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WAGE BARGAINING AND UNEMPLOYMENT PERSISTENCE

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ABSTRACT

This paper looks at models of unemployment which make two central assumptions. The first is that wages are bargained between firms and employed workers, and that unemployment affects the outcome only to the extent that it affects the labor market prospects of either employed workers or of firms. The second is that the duration of unemployment affects either the search behavior or the skills of the unemployed, and/or the perceptions of firms of such skills. It argues that such models may explain not only the evolution of European unemployment over the last two decades -an evolution which triggered their development-, but many of the cyclical features of labor markets in general.

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Introduction

In 1970, the European unemployment rate stood at 2.4%. In 1980, it had increased to 6.2%. In 1990, it stood at 8.8%, and the forecasts are of roughly stable unemployment and inflation over the next two years [1].

These numbers make clear why unemployment has been the major topic of macroeconomic research in Europe over the last two decades. For most of the first decade, research focused on how adverse supply factors, from higher oil and commodity prices to higher tax rates and more generous unemployment benefits, could explain the steady rise in unemployment [2] But most of those factors turned favorable in the 1980's, while unemployment remained very high. Out of logical necessity, one line of explanation became more and more appealing, quite simply that unemployment remained high because it had been high for so long.

Two channels of persistence were examined. The first, which was first articulated in the context of European unemployment by Bruno and Sachs [1985], and then further explored by Dreze and others, emphasized the role of capital accumulation [3]. A long period of adverse shocks decreased capital accumulation, decreasing the number of available jobs and making impossible a quick decrease in unemployment. The second focused instead on wage bargaining, and the idea that bargaining from a situation of low employment would not lead to a quick return to full employment. While both channels are surely relevant, I shall devote the lecture only to the second [4]. I believe that there has been enough progress since the crude initial formulations to occupy a full lecture.

I see progress as having happened in three main steps. This is only roughly historically accurate and probably reflects more on my own intellectual evolution than on that of the field. But, by associating each step with a specific conceptual contribution, it makes for a nice, logical, presentation, and thus I shall proceed.

The first step was that taken by the so called *hysteresis* models. The structure of those models is presented in Section 1. Designed specifically to explain European unemployment in the 1980's, their theoretical structure was rather crude, and

1. These numbers are for the average of the unemployment rates of those countries which are today in the EEC. The forecasts are June 1990 OECD forecasts (OECD [1990])
2. See the country studies in Bean et al. [1986].
3. See the country studies in Bean and Dreze [1990].
4. In Blanchard [1990], I formalize both channels, and look at the interactions between them.

they covered a short distance from assumptions to conclusions. Wages were set unilaterally by the employed workers, who cared about their employment. Thus, the models implied, any level of employment could become the equilibrium level. Unemployment was highly persistent, perhaps even *hysteretic* –with no tendency to return to any given value over time. Those models offered a simple explanation for persistence. But they did so in effect by assuming away any effect of unemployment on wages. Progress since has come from relaxing this assumption and seeing what remains.

A number of models have been developed which maintain the assumption that wages are set by bargaining between firms and employed workers. Even under that assumption, those models point out, unemployment is still likely to affect bargained wages through two channels : labor market conditions determine how easy it is for employed workers to find alternative jobs, and how easy it is for firms to find alternative workers. Those models have clarified the role of unemployment in wage bargaining, and have shown how wage bargaining leads to persistence –although not in general to hysteresis– in unemployment. The structure of those models is presented in Section 2.

Those models also give strong hints as to why a period of sustained unemployment may lead to more persistence. If unemployment is a poor proxy for the labor market conditions relevant to employed workers and to firms, then unemployment may not affect bargained wages very much. Thus, a number of authors have explored so called *duration effects*, the fact that the perceptions, behavior or skills of the unemployed may be affected by the duration of their own unemployment as well as by the state of the labor market. When these effects are at work, the history of unemployment affects the duration distribution of unemployment, and thus the pressure that unemployment exerts on wages. Those models can potentially explain why persistence may be much higher after a period of sustained high unemployment. Their structure is presented in Section 3.

