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Real and Money Wages

by Allan H. Meltzer

Alfred Marshall, in his testimony before the Gold and Silver Commission of 1887 [Official Papers, p. 19], argued that "a powerful friction tends to prevent money wages in most trades from falling as fast as prices."

Marshall repeated the proposition in his testimony for the Indian Currency Commission of 1899 [Official Papers 284-8], but on the latter occasion, he relied on statistical work by Bowley [EJ, 1898] to support the argument. Neither in his testimony, nor in his classic text, is there an analytic explanation of the cyclical fluctuation in real wages.

The proposition that money wages are rigid downward is linked inextricably with Keynes' General Theory [1936]. Keynes', however, attributed the proposition to Marshall and made no claim to originality [EJ, 1939]. In fact, the proposition is much older than Marshall. Thornton explained fluctuations in output by arguing that money wages are rigid downward. [1965, pp. 118-19 Italics in the original]

"The tendency...of a very great and sudden reduction of the accustomed number of banknotes, is to create an unusual and temporary distress, and a fall of price arising from that distress. But a fall arising from temporary distress, will be attended probably with no correspondent fall in the rate of wages; for the fall of price, and the distress, will be understood to be temporary, and the rate of wages, we know, is not so variables as the price of goods."

Thornton's argument can be regarded as a proposition about the way in which workers and producers form expectations. But Thornton did not take his
argument beyond this conjecture or explain why the pattern persisted. Why do workers not raise money wages in expansion and lower money wages in recession to smooth employment? 2

The new element added by Keynes was an attempted explanation for the cyclical movement of real wages. Keynesian or neo-Keynesian economists are, I believe, correct when they insist that Keynes' theory of wages is at the center of his argument. Davidson ( ) 3/ Keynes supplied what Friedman has called the "missing equation" by offering an explanation of what he believed to be the facts -- that money wages adjust more slowly than prices to changes in demand.

Keynes' argument was one of the first parts of the General Theory to be tested empirically. Dunlop (1938) and Tarshis (1939) showed, according to Keynes' summary of the evidence, that when money wages rise, real wages rise; but when money wages fall, real wages may either rise or fall and "are no more likely to rise than to fall." (Keynes, 1939, p. 34). Keynes made several points in reply. He noted, correctly, that Bowley, Dunlop and Tarshis had not separated the effects of cyclical fluctuations in output from other determinants of money wages and argues that the inflation and cyclical movements in prices and output had different effects on wages. The proposition that money wages and real wages move inversely referred to the cyclical movement, not to the long-term effects of inflation, deflation or secular changes in wages. Failure to separate the two made the empirical evidence difficult to interpret.

The theoretical argument that led Keynes to accept the proposition was an application of competitive theory. [1939, pp. 39-40] Marginal cost rises with output, and the principal short-run cost of increasing output is wage
cost. If marginal cost equals price, and employment increases, money wages rise less than prices. Real wages fall in cyclical expansions as employment increases, and rise in recessions.

Data showing that the share of national income going to wages was independent of the level of output and the position in the cycle was disturbing. Keynes argued that an adequate explanation of the cyclical changes in wages must be consistent with the data on labor's share. The usual arguments suggesting a transfer from labor to capital during cyclical expansions are not consistent with the data he reported on the share of wages in the United States and Britain. 4/
This paper benefitted from useful discussions with Francisco Lopes and from correspondence with David Laidler.

Marshall did not equivocate. He refers to Bowley's work as "practically decisive" and reports that he had held the contrary opinion, which he calls "the common doctrine," until he began to study the subject. But his conviction increased when he read Bowley's study. The quotations from Marshall and some of Bowley's data are reproduced in Keynes [EJ, 1939].

Thornton's statement is, of course, a denial of Say's Law. A careful reading of the book shows that the excess supply of labor and output was regarded as temporary because the price-specie flow mechanism adjusted the price level to the world price level under the gold standard.

Keynes did not regard Chapter 19 as central to his discussion of fluctuations, however. In Keynes (1939, p. 35), he distinguishes between response of wages to cyclical changes in employment "caused by changes in effective demand" and the subject matter of Chapter 19. The latter discusses prices or other conditions of the wage contract that "are not primarily the result of changes in the level of output and employment."

