and strengthened union bargaining power. When the NIRA was declared unconstitutional in May 1935 its pro-union policies were revived two months later by the National Labor Relations Act (Wagner Act). But economists have proposed various alternative explanations including “hysteresis” in the natural rate of unemployment (Blanchard and Summers 1986, an elaboration of Samuelson and Solow’s speculation that high unemployment had become structural), and social norms that forbid nominal wage cuts and link wages to employers’ profits (Akerlof, Dickens and Perry 1996).

In this paper, I consider an alternative explanation offered by the “new Keynesian” macroeconomic models that frame most current debates about monetary policy. In those models an increase in the price level expected to prevail at some future horizon, however distant, can give an immediate boost to current inflation and real activity. A higher long-run future price level means the economy must experience higher inflation at some point between now and then. Through the "new Keynesian Phillip curve," an increase in the expected rate of inflation for any future period tends to raise inflation in all prior periods. For any given path of nominal interest rates, an increase in expected inflation lowers long-term real interest rates and hence raises current real activity. Thus a policy change that raises the price level that the public expects to prevail in the long-run future can lift an economy out of a slump by its expectational bootstraps. In recent years many
economists have recommended policies that would rely on this new Keynesian expected-inflation mechanism to stimulate real activity when nominal interest rates are stuck at a lower bound. These policies include hikes in central-bank inflation targets, replacement of inflation targets with price-level or nominal GDP targets (perhaps just temporarily) (Bernanke 2017), and pegging to devalued exchange rates which “serves as a conspicuous commitment to a higher price level in the future” (Svensson 2003, p. 155).

The Roosevelt administration appears to have followed just such a policy in the 1930s. When Roosevelt took office in 1933 he devalued the dollar and announced a commitment to raise the price level. Over 1934-36 American monetary authorities followed up by allowing international gold inflows to boost the high-powered money supply. Economic historians have argued that these policies created expectations of future inflation (Temin and Wigmore 1990; Romer 1992; Jalil and Rua 2016). Krugman (1998: 161) and Bernanke, Reinhart and Sack (2004:18-19) note that Roosevelt's policies could have boosted real activity through the new Keynesian expected-inflation mechanism. Svensson (2004:90) points to the “‘Rooseveltian Resolve’ of 1933-34” as “a good case to examine from this point of view, with its devaluation, its new commitment to end deflation and reflate the economy, and its associated impression of a regime change.” Eggertsson (2008) presents a new Keynesian model of the Great Depression in which an increase in expected future inflation due to Roosevelt’s policy innovations creates an increase in real GDP nearly as big as that which occurred over 1933-37. All of these authors focus on real activity. My focus is on wage inflation. If the new Keynesian expected-inflation mechanism indeed boosted real activity in the 1930s, it should have also raised the rate of wage inflation associated with any given level of unemployment or output. Thus, it is a potential explanation for high wage inflation starting in 1933.

I ask whether the anomalous wage inflation of the 1930s is better explained by the new Keynesian expected-inflation mechanism, or effects of New Deal labor-market policies. Looking at it from the other end, does 1930s experience give evidence that the new Keynesian expected-inflation mechanism works in reality? The answer to this question may interest policymakers of our day. So far central banks have not adopted policies that would rely on the expected-inflation mechanism of new Keynesian models. In rejecting a price-level target, Bank of Canada policymakers noted that "these models assume that agents are forward-looking, fully conversant with the implications [of the policy change] and trust policy-makers to live up to their commitments." They expressed doubt those conditions "would be sufficiently satisfied in the real
Evidence that the mechanism worked in the real world of the 1930s would be useful. The fact that Roosevelt’s inflationary policies were coincident with economic recovery is not enough. At the time there were many other conditions promoting recovery, including extremely low nominal interest rates, mildly stimulative fiscal policy and recovery of the banking and payments system after a massive financial crisis (Hanes, forthcoming) - the same conditions, more or less, that were associated with recovery from the “Great Recession” of 2008.

To answer the question I examine the exact timing of anomalies in wage inflation, policy announcements and other events that could affect expectations of the future wage and price levels, the application of labor market regulations directly affecting wages, and indicators of increases in workers' bargaining power. I find that all anomalies are precisely coincident with application of minimum wages and obvious increases in workers’ bargaining power. I conclude that New Deal labor policies fully account for the peculiar behavior of wage inflation in the 1930s. There is nothing for alternative theoretical constructs to explain. This is not evidence against the new Keynesian Phillips curve: in a new Keynesian model New Deal labor policies correspond to "wage mark-up" shocks that should affect wage inflation. And it does not mean the expected-inflation mechanism can never work. The mechanism relies crucially on sufficient degrees of policy credibility, rationality and economic knowledge on the part of the relevant agents so that they translate policy changes into changes in expectations of future inflation and real activity. Perhaps Roosevelt’s announcements were not credible. Perhaps the expectations of the particular people who matter for the wagesetting process were not sufficiently rational or well-informed. One can say, however, that there is no evidence from the 1930s U.S. that policies relying on the new Keynesian expected-inflation mechanism can work in reality.

To begin, I show the existence and rough timing of 1930s wage inflation anomalies using annual data. Next I show how standard new Keynesian models can account for such anomalies as the result of extraordinary events affecting expectations of future inflation, or factors such as changes in workers' bargaining power and minimum wages. In the third section I describe New Deal labor policies and policies that could have affected the expected future price level. Finally I line up the timing of these policies against the timing of inflation anomalies.

