

The wage equation.

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April 1998

A central equation in the models we have used so far has been the wage relation, the relation between the wage set in bargaining between firms and workers, and labor market conditions. The purpose of this note is to review the state of our (limited) empirical knowledge on this topic.

1 Empirical wage equations

Start with the standard characterization of the joint behavior of wage inflation, price inflation, and unemployment in U.S. macroeconomic models.

Standard macroeconomic models determine the natural rate through two equations, a “price equation” and a “wage equation” In their simplest form, the equations can be written as:

$$\Delta \log P_t = a_p + \Delta \log W_t + \epsilon_{pt} \quad (1.1)$$

$$\Delta \log W_t = a_w + \Delta \log P_{t-1} - \beta u_t + \epsilon_{wt} \quad (1.2)$$

* Prepared for Lecture 9, Econ 2410d

where P is the price index, W is the nominal wage, so that $\Delta \log P$ and $\Delta \log W$ are price and wage inflation respectively, u is the unemployment rate, a_p and a_w are constants, and ϵ_p and ϵ_w are error terms.

Eliminating wage inflation between the two, these equations yield the (expectations-augmented) “Phillips curve” relation between the change in inflation and the unemployment rate:

$$\Delta \log P_t = a + \Delta \log P_{t-1} - \beta u_t + \epsilon_t$$

where $a \equiv a_p + a_w$, and $\epsilon_t \equiv \epsilon_{wt} + \epsilon_{pt}$.

The natural rate of unemployment is then taken to be the rate of unemployment consistent with constant (non-accelerating) inflation in this Phillips curve equation.

The first three columns of Table 1 (taken from Blanchard and Katz [1997]) report the results of estimating these relations using annual U.S. data for 1970-95, with the consumer price index as a measure of the price level, and compensation per hour in the business sector as a measure of the wage level. Even in their simplest form, these three equations fit the data quite well. The specifications capture the basic dynamics in the data. Correction for serial correlation does not materially affect the estimated coefficients. The constraints that some coefficients are equal to one do not do injustice to the data.

The specifications presented in the first three columns of Table 1 can obviously be improved upon. The actual wage equations of large macroeconomic models include richer lag structures, as well as other variables such as trend productivity growth and wage/price-control dummies. Actual price equations typically specify price inflation not only as a function of wage inflation, but also of productivity growth and the rate of change of other input prices. A state-of-the art specification of the reduced-form Phillips curve model is given for example by Gordon [1997].

Table 1
Price Inflation, Wage Inflation, and Unemployment
in the United States, 1970-95

	(1) Δp	(2) Δw	(3) Δp	(4) Δw
Constant	-0.77 (0.28)	7.20 (1.40)	6.64 (1.65)	6.75 (1.31)
Δp_{-1}		1.00*	1.00*	1.00*
Δw	1.00*			
$(w_{-1} - p_{-1})$				0.16 (0.13)
Unemployment rate (u)		-0.99 (0.21)	-1.02 (0.24)	-0.95 (0.20)
Productivity (Z)				0.16 (0.13)
Durbin-Watson Statistic	1.26	1.18	1.48	1.33
R ²	0.76	0.67	0.71	0.68

All regressions include 26 annual observations for 1970 to 1995. A star . indicates that the coefficient is constrained to equal 1.

$p = 100 \times \log(\text{Consumer Price Index})$, using the CPI-U; $w = 100 \times \log(\text{Compensation per hour in the business sector})$; u is the civilian unemployment rate measured in percentage points. Time is a linear time trend equal to (year minus 1970); $Z = \log(\text{cyclically-adjusted labor productivity}) = \text{predicted value from a regression of } \log(\text{business sector output per hour}) \text{ on a linear time trend and its square for the 1969 to 1994 period.}$

Sources: Citibase.

It includes longer lags of past inflation, price-control dummies, and the rate of change of food and energy **prices**, and allows for a slowly moving intercept in the wage equation. But the basic structure of these equations remains close to those of the bare-bones specifications presented in the first three columns of Table 1, so that we can use these simpler equations as a basis for discussion.

The question we now take up is: Is the standard empirical wage equation (1.2) at all consistent with the wage relation we have derived in theory?

2 The wage relation

The best way to organize the discussion is to go to the wage relation implied by our benchmark model. When we derived the wage relation in that model, we assumed symmetry and thus assumed that wages at all firms were the same. We now want to return to the model without making this assumption.

