— the reduced-form real wage equations (loosely interpreted as aggregate supply curves) also identify the cyclical sensitivity of real wages and their response to external changes. For instance, the aggregate supply curves for the United Kingdom are rather flat, implying that shifts in the labour demand curve mainly affect employment. By contrast, real wages in Germany and Belgium have a high degree of cyclical sensitivity, so that a fall in labour demand automatically generates a moderation of wage growth. As regards the impact of external changes (productivity growth and changes in import and export prices) and the stability of the aggregate supply curves, the United States, in particular, has benefited from a smooth adjustment of real wages. On the other hand, the Belgian supply curve is highly sensitive to external price changes, reflecting constraints on output prices as well as widespread wage indexation, whereas fluctuations in productivity growth are largely accommodated in real wages.

As a final point, there is relatively firm evidence of an adverse real wage effect in Europe, but the precise transmission mechanism has not been identified. This paper has assumed a direct employment effect on the basis of a classical labour demand curve, but an alternative explanation might be that higher real wages mainly influence employment via changes in investment and growth of the capital stock. We have not explored this issue, but [7; 17; and 19] interpret declining profitability and lower capital stock growth as being caused by inflexible real wages and as a major reason for the recent wage employment growth. A more rigorous test of this capital shortfalls hypothesis would, however, be beyond the scope of this paper and we shall leave it as an issue for future work.

References

WAGE FLEXIBILITY AND EMPLOYMENT

PETER HOWITT

1. Introduction
One of the central messages of Keynes's General Theory [3] was that wage flexibility cannot be counted on to cure unemployment. One part of Keynes's argument was that wages were not in fact very flexible. But he did not rest his case on the assumption of sticky wages. In Chapter 19 he argued that if wages were more flexible, matters would be even worse. Greater wage-flexibility would be detrimental to social justice, would lead to greater labour unrest, and would destabilize the value of money. More to the point it would probably also make unemployment even worse because wage reductions would cause the level of aggregate demand to fall.

Keynes pointed to several channels through which a wage-reduction might reduce aggregate demand. The one he seemed to rely on most was an expectation effect:

- The reduction leads to the expectation, or even to the serious possibility, of a further wage-reduction in prospect... it will diminish the marginal efficiency of capital and will lead to the postponement both of investment and of consumption [3, 26].

He pointed out that if wages were suddenly to fall so low that they were believed to have "touched bottom" then the expectation of wage inflation would stimulate aggregate demand. But he argued that this was "scarcely practical", and that:

- it would be much better that wages should be rigidly fixed and deemed incapable of material changes, than that depressions should be accompanied by a gradual downward tendency of money-wage, a further moderate wage reduction being expected to equalize such increase of, say, 1 per cent in the amount of unemployment [3, 26].

Another channel was the distribution effect of a wage reduction, between wage earners and "other factors entering into marginal prime cost whose remuneration has not been reduced" [3, 26]. This effect he argued would probably diminish the propensity to consume.

Still another channel was the increase in the real burden of nominal debts. This would transfer income "from entrepreneurs to rentiers" (Keynes's archetypal debtors and creditors), which he believed was more likely to lower than to raise the propensity to consume. It would also deprive entrepreneurial confidence, with adverse effects on investment. And if the reduction was large enough it would even lead many entrepreneurs to the point of insolvency, "with severely adverse effects on investment" [3, 264].

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There are two separate propositions involved in Keynes's argument, although he was not careful to distinguish between them. The first is that the impact effect of a given wage reduction is to reduce employment. The second is that an increase in the degree of flexibility of wages will make employment more variable—that depressions will be deepened or prolonged by the expectation that they will cause wage deflation. The distinction between these two propositions corresponds to the now familiar rational-expectations distinction between the effects of a one-time policy action and the effects of a policy regime.

Despite the enormous influence that Keynes has had (and continues to have) on the development of macroeconomics, his ideas concerning wage flexibility have never "caught on". Modern Keynesian economics has been built on the assumption of sticky wages (and possibly prices). Most Keynesian models would exhibit no involuntary unemployment without this assumption. Several authors have noted that the impact effect of wage-reductions might be pervasive, but that possibility has played no part in the development of mainstream Keynesian models. Likewise, the idea that the variability of output is positively related to the degree of flexibility of wages seems hardly to have been examined in recent years. Instead, it is commonplace to assert that wage- and employment-variability are substitutes.

