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THE FLOW APPROACH TO LABOR MARKETS

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ABSTRACT

The "flow approach" to labor markets builds up from the flows of workers and of jobs. It is based on three essential components, a specification of labor demand in terms of flows of job creation/destruction, a process of matching between workers and firms, and a process of wage determination where wages depend on the labor market prospects of employed workers and firms.

We think that this approach gives the right basic picture of unemployment and unemployment dynamics, and of the relation between wage movements and the state of the labor market. The additional richness it naturally delivers also captures important implications of labor market mechanisms for macroeconomics. Finally, its structure is realistic enough to allow for a productive interaction with - and use of - micro-work and micro-evidence in both labor and product markets.

This paper shows the structure of the approach and some of its implications. The first section develops a barebone model; the second adds the flesh.

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Macroeconomists, when looking at labor markets, need to choose those characteristics which are central to an understanding of aggregate evolutions, and ignore the others.

Following this research agenda over the past few years, we have developed a view of labor markets which builds up from the flows of workers and of jobs, "a flow approach" to labor markets [1]. This approach is based on three essential components, a specification of labor demand in terms of flows of job creation and job destruction, a process of matching between workers and firms, and a process of wage determination where wages depend on the labor market prospects of employed workers and the difficulty for firms of replacing them.

We think that this approach gives the right basic picture of unemployment and unemployment dynamics, and of the relation between wage movements and the state of the labor market. The additional richness it naturally delivers, about the efficiency of matching in the cycle or about the effects of sustained unemployment on the allocation of workers and the determination of wages for example, also captures important implications of labor market mechanisms for macroeconomics. Finally, while it yields simple and tractable analytical aggregate models, its structure is realistic enough to allow for a productive interaction with –and use of– micro-work and micro-evidence in both labor and product markets.

The purpose of this paper is to show the structure of the approach and some of its implications. The first section develops a barebone model; the second adds the flesh.

1 A barebone model

1.1 The building blocks

The "flow approach" is based on three building blocks:

(1) A specification of labor demand in terms of gross flows of job destruction, x

and job creation, y. A simple specification along these lines is:

$$x = x(w, \theta_x); \quad x_w \geq 0 \tag{1.1}$$

$$y = y(w, \theta_y); \quad y_w \leq 0 \tag{1.2}$$

The θ's shift destruction and creation. They reflect many factors, from aggregate demand to foreign competition, to changes in technology and tastes. We shall not examine where they come from here; in that sense our model is a partial equilibrium model.

This specification implies a perfectly elastic long run labor demand at the wage which is such that $x = y$. That is, the stock of jobs does not enter into either creation or destruction equations. This is convenient, not essential. So is the specification in terms of the current wage rather than in terms of current and expected future wages.

In the barebone model, all flows come from the process of creation and destruction. We shall introduce quits later.

(2) A specification of the hiring process through a "matching function" giving the number of hires as a function of the pools of jobs looking for workers, "vacancies", and workers looking for jobs. For the moment, we assume that only the unemployed are looking, so that:

$$h = m(u, v); \quad m_u > 0, \quad m_v > 0. \tag{1.3}$$

where h denotes hires, v and u vacancies and unemployment respectively. For the time being, we further assume constant returns in matching.

This matching black box reflects many factors: the geographical and skill distributions of jobs and workers, their search intensities and their reservation levels in terms of wages and productivities. We shall look inside the box later.

(3) A specification of the determination of the wage, w, which makes the wage depend on the labor market prospects of employed workers and the difficulty for firms of replacing them.