There is, of course, no inherent contradiction between constant shares and the Thornton-Marshall-Keynes proposition. The reconciliation restricts the elasticity of the supply of a labor as function of the real wage. Keynes concentrates on the determinants of changes in profits and does not mention this point.
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Importance:

Keynes assumed \( w = \ddot{w} \)

Older theories: Marshall
Thornton

Relation to \( wn/y \) 

Keynes

Tested by: Dunlop, Bowley (used by Marshall)

Keynes contribution - (1939 paper) (Chico)

Develop a Theory of wages (Friedman's missing equation)

Davidson The facts he accepted despite Dunlop's findings

Keynes asserted

\[
\frac{d(w/p)}{dw} < 0 \quad \text{cyclically and}
\]

Dunlop found \( dw > 0, \frac{dW}{p} > 0 \) but

\( d<0 \)

\( dw < 0, \frac{dW}{p} > 0 \)

\[
\frac{dw}{p} = \frac{p - \frac{dp}{dw} W}{p^2} = \frac{1}{p} \left[ 1 - \varepsilon(p, w) \right]
\]

\[
\frac{dw}{p} \cdot \frac{W}{p} \varepsilon(\frac{W}{p}, w) = p \frac{dW}{p} \cdot
\]

\[
\varepsilon(\frac{W}{p}, w) = 1 - \varepsilon(p, w)
\]

and this is negative if \( \varepsilon(p, w) > 1 \)

Small changes in \( w \) induce larger changes in \( p \).
This is Keynes argument - reached it as follows

1. \( MC = p \)
2. \( MC \sim \Delta(W+N) \)

He considered various qualifications to the two propositions but concluded that they were true. Formally, his argument reduces to the following:

\[
d(W+N) = d(px) = dWN + dN\cdot W = dpx + xdp
\]

and

\[
\frac{dp}{p} > \frac{dw}{w} \quad \text{if} \quad \frac{1 + \varepsilon(x,p)}{1 + \varepsilon(N,W)} \frac{px}{NW} < 1
\]

or \( \varepsilon(x,p)px < \varepsilon(N,W)NW \)

Keynes made \( \varepsilon(N,W) \) very large in cycles

The crucial assumption is that

\[
\frac{\varepsilon(x,p)}{\varepsilon(N,W)} < \frac{NW}{px}
\]

or as Keynes preferred, return to capital increase relative to wage payments in expansions and fall in contractions.

The problem that troubled Keynes was data showing that the share of wages in output was constant. Keynes described the statistics on wage share as one of the "best-established facts in the whole range of economic statistics," and remarked further that these statistics showed no "tendency to move against labor in years of increasing output" by which he meant cyclical recovery.

This is irrelevant. \( \frac{NW}{px} \) can be a constant and the relation still may hold. All that seems to be involved is that the ratio of elasticities \( \frac{\varepsilon(x,p)}{\varepsilon(N,W)} \) be a constant smaller than \( \frac{NW}{px} \).
Keynes is correct in arguing that

(1) Should explain wage share and cyclical fluctuations with the
the same model

and (2) but wrong in arguing that the constancy of wage share

\[ \frac{dp}{p} > \frac{dw}{w} \]

Evidence on the two elasticities would settle the issue.

Relation to Phillips Curve

Recent discussion of relation of \( w \) or \( p \) and output is the Phillips
curve. The Phillips curve assumes a delay in response of \( p \) and \( w \) to
\( y \). Single equation models take a disequilibrium view of the labor or
output market and provides no answer to the question about movements
of \( w/p \) and \( w \).

\( P \)-curve models in which

\[ \hat{p} = f(\hat{w}_{t-1} \ldots) \]

and

\[ \hat{w} = g(\hat{p}_{t-1} \ldots) \]

have not given very stable or reliable estimates, and suffer from the
deficiency of most of \( P \)-curve

Confined to quarterly data for a few years --

One reason, at least in the U.S., and U.K. is the difficulty in fitting
interwar years (Lucas & Rapping, Ries).
It is interesting to speculate about why Keynes' concern for $e(w/p,w)$ became converted into P-curve. Among K - Modigliani accepts Dunlop's evidence -- Tobin (Pres. address) uses K argument by relying on intersectional way diff. K specifically separate effect on P but Tobin does not.