The framework is the same as in the benchmark model. Workers are all alike. Firms may differ in the level of output per worker, y_i (One could further allow for differences in reservation wages across workers. Think about how this would change the equations below). We look at the wage w_i determined in a bargain between a worker and a firm with output per worker y_i .

The value equations for the worker are given by (ignoring the time derivatives for simplicity) :

$$rV_{Ei} = w_i + s(V_U - V_{Ei}) \quad (2.1)$$

$$rV_U = b + (h/u)(V_E - V_U) \quad (2.2)$$

$$rV_E = w + s(V_U - V_E) \quad (2.3)$$

Note that we now distinguish between the value of being employed in firm i , at wage w_i , and the value of being employed in the average firm, at wage w . If the

worker becomes unemployed, he will be hired again at expected wage w , not w_i .

The value equations for the firm are given by (ignoring again time derivatives):

$$rV_{Fi} = (y_i - w_i) - sV_{Fi} \quad (2.4)$$

$$rV_{Vi} = (h/v)(V_{Fi} - V_{Vi}) - sV_{Vi} \quad (2.5)$$

Except for the indexing of the firm by i , the equations are the same as in the benchmark model. Symmetric Nash bargaining implies that:

$$V_{Ei} - V_U = V_{Fi} - V_{Vi}$$

Solving out for wage w_i gives:

$$w_i = \left[1 + \frac{h/u}{r+s} + \frac{r+s+h/u}{r+s+h/v}\right]^{-1} \left[b + \frac{(h/u)}{r+s} w + \frac{r+s+h/u}{r+s+h/v} y_i\right] \quad (2.6)$$

And solving for the aggregate wage (i.e setting $w_i = w$):

$$w = \left[1 + \frac{r+s+h/u}{r+s+h/v}\right]^{-1} \left[b + \frac{r+s+h/u}{r+s+h/v} y\right] \quad (2.7)$$

Note that wage w_i depends on four factors:

- The wage elsewhere, as the worker has the option of looking for another job.
- The reservation wage b
- Productivity in the firm, y_i
- Labor market conditions, summarized by (h/u) and (h/v)

To get a better sense of what equations (2.6) and (2.7) imply, it is convenient to

use a log linearized approximation. Note first that w_i is homogenous of degree 1 in b , w and y_i . Assume that the matching function is given by the symmetric Cobb Douglas function $h = m\sqrt{uv}$, so that $(h/v) = m^2/(h/u)$ and labor market conditions can be summarized by (h/u) only. Reintroducing time indices, we can then rewrite equation (2.6):

$$\log w_{it} = a_1 \log w_t + a_2 \log b_t + a_3 \log y_{it} + a_4 \log (h/u)_t \quad (2.8)$$

where, because of homogeneity of degree one in the original equation, ($a_1 + a_2 + a_3 = 1$). The parameters a_1, a_2 and a_3 are straightforwardly related to the derivatives in (2.6) times the mean ratios of b , w and y_i to w_i respectively. The expression for a_4 is rather formidable, but is well approximated by:

$$a_4 \equiv [1 + (h/u)^2/m^2]^{-1} [2 \frac{y'}{w} - \frac{y''}{m^2}]$$

To get a sense of the values for the parameters in (2.8), think of the time period as a month and let $r = .01, s = .02, (h/v) = 1.0, (h/u) = .3$. Let $\bar{y}_i = \bar{y} = 1, b = .6$. These values imply a value of $\bar{w} = .7$. Together, these assumptions imply:

$$\log w_{it} = .88 \log w_t + .08 \log b_t + .04 \log y_{it} + .03 \log (h/u)_t \quad (2.9)$$

The corresponding equations for the aggregate wage are obtained by putting $w_i = w$ in the above equations and are given by:

$$\log w_t = b_1 \log b_t + b_2 \log y_t + b_3 \log (h/u)_t \quad (2.10)$$

Or, using the parameters above:

$$\log w_t = .66 \log b_t + .33 \log y_t + .25 \log (h/u)_t \quad (2.11)$$

3 Comparing the empirical and the theoretical relations

We can now return to the question of whether and how one can reconcile an equation such as (2.10) with the empirical characterization we saw earlier.