The purpose of this paper is to reexamine Keynes's two propositions using a simple rational-expectations macro model. The assumption of rational expectations is useful for distinguishing clearly between Keynes's two propositions. It is also appropriate for analyzing the second proposition, since it deals not with a once-over unique historical event but with a recurrent systemic pattern of wage-behaviour that people can reasonably be supposed to anticipate.

The model distinguishes between two sorts of wage flexibility: sensitivity to employment, and speed of adjustment. Sensitivity is represented by the effect of a given increase in employment on a target wage. The change in the money wage each period is a fraction of the gap that existed last period between the target wage and the actual wage. That fraction represents the speed of adjustment.

The model also includes two kinds of random shocks that affect employment; shocks to aggregate demand and wage shocks. Demand shocks are included for obvious reasons; wage shocks are included in order to make the experiment of a once-over reduction in wages logically admissible in a rational-expectations model. Keynes's second proposition also has a temporal dimension to it that his analysis does not address. Specifically, if we interpret the variability of employment as the variance of a rational forecast of employment, it matters how far ahead that forecast is made. In the following analysis I consider two forecast horizons: one period and infinity. Thus I consider

1Before the General Theory, Keynes's first proposition was a central aspect of Fisher's [2] theory of depressions. Fischer's analysis has recently been revived by Tobin [8]. Keynes's second proposition was also invoked by Patinkin [6, 71-72], who emphasized the positive perverse effects of wage-price reductions working through expectations and through increased bankruptcy induced by greater real debt. None of these authors, however, artificiated Keynes's second proposition. In particular, the idea stressed by Patinkin, and analysed more formally by Tobin [8], that a full employment equilibrium might be dynamically unstable does not imply that greater wage flexibility would increase the likelihood of dynamic instability. In fact, it would decrease the likelihood in Tobin's [8] model.

More recently DeLong and Summers [4] have presented an analysis of Keynes's second proposition. Their paper, which was not in issue of Tobin's [2] overlapping-gage model does not include the possibility of Keynes's first proposition, because it excludes the real-debt effect and the real-wage effect. It deals exclusively with the unconditional stationary variance of output and it employs a much simpler specification than the theoretical demonstrations of the present paper. Currie and Patinkin [1] develop a model with a real-debt effect. They carry out simulations to show results like those of DeLong and Summers. They also show analytically that (a) the immediate offset but following a monetary contraction and (b) the likelihood of asymptotic instability are both increased by greater wage flexibility.

2Stocks to the price equation could be added with little effect on the main results. the effects of varying wage flexibility on both the one-period-ahead conditional variance of employment and the unconditional stationary variance of employment.

This reexamination confirms that Keynes's first proposition is correct under the conditions that he postulated—a large real-debt effect or a large real-wage effect. It also tends to confirm the short-run version of his second proposition. Specifically, the one-period-ahead variance of employment is an increasing function of the sensitivity of wages to employment; it is also an increasing function of the speed of adjustment of wages if either demand shocks account for a large enough fraction of the variability of output or Keynes's first proposition is invalid.

The main reason for the confirmation of Keynes's second proposition is the expectation effect that he stressed in his own analysis. Through this effect wage adjustment generates a multiplier process. An increase in aggregate demand causes a rise in employment, and hence a rise in this period's target wage. This will cause a rise in wages next period. The anticipation of this rise in wages induces a secondary rise in aggregate demand this period. The greater the sensitivity of wages to employment, or the greater the speed of adjustment, the greater the anticipated rise in wages and hence the greater the multiplier effect.

The analysis is less clear concerning the long-run version of Keynes's second proposition. In particular, raising the flexibility of wages can cause shocks to be damped more quickly, which tends to reduce the stationary variance of employment. However, the model does imply that an increased sensitivity of wages to raise the stationary variance of employment in the case where Keynes's first proposition is correct. It also implies that an increase in wage flexibility by either interpretation will raise the stationary variance in the special case where the only channel through which wages affect employment is the expectation effect.

The results depend heavily on the assumption that the effect on wages of an increase in employment works with a one-period delay. Without this delay the multiplier process resulting from Keynes's expectation effect would not arise, because an increase in demand would have an immediate effect on wages, which would start to go away in the following period. Thus it would give rise to the expectation of deflation, not inflation, an expectation that would dampen the impact on employment rather than amplify it. The sensitivity of the new model to the timing assumption illustrates the importance of the considerations stressed by Keynes. If wages were to "touch bottom" in response to a fall in demand, the expectation of the subsequent rise would stabilize employment. The model presented below rules out such a response by assumption. This is consistent with Keynes's view that the case is "scarcely practical", but it is nonetheless an arbitrary timing assumption in the context of the formal model.