1. Wage inflation anomalies in the 1930s
Figure 1 plots inflation (percent change from the same month or quarter of the previous year) from 1927 through 1939, in a monthly index of average hourly earnings in manufacturing and two price indices: a monthly CPI, and a quarterly GNP deflator. Vertical lines mark cyclical peaks and troughs according to the NBER chronology. The AHE series (from Hanes 1996) was aggregated up from industry-level series with fixed weights. These are surely imperfect indicators of changes in wage rates, but they are the only indicators of wage inflation from the 1930s that can be compared with data from other eras.\(^1\) To show fluctuations in real activity, Figure 2 plots the FRB’s monthly IP index and Weir's (1992) estimate of the private nonfarm unemployment rate, which defines the number of unemployed to be the difference between the number of employed and an estimate of the long-term trend “usual labor force” based on population censuses.\(^2\)

Wage and price inflation started to fall shortly after the cyclical peak in August 1929. Inflation fell more as the depression deepened. Because inflation was about zero at the start this meant deflation. Over 1930-31 the two measures of price inflation fell faster than wage inflation: real wages were countercyclical. That may seem odd. Most studies of postwar data find real wages to be procyclical or acyclical. But it was the usual pattern in recessions prior to the Second World War. It was not anything special about the Great Depression. Whenever one can compare similarly-constructed wage and price series across historical eras, real wages appear less procyclical, more countercyclical in eras prior to the Second World War (Hanes 1996). Huang, Liu and Phaneuf (2004) show that this historical development is consistent with new Keynesian models that allow for multiple stages of production, so that sticky-priced output is used partly as an input to

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\(^1\) Changes in industry average hourly earnings are an imperfect indicator of changes in wage rates, as they are affected by shifts in employment shares between high- and low-wage jobs, establishments and firms. The resulting measurement errors may be correlated with business cycles, as observed by Dunlop (1944:19-27). Indexes of wage rates, like the BLS Employment Cost index of our day, are not available for the 1930s.

\(^2\) Standard BLS series for the post-World War II era define the unemployed to be people who are not employed but are actively searching for work, as indicated by their answers to monthly household surveys. Such surveys are not available for years before 1948. Weir's estimate of the "usual labor force" is acyclical. In standard postwar series, the number of people in the labor force is strongly procyclical. Weir excludes agriculture, government and relief workers from both the employment and labor force figures. Weir excludes agriculture because, absent survey data, there is no reliable way to estimate short-term variations in agricultural employment (since so much farm labor is family labor). By excluding government workers Weir sidesteps a debate as to whether the large numbers of Federal relief workers in the 1930s should be classified as employed or unemployed (see Darby, 1976 *versus* Lebergott, 1964). Within the 1920-30s Weir's underlying estimates for private nonagricultural employment are not significantly different from those underlying the alternative unemployment series of Lebergott (1964) and Romer (1986).
production of more sticky-priced output. In these models real wages are more countercyclical if there are fewer number of stages or rounds of production before final sale. In the U.S. both consumer goods and aggregate final output (GDP) were less finished, in this sense, in the 1930s than in postwar decades (Hanes 1999).

Wage and price inflation picked up around the cyclical trough in March 1933. They rose to extremely high rates in the first quarter of 1934 and around the May 1937 cyclical peak preceding the 1937-38 recession.

The anomalous nature of this inflation is easy to see in simple Phillips curve scatterplots that compare 1930s experience with other eras of American history. In making that comparison it is important to account for changes across eras in the nature of the Phillips curve. American data from the pre-1914 gold standard era, the 1920s, and the early postwar (post-World War II) eras show a positive relationship between inflation and real activity - that is, a negative relationship between inflation and the unemployment rate. This is what A.W. Phillips (1958) originally observed in British data. From the mid-1960s through the 1980s the relationship was different: real activity was correlated with the change in inflation in the “accelerationist Phillips curve.” Starting about 1990 the old relationship between real activity and wage inflation reappeared. In regressions of wage inflation on real activity and lagged inflation, estimated coefficients on lagged inflation are practically equal to one in samples dominated by the late 1960s-1980s, practically zero in samples from the pre-1914 era, the 1920s, the 1950s to mid 1960s, and the 1990s on (Gordon 1990; Allen 1992; Hanes 1993; Gali, 2011; Ball and Mazumder 2015; Blanchard 2016). Economists have explained these historical transitions in the Phillips curve as the outcome of changes in the correlation between expected inflation and lagged inflation, interacting with the “expectations-augmented Phillips curve” hypothesized by Phelps (1967) and Friedman (1968). The latter is a structural relationship between real activity and the difference between realized inflation and past expectations of current inflation. The original empirical Phillips curve should appear in data from eras when expected inflation was uncorrelated with recent inflation; the accelerationist Phillips curve appears when expected inflation is strongly correlated with recent inflation.
(Alogoskoufis and Smith 1991; Ball and Mankiw 2002). A variety of evidence confirms that the relationship between past inflation and expected future inflation was indeed much stronger in 1965-1990 than in the other eras (Barsky 1987; Bordo and Dewald 2001).

Figure 3 is a scatterplot of annual wage inflation against unemployment rates over 1924-40 and two other eras that fit the original Phillips curve relationship: 1891-1914 and 1954-1965. I choose these particular spans because they were unaffected by wage and price controls (Korean War controls were lifted in February 1953 [Rockoff 1984]), and they are covered by wage and unemployment series that are comparable across the different eras. In the figure, all years after 1932, except 1936, are outliers above the otherwise downward-sloping scatter of points; the most obvious outliers are 1934 and 1937.

Figure 4 illustrates the anomalies in a slightly different way. It plots the difference between actual wage inflation and a "forecast" based on coefficients from regressing wage inflation on the current year's unemployment rate and the previous year's unemployment rate, with a dummy variable for pre-World War II years, excluding 1924-39 from the sample. (That leaves 36 observations.) The coefficients are:

\[
\text{Wage inflation} = 6.714 - 0.448 \times \text{Prewar} - 0.441 \times \text{Unemployment} - 0.025 \times \text{Unemployment}_{-1}
\]

<table>
<thead>
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<th>SE (robust)</th>
<th>p-value</th>
<th>R² = 0.49</th>
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Figure 4 shows substantial deviations from this relationship within 1891-1914. (This might reflect measurement errors in the series, which must be greatest in this era.) But the deviations are much greater in the 1930s, especially 1934 and 1937.

Note that both figures indicate wage inflation over 1929-32 was in line with the Phillips curve relationship seen in other years. It is sometimes claimed that nominal wages were unusually rigid in these years (e.g. O’Brien 1989; Ohanian 2009). Obviously not true.


The "new Keynesian Phillips curve" (Roberts 1995) is a structural relationship between real activity and the spread between current inflation and current expectations of future inflation. It appears in models

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where there is a cost of adjusting nominal wages and/or prices (Rotemberg 1982; Gertler and Leahy 2008), or a constraint that prevents adjustment of nominal wages or prices except at certain points in time, with “staggering” (Taylor 1980, Calvo 1983). Based on such models the appearance of the accelerationist Phillips curve in the late 1960s-80s has been explained as the result of a correlation between lagged inflation and current expectations of future inflation (Ball 2000; Erceg and Levin 2002; Kozicki and Tinsley 2005; Cogley and Sbordone 2008).