Our derivation of the theoretical wage relation was in terms of the real wage. Assume that the nominal wage is set according to (2.10), but based on the expected price rather than the actual level. Then we can rewrite the theoretical wage relation as:

$$\log W_t - \log P_t^e = b_1 \log b_t + b_2 \log y_t + b_3 \log (h/u)_t \quad (3.1)$$

Conversely, assume that in the empirical wage equation, lagged inflation stands for expected inflation, $(\log P_t^e - \log P_{t-1})$ and rewrite equation (1.2) as:

$$\log W_t - \log P_t^e - (\log W_{t-1} - \log P_{t-1}) = a - \beta u_t + \epsilon_{wt} \quad (3.2)$$

There are three main differences between the two equations.

- Theory suggests a different labor market variable than the unemployment rate, (h/u) rather than u . Recall that constant returns in matching implies that (h/u) can be expressed as a function of (v/u) . Thus, to the extent that h is not easily available, one can replace (h/u) by (v/u) . In a paper with Diamond (Blanchard and Diamond [1990]), we explored whether (v/u) or (h/u) performed better than u in a wage Phillips curve. It did not. James Medoff has however argued that vacancies often do better than unemployment in conventional Phillips curves, both in the United States and in other countries. In the recent past also, it is clear that one would have done better using (h/u) than u to predict wage inflation: while u has declined, (h/u) has not increased in relation to u (see a previous hand-out). Put another way, given the historical relation of unemployment duration to the unem-

ployment rate, and how low the unemployment rate is today, unemployment duration is surprisingly high today, and wage inflation is surprisingly subdued.

- a At least in the simple empirical specification, two variables are missing. The reservation wage. And productivity, that affects the wage through its effect on the size of the total flow surplus (productivity would not necessarily be there if we had closed the model through the alternative route of assuming $V_{Ei} - V_U = G$, as for example in the Shapiro-Stiglitz model). And the reservation wage is missing as well.
- The main difference is however the level versus rate of change specification for the aggregate wage. The wage relation states that, given productivity and the reservation wage, there should be a relation between the current wage level and current labor market conditions. The empirical wage equation states that there is a relation between the (expected) rate of change of the wage and current labor market conditions. This is a very important difference: the first relation says that the wage will be low when unemployment is high, the second says that the wage will keep decreasing as long as unemployment is low.

Let's focus on this level/rate of change difference. The question is: Should we change the theory, or are we looking at facts incorrectly?

(1) The first hypothesis one may want to explore is that the second and third problems are related. Maybe the problem comes from missing variables. To the extent that the missing variables are trending, and be highly serially correlated, leaving out may induce spurious serial correlation in the wage equation

This suggests nesting the standard specification in a more general specification with an explicit treatment of productivity and the reservation wage, and allowing for the lagged real wage. Consider the following extension of the empirical standard wage equation (3.2) :

$$\log W_t - \log P_t^e = (1 - \lambda)(\log W_{t-1} - \log P_{t-1}) + Z_t - \beta u_t + \epsilon_{wt} \quad (3.3)$$

where Z_t is a variable proxying for the log of the productivity level and the log of the reservation wage. The two changes are the presence of Z_t , and of λ . The standard macroeconomic wage equation can be seen as imposing the restriction that λ is equal to zero. Theory suggests that λ should instead be positive, that, while it may take some time, the real wage eventually adjusts to a level determined by the reservation wage, the level of productivity, and the unemployment rate.¹

The results of estimation are reported in the last column of Table 1.² The variable Z_t is constructed as the fitted value from a first stage regression of the logarithm of labor productivity on a quadratic time trend. The point estimate of λ is actually *negative* (-0.16 with a standard error of 0.13), suggesting the absence of any long-term level relation between the real wage and the unemployment rate.³

This clearly does not settle the issue. Issues of specification are many and have been discussed at length in the empirical literature. They range from the treatment of expected inflation, to the measurement of the underlying productivity growth trend, to the non-inclusion of other possibly highly autocorrelated wage determinants, and so on. But, at least for the United States, nobody has found

1. This can be straightforwardly rewritten as an error correction specification. Such a specification was first proposed and estimated in this context by Sargan [1964].

2. For ease of comparison with the standard wage equation, equation (3.3) is rewritten as $\log W_t - \log W_{t-1} = (\log P_t^e - \log P_{t-1}) - \lambda(\log W_{t-1} - \log P_{t-1}) + Z_t - \beta u_t + \epsilon_{wt}$. Expected inflation is then proxied by lagged inflation: $(\log P_t^e - \log P_{t-1}) = (\log P_{t-1} - \log P_{t-1})$. Thus, the coefficient on the lagged wage is equal to $-\lambda$.