II. The Model

The model employs the following notation:

\[ n = \text{log of employment} \]
\[ p = \text{log of price level} \]
\[ w = \text{log of money wage rate} \]
\[ c = \text{demand shock} \]
\[ e = \text{wage shock} \]

The shocks are independent white-noise processes with variances \( \sigma^2_x \) and \( \sigma^2_e \), respectively.

The variables are related by the following three equations:

\[ n_t = a_1 (n_{t-1} + p_{t-1}) + a_2 (w_{t-1}) + e_{t-1} \]
\[ w_t = a_3 (f_{t-1} + p_{t-1}) + (1 - a_3) w_{t-1} + e_{w, t} \]
\[ p_t = w_t + e_{p, t} \]
All constants are suppressed, and \( E_t \) denotes the rational expectation conditional on an information set \( I_t \) that includes all parameters and current dated variables. Equation (1) can be derived as the reduced form of an IS-LM system in which the distribution of wealth between debtors and creditors, and the distribution of income between workers and others are included as arguments in the IS curve, and where Mundell’s [5] analysis of real and nominal interest rates is included.

The parameter \( \epsilon \) in (1) represents Keynes’s expectation effect, and is positive. A rise in expected inflation increases demand and hence employment. The parameter \( d \) is the effect on employment of an increase in demand caused by a rise in the price level. If Keynes’s real-debt effect is large enough \( d \) will be positive, but if the Keynes or Pigou effect is large enough it will be negative. The parameter \( r \) embodies the income-distribution effect of a change in real wages, and is positive.

Equation (2) represents the assumed outcome of the wage bargain. It states that wages adjust with a lag to a target wage. The target wage adjusts one-for-one to changes in the cost of living. The speed of adjustment is measured by the parameter \( \alpha \), which lies between zero and one. The sensitivity of wages to employment is measured by the parameter \( f \), which is positive.

Equation (3) is a log-linear approximation to a simple markup of price over a weighted average of short-run and long-run cost, under an assumption of constant returns. Thus the parameter \( m \) lies between zero and one.

III. Employment and Wages

It is straightforward to verify that the unique solution to equations (1)-(3) is given by the two equations:

\[
\begin{align*}
\phi &= (d - \alpha)(1 - \alpha f) \frac{1}{1 - \alpha f} \\
\theta &= \lambda \frac{1}{1 - \alpha f}
\end{align*}
\]

**Assume that**

\[
\alpha f < 1.
\]

Then (8) can be interpreted as a multiplier formula. When a demand shock causes a one unit direct effect on employment, the change in the target wage on the rate by \( \phi \), causing the rational expectation that wages next period will rise by \( \alpha \phi \), and that prices will therefore rise by \( \alpha f \phi \). This expectation has a secondary effect of making employment this period rise.

by \( \alpha f \) through the expectation effect, causing another increase in the target wage, and so forth. The limit of this process is (8). The greater is the sensitivity of wages \( f \) or the speed of adjustment \( \alpha \), the larger is this multiplier.

Next, note that the impact effect on employment of an exogenous change in wages is:

\[
\theta_{t+1} = \theta_t + \frac{\partial \theta_t}{\partial \text{wage}} \cdot \delta
\]

Keynes’s first proposition is that \( \delta \) is positive. It follows from (7) and (9) that this will be the case whenever the real-debt effect \( d \) and/or the real-wage effect \( \alpha \) is positive and large enough relative to the expectation effect \( \epsilon \) and/or the speed of adjustment \( \alpha \).

The expectation effect \( \epsilon \) works against Keynes’s first proposition because in this model an exogenous increase in wages always reduces the rate at which wages are expected to rise next period. Thus a negative \( \epsilon \) effects works like the case discussed by Keynes of wages being thought to have “touched bottom”.