Under plausible conditions the New Keynesian Phillips curve implies that data will show a relationship between wage inflation and current real activity matching the original Phillips curve. Wage inflation will deviate from this usual relationship when there are unusual changes in the price level expected to prevail in the long-run future, or when there are unusual wage “markup shocks,” that is changes in the spread that the wagesetting process effectively seeks to maintain between wages and workers’ opportunity cost of employment (Gali, Smets and Wouters 2011). A obvious source of wage markup shocks is changes over time in union power (Christiano, 2011).

I illustrate these points with reduced-form expressions from a standard Calvo-type model approximated around a zero-inflation long-run steady state. An assumption that wagesetters expect a zero average rate of nominal wage inflation in the very long run is plausible for the 1930s: nominal wage inflation had actually been close to zero on average over both the 1920s and the pre-1914 gold-standard era.

Variables are in logs. $z$ is the total number of available workers (the labor force). Aggregate output is $y_t = \lambda l_t$ where $l$ is aggregate employment. Following Gali (2011), labor is “indivisible:” one unit of labor

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4This argument is trickier than in models with a Friedman-Phelps expectations-augmented Phillips curve. New Keynesian Phillips curves are usually derived within models with a representative agent who engages in dynamic optimization with discounting of future utility, and a zero-inflation long-run steady state. Erceg and Levin (2002) generate an accelerationist empirical Phillips curve in this sort of model by assuming there are long-term (but not permanent) deviations of a central bank’s inflation target from the long-run steady state, and less than perfectly-rational expectations (in the conventional sense). Ascari (2004), Kozicky and Tinsley (2002) and Cogley and Sbordone (2008) show that a relation between real activity and inflation can be derived in a Calvo-type model with a positive, perhaps varying long-run steady state inflation rate, but the relationship is meaningfully different from a standard new Keynesian Phillips curve. (The coefficients on real activity and expected future inflation both depend on the trend inflation rate, and there are extra terms which can vary over time). Kozicky and Tinsley argue that the difference is not likely to be substantial as long as the positive long-run inflation rate is not too high. Ascari (2004) does not agree. Many new Keynesian models reproduce an accelerationist Phillips curve by assuming that wages or prices are indexed to lagged inflation in the periods when they cannot be fully readjusted (e.g. Christiano, Eichenbaum and Evans [2005]). But this cannot account for the appearance of the original empirical Philips curve in many historical eras. I am not aware of a new Keynesian dynamic model in which optimizing agents endogenously choose to index under some circumstances, and not index under others.
means employment of one worker. The unemployment rate is approximately \( u = (z - l) \). \( w_j \) is the wage paid to one group of workers (or type of labor), where the number of groups is large. The wagesetting process for group \( j \) minimizes a loss function:

\[
L_t = E_t \left[ \sum_{t=0}^{\infty} \beta^t (w_j - w_j^*)_t^2 \right] \quad 0 < \beta < 1
\]

\( \beta \) is a discount factor. \( E_t \) generally denotes some agent(s) time-\( t \) expected value for a future variable, not necessarily a rational expectation. \( w_j^* \) is the optimal or "desired" wage for a period. \( w_j^* \) increases with the average wage level \( w \) and the level of real activity. \( w_j^* \) also increases with a desired wage "markup" \( \mu \) over the opportunity cost of labor which may vary across worker groups and time. Thus:

\[
w_j^* = w_t - \gamma \mu_t + \mu_j = w_t + \frac{\lambda}{\alpha} (y - \lambda z)_t + \mu_j
\]

Most new Keynesian models derive relationships corresponding to (1) and (2) from specific assumptions needed to fit a dynamic representative-agent setting (e.g. Erceg, Henderson and Levin 2000; Erceg and Levin 2003; Gali 2011), but (2) is consistent many other types of employment models including efficiency-wage, insider-outsider and union-bargaining models (Summers 1988). Gali (2016) is a version of an insider-outsider model within a new Keynesian setting.

The natural rate of unemployment \( u^n \) is the rate that would prevail in the absence of constraints that generate nominal wage rigidity, defined by setting \( w_t \) equal to an average of \( w_j^* \)’s:

\[
u_t^n = \mu_t / \gamma
\]

where \( \mu_t \) is a corresponding average of \( \mu_j^* \)'s. The natural rate of output, defined in the same way, is \( y_t^n = \lambda(z_t - \gamma^{-1} \mu_t) \).

In each period there is a fixed probability \( \alpha \) that a group’s wage \( w_j \) can be adjusted. (1) is minimized subject to this constraint and assuming that wagesetters' expected values for inflation and real-activity gaps are zero for some, perhaps-distant point in the future. That gives the new Keynesian Phillips curve equation that relates wage inflation to the expected value of wage inflation for the upcoming period and the current "real activity gap" \( \lambda (z - x^n) \):
(4) \[ \Delta w_t = \theta s(x-x^n)_t + \beta E_t[\Delta w_{t+1}] \] \[ \text{where } \theta = \frac{\alpha}{1-\alpha}(1-\beta - \beta \alpha) \]

For unemployment \((x-x^n) = (u-u^n)\) and \(s = -\gamma\). For output \((x-x^n) = (y-y^n)\) and \(s = \gamma/\lambda\). In standard models expectations are fully rational but a weaker condition, the “law of iterated expectations,” is enough for (4) (Branch and McGough 2009; Adam and Padula 2011).

Solving back from the long-run steady state:

(5) \[ \Delta w_t = \theta s(x-x^n)_t + \theta s E_t \left[ \sum_{\tau=1}^{\infty} \beta^\tau (x-x^n)_{t+\tau} \right] \]

Current wage inflation depends on the current real-activity gap and expected values for the real-activity gap in the upcoming period through the distant future. The expected value of the price level that will prevail in the distant future is:

(6) \[ E_t[p_s] = p_{t-1} - (E_t[\zeta^\infty] - \zeta_{t-1}) + \frac{1}{1-\beta} \sum_{\tau=0}^{\infty} (1-\beta^{1+\tau}) \theta s(x-x^n)_t \]

where \((E_t[\zeta^\infty] - \zeta_{t-1})\) is expected growth in real wages over that horizon.