3. This result is consistent with the results of estimation of a broadly similar specification by others. Grubb [1986] estimates a similar specification for each OECD country. He also finds an estimated negative value of λ for the United States, but a positive value for most other countries.

a large, positive, and significant value of λ . (Recent estimates by Turner et al. [1996] report a small but positive value of λ for the United States (0.08).)

(2) The second hypothesis that comes to mind is that interactions between wage decisions may explain part or all of the lag structure. Research on price and wage stickiness has shown how the combination of strong interactions and small lags can lead to substantial aggregate price level stickiness. And equation (2.9) shows that there is indeed a strong effect of other wages (an elasticity of .88) on the wage bargained in firm i .

To see this, ignore nominal rigidities (i.e. assume that wages are set in real terms) and make the assumption that workers do not observe other real wages but assume that the aggregate real wage is equal to the real wage last year. Then, equation (2.8) becomes:

$$\log w_{it} = .88 \log w_{t-1} + .08 \log b_t + .04 \log y_{it} + .03 \log (h/u)_t \quad (3.4)$$

And aggregating over i :

$$\log w_t = .88 \log w_{t-1} + .08 \log b_t + .04 \log y_t + .03 \log (h/u)_t \quad (3.5)$$

Under this assumption, wages exhibit indeed a high degree of serial correlation given the right hand side variables. (One can add nominal wage predetermination, and the assumption that expected inflation is equal to last year's inflation to get even closer to the empirical wage equation.) The parameter λ is positive, but small. In the long run, the wage satisfies a level-level relation, given by equation (2.11); but in the short run, the relation appears to be more between the rate of change of the wage and current labor market conditions.

Can one derive a similar result from more appealing assumptions? This is the type of question that has been studied by research on staggering. I shall summarize the main conclusions as they apply to this case.

- Given that here, a proportion s of existing jobs closes every period, and, in steady state, an equal proportion s of jobs open, a natural staggering structure is that introduced by Calvo. Namely, as new jobs open, the nominal wage is set equal to the annuity value of the desired expected nominal wage over the expected duration of the job. The aggregate wage is then equal to the average over existing contracts of these nominal wages. Thus, the model can deliver a Calvo-Taylor structure.
- In the Calvo model, the assumption is that the desired wage in job i depends, among other things, on the aggregate wage. This is not obviously the case here. The real wage which is relevant at time t to workers in firm i is not the aggregate wage, but the wage in those jobs that open. But, when setting nominal wages, workers also care about the current and expected price level, which itself depends on wages in all existing contracts. I have not worked out the implied dynamics.
- Recent research (in particular Fuhrer and Moore [1995]) has pointed out that, under rational expectations, either the Taylor and Calvo deliver price rigidity, but not inflation inertia, and thus cannot be used to justify empirical standard empirical wage equations. In the Calvo model, inflation depends on expected future inflation, and current and future labor market conditions. There is no direct dependence of inflation on the past.

While there is a large number of open issues, my own assessment is that (1) interactions between wages are a plausible source for the high serial correlation in wages given unemployment (2) the true value of λ is positive, but small. Empirical wage equations must be misspecified in some way that leads to the wrong estimated value of λ .

In that context, Blanchflower and Oswald [1994] have suggested one way of avoiding a number of specification problems, by looking at the behavior of wages and unemployment rates across regions (or states) within a country over time. Their argument is a simple one. If many of these difficult-to-measure variables,

such as expectations of inflation or the underlying productivity growth trend, are common across regions within a nation, then they can be dealt with by using time effects in a panel data regression model.

I end this note with a review of their results, and the issues they raise.

4 Wage curves

Suppose that the true aggregate wage relation is given by equation (3.2):

$$\log W_t = a_w + \log P_t^e + (1 - \lambda)(\log W_{t-1} - \log P_{t-1}) + Z_t - \beta u_t + \epsilon_{wt}$$

Two reasons why we may get a biased estimate of λ is that we do not observe P_t^e or Z_t . Now suppose that the country is composed of n regions. Assume that there is no interstate labor mobility, so that regional wages do not depend on national wages. Assume that the factors in Z_t , such as productivity growth, are common to all states. Assume that inflation is also common to all states. Then, the relation between wages and labor market conditions in state j will take the form:

$$\log W_{jt} = a_{wj} + \log P_t^e + (1 - \lambda)(\log W_{j,t-1} - \log P_{t-1}) + Z_t - \beta u_{jt} + \epsilon_{wjt}$$

With panel data, the terms that do not depend on j can be treated as fixed time effects, and the equation can be rewritten as:

$$\log W_{jt} = a_{wj} + (1 - \lambda) \log W_{j,t-1} + d_t - \beta u_{jt} + \epsilon_{wjt} \quad (4.1)$$

Estimating this equation using yearly data by region for a number of countries, Blanchflower and Oswald [1994] estimate $(1 - \lambda)$ to be close to zero (equivalently, λ to be close to zero). They conclude that that once region and time effects are

λ to be close to zero). They conclude that that once region and time effects are included that there is “little sign of autoregression in wage equations” so that the wage adjusts to the unemployment rate rapidly with little interesting dynamics.