1 Unilateral wage setting and hysteresis .

The first models (for example Blanchard and Summers [1986]) assumed, following a long macroeconomic tradition, that labor demand was determined unilaterally by firms through profit maximization given the set wage. They then assumed

that the wage was set unilaterally by workers, possibly in advance of the realization of some of the shocks affecting labor demand, an assumption also with a long tradition, and known as the *monopoly union* model.

Where they differed from traditional monopoly union models was in their assumption that the wage was set so as to keep the relevant *membership* employed, at least in expected value. To the extent that membership was closely related to the past history of employment, the implication was that movements in employment were highly persistent.

1.1 A model

A log-linear formalization will help to show the effects introduced at each step. I shall make no attempt to derive it from anything like explicit maximization and bargaining, but will refer to papers which either do so, or try and come close to doing so. I shall also abstract from a number of aspects of reality which I believe are highly relevant to the European unemployment experience, but are not central to the conceptual points at hand. I shall ignore non competitive goods markets, which imply the existence of *surrogate* –to use an expression coined by Phelps– rather than traditional labor demand relations. I shall ignore dynamics of labor demand. I shall finally ignore all issues of nominal wage setting, assuming the real wage to be set in advance, thus precluding any discussion of the relation between nominal and real variables, between inflation and unemployment [5]. All three would have to be reintroduced before any of the models below was taken to the data [6].

Let n and w be the logarithms of employment and the (real) wage. Let labor demand be given by $n = -w + \epsilon$, where ϵ stands for those unexpected shocks to labor demand which are realized after the wage is set. These may range from technological to input price shocks, and would in a model with nominal wage setting also include price level shocks. The constant term is omitted and the elasticity of demand is assumed to be unity only for notational simplicity ; were

5. I make this last simplification with mixed feelings, as I believe that one should look at the joint behavior of unemployment, wage and price inflation. But the introduction of nominal rigidities, and the use of expressions such as "Phillips curves" have become such red flags for many US macroeconomists that I would rather not take on that fight here.

6. A paper which shares many of the themes of this paper, and allows for all these elements, is the recent survey on unemployment by Nickell [1989]

a constant term included, or the elasticity to be different from one, the equation for employment derived below, equation (1.1), would be unaffected.

Let *membership* be denoted by n^*, and assume that the wage, w^*, is set by the membership so as to achieve expected full employment of the members. Thus, w^* is given by $n^* = \mathrm{E}\, n = -w^*$. Putting both relations together gives: $n = n^* + \epsilon$.

The last step is to specify membership. In many earlier macroeconomic models, such as Fischer [1977], membership was in effect assumed to be the whole labor force. In contrast, the central assumption of membership models was that membership was closely related to current and past employment. The simplest assumption along those lines is that membership is just equal to employment at the time of wage setting, so that $n^* = n(-1)$. This in turn implies that employment follows a random walk:

$$n = n(-1) + \epsilon \tag{1.1}$$

To the extent that the labor force is constant, the same will apply to unemployment.

Those first models therefore explained persistence, and how short lived shocks could have long run effects. Indeed they easily generated unit roots in unemployment, *hysteresis*, implying the irrelevance of the concept of a stable *natural rate*. More complex specifications of the relation of membership to current past employment yielded more appealing unemployment dynamics. If membership was taken to be largely a metaphor for unions –an interpretation strongly resisted, but without very convincing arguments, by Blanchard and Summers–, the idea that laid off workers would be represented in wage negotiations only for some time, after which they would drift away and be forgotten, was plausible. And it implied that, while a short sequence of adverse shocks did not have persistent effects on unemployment, a longer sequence would. This was an implication which seemed to fit the European experience, where many of the unemployed had become long term unemployed and thus *disenfranchised*, no longer represented in wage negotiations.

1.2 An assessment

Those first models made a correct and important point, that wages are set through bargaining not between firms and "the labor force", but rather between firms and

their workers. I shall return to this point at length in the next section. Beyond that however, they suffered from serious problems, both in their assumptions and their implications.