Many studies find that, in reality, expected values of future real-activity variables such as unemployment and real GDP generated by the most sophisticated forecasting methods are usually quite close to simple autoregressive forecasts (literature surveyed by Chauvet and Potter 2013). Thus, it is realistic to assume that the public’s expected values for the future real-activity gap are close to AR(1) forecasts except under special circumstances. Describe the public’s expected value for the real-activity gap in a future period \(t+\tau\) as:

(7) \[ E_t[(x-x^n)_{t+\tau}] = \rho^\tau (x-x^n)_t + \epsilon^{x-x^n}_{t+\tau} \]

where \(\rho\) is the serial correlation coefficient from an AR(1) forecast. \(\epsilon^{x-x^n}_{t+\tau}\) is the difference between wagesetting agents’ actual forecast for the real-activity gap in period \((t+\tau)\) and the simple the AR(1) forecast. Most of the time \(\epsilon^{x-x^n}_{t+\tau}\) must be small relative to fluctuations in real activity - otherwise AR forecasts would not work as well as they do. Together with (6), (7) gives:

(8) \[ \Delta w_t = \phi(x-x^n)_t + \epsilon_t, \text{ where } \phi = \theta s / (1-\beta \rho) \]

\[ \epsilon_t = \theta s \sum_{\tau=1}^{\infty} \beta^\tau \epsilon^{x-x^n}_{t+\tau} \]
Finally, suppose one has a time series correlated with the real-activity gap, such as an unemployment rate or a deviation of an output measure from a long-run trend. Let \((\bar{x} - \bar{x}^n)\) denote this series. Then:

\[
\Delta w_i = \phi(\bar{x} - \bar{x}^n)_i + \epsilon_1 + \epsilon_2, \quad \text{where} \quad \epsilon_2 = \phi[(x - x^n) - (\bar{x} - \bar{x}^n)],
\]

\(\epsilon_2\) reflects the error in the time series as a measure of the real-activity gap.

The apparent relationship between wage inflation and real activity will match the original Phillips curve as long as \(\epsilon_1\) and \(\epsilon_2\) are not too big within the sample. Extraordinarily large, positive values of \(\epsilon_1\) and/or \(\epsilon_2\) in a period will be observed as anomalously high wage inflation.

An increase in the average desired wage markup \(\mu\) could cause a positive value of \(\epsilon_2\). Recall the unemployment-rate gap is \((u - u^n)_i = (u_i - \mu_i / \gamma)\). The output gap is \((y - y^n)_i = (y_i - \lambda(z_i - \gamma \mu_i))\). An increase in \(\mu\) raises the natural rate of unemployment and lowers the natural rate of output. If the available real-activity gap series fails to account for this, \(\epsilon_2\) increases.

\(\epsilon_1\) can increase as a result of changes in economic policy that raise wagesetters' expected value for the price level that must prevail in the distant future. In (6), an increase in \(E_t[p_{\infty}]\) implies an increase in the expected value of the real-activity gap for some future period or periods - that is the only way to get to the higher price level. A policy that promises a higher future price level is effectively a commitment by the authorities to cause (or allow) higher real activity at some point(s) in the future. In (7) that is an increase in \(e^{\gamma \mu - \infty}\), which is an increase in \(\epsilon_1\) in (8). This is what I referred to as the effect of the new Keynesian expected inflation mechanism on current wage inflation.

3) New Deal policies, expected future inflation and wage mark--ups

Several monetary and exchange-rate policies announced over 1933-39 had implications for the long-run future price level. Thus, they might be able to account for the era’s Phillips-curve anomalies through the new Keynesian expected-inflation mechanism. Meanwhile, labor policies created minimum wages and boosted workers’ bargaining power. In just about any view of wage determination, these policies would be expected to affect wage inflation. In new Keynesian models they correspond to wage mark-up shocks. In this
section, I describe these two sets of policies and their timing.

3.1) New Deal labor policies

In the late 1920s there were no Federal minimum-wage laws. State minimum-wage laws were generally undercut by court decisions. Agreements between employers and labor unions were not enforcable by the legal system. During the First World War, union membership had grown enormously and many employers began to bargain with unions, while the Federal government adopted several policies supporting union power. But in the early 1920s union membership and the fraction of employers bargaining with unions had fallen off sharply, especially during the cyclical downturn of 1920-21. By the late 1920s union membership as a fraction of workers in relevant sectors was about the same as it had been before the First World War (Lewis 1963 Table 51). Over the 1929-33 downturn of the Great Depression, under the Hoover administration, there were no substantial innovations in laws affecting employment or unions. Hoover held conferences in which he exhorted large employers not to cut wage rates but these conferences had no apparent effect on wages (Rose 2010).

Under the Roosevelt administration there were many unprecedented changes in employment law. The National Industrial Recovery Act (NIRA), passed in June 1933, applied to nearly all nonagricultural employers. The NIRA affected wages directly through the employment provisions of industry “codes,” which included industry-specific minimum wage rates. According to all accounts adoption of minimum wages raised wages of all workers because employers generally attempted to maintain pre-existing differentials. The first industry code, in cotton textiles, came into effect in July 1933 and was estimated to raise industry average wage rates substantially (Sachs, 1934: 147). At the end of July 1933 Roosevelt “invited” nearly all nonagricultural employers in industries that had not yet adopted their own codes to sign the “President’s Re-Employment Agreement,” known as the “blanket code.” Its provisions required most employers to raise wages. It came into effect in August. The blanket code fixed minimum hourly wage rates, maximum weekly hours and minimum weekly earnings, and required "equitable" maintenance of differentials above the minimums for higher-paid workers (Sachs 1934, 131). Between August and December 1933 industries representing the bulk of employment adopted their own industry codes; by June 1934 all industries had been codified (United States 1935: Chart 36). Industry codes created pay hikes beyond those associated with the blanket code. They required more wage hikes and changes in compensation
policies such as premium pay for overtime (Schoefeld, 1935; Weinstein, 1980, 9; 17; 47).