If Blanchflower and Oswald were right, the problem would then be to reconcile micro and macro empirical results. But their results raise a number of both theoretical and empirical issues.

(1) The assumptions under which the value of λ estimated from region-specific equations is an unbiased estimate of λ in the aggregate wage equation are quite stringent, and unlikely to be satisfied. Biases run in both directions:

If we relax the assumptions that inflation and productivity conditions are the same in all states, then state specific error terms will contain the state specific components of these two variables. To the extent that they are highly serially correlated, which is likely, this will tend to bias upwards the coefficient on the lagged state wage, to bias $(1 - \lambda)$ up, λ down.

If we relax the assumption of no interstate labor mobility, then the wage in state j is likely to depend in part not only on lagged wages in the state, but also the aggregate wage. Take the case where it only depends on the aggregate wage. In this case, the lagged aggregate wage effect will be fully picked up by the time fixed effect, and the estimated value of $(1 - \lambda)$ will be zero, independent of the true value of λ . My guess is that, at least for the United States, this source of bias is likely to be important (the issue is even more serious when researchers use very small geographical units, such as counties or cities.)

(2) In the process of exploring their results for the Blanchard Katz paper on the natural rate, we concluded that their results are not robust, at least for the United States. (Similar conclusions have been reached by Card and Hyslop [1996] and Bell [1996a]). The basic source of the difference between their results and ours is, we believe, their use of annual earnings from the March Current Population Survey (CPS) as their basic wage measure. This annual earnings measure devi-

Table 2
The Relationship Between Wages and Unemployment
U.S. States, 1980-91

	Dependent variable = Log State Wage (w_{it})					
	(1) Weekly UI	(2) Hourly Manuf.	(3) Hourly ORG CPS	(4) Hourly ORG CPS	(5) Hourly March CPS	(6) Annual March CPS
Lagged log wage (w_{it-1})	0.978 (0.010)	0.953 (0.020)	0.911 (0.017)	0.920 (0.017)	0.633 (0.030)	0.258 (0.039)
Log unemployment rate (u_{it})	-0.034 (0.002)	-0.019 (0.004)	-0.041 (0.003)	-0.039 (0.003)	-0.057 (0.008)	-0.062 (0.017)
Adjusted wage ^a	No	No	Yes	Yes	Yes	No
State average worker controls ^b	No	No	No	No	No	Yes
Standard error ()	0.008	0.011	0.011	0.011	0.028	0.042

All regressions except column (2) contain 612 observations (51 states x 12 years) for 1980 to 1991; column (2) contains 561 observations for 1980 to 1990. All regressions include state and year fixed effects. The estimates are obtained by weighted OLS using as weights the relative number of workers in each state in each year. Standard errors are in parentheses. i indexes state; t indexes time.

^aThe dependent variable (w_{it}) and the lagged dependent variable (w_{it-1}) are log state average wage adjusted for characteristics of workers in the state using year-specific OLS log earnings regressions (using CPS sampling weights) as a wage prediction model; w_{it} is the mean wage residual (coefficient on state dummy variable) for state s in year t from such a cross-section log hourly earnings regression. Individual-level controls include schooling dummies, a quartic in experience, a female dummy, interactions of the quartic in experience with the female dummy, marital status, marital status interacted with female, a nonwhite dummy, and a full-time dummy in column (3). The adjustment equation for (4) also includes 10 one-digit industry dummies. The adjustment equation for (5) is described in Card and Hyslop (1996).

^bIncludes average worker characteristics by state and year from the Merged Outgoing Rotation Groups of the Current Population Survey (CPS) analogous to individual controls in wage adjustment equation used for column (4).