Take implications first. As long as membership was only a function of current and past employment, the models implied that changes in the labor force would translate one for one into changes in unemployment. But, as Layard and Nickell [1987] pointed out, changes in the labor force do not appear to have a long run effect on unemployment. And in Europe, countries with rather different evolutions of their labor force appeared to have roughly similar unemployment experiences.

When the wage decision was derived from an explicit optimization on the part of membership, the outcome was not in general that expected employment was simply set equal to membership. In the model of Gottfries and Horn [1987], which was developed independently of ours, and made more conventional assumptions about the objective function of workers, the results and implications for persistence were much less clear cut than in our paper. In Blanchard and Summers [1986], where the objective function was cooked to deliver something close to what we wanted in the first place, the exact result was that wages were set so that expected employment was equal to membership *plus* a constant term, which could be negative or positive. A positive constant term reflected the desire by members to be on the safe side, the choice of a low probability of being laid off. The constant term did not disappear when current members were assumed to rationally take into account the implications of employment on future membership and future decisions. It also remained true in union models based on median voter assumptions. But a positive constant term, in an equation such as equation (1.1) above, implied that employment followed a unit root process with drift, or equivalently that unemployment eventually went to zero... This was not an appealing implication; the implications of a negative term, and forever increasing unemployment, were hardly more appealing.

More importantly however, the models had overly strong assumptions. By assuming that employed workers had constant utility if laid-off, they eliminated the pressure of unemployment on wages through that channel. By assuming that wages were set unilaterally by workers, they eliminated any effect of unemployment through bargaining power of firms, coming from the option that firms have

of hiring the unemployed [7]. But both of these channels are important, and they have been the focus of much of the research since then.

2 Bargaining, and the role of unemployment

On the surface, the assumption that wages are the result of bargains between firms and *employed workers* would appear to be largely unobjectionable. Except possibly when collective bargaining takes place at the national level, there is little evidence that unions act on behalf on anybody else than employed workers, and perhaps the recently or the temporarily laid-off. And to the extent that many wages result from informal, one on one, bargaining between a firm and a worker, nobody would argue that workers act in such negotiations on behalf on anybody but themselves.

Appearances may however be deceiving. *First*, for both sides to affect the outcome, both must have bargaining power. For a firm to affect the bargained wage, its workers must find it costly to find alternative employment. Symmetrically, for employed workers to affect bargained wages, it must be costly for firms to find alternative workers. The presence of such costs is however not much of an issue. At a minimum, it takes time and effort for both firms and workers to find acceptable alternatives. There are also often additional hiring and firing costs, either for technological or for institutional reasons. And, as Lindbeck and Snower [1988] in particular have emphasized, turnover costs to firms may be larger when employed workers act in concert, threatening for example harassment of new workers, thus leading to larger costs to firms under explicit or implicit collective bargaining. *Second*, even if employed workers have bargaining power and thus can extract some rents, the question arises of why firms don't extract the present value of those rents when they hire those workers, and thus before the workers have any bargaining power. This issue, known as the issue of *bonding*, has been hotly debated over the past decade in the context of efficiency wage models but the issue is much more general. [8]. What proportion of the rents firms can and do extract ex ante, through low paid apprenticeship periods, deferred compensation and other

7. This criticism was first articulated by the editor of the NBER Macroeconomics Annual where Blanchard and Summers was published. At the time his calls were not heeded.
8. For a discussion, see for example Dickens et al. [1989]

arrangements, is still an open issue. I shall take it as a given that bonding is sufficiently limited and inflexible that it can be ignored in thinking about the effect of changing labor market conditions on wages.