Many theories, such as Nash bargaining (Diamond [1982b]) or efficiency wages (for example Shapiro and Stiglitz [1984]), will do here. If, for example, we think of wages as set to prevent shirking, the wage that firms will have to offer will depend on the probability that a worker who is fired and thus unemployment can find another job, thus, if all unemployed have equal chances of finding a job, on m/u. Under constant returns in matching, this probability will only depend on v/u so that we can write w as:

$$w = w(v/u); \quad w' > 0 \tag{1.4}$$

Many factors, from interest rates to regulations on hiring and firing, enter the wage function. We ignore them here. We also ignore the fact that wages are likely to depend not only on current but also future labor market conditions: as long as unemployment duration is relatively short, this is a minor crime. Finally, we shall ignore the additional dynamics which arise when wages are set in nominal terms for some period of time, rather than continuously set by firms. This is a more serious empirical shortcoming. First, adjustments of the aggregate wage are surely slower than those implied by (1.4). Second, as we have learned from the research on staggered wage setting, the simple relation between the real wage and labor market conditions which holds in the absence of nominal wage setting in (1.4) may disappear to lead instead to a more complex relation between inflation and labor market conditions [2].

Before turning to the mechanics, one remark about semantics. This line of thinking about the labor market is often called the "search approach" to labor markets. This probably comes from the assumption in early models of this type, such as those in the original "Phelps volume", that all separations were induced by the desire to search. But in our basic model, separations all come from job destruction, and search while unemployed may be completely mechanical. "Waiting" is

then a more descriptive term than "searching". In our view, endogenous search, while surely present, is not of the essence. What is of the essence is that there is an endogenous delay in finding another job. This is what matters for the determination of unemployment and for the determination of wages.

1.2 Mechanics

Putting things together, and using the two accumulation identities for unemployment and vacancies gives two dynamic equations:

$$du/dt = x(w(v/u), \theta_x) - m(u, v) \tag{1.5}$$

$$dv/dt = y(w(v/u), \theta_y) - m(u, v) \tag{1.6}$$

And, given u and v, wages are given by:

$$w = w(v/u) \tag{1.7}$$

The steady state loci corresponding to the two dynamic equations can be drawn in the u-v space. This is done in figure 1. As there are two conflicting effects at work, both loci have slopes of ambiguous sign. Consider (1.5). An increase in vacancies increases hires, decreasing unemployment. But by improving the labor market prospects of workers, it increases the wage, increasing job destruction and thus unemployment. When the wage effect dominates, an increase in vacancies increases unemployment, and this is how we draw the locus in figure 1. A similar ambiguity holds for (1.6). We also draw the locus as upward sloping; it is then unambiguously flatter than the other. The equilibrium is given by E and is stable.

Having drawn the phase diagram, one can then look at the dynamic effects of various shocks on unemployment and vacancies. And, from (1.7), movements along the ray from the origin are associated with no change in wages, movements to above the ray with increases, movements to below the ray with decreases.

The figure below was inadvertently omitted from the text and should be found between pages 5 and 6.