An entirely different issue is the effect of inflation on output. Keynes proposition about $e(w/p,w)$ hold $\hat{p}^a$ constant. Here the P-curve inters, but not to resolve the K issue.

The approach taken -- (a simple model)

Max consumer chooses $C$ and $N^S$ as of $y^*$

Consistency

i.e. $\langle w N \rangle^a_p = y_L^a$

and $y^a = y_L^a + \hat{y}_K^a$

\[
\frac{y^a}{N} = F\left( \frac{K}{L_{-1}}, \frac{L}{N_{-1}}, Lg_{t-1}, B/p_{t-1} \right)
\]

and $y^a = F\left( \frac{K}{L}, \frac{L}{N}, Lg, B/p, N \right)$

(1) Positions can change - but only if others change

(2) Society is tied to its production function

(3) $B/p$ raises $y^a$ -(a) expected effect of monetary policy in an under employed economy

(b) steady-state effect of technical changes in payments on $\hat{y}$. 

Workers supply labor according to anticipations

\[ L^a = p \left( \frac{w}{p}, y^a \right) \]

Firms in the aggregate hold some anticipation

\[ y^a \text{ is the same for everyone} \]

\[ L^d = d \left( \frac{w}{p}, y^a, \text{Lg} \right) \]

\[ y = y^a + \epsilon \]

\( \epsilon \) may not be N(0,\( \sigma \))

Both equations linear in logs

\[ \ln w = w_D + w_L \ln y^* + \ln p \]

\[ \hat{w} = w_0 + w_4 y + p_1 \text{Lg} + p \]

Two H₀ about \( \hat{p} \) - rational expectations if \( \hat{B} \) is difficult to forecast

1. \( \hat{p}^a = \mu - g \)

\[ \mu_t = \sum_{t=1}^{3} \mu_{t-i} \]

\[ g = \text{constant} \]

2. \( \hat{p} = \varphi_1 \hat{p}^a + \varphi_2 \hat{B} \)

- I use this

Estimated: 1900-40 and 1955-74 U.S. annual data

\[ (\hat{w} = -.02 + .61 \hat{p}^a + .53 \hat{B} + .01 \text{Lg} + .64 \hat{y}^* \]

\( (2.0) \quad (2.75) \quad (4.70) \quad (.18) \)

\[ R^2 = .80 \]

\[ DW = 1.88 \]
Previously I had for same period

\[
\begin{align*}
\hat{\rho} &= -0.029 + 0.69 \hat{p}^a + 0.25 \hat{B} + 0.11 \hat{L}_g + 0.65 \hat{y}^a \\
&\quad (4.36) \quad (4.44) \quad (3.09) \quad (2.61) \quad (5.65) \\
\hat{R}^2 &= 0.84 \\
\text{DW} &= 1.98
\end{align*}
\]

So \( \hat{w} - \hat{p} = 1.0 -0.08 \hat{p}^a + 0.28 \hat{B} -0.10 \hat{L}_g -0.01 \hat{y}^a \)

Answers to questions

(1) Real wages rise (constant) on average by about 1% per year of \( \hat{B}, \hat{p}^a, \hat{y}^a \) are constant.

(2) Changes in anticipations of \( \hat{y}^a \) increase \( \hat{p} \) and \( \hat{w} \) about the same so \( \hat{w} - \hat{p} \) unaffected or falls slightly.

(3) The principal effect of anticipated inflation is slightly negative (-.08) but not significant.