Sources of Wage Measures: Column (1): Log(average weekly earnings in employment covered by unemployment insurance), U.S. Department of Labor (1996); (2) Log(average hourly earnings of production workers in manufacturing), BLS; (3) & (4) Adjusted log hourly earnings, Merged Outgoing Rotation Group Files of CPS; (5) Adjusted log hourly earnings from March CPS, Card and Hyslop (1996); (6) Average log annual earnings, March CPS, Card and Hyslop (1996). Annual state unemployment rates are from BLS, LABSTAT.

ates from a theoretically appropriate wage rate measure since it mixes up actual changes in wages with changes in hours of work. The March CPS samples are also relatively small for measuring annual state average wages. Systematic measurement error from the use of an inappropriate wage measure and sampling error in the lagged wage measure both bias down the coefficient of the lagged log wage in a regression of the current log wage on lagged log wage and other covariates (equivalently, they lead to an upward biased estimate of X .)

A sampling of our estimates from regressions of the current log wage on the lagged log wage, the (log) unemployment rate, state, and year dummies for U.S. states over the 1980-91 period is presented in Table 2.⁴ The estimates in the first four columns of Table 2 use administrative data on average weekly earnings of covered workers from the U.S. unemployment insurance (UI) system, data on average hourly earnings of manufacturing production workers from a large-scale establishment survey, and data on hourly earnings from the Merged Annual Outgoing Rotation Groups of the CPS. The use of larger samples and more appropriate weekly or hourly wage rate measures consistently yield estimates of the coefficient on the lagged log wage from 0.91 to 0.97 implying a value of λ between 0.03 to 0.09. Such large coefficients on the lagged log wage remain even when adjusting the wage measure for detailed individual worker characteristics (as seen in the fourth column) or adding average state worker characteristics to the models.

Columns 5 and 6 show the effects of using the March CPS (column 5) and the annual earnings measure (column 6) -the sample and the earnings measure used by Blanchflower and Oswald. The use of the March CPS sample reduces the estimated coefficient on the lagged wage to 0.63. The use of annual earnings together with the March CPS further reduces the coefficient to 0.26, an estimate close to that of Blanchflower and Oswald. Thus, smaller samples and a poor earnings mea-

4. We use the log unemployment rate rather than the level of the unemployment rate to be consistent with Blanchflower and Oswald's empirical specifications.

sure appear to be the source of the difference between our results and theirs.

To summarize, estimates from state regressions suggest that λ is positive but small. There is a long-run relation between real wages, productivity and labor market conditions. But the adjustment is slow.⁵

I see three major unresolved empirical issues at this point.

(1) The first is to reconcile macro and micro estimates of λ , and to understand why λ is so often insignificant or of the wrong sign in estimated aggregate wage equations.

(2) The second is to pinpoint the source of lagged dependence for wages. Does the dependence of wages on lagged wages reflect the effects of an individual's own lagged wage, or of the lagged wages of others in the relevant labor market, or of (unmeasured) variables correlated with lagged wages? We do not know. The most interesting piece of evidence here is Card [1990]'s study of wage determination in Canadian union contracts. Card uses the interaction of unanticipated inflation with partial wage indexation to decompose real wage changes during the course of a contract into "intended" and "unintended" components. He finds that intended and unintended changes in real wages over the course of the previous contract have similar effects on wages in the next contract: a 10 percent intended or unintended increase in real wages in the previous contract is associated with a 4 percent higher wage in the new contract. This suggests that the actual own lagged wages, not just unobservables correlated with lagged wages, play a role in affecting current wages. Other pieces of evidence are relevant here, such as for example the evidence that workers who have lost high wage jobs appear to hold out for high wages, even when jobs with such high wages are unlikely to be offered

5. Bell [1996b] finds similar results using appropriate weekly wage measures for Canada, Germany, and the United Kingdom. See also Black and FitzRoy [1997] for the United Kingdom.

to them.⁶ The issue is an important topic for research.

(3) It is only when these issues are settled that we shall, with some confidence, be able to look at the role of other variables (employment protection, matching structure, unemployment benefits) on wage determination.⁷

6. See, for example, Kruse [1988] and Summers [1986].

7. Two recent Fed working papers (Whelan [1997] and Roberts [1997]) argue that, from a macroeconomic point of view, it does not matter whether the wage relation is a rate of change or a level relation. They are partially right with respect to the derivation of an aggregate price-price Phillips curve. Such a relation can be derived whether the wage relation is of the rate-of-change or level form. But the slope of the long-run labor supply curve (vertical under a rate of change specification, upward sloping under a level specification) is central with respect to any shock to labor demand.

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