To analyze Keynes’s second proposition, consider the one-period-ahead conditional variance:

\[
\text{var}(w_{t+1} | I_t, \epsilon) = \left( \frac{1}{1 - \alpha f} \right)^2 \sigma_e^2 + \left( \frac{\delta}{\alpha f} \right)^2 \sigma_w^2
\]

Note that an increase in either the sensitivity \( f \) or the speed of adjustment \( \alpha \) will increase the part of this conditional variance attributable to demand shocks \( \left( \frac{1}{1 - \alpha f} \right)^2 \sigma_e^2 \) by increasing the size of the expectation multiplier. By (7), an increase in sensitivity will also increase the part attributable to wage shocks, because the coefficient \( \phi \) can be expressed as the product of a direct effect \( d - \alpha \phi (1 - m) + r(1 - m) \) and the expectation multiplier, and an increase in \( f \) increases the multiplier. An increase in the speed of adjustment \( \alpha \) has an ambiguous effect on the conditional variance attributable to wage shocks because it reduces the direct effect but increases the multiplier. Note, however, that under “classical” conditions; i.e. assuming that \( \phi < 0 \), this effect \( \left( \frac{\delta}{\alpha f} \right)^2 \sigma_w^2 \) is unambiguously positive.

Thus the short-run version of Keynes’s second proposition is borne out by the model, with one exception. Specifically, the proposition is invalid only if demand shocks account for a small enough proportion of the variability of output, flexibility is interpreted as speed of adjustment, and Keynes’s first proposition \( (\phi > 0) \) is valid.

The model is less clear-cut concerning the long-run version of Keynes’s second proposition. This is because an increase in the speed of adjustment \( \alpha \), while it may increase the impact effect on employment of a demand or wage shock, may increase the speed with which that effect is dampened by the system. The more rapid dampening tends to offset with an ambiguous overall effect on the unconditional stationary variance of employment. The effect of an increase in sensitivity \( f \) is similarly ambiguous.

More specifically, the damping factor of the system is the eigenvalue \( \lambda \) given by (6); the dynamic response of employment to a wage or demand shock is:

\[
\begin{align*}
\text{sn}_{t+1} / \text{sn}_t &= \phi \lambda \gamma; \qquad i = 0,1,\ldots \\
\text{sn}_t / \text{sn}_t &= \frac{1}{1 - \alpha f} \lambda^{-1} \lambda_i \phi (1 - \alpha f) \\
\text{sn}_{t+1} / \text{sn}_t &= \lambda^{-1} \lambda_i \phi (1 - \alpha f) \quad i = 1,2,\ldots
\end{align*}
\]

Assume that the system is stable:

\[
\lambda^2 < 1,
\]

Then the unconditional variance of employment is:

\[
\text{var}(w_t) = (1 + \alpha f)^2 \phi^2 (1 - \lambda^2) \left( \frac{1}{1 - \alpha f} \right)^2 \sigma_e^2 + \left( \frac{\delta}{\alpha f} \right)^2 (1 - \lambda^2) \sigma_w^2
\]

Which could be increasing or decreasing in \( \alpha \) or \( f \) because \( \lambda^2 \) could be increasing or decreasing in \( \alpha \) or \( f \).
INERTIA IN LABOR MARKETS

GRAHAM PYATT*

1. Introduction

The model presented in this paper is an attempt to characterize the short-run equilibrium of a firm which is faced with a firm-specific and unionized labor force. The starting point is the formulation provided by McDonald and Solow [5], which is generalized here in three main respects.

First, and most importantly, in the McDonald and Solow analysis the firm is faced by a unionized labor force of a given size, and it is unable to recruit from any other source. In contrast, the approach here assumes that additional labor is available externally in infinitely elastic supply at a wage which is exogenous to the firm.

Secondly, McDonald and Solow assume that the firm will always operate on its production function boundary, i.e., that it will maximize output, given the level of employment. By relaxing this condition, it is shown that circumstances can exist under which it will be optimal for the firm to produce inside the production boundary, i.e., for the firm to be x-inefficient.

Thirdly, in common with McDonald and Solow, the present analysis treats the determination of wages and employment for unionized labor as a bargaining problem and, more specifically, as a cooperative game. Their specific results depend on assuming the Nash [3] solution, although they note that other solution algorithms are likely to give similar results.

Here, no specific algorithm is to be adopted and the results obtained are dependent only on the notion of a Pareto efficient solution, i.e., on a solution which could not be improved either for the firm or for the union without the other party being made worse off.

The main result of the analysis is that the level of employment is largely determined independent of the wage in this model. In consequence, changes external to the firm, e.g., in product demand, may have no effect on the number of workers which the firm employs.

And with respect to wages, it is shown that, contrary to the statement by McDonald and Solow [2], the wage will not necessarily exceed the marginal revenue product of labor either in their version of the model or in its generalized form as presented here.

One advantage of the present approach is that by not adopting any specific solution algorithm, the results obtained can be related to those for the labor managed firm as set out, for example, in Brewer and Browning [2] and Steinbruck and Thoms [5].

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