In addition to (but interacting with) setting up the code process, the NIRA stated that employees had a right to organize for collective bargaining. The enforcement agency established by the NIRA, the National Recovery Administration (NRA), took months to work out what this meant in specific regulations and to create institutional structures to enforce them. But as soon as June 1933 and July, auto manufacturers began to give raises to "improve their bargaining power in code negotiations" (Fine 1963: 125). Though the NIRA required employers to negotiate with employee representatives, it was not clear at first that this had to mean independent unions. Auto industry executives wanted NRA administrators to allow the industry to remain nonunion. They gave raises immediately to demonstrate unions were not needed (Fine 1963: 48-49, 444 note 12). Workers immediately understood the NIRA to bar employers from replacing strikers or firing employees attempting to organize a union. Figure 5 plots the number of workers involved in strikes beginning in each month. It shows an enormous increase in strikes from May to June 1933, immediately on passage of the NIRA.

The NIRA was declared unconstitutional in May 1935 but most of its pro-union elements were re-established and strengthened by the Wagner Act (National Labor Relations Act) passed in July 1935 (Mills and Brown 1950). In November 1936 "The overwhelming Roosevelt victory" in the presidential election "led employers to expect aggressive organizing drives by trade unions...wage rates were influenced by the large number of industrial disputes and by the efforts of employers to forestall unions by making concessions" (Slichter 1938: 98-99). Figure 5 shows another enormous increase in strikes around November 1936. In April 1937 the Supreme Court ruled the Wagner Act constitutional, and many companies that had so far refused to bargain with elected unions gave in (Fine, 1963: 415; Schatz, 1983: 70). Estimates of union membership, which are annual (and imperfect), are plotted in Figure 5. They indicate enormous increases in union density from 1936 to 1937 and again from 1937 to 1938.

It is important to keep in mind that workers' bargaining power increased even in establishments that were not formally unionized. Many firms that remained nonunion through the late 1930s raised wages at times over 1934-1938 to forestall union threats. As of March 1934 the auto industry was still not unionized, formally. No union had signed up a majority of workers in any auto firm. Neither automakers nor the NRA had recognized any union as a bargaining agent for worker. But in that month auto manufacturers gave a
general ten percent wage increase “with a view to strengthening their position with the administration, their workers, and the public at a time when the A.F. of L. federal labor unions in their plants, for whose existence the N.I.R.A. was largely responsible, were threatening an industry-wide strike” (Fine, 1963:125,142). In March 1937 the nonunion Westinghouse Corporation raised wages in response to General Electric’s recognition of a union (Schatz 1983: 67). The Allis-Chambers Corporation did not have an NLRB-certified union until 1938, but in April 1936 “The impact of increasing union pressure on the company was obvious” and it granted substantial bonuses (Peterson 1976:322). Most International Harvester plants were not unionized until 1941, but the company gave a number of company-wide wage hikes in 1935 and 1936 to discourage unionization (Ozanne, 1967: 148, 178, 179).

3.2) Monetary and exchange-rate policies that could affect the expected price level

In the late 1920s the U.S. and most of its international trading partners were in an international gold standard system. Monetary authorities exchanged currency and central bank reserve deposits for a fixed quantity of gold, effectively fixing international exchange rates. Ultimately, a country’s long-run price level would be determined by its currency’s gold content and the gold price level of tradable goods. The gold price level depended in turn on the balance of world gold supply against gold standard countries’ demand for gold reserves. In the United States, most economists and writers in business publications thought about the price level in these terms. They assumed the dollar’s gold value would remain fixed and forecast a stable or slightly decreasing price level based on the balance of world gold supply and demand (Nelson, 1991: 6-7).

The United States ran a balance of payments surplus through most of the 1920s, which meant the authority in charge of exchanging dollars for gold - at the time, the Federal Reserve system - was usually buying gold and selling dollars. (The Fed did not hold substantial reserves of foreign financial assets.) The Fed generally sterilized the effect of its gold purchases on the high-powered money supply by selling bonds in open market operations. Fed policymakers aimed to stabilize the American price level. They did not want the decrease in nominal interest rates that would result from an increase in high-powered money (Meltzer, 2003: 169,209,230).

After the stock market crash in October 1929 American short-term interest rates fell steadily as the Federal Reserve system cut discount rates, purchased Treasury bonds in open-market operations and refrained from sterilizing gold inflows. In early 1934 overnight rates fell to floors determined by lenders’
transaction costs, while there was no demand for funds at these rates, so that the return to overnight lending was effectively zero: the U.S. was in a liquidity trap (Hanes, 2006). In the outside gold-standard world, meanwhile, gold demand had increased sharply after 1929 due to widespread runs on banks and currencies. In any gold-standard country, output and employment could remain at the natural rate only if there was a massive deflation of wages and prices, or a devaluation of the currency relative to gold (Temin, 1989; Eichengreen, 1992; Bernanke, 1995; Bernanke and Mihov, 2000). Britain devalued early on, in 1931, but many others, including France and the Netherlands, held to their 1929 gold values until autumn 1936 (Clarke, 1977; Eichengreen and Sachs, 1985). When countries did devalue, they did not allow exchange rates to float. Instead they continued to peg against gold, or (like Britain) held exchange rates within fairly tight bands.

In 1933 the incoming Roosevelt administration introduced a number of policy innovations which, in the context of the gold standard, could be taken to imply a higher future level of nominal wages and prices in the U.S. Coming out of the Bank Holiday in April 1933, Roosevelt ordered the Fed and banks to cease paying out gold, ordered Americans to sell privately held monetary gold to the government, and allowed the dollar to float against gold in foreign markets. In May 1933 Congress passed the Thomas amendment to the Agricultural Adjustment Act, which was “explicitly directed at achieving a price rise through expansion of the money stock” (Friedman and Schwartz, 1963, p. 465). Roosevelt began to state clearly that his administration intended to “reflate” prices to their pre-Depression level. In his second “fireside chat” on May 7th, Roosevelt said “The Administration has the definite objective of raising commodity prices to such an extent that those who have borrowed money will, on the average, be able to repay that money in the same kind of dollar which they borrowed.” In June 1933 Congress passed legislation abrogating financial contracts that required payment in gold at the old parity. Roosevelt sent representatives to an international economic conference in London that was called to promote restoration of gold convertibility at the old exchange rates. But “while it was in process, the President apparently decided definitely to adopt the path of currency depreciation” (Friedman and Schwartz, 1963: 469). At the beginning of July 1933 he sent a message to the conference disavowing its aims. In a fireside chat on October 22nd 1933, Roosevelt gave perhaps his most explicit and detailed statement of support for a higher future price level:

I repeat what I have said on many occasions, that the definite policy of the Government has been to restore commodity price levels. The object has been the attainment of such a level as will enable
agriculture and industry once more to give work to the unemployed. It has been to make possible the payment of public and private debts more nearly at the price level at which they were incurred. It has been gradually to restore a balance in the price structure so that farmers may exchange their products for the products of industry on a fairer exchange basis. It has been and is also the purpose the prevent prices from rising beyond the point necessary to attain those ends...Obviously...we cannot reach the goal in only a few months. We may take one year or two years or three years...When we have restored the price level, we shall seek to establish and maintain a dollar which will not change its purchasing and debt paying power during the succeeding generation.