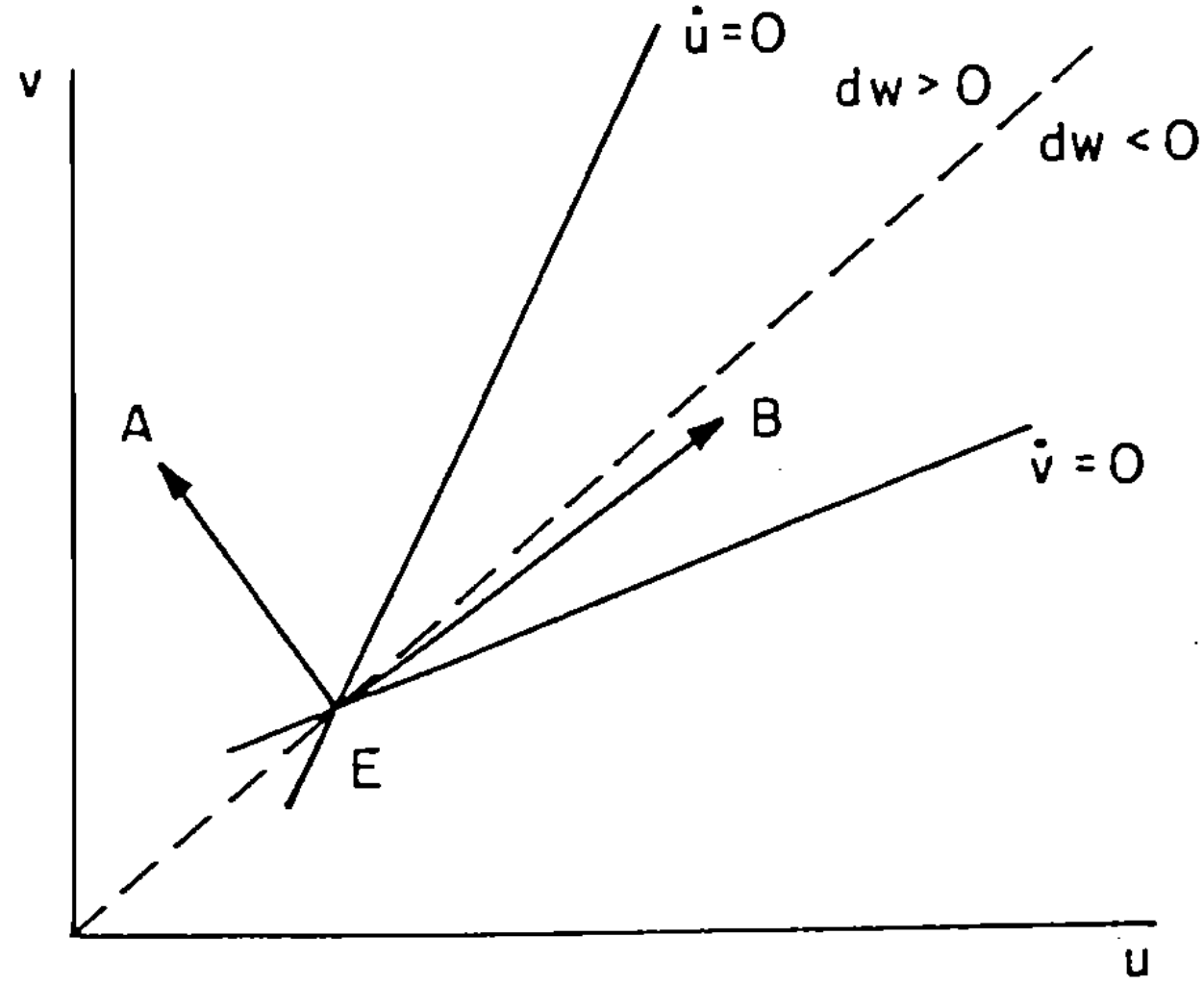

Figure 1
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The effects of pure shocks to either job creation, or to job destruction, are easiest to characterize. But shocks are more likely to arise in combination. General movements in aggregate activity –such as those triggered by aggregate demand in a full macro model– are likely to lead to opposite shifts in job creation and job destruction. Such movements usually lead to movements in u and v of opposite directions, such as on the path EA in figure 1. Increases in unemployment are then associated with decreases in vacancies and, thus, decreases in wages. On the other hand, times of increased reallocation, due to, say, more rapid technological progress or increased international openness, are likely to lead to shifts of the same sign in job creation and destruction. Such shifts usually lead to movements in u and v in the same direction, such as on the path EB in figure 1. Increases in unemployment are then associated with increases in vacancies and thus little change in wages.

1.3 First looks

This barebone model gives a way of interpreting the joint movements in u, v and w, and, through them, to learn about the nature of the shocks affecting the economy. In Blanchard and Diamond [1989], we followed that lead, and used such an approach to rehabilitate the Beveridge curve as a diagnostic tool. Our basic conclusion was that, at all but low frequencies, shifts in the intensity or the efficicency of reallocation have little to do with fluctuations in US unemployment. In a couple of papers (in particular Blanchard and Diamond [1990a]), we have taken a stab at the more ambitious task of using information from u, v and w, or in other words, information from both the Beveridge and the Phillips curve, for the US and a number of European countries. We do not feel we are there yet.