(4) On avg. 
\[
\begin{align*}
\hat{B} &= 0.065 \\
\hat{p}^a &= 0.023 \\
\hat{y}^a &= 0.038
\end{align*}
\]
So \( \hat{w} - \hat{p} \) rise \( 0.01 + 0.02 = 0.03 \)

(5) Maintained money growth \( \hat{p}^a \) has little long-term effect but \( \hat{B} \) rises in expansion and \( \hat{w} \) rises in expansion and \( \hat{w} \) rises and so does \( \hat{w} - \hat{p} \).
Previously, I had estimated $y^a$, $p$ and computed $\hat{y}^a$ but $\hat{w} - \hat{p}$ independent of $\hat{y}^a$ so no need to solve for this effect.

(6) \[ \text{R. Constancy of } \frac{\hat{w}_N}{\hat{p}_N} \text{ reflects } \]

(a) $\hat{w} - \hat{p}$ independent of $\hat{y}$ - rise at a constant rate
(b) $\hat{w} - \hat{p}$ affected by $\hat{B}$ - rise $\hat{w}/\hat{B}/\hat{p}$ representing effect of payments imp. on $N^a$
(c) $\hat{y}$ affected by $\hat{N}$ and participation rate

The effect of technical changes in payments system.

Technical changes in payments system raise real wages --

(7) Cyclical effect on real wages

\[ \frac{\hat{w}}{\hat{p}} \text{ rises via relative price adjustment induced by } \hat{B} - \hat{p}^a \]

(or dynamic real balance effect)

Refer to P. Johnson - JPE

Long-run $\hat{M} = \hat{p}$

but technical changes in payments affect the wage rate by changing labor supply.

Payments less time intensive, leisure increases and labor supply increases but $L^d$ also increases and this dominates.

(8) The cyclical relation discussed by K appears to be a relative price effect.

i.e. when $\hat{B} < 0$ $\hat{w}$ falls more than $\hat{p}$, and when $\hat{B} > 0$ $\hat{w}$ rises more than $\hat{p}$.
There is some evidence of the asymmetry so commonly mentioned in literature.

**Two additional tests**

1. **Effect of errors in anticipations**

2. **Effect of gap (P-curve)**

**1. Errors**

\[
\hat{w} = -2.06 + 0.62 \hat{p}^a + 0.51 \hat{y} - 0.02 Lg + 0.38 \hat{y}^a + 0.37 \hat{y} \\
\text{\textit{(2.24)}} \quad \text{\textit{(2.92)}} \quad \text{\textit{(4.72)}} \quad \text{\textit{(3.5)}} \quad \text{\textit{(2.08)}} \quad \text{\textit{(2.83)}}
\]

\[R^2 = 0.82 \quad \text{DW} = 1.71\]

Effects of \(\hat{y}\) given \(\hat{y}^a\) seem to be same as \(\hat{y}^a\) - So error does not affect \(\hat{w}\).

**2. Gap** - Used Supply Side model of P-curve

\[
\hat{w} = -0.01 + 0.67 \hat{p}^a + 0.92 \hat{y}^a + 0.46 \hat{y} - 0.37 (y-y_f) \\
\text{\textit{(1.0)}} \quad \text{\textit{(2.70)}} \quad \text{\textit{(5.57)}} \quad \text{\textit{(3.03)}} \quad \text{\textit{(0.13)}}
\]

No effect of gap.

**Comparison w/Gold Standard (1901-31)**

(Change expectations as change policy -- Lucas)

\[
\hat{w} = -0.004 + 0.71 \hat{p}^a + 0.70 \hat{B} - 0.03 \hat{Lg} + 0.08 \hat{y}^a - 0.2 \\
\text{\textit{(0.37)}} \quad \text{\textit{(2.21)}} \quad \text{\textit{(3.65)}} \quad \text{\textit{(0.59)}} \quad \text{\textit{(0.28)}} \\
\text{\textit{R^2 = 0.5)}} \quad \text{DW 1.93}
Only difference is $\hat{y}^a$ - no effect

and $\hat{w} = -.01 + .82 \hat{p}^a + .64 \hat{B} - .05 \hat{Lg} - .06 (\hat{y}^a) + .32 \hat{y}$

This suggests current $\hat{y}$, not $\hat{y}^a$ is most important for gold standard year.

Fortunately I had estimated and reported for 1901-31.