If appearances are not deceiving, and if wages are indeed the result of bargaining between firms and selfish employed workers, what is then the role of unemployment in wage determination ? A number of different approaches have answered precisely this question. The first, conducted largely at the LSE, has explored the implications of formal collective bargaining between unions and firms [9]. The second has explored models with explicit or implicit collective bargaining but with endogenous bargaining power [10]. The third, which, no doubt under the influence of Peter Diamond, I find both convenient and revealing, has explored the implications of one-on-one (Nash) bargaining, in models explicitly formalizing the flows of workers and jobs, so-called *search models* [11]. Those formalizations differ in many ways. But, in all of them, unemployment affects bargaining through two channels, *fear* and *threat*:

First, unemployment affects how easy it would be for employed workers to find another job, were they to become unemployed. Thus, even if workers were to set the wage unilaterally –as was assumed in the first generation models-, high unemployment should in general lead them to be more careful, i.e to choose lower wages. If wages are set in bargaining rather than unilaterally, worse prospects in case of unemployment clearly weaken the hand of workers, decreasing the wage. Call this the *fear* effect. *Second*, unemployment affects how easy it would be for firms to find alternative workers, were they to replace existing workers. Firms can threaten to turn to the unemployed. How strong and credible a threat this is depends on how expensive this alternative would be. This will depend on institutions, on whether for example firms can freely lay off workers, something which is much more difficult to do in Europe than in the US. It will also vary with labor market conditions, being cheaper in times of high unemployment, when the unemployed are waiting at the gate. Call it the *threat* effect.

This makes clear that what matters in wage determination is labor market conditions as perceived by the employed workers and by the firms. Is unemployment

9. See the survey by Nickell [1989], and the book by Jackman et al. [1990]
10.See in particular the book by Lindbeck and Snower [1988]
11.See in particular the book by Pissarides [1990a]. See also Mortensen [1989] and Blanchard and Diamond [1990a]

likely to be a sufficient statistic for such market conditions ? The answer is in general no, even when the unemployed are similar in all respects to the employed workers (The answer is a fortiori negative when the unemployed are different from the employed. This will be the topic of the next section). For example, in the models that Peter Diamond and I have developed (as in the earlier work by Diamond [1982]), the relevant labor market variable in wage determination is not unemployment, but the present discounted value of current and anticipated ratios of unemployment to vacancies (with a high discount rate so that only the near future matters). With respect to some shocks, such as changes in the intensity of the reallocation process, unemployment and vacancies are likely to move in the same direction. Thus, unemployment and the ratio of unemployment to vacancies may well move in opposite directions, and proxying labor market conditions by just unemployment is likely to be misleading. With respect to shocks in aggregate activity however, unemployment and vacancies move in opposite directions, leading to movements in unemployment and the ratio of unemployment to vacancies in the same direction. Thus, in the model that follows, and in which I focus on the effects of aggregate shocks, I shall ignore this complication and assume unemployment to be the relevant market variable.

2.1 Allowing for bargaining in the earlier model

In the models I have just sketched, labor market dynamics derive from two distinct sources. *First*, the very costs which lead to non trivia bargaining also imply non trivial employment dynamics given the wage. In the presence of firing costs for example, optimizing firms must look forward when deciding whether to hire or to fire [12]. *Second*, wage bargaining itself leads to wage dynamics. Fully articulated models such as Lindbeck and Snower [1988] or Blanchard and Diamond [1990a] allow for both sources of dynamics. In order to focus on the dynamic implications of wage bargaining, I shall maintain here the assumption of a static labor demand. This is clearly a short cut, but one which is useful and, I believe, not too misleading. I believe –without, I must admit, a tightly argued case at this stage– that, for the issue at hand, the medium run persistence of unemployment, the dynamics coming from wage bargaining dominate those coming from search, firing and hiring costs.

12.For a derivation of optimal labor demand under hiring and firing costs under the assumption of an exogenous wage, see Bertola [1990] and Bentolila and Bertola [1990].

Thus, I assume that labor demand is given as before by $n = -w + \epsilon$. That is, I ignore dynamics in labor demand, and I maintain the assumption that the firm chooses employment given the bargained wage. The change is in the determination of the wage.

Let, as before, w^* be the wage such that initially employed workers, $n(-1)$ remain employed in expected value, thus such that : $w^* = -n(-1)$. And let the wage yielding the same utility as that of not working be w_r. This is the wage that firms would pay, were they free to choose the wage unilaterally; were the wage less than that, workers would stay home. Let n_r be the (logarithm of the) level of employment which would prevail if workers were paid w_r, and ϵ were equal to zero: $n_r = -w_r$. I define the unemployment rate as $(n_r - n)$ [13].