In January 1934, the Gold Reserve Act allowed Roosevelt to fix a new gold value for the dollar, depreciated about 40 percent from its pre-1933 value. Over January and February 1934 Treasury purchases of gold in foreign markets drove the dollar down to the new rate. Roosevelt and other supporters of reflation believed (or at least hoped) devaluation would promote reflation and reflation would promote recovery. But it is not clear what channels they had in mind.\(^5\)

Real activity had in fact turned up from a cyclical trough in March 1933 (NBER chronology). The turnaround was perceived at the time. Businessmen expected it to continue.\(^6\)

Some economists have argued that devaluation of the dollar along with Roosevelt’s rhetoric about reflating the price level indeed raised the public’s expectations for the future price level. Temin and Wigmore (1990: 485) argue that “The devaluation of the dollar was the single biggest signal” of a change in regime that should have affected inflation expectations: “Devaluation...sent a general message to all industries because it marked a change in direction for government policies and for prices in general.” Based on analysis of

\(^5\) Roosevelt took counsel from many economists and financiers. Some strenuously opposed devaluation and reflation. Roosevelt’s actions were most consistent with the ideas of Cornell economist George F. Warren. Warren understood that under a gold standard each country’s price level was determined by its currency’s gold value, and that prices of internationally-traded agricultural commodities were set in world markets so their prices in any one country would respond immediately to a change in the currency’s gold value (Warren and Pearson, 1933). Warren believed that the structure of relative prices had been disturbed after 1929 because prices of internationally traded agricultural commodities had plummeted but “sticky” prices of domestic manufactured goods had not. In the words of Warren’s colleague and co-author, Frank Pearson (1957: 5671), “The problem...was to deflate the high, sticky prices down to the level of the low, flexible prices or to inflate the low, flexible prices up to the high, sticky prices. There was no other alternative...F.D.R. had plenty of advice on what should be done. One group proposed that the process of deflation should be completed; their remedy, completion of deflation, would have been politically unacceptable. Dr. Warren had the correct remedy: the equilibrium should be restored by inflating the flexible relative to the sticky prices by raising the [dollar currency] price of gold.”

\(^6\) In this era, railroad managers’ associations surveyed freight customers on a quarterly basis to get their plans for rail shipments in the upcoming quarter. Customers reported their planned volumes of shipment for the next quarter as percent increases over the same quarter in the previous year. Suitably aggregated reports from manufacturing firms, given by Hart (1960), indicate their production plans for the upcoming quarter. Since early 1929, manufacturers’ production plans for coming quarters had embodied decreases in planned output from the same quarter of the previous year (and realized output had always been even lower than planned). Starting in the first quarter of 1933, manufacturers began to plan increases in production over the previous year. See especially Chart 2, p. 210.
contemporary newspaper articles and business publications, Jalil and Rua (2016: 33) argue that expected
total inflation rose sharply over the first six months of 1933, then there was “a sudden moderation of
inflationary expectations after July 1933 due to mixed messages from the Roosevelt administration” which
“hinted that because the recovery was proceeding so smoothly and the National Industrial Recovery Act
(NIRA) was about to be implemented, it no longer considered inflation necessary.”

From 1934 through the end of the 1930s the U.S. usually ran a balance of payments surplus and
accumulated monetary gold, as it had in the 1920s. Under new institutional arrangements gold was purchased
from foreign sellers by the Treasury rather than the Fed. The Treasury also bought gold and silver from
domestic mines. Through summer 1936, American policymakers allowed these specie purchases to boost the
high-powered money supply. From January 1934 to December 1936 the high-powered money supply
increased about 63 percent. Romer (1992, p. 176) argues that due to subsequent high-powered money growth
“consumers and investors realized that prices would have to rise eventually and therefore expected inflation
over the not-too-distant horizon.”

In July and December 1936 occurred policy actions that could have been interpreted as reneging on a
commitment to reflate the price level. Some high-powered money growth since January 1934 had gone into
currency, but most went into banks’ excess reserves. In 1935 and 1936 Federal Reserve policymakers began
to push for a hike in reserve requirements to soak up excess reserves. They feared that the buildup of excess
reserves could allow a burst of uncontrollable inflation to take place in the future (Goldenweiser 1951:
175-82). In July 1936 the Fed announced a hike to take effect in August. In January 1937 the Fed announced
that more hikes in reserve requirements would occur in March and May 1937. Meanwhile, in December 1936
the Treasury announced it would sterilize gold inflows. It began to do so immediately. According to the
NBER chronology, real activity turned down in June 1937 (cyclical peak May 1937). Eggertsson and Pugsley
(2006) argue that the changes in monetary policy caused the downturn through the the new Keynesian
expected-inflation mechanism.

In 1937 these actions began to be reversed, which might have been taken as a return to a reflation
commitment. Fed and Treasury officials had observed signs of a slowdown in economic growth before that.
In March 1937 the Treasury bought bonds; in April the Fed announced that, for the first time since 1933, it
would buy bonds to boost reserve supply (Blum 1959: 269-375; Gordon and Westcott 1937: 107). In
September 1937 the Fed announced more bond purchases “for the continuation of the System’s policy of monetary ease” (Blum, 1959: 378) and the Treasury announced it would boost the money supply by creating gold certificates against part of its stock of inactive gold (Johnson 1939: 137). In February 1938 the Treasury announced that a limited volume of current gold purchases would be allowed to boost the money supply (Crum, Gordon and Westcott 1938b: 93). In April 1938 FDR announced that all sterilized gold and all future gold inflows would be released into the money supply, and reserve requirements would be reduced immediately (Crum, Gordon and Westcott 1938b:94; Blum 1959:425). Real activity turned up from a cyclical trough in June 1938.