When data on gross flows are available, looking at them is clearly more instructive than looking at the stocks. In Blanchard and Diamond [1990b] we examined the cyclical behavior of US gross flows of workers and jobs. There we confirmed the earlier findings of Davis and Haltiwanger [1990] that, while aggregate fluctuations

are indeed associated with opposite movements in job creation and destruction, movements in job destruction are much larger than movements in job creation. This raises the intriguing possibility that recessions thus play a useful, "cleansing" role ? But that must depend on whether cleansing would have happened anyway and is simply bunched in recessions, or whether recessions play a special role, and whether cleansing eliminates mostly unprofitable or mostly illiquid firms. These questions are the subject of current research [3].

2 Endogeneities and heterogeneities

The basic structure can accomodate extensions; and, in many cases, extensions are needed before the model can be confronted to the data. We consider three of them.

2.1 Layoffs and Quits

In the barebone model, the only flows out of employment are layoffs, triggered by job destruction. But, in fact, more than half of separations in US manufacturing (for which the appropriate data exist) are quits rather than layoffs, and of those more than half are movements directly from one job to another. Allowing for those movements not only adds realism, but, as we shall show, yields additional insights about the relation between fluctuations and match quality:

A simple way of easily extending the basic model to generate job to job quits is to assume now that, while workers and jobs are identical ex ante, new matches can either be good with probability, π or bad, with probability $1 - \pi$. Badly matched workers are better off working than being unemployed, but, while employed, keep looking for a better match. Thus, the pool of workers looking for jobs includes not only the unemployed, but also those who are badly matched. The basic implications of the extended model are easily stated:

In response to shifts in aggregate activity, the model now generates the countercyclical layoff and procyclical quit flows we observe in labor markets. In an expansion, layoffs are low and vacancies are high. High vacancies make it easier for badly matched workers to find a new job, leading to increased quits. The increase in quits is amplified by the fact that quits create "vacancy chains" –an expression coined by Akerlof et al. [1988]– as firms post new vacancies to replace those who have quit, and so on. A further implication is that expansions, which provide more opportunities for badly matched workers to find jobs, lead to a steadily increasing proportion of good matches (a point explored in Akerlof et al. [1988]). Earlier, we focused on the cleansing effect of recessions. As a counterpoint, this extension generates matching quality effects of expansions. Expansions lead to steadily better matching, better job satisfaction.

2.2 Increasing returns

In the barebone model, we specified matching as having constant returns. Some have argued instead that increasing returns in matching may be both more empirically appropriate and important to an understanding of fluctuations (for example Robert Hall's comments on Blanchard and Diamond [1989]). Despite the work of one of the authors on thick markets (Diamond [1982a]), we are skeptical of their relevance here, at least in this partial equilibrium setting. Here again, the model provides the right starting point to discuss the issues:

We can think of the matching function as a convolution of the purely mechanical process of matching given search intensity, and of the search intensity of workers and firms. Take each in turn.

The mechanical process, which reflects the process through which workers and jobs find each other surely has increasing returns over some range. Over space, that is New York City versus Iowa, the range is surely wide enough that they matter. The question is however how strongly increasing returns are over the range of typical aggregate fluctuations in unemployment and vacancies; we suspect that,

given the size of the flows and the existence of newspapers as information devices, they may be roughly constant.

Turning to the the search intensity of workers and firms, it is quite plausible that those depends on market conditions. The empirical evidence suggests that, at least for workers, the intensity of search decreases in depressed labor markets. Endogenous search intensity by either firms or workers does not however lead by itself to increasing returns. To see this, rewrite the matching function as:

$$h = g(a(u,v)u, b(u,v)v) \equiv m(u,v); \tag{2.1}$$

Assume $g(.,.)$, which captures the mechanical part of matching, to have constant returns. The functions $a(.,.)$ and $b(.,.)$ give the search intensities of workers and firms. As long as a and b are functions of labor market conditions as measured by v/u, thus being homogenous of degree zero in v and u, $m(.,.)$ will also have constant returns. And, in turn, if $m(.,.)$ has constant returns, then v/u is indeed a sufficient statistic of labor market conditions for search decisions. A similar conclusion holds with respect to reservation levels.