Assuming that labor market conditions for both firms and employed workers are adequately proxied by the unemployment rate, I take the bargained wage to be:

$$w = aw^* + (1 - a)w_r - b(n_r - \mathrm{E}\, n); 1 \geq a \geq 0; b \geq 0 \qquad (2.1)$$

The wage depends on a weighted average of w^*, the wage which in expected value would maintain employment at its previous level, and of w_r, the reservation wage. In addition, it depends on expected unemployment as of the time of contracting, $(n_r - \mathrm{E}\, n)$, which affects the wage through both fear and threat effects. [14]

Replacing the wage in the labor demand relation and rearranging:

$$(n_r - n) = \frac{a}{1 + b}(n_r - n(-1)) - \epsilon \qquad (2.2)$$

13.This definition of unemployment is convenient but slightly unconventional. Defining unemployment as the difference between a given labor force and actual employment complicates slightly the algebra but does not affect anything of substance.

14.Compare this –postulated– relation to the wage equation derived from first principles in Blanchard and Diamond [1990a] in a search model with Nash bargaining. Let upper case letters denote the same variables as in the text, but in levels rather than in logarithms. Let U denote unemployment, and V denote vacancies. Then to a close approximation –i.e ignoring terms which are quantitatively unimportant–, the wage is given by:

$$W = \left(\frac{Z}{Z + (U/V)}\right)W^* + \left(\frac{(U/V)}{Z + (U/V)}\right)W_r$$

where Z is the ratio of the share of the surplus of the match going to workers to the share going to firms, a positive scalar.

Unemployment follows a first order autoregressive process, with coefficient $a/(1 + b)$, and innovations equal to the negative of labor demand innovations. Compare equation (2.2) and equation (1.1) derived earlier. Unless both $a = 1$ and $b = 0$, the model no longer delivers *hysteresis*. But it delivers unemployment persistence : how much depends on how powerful employed workers are in bargaining –how close a is to one–, and how weak the effects of unemployment are on wages, –how close b is to zero.

Thus, models based on bargaining between firms and employed workers naturally deliver persistence of unemployment. In their simplest form, they do not however explain why a long period of sustained unemployment would lead to more persistence of unemployment; in equation (2.2) above, unemployment returns to equilibrium at rate $a/(1 + b)$, regardless of its history. But these models give a strong hint as to how they may be modified so that this happens. Suppose, to take an extreme case, that the long term unemployed are perceived as unemployable by firms. Then, after a period of prolonged aggregate unemployment, the reemployment prospects of employed workers, were they to become unemployed, will be much better than is suggested by measured unemployment. The pressure of unemployment on wages will steadily decrease. A number of recent contributions have explored more sophisticated versions of this simple argument, and I now turn to them.

3 Duration effects and persistence

Layard and Nickell [1987] were the first in the European unemployment context to focus attention to the potential macro implications of *duration effects*. By duration effects, I mean changes in either the skills, the motivation, or the search behavior of the unemployed as a function of the duration of their unemployment, or/and perceptions by firms of such differences. Those duration effects can potentially account for why sustained unemployment leads to more persistence. I look at them in turn.

3.1 Skill Deterioration and ranking

There is little doubt that prolonged unemployment decreases skills and weakens work habits. Suppose that some of the long term unemployed simply become

unemployable. This will affect the relation between unemployment and wages in two ways. On the one hand, it will strengthen the effect of unemployment through fear: employed workers realize –or at least should realize– that, were they to become unemployed, they stand a chance of becoming eventually unemployable; this leads to a stronger initial effect of unemployment on the wage. But, on the other hand, as unemployment persists, more and more workers will become unemployable, leading to their de facto exclusion from the labor market, and decreasing both fear and threat factors. Thus high unemployment will first exert substantial pressure on wages ; but the pressure will decrease as more workers become unemployable, no longer having an effect on wage determination. This would appear to provide a simple explanation for the persistence of unemployment in Europe in the 1980's: many workers became unemployable; although they were recorded in the unemployment statistics, they were irrelevant to the process of wage determination. But the explanation is much too simple, and probably not of much relevance. Direct and indirect evidence simply does not support the idea that the skill deterioration associated with unemployment is so strong as to make many of the long term unemployed truly unemployable.