4. Timing of wage inflation anomalies versus the two types of policy events

Which policy innovations best explain the wage-inflation anomalies apparent in Figures 3 and 4: labor-market policies that boosted workers’ bargaining power and set minimum wages, or news about monetary policies that could have boosted the expected future wage level? To answer this question I examine 1930s wage data at the shortest available frequency, which is monthly. I determine the monthly timing of wage-inflation anomalies by estimating empirical Phillips-curve relationships in monthly data from post-World War II eras unaffected by wage and price controls. I apply estimated postwar coefficients to interwar real-activity series to make “projections” of wage inflation starting in January 1929, based on postwar Phillips-curve patterns. Big deviations of actual 1930s wage inflation from projected paths are the monthly anomalies to be explained. I compare the timing of these anomalies with the timing of the two sets of policy events.

4.1 Data

Series on average hourly earnings (AHE) in manufacturing are the highest-frequency indicators of wage changes in the 1930s that are comparable to wage-related data from other eras. They can be compared with series from the post-World War II era. Unfortunately, there are no comparable series from pre-1914 eras, so I can compare 1930s movements in wage inflation only with postwar Phillips-curve patterns. Hanes (1996) matched 1930s industries to industries in postwar data and applied fixed industry weights to construct a monthly manufacturing AHE series that is consistent from the 1920s through 1990.

The only monthly time-series indicator of real activity from the 1930s that can be compared with postwar series is industrial production (IP). (There are no reliable monthly or quarterly estimates of
unemployment or real GDP from the 1930s.) To indicate the level of real activity, I use the deviation of monthly IP from a trend. It is tricky to define trends for the Great Depression era. It is clearly inappropriate to use a Hodrick-Prescott trend with conventional parameters, or a loglinear trend estimated on the interwar era alone: either of those trends would imply real activity was back to “normal” or even above normal by the mid-1930s, which would be inconsistent with anyone’s view of the Great Depression and with all unemployment estimates. I follow Romer (1989) and Balke and Gordon (1989) and define trends by loglinear interpolation between benchmark “normal” years. Both authors span the Depression era with benchmarks at 1924 and 1947. Through the rest of the postwar era they use 1955, 1962, 1972 and 1981. I use the same benchmark years, plus 1990 (which contains an NBER cyclical peak, in July). Using 1941 rather than 1947 to span the Great Depression gave very similar results.

4.2 Estimated postwar Phillips curves and projections

To make monthly projections, I ran this regression on postwar data:

\[
gap_t - w_{t-12} = c - a IP_t^{GAP} + b_1 (w_{t-12} - w_{t-24}) + b_2 (w_{t-24} - w_{t-36})
\]

where \(t\) is a month, \(w\) is the log of the AHE series, \(IP_t^{GAP}\) is the deviation of the log of the Federal Reserve index of industrial production from a straight-line trend between benchmark-year values. Note that I use the change in the log of the AHE series from the same month in the prior year, rather than month-to-month changes. Month-to-month changes would be sensitive to precise definition of seasonals. There is good reason to believe NRA code adoption affected AHE seasonals strongly. (Many codes introduced worksharing, stabilization of hours and premium pay, among other things). To avoid months affected by wage and price controls, my postwar sample runs from March 1955 through July 1971 and from May 1976 through December 1990.\(^7\) The estimated values are:

\[
w_t - w_{t-12} = 0.0044 + 0.1368 IP_t^{GAP} + 0.5627 (w_{t-12} - w_{t-24}) + 0.3007 (w_{t-24} - w_{t-36}) \quad R^2 = 0.73
\]

My manufacturing AHE series ends with 1990. It is not clear that a series comparable with 1930s manufacturing AHE data can be constructed for years much past 1990, since many manufacturing industries in the 1930s data disappeared from the United States soon after 1990 (e.g. textiles, shoes, leather tanning).

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\(^7\) Korean War controls were lifted in February 1953, plausibly affecting the rate of wage inflation from 1953 to 1954. With two years’ lags in my specification, I begin with 1956. The Nixon controls held in one form or the other from August 1971 through April 1974 (affecting wage inflation from 1974 to 1975). Rockoff (1984) gives chronologies of the Korean and Nixon controls.
One can guess, however, that postwar samples after 1990 would generally give smaller coefficients on real activity, since that is the case for wage series that are comparable across postwar decades (Blanchard 2016).

I apply these coefficient to monthly values of $IP^{GAP}$ in the 1930s, in two ways. For one set of projections I apply the coefficients on lagged inflation. For the other, to deal with the possibility that the accelerationist Phillips curve is not the right specification for the 1930s, I set coefficients on lagged inflation equal to zero. I start projections at January 1929. The projections using lagged inflation jump off from actual wage inflation in 1927 and 1928. From 1930 on the lagged inflation rates entering projections are lagged projections.

There are, of course, many other reasonable specifications of empirical Phillips curves and postwar samples I could have used. I welcome suggestions. This particular specification has some virtues, however. It is transparent and similar to specifications used in other studies (e.g. Akerlof, Dickens and Perry 1996). It is consistent with standard new Keynesian structural Phillips curves, but also consistent with other theoretical approaches. Within the postwar sample it gives more or less unbiassed projections of wage-inflation slowdowns in cyclical downturns. Within the interwar era, the projected paths it gives for wage inflation are extremely close to actual wage inflation from 1929 through 1932. That is consistent with the annual unemployment-rate Phillips curves plotted in Figure 3, which show that wage inflation 1929--32 was very much in line with patterns from other eras.