$\hat{p} = -.03 + .28 \hat{p}^a + .71 \hat{B} + .08 \hat{Lg} + .38 \hat{y}^a + .16 \hat{y}$

and for this period

$\hat{y}$ raises $\hat{w}$ relative to $\hat{w} - \hat{p}$ given $\hat{y}^a$

but $\hat{y}^a$ lowers $\hat{w} - \hat{p}$

So Keynes appears to be right for gold standard years

i.e.

$\hat{B}$ has no effect

$\hat{y}^a$ raise $\hat{p}$ more than $\hat{w}$ and lowers real wages, but not for the whole period.

A likely reason -- Unemployment Compensation

Now reformulate the model

$L^d = d(\frac{w}{p}, y^*, Lg)$

$L^s = s(\frac{w}{p}, y^*, C) C = \text{Compensation}$

$L^d = d(\frac{w}{p}, y^*, Lg)$
Take logs -

\[ L = L_0 + L_1 y^a + L_2 Lg + L_3 C \]

\[ L_1 = \frac{s_1 d_2 - s_2 d_1}{s_1 - d_1} > 0 \]

\[ L_2 = \frac{d_3 s_1}{s_1 - d_1} > 0 \]

\[ L_3 = -\frac{s_3 d_1}{s_1 - d_1} < 0 \]

\[ \hat{w} - \hat{p} = w_o + w_1 y^a + w_2 Lg + w_3 C \]

\[ w_1 = +\left(\frac{d_2 - s_2}{d_1 - d_1}\right) > 0 \quad \text{if} \quad d_2 > s_2 \]

\[ w_2 = +\frac{d_3}{s_1 - d_1} > 0 \]

\[ w_3 = -\frac{s_3}{d_1 - d_1} > 0 \]

Identification -- System is just identified

\[ \frac{w_3}{L_3} = d_1 \]

\[ \frac{w_2}{L_2} = s_1 \]

\[ w_2 \quad \text{and} \quad L_2 \quad \text{and} \quad w_3 \quad \text{and} \quad L_3 \rightarrow d_3 \quad \text{and} \quad s_3 \quad \text{given} \quad s_1, \quad d_1 \quad \text{and} \quad L_1 \quad \text{and} \quad w_1 \]

can be used to solve for \( d_2 \) and \( s_2 \).
Further work

(1) Effect of $\Delta \left( \frac{D}{DL} \right)$ in $\mathbb{L}^d$

(2) Effect of $\hat{p}^*$ in $\mathbb{L}^d$ $\rightarrow$ British prices to 1931 or to 1940 OECD after 1954

(3) Loops - Counter-clockwise in 19th century Britain
Wages rise more when unemployment is falling $\hat{U} < 0$
and rise less when $\hat{U} > 0$
See Laidler and Parkin p. 754 of Survey

(4) Disequilibrium -- Effect of $\hat{U}$, and $U$ and $y-y_f$
To be done

1. LF (employment reduced forms)

2. Role of unemployment compensation in labor supply and wage rate

3. Discuss share of wages in income

\[
\frac{dw - dp}{w - p} \left( \frac{dy}{y^*} \right) = 0 \quad \text{and} \quad \frac{dN}{N} = ?
\]

The earlier period 1901-40 differ from later

4. Real wages and inflation

If labor's share rises with \( \hat{p} \) (or falls) capital share falls or rises. Relation to \( \hat{p} \) and growth

Previous finding -- no relation
(Anticipated \( \hat{p}^a \) and unanticipated \( \hat{p} - p \). p. 199) in full period data but small positive effect of \( K \) on \( \hat{p} \).

5. Relation to slope of P-curve and problem w/ pre-war

(a) \( \hat{p}, \hat{y} > 0 \)
(b) \( \hat{p}, \hat{y} < 0 \) Friedman
(c) \( \hat{p}, \hat{y} = 0 \) Long-run (Prev. Finding)

Same for \( \hat{w} \) ?

6. Is there a difference between reductions in \( \hat{w} \) and reductions in \( \hat{w} - \hat{p} \) by inflation

Keynes-
Tobin