Milder forms of skill deterioration may however affect the unemployment–wage relation in more subtle, but equally important ways. Even if skills deteriorate little with unemployment duration, and all the unemployed remain employable, firms which have the choice between workers of different unemployment duration, may hire first those who have been unemployed with the least time. Put another way, they may rank workers inversely by duration of unemployment, a phenomenon that Diamond and I have therefore called *ranking*. Such behavior has important macro implications. By making the probability of getting a job a decreasing function of unemployment duration, it implies that the reemployment prospects of employed workers may be quite different from those of the currently unemployed. A high unemployment rate may then be of relatively little concern to the currently employed who realize that their chances of finding employment, were they to become unemployed, are much better than those of the average unemployed worker [15]. The fear effect of high unemployment may therefore steadily weaken as unemployment persists [16]. Thus, ranking may help

15.The hypothesis that aggregate unemployment was of little relevance for employed workers was first suggested by Gregory [1986] in one of the first papers on hysteresis, in that case for Australian unemployment

16.For details and qualifications, see Blanchard and Diamond [1990a]. Related models are pre-

explain the persistence of European unemployment in the 1980's: while the increase in unemployment was associated with a strong deterioration of the labor market prospects of even employed workers and thus had a strong effect on wages, much of the effect disappeared as high unemployment persisted, and the reemployment prospects of employed workers differed more and more from those who remained unemployed.

3.2 Search Behavior, duration and state dependence

Economic theory is agnostic as to the effects of aggregate labor market conditions or of individual unemployment duration on search behavior and search intensity. The familiar conflict between income and substitution effects is at work : worse chances of finding a job may lead the unemployed either to try harder, or instead to give up. If ranking is at work, so that the probability of being hired decreases with duration, the effect of duration on search intensity can, for the same reason, go either way. Empirical evidence suggests however that, if anything, both duration and labor market conditions affect search intensity negatively. That this will affect the dynamic relation between wages and unemployment is obvious. But there are again some subtle and important issues involved, which have to do with exactly how duration affects search intensity.

Suppose that the unemployed just give up search after some time in unemployment, reorganizing their life so as to survive on the dole. The argument then closely parallels that we used earlier in discussing skill deterioration. If the currently employed dislike the idea that they may end up adjusting to unemployment, the first effect will be to strengthen the initial effect of unemployment through the fear factor. But the case is not as clear cut as for the loss of skills: workers may not consider this potential endogenous change in tastes a tragedy. The second effect is the more important one. As unemployment persists, more and more workers give up effective search, leading to their de facto exclusion from the labor market, and decreasing both and fear effects of unemployment. Thus high unemployment will first exert substantial pressure on wages, but the pressure decreases as more workers give up effective search.

Suppose instead that tastes do not change, but that when the probability of finding a job falls below a critical level, the unemployed stop searching. If the proba-

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sented in Ball [1989], Pissarides [1990b]

bility of getting a job decreases with duration, search will stop after some duration, the critical duration being itself a function of labor market conditions. Again, the fear factor may lead to a stronger effect of unemployment on wages, as employed workers now have to take into account the probability that they may give up search. But the effect of unemployment on wages will decline as unemployment persists. After an increase in unemployment, most workers will still be searching. But as time passes, more and more workers will reach the critical duration and give up search, becoming irrelevant to the process of wage determination. Put another way the effect of unemployment on wages will steadily decline. The speed of decline will itself depend on the level of unemployment. At low unemployment, the cutoff duration will be very long, the effect of declining search intensity negligible. But at high unemployment, the cutoff duration will be much shorter, the search intensity effects much stronger. [17].