4.3 Anomalies in monthly wage movements

Figure 6 plots projected and actual 12-month wage inflation, at a monthly frequency, after seasonally adjusting actual and projected wage inflation (with X-11). Figure 7 plots the level of the actual AHE series. As noted above, industry-level AHE series like those making up the AHE series can reflect many things other than wage rates (the distribution of workers across a given firm’s wage structure, the distribution of employment between high- and low-wage firms, the fraction of hours paid at premium rates). To make sure that the apparent monthly changes in AHE series reflected actual changes in wage rates, not other factors, I compare it with a “wage index” also plotted in Figure 7. Creamer (1950) constructed this wage index from information the BLS collected from the early 1920s through October 1935. In this era the BLS asked respondents to its monthly survey of manufacturing establishments to report actual changes in wage rates (the
number of employees affected by wage rates and the percent changes in their wage rates), in addition to total payrolls and employment (from which AHE series are calculated). Unfortunately, this 1930s wage-change index has no counterpart in other eras.

Together, figures 6 and 7 show the months in which the wage inflation anomalies of 1933-35 occurred. In figure 6, through July 1933 actual 12-month wage inflation remains close to the Phillips-curve projections - actually below the projection without lagged-inflation coefficients. Wage inflation turned up in July, but the projections indicate that can be accounted for by the upturn in real activity that began after March 1933. 12-month wage inflation rates soared above projected values from August 1933 through June 1934, then dropped down. From late 1935 through most of 1936 actual wage inflation was actually quite close to the projection with lagged-inflation coefficients set to zero. Starting in November 1936 actual wage inflation again soared above projections. Looking at figure 7, it is clear that the anomalous wage inflation starting around July 1933 reflects an enormous hike in the wage level from July to August 1933 and continuing wage hikes until June 1934. These big hikes appear in the wage index as well as AHE. From June 1934 on the wage level remained nearly stable until November 1936. Then there was another spell of wage hikes that continued until September 1937.

This timing of wage-inflation anomalies is entirely consistent with effects of labor policies. Recall the NRA blanket code took effect in August 1933, and strikes increased enormously from April 1933 through September 1933. The later wage-inflation increase around November 1936 was coincident with another wave of strikes, as well as formal union organization.

The timing of wage-inflation anomalies is less consistent with effects of changes in expected inflation through the new Keynesian channel. Prior to August 1933 there were several inflation-related policy changes and announcements including the cessation of gold payments in March 1933 and the Thomas inflation amendment to the AAA. But there was no anomalous pickup in wage inflation. Recall that Jalil and Rua (2016) concluded that the public’s future-inflation expectations rose sharply over the first half of 1933 and moderated after July 1933. The anomalous pickup in wage inflation beginning in November 1936 is especially hard to explain with changes in inflation expectations. It occurred within the period when monetary policy was being tightened, between the announcement of reserve-requirement hikes in July 1936 and the beginning of gold sterilization in December 1936. Wage inflation moved back towards the projected
paths while monetary policy was loosening again in late 1937 and 1938.

Further evidence that the anomalous wage inflation of 1936-37 was due to unionization can be found by comparing AHE in different sectors. The wave of unionization over the 1930s was largely confined to manufacturing, mining and transportation (Lewis, 1963). If 1936-37 inflation was in fact due to an increase in wage markups, it should be concentrated in manufacturing establishments specifically. That should boost manufacturing wages relative to wages in sectors that did not unionize. In 1935 the BLS began to collect data to construct average hourly earnings from establishments in a few mostly-nonunion sectors: wholesale and retail trade, hotels and laundries. Figure 7 plots the ratio of the manufacturing AHE series to a fixed-weight average of the available nonmanufacturing earnings series. This ratio increases at the same time the anomaly appears in manufacturing wage inflation.

5. Conclusion

The exact timing of wage-inflation anomalies over 1933-38 is entirely consistent with effects of New Deal policies that created minimum wage rates and boosted workers’ bargaining power. Many monetary-policy announcements that could be taken to imply a higher long-run wage and price level were not accompanied by wage-inflation anomalies. I conclude that the correct explanation for anomalous wage inflation in the recovery from the Great Depression is the simple one: New Deal labor policies. There is nothing for alternative theoretical constructs to explain. There is no evidence from the 1930s that the new-Keynesian expected-inflation channel works in reality. The experience of the 1930s does not support arguments that policymakers can use the new Keynesian expected-inflation channel to affect current inflation and real activity with policy changes such as adoption of price-level targets or depreciated fixed exchange rates. That said, one cannot conclude that the experience of the 1930s gives evidence against the new Keynesian Phillips curve. New Keynesian models imply that New Deal labor policies were wage mark-up shocks that should have created anomalies in empirical Phillips curves. There are many possible reasons Roosevelt’s devaluation of the dollar and announced commitment to reflate the price level might have failed to affect current wage inflation, even if expectations of the long-run future wage level affect current wage inflation as in new Keynesian models. Perhaps Roosevelt’s announcements were not credible. Perhaps the expectations of the particular people who matter for the wagesetting process were not sufficiently rational or well-informed.
References


155-183.


Average hourly earnings from Hanes (1996). Consumer price index from Federal Reserve Bank of St. Louis (https://fred.stlouisfed.org/series/CPIAUCNS). GNP deflator from Balke and Gordon (1986) Table 2. Both the CPI and GNP deflators are rougher estimates than their postwar counterparts constructed from lower-frequency estimates by interpolation on very limited data.
Figure 2 Monthly Industrial Production Index and Annual Unemployment Rate

January 1929-December 1939

[Diagram showing the Monthly Industrial Production Index and Annual Unemployment Rate from January 1929 to December 1939.]
Figure 3 Wage inflation and unemployment, annual 1891-1914, 1924-1940, 1954-1965
Figure 4 Deviations from Phillips Curve Forecast 1891-1914, 1924-1940, 1954-1965
Figure 5 Strikes (monthly) and union density (annual) 1927-1939

Sources: Workers involved in strikes beginning in that month, from Peterson (1938 Table 21), U.S. BLS (1942, Table 2), seasonally adjusted by X-11
Percent union membership among wage and salary workers in manufacturing, mining, forestry, fisheries, construction, transportation, communication and utilities, from Lewis (1963, Table 51 column 1)

1 June 1933 NIRA passed
2 August 1933 NRA blanket code imposed
3 November 1936 Roosevelt re-elected
Figure 6: Projected and actual 12-month AHE inflation 1929-1939, monthly.
Figure 7 Levels of AHE and wage series, 1929-1939 monthly

Sources: Wage index from Creamer (1950, Table A, "all manufacturing")
AHE manufacturing: Hanes (1996)
AHE nonmanufacturing: see text