The two mechanisms sketched above look quite similar. They are however conceptually quite different and have very different dynamic implications when unemployment decreases. The first exhibits true duration dependence; whether, when unemployment decreases and labor market conditions improve, those workers who had given up search start searching again is highly uncertain. The second does not have pure duration dependence : the decision to search depends only on labor market conditions, and duration enters only because it affects the chances of finding a job given aggregate conditions. As unemployment decreases, workers will start searching again, thus allowing for a decline in unemployment without as much pressure on the wage. Thus, knowing which mechanism is at work is crucial when thinking about how far and how fast employment can increase after a long period of sustained high unemployment.

3.3 Extending the bargaining model for duration effects

The arguments I have sketched lead to dynamics which are again substantially more complex than can be captured by any log-linear model in wages and unemployment. In general, if skills or search exhibit duration dependence, the wage

17.While I have cast the argument in terms of search, the argument applies to labor mobility just as well. The decision to move, say to a new region, depends on how likely it is to find a job in the new region. Above some level of unemployment, there may be little incentive to move to regions which have lower, but still high unemployment. Labor mobility decreases, decreasing the efficiency of the matching process going on in the labor market, and increasing the equilibrium level of unemployment

will depend on the whole distribution of unemployment durations, which itself will depend on the whole history of unemployment [18]. But they all point to the idea that sustained high unemployment will have a decreasing effect on wages. This suggests the following modification of the earlier wage equation. Let all variables be the same as before. For notational economy, introduce $u \equiv (n_r - n)$ to denote the unemployment rate. Assume that the wage is now given by:

$$w = aw^* + (1-a)w_r - b(\mathrm{E}\,u - c(L)u(-1)); 0 \leq c(1) \leq 1 \qquad (3.1)$$

where c(L) is a lag polynomial of order n, with positive coefficients. The short run effect of unemployment on the wage is given by b, the effect of sustained unemployment for n periods by $b(1 - c(1))$. c(1) is likely to be less than one: except for the most extreme versions of the theories I have sketched, the effect of sustained unemployment on wages remains positive even in the long run.

When equation (3.1) is used to replace the wage in the labor demand equation, the behavior of unemployment becomes:

$$u = (\frac{a}{1+b})u(-1)) + \frac{bc(L)}{1+b}u(-1) - \epsilon \qquad (3.2)$$

There are two major differences between equation (3.2) and equation (2.2) which we derived in the previous section. First, as long as $c(1) > 0$, the sum of the weights on lagged unemployment is higher than before, implying higher persistence. Note that duration effects do not in general generate hysteresis: this would require both $c(1) = 1$ and $a = 1$, and neither condition is likely to be satisfied. Second, if c(1) is close to one, and if c(L) is of high order, that is if the effect of a given level of unemployment on wages decreases slowly but steadily through time, the return to normal from a period of high sustained unemployment will be much slower than that from a short burst in unemployment. Thus, duration models provide a potential explanation for why unemployment will decrease slowly in an economy which has been depressed for a long time [19].

18.Blanchard and Diamond [1990b] characterize the dynamics of the distribution of unemployment durations and wages under ranking. See also Pissarides [1990b]

19.Note that, in contrast to the equation derived in the previous section, there will be persistence of unemployment even if a is equal to zero. Some *efficiency wage* models, such as Shapiro and Stiglitz [1984] for example imply exactly that; in those models, the wage does not depend on

Conclusion

I have developed a class of models based on two essential assumptions. First, the wage is the result of bargaining between firms and employed workers, and unemployment affects the wage only to the extent that it affects the prospects of employed workers and of firms. Second, duration effects imply that the labor market prospects of the unemployed may differ in systematic ways from those of employed workers, were they to become unemployed. In the conclusion, I want to take up briefly the next obvious question, that of how much empirical evidence there is in support of those assumptions and of this class of models in general. This will be little more than a glimpse, as a thorough review of the empirical evidence would require another paper; I shall use it to indicate what I see as the main results so far and the main outstanding questions.

Remember that this line of research was triggered by the joint behavior of inflation and unemployment in Europe in the 1980's. It is therefore no great surprise that these models fit those aggregate facts rather well... Very many wage equations, specified –more or less– along the lines of (3.2) but extended to include in particular nominal wage setting, have been estimated for Europe and other countries, for recent times or using longer historical time series. Most of them have found larger short run effects than long run effects of unemployment [20]. They have also found that short term unemployment has more effect on wages than long term unemployment [21]. But, while aggregate wage equations are useful statistical descriptions, they are not ideal testing grounds for any theory. Their lag structure arises not only from the factors I have focused on, but also from the time structure of nominal wage setting, from the formation of expectations, and from the dynamics in labor demand and so on. Disentangling the various sources of aggregate dynamics using only aggregate data is a hopeless task. The way to test these theories is with more disaggregated data: the models have sufficient flesh and micro-detail that not only their macro implications but also their assumptions and micro-implications can be confronted to the data.

The first crucial assumption of these models is that wages are affected by factors within the firm. In (3.1) for example, the wage depends, among other factors, on

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w^*, on conditions within the firm, but depends rather on w_r and the prospects of the currently employed workers, were they to become unemployed

20.See Nickell [1989] and references therein

21.See Bean et al. [1986]

w^*, the marginal product of labor of the currently employed workers, which in turn depends both on the position of the labor demand curve and the number of employed workers. This implication has been tested in a number of studies using either cross section or short panel data for firms, individuals, contracts or industries, for the US as well as the UK [22]. The results have been nearly uniform in finding that wages in a given firm or industry respond to firm- or industry-specific conditions –usually measured by profit rather than the -unobservable- marginal product w^*–, as well as to aggregate labor conditions. The issue in those studies is always of whether the estimation controls for the relevant variables; while one may quibble with each paper, the basic result appears to be quite robust. I do not want however to give the impression here that all issues have been resolved. Not all studies speak loudly, nor do I find all specifications satisfactory. I am also not sure that the role of firm specific factors found in those regressions is strong enough to generate the aggregate persistence which we observe in macro data. In terms of equation (2.2) for example, I am not sure that the estimates of a and b derived from the micro studies are consistent with the estimated $a/(1+b)$ from macro regressions. Finally, I am not sure of how to reconcile those results with the findings of very stable relative wage structures which have been emphasized in the empirical research on efficiency wages (Krueger and Summers [1986] for example).

The other crucial assumption of these models is that of duration effects. Recent UK studies have looked at hiring practices of firms and documented that unemployment is indeed often used as a ranking criterion in hiring [23]. Studies have also looked at the relation between methods of search, search intensity and duration in the UK, and have documented that active search decreases with duration [24]. These micro studies however tell us only that the various effects are at work; they do not tell us about their quantitative importance. One set of data which should be of great use in the time series evidence on on unemployment by duration, which is available for a number of European countries. Those data have been used to document the increase in the average duration of unemployment, and in the share of long term unemployment in total unemployment as unemployment increased. They can in principle be used further to look at the behavior of exit

22.See for example Christophides and Oswald [1990], Carruth and Oswald [1989], and other references in Nickell [1989]

23.See in particular Meager and Metcalf [1987]

24.See Hughes and McCormick [1989]

rates from unemployment as a function of duration and the state of the labor market. In Blanchard and Diamond [1990c], we made a first pass at the duration data for the two countries in which unemployment has sharply decreased in the late 1980's, the UK and Spain [25]. Much better can surely be done. Those aggregate data suffer however from a number of potential problems, from measurement error to heterogeneity. A complementary approach is the estimation of hazard rates using individual panel data, which also exist for a number of countries. Some existing studies (Imbens [1990] for example) have allowed hazard rates to be a function of both individual duration and the state of the market; to my knowledge however, none has allowed for the interactions between duration and the state of the market which are suggested by the theories I have sketched in the previous section. Much work, both theoretical and empirical, remains to be done. But I am reasonably optimistic that models along the lines I have sketched will prove useful both in reconciling micro and macro evidence and in explaining not only the evolution of European unemployment over the last two decades, but many of the cyclical features of labor markets in general.

25.See also the study by Jackman and Layard [1988]

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