Even if there are increasing returns, they are unlikely to matter much with respect to movements in aggregate activity. This is because, as we saw earlier, those movements lead to opposite movements in u and v, to movements along EA in figure 1. Thus, to a first order approximation, increases in u and higher returns to u will be cancelled by decreases in v and higher returns to v in their effect on the flows of hiring. Where increasing returns play a more important role is in the presence of shifts in reallocation intensity. An economy with high reallocation will have more efficient matching, leading at a given wage, to larger effects on unemployment and vacancies. To the extent that job creation and destruction depend not only on wages as we assumed in our basic model, but also on market conditions, the effects can be further amplified . Wages however are likely however to respond more strongly as well, offsetting in part the effects of improved

efficiency. And as we have indicated, the evidence in favor of important shifts in reallocation intensity is weak at best.

Finally and most to the point, what we found, when estimating the matching function in Blanchard and Diamond [1989] and Blanchard and Diamond [1990a], was roughly constant returns. As estimation has to confront a number of data and econometric issues, from the definition of the labor pool to the choice of instruments, this is not the last word. But, at this point, there is no evidence at this stage of large increasing returns in matching.

2.3 Duration dependence

Our barebone model assumes homogeneity of jobs and of workers. But there are clearly good jobs and bad jobs, workers with strong and workers with weak labor force attachment. In Blanchard and Diamond [1990b], we focused on heterogeneity in labor force attachment to explain the flows between employment, unemployment and out of the labor force, and found the movements to and from the non-employment pools to be sharply different. We shall focus here on another form of –endogenous– heterogeneity, unemployment duration dependence. We have explored its implications in a number of papers, in particular Blanchard and Diamond [1990c] and Blanchard [1991]. We believe that duration dependence holds one of the keys to an understanding of changes in labor markets during episodes of sustained unemployment.

Consider first the idea that the long term unemployed may search less or search less effectively. Again the basic model is easy to extend. Assume, rather starkly, that there are two levels of search, high and low. Assume that unemployed workers start with high search intensity, but with constant probability, become low intensity searchers. The economy then has two pools of unemployed workers, high and low intensity searchers. The relevant pool in the matching function is equal to the sum of the two pools, weighted by their search intensity. And the wage function depends on the exit rates from unemployment perceived by employed

workers, were they to become unemployed. For a given unemployment rate, their prospects are more favorable the higher the proportion of low intensity searchers.

What differences does this make ? A period of high unemployment leads to an increasing pool of low intensity searchers, and low hires given unemployment. More importantly perhaps, the labor market prospects of those employed, were they to become unemployed, increasingly differ from those already unemployed. This leads to a decreasing effect of unemployment on wages, and in turn a decreasing effect on net job creation [4].

There are more subtle but, we believe, equally relevant forms of duration dependence, one of which we examined in Blanchard and Diamond [1990c]. It is unlikely that loss of skills among the long term unemployed –who are disproportionately unskilled workers to start with– is sufficient to make them unemployable. But perceptions by firms that the long term unemployed may be slightly less qualified than those short term unemployed may by itself have important effects. Suppose that firms, in choosing between applicants, favor, other things equal, those with shorter duration, an effect we have called "ranking". This will make the prospects of the employed workers, were they to become unemployed, more favorable than those of the average unemployed. And the difference will be larger in depressed labor markets. Again, a long period of high unemployment may lead to a decreasing effect on wages.

How important are these effects ? Our discussion suggests a number of ways in which to look for them. As a first pass, one can use aggregate data: some forms of duration dependence -search intensity- affect both the matching function and the wage function; some, -"ranking"- may not affect the matching function. But our approach also suggests how one may use more disaggregated data, such as time series on the distribution of unemployment duration. Many of these implications have been explored in the context of European unemployment. Our reading is that there is strong, if circumstantial evidence that those effects have been at work. Here again, much remains to be done. We think the framework sketched

above provides the right conceptual structure for further research.

Notes

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[1] We are neither the first nor the only ones. Mention must be made at least of the work of Dale Mortensen who has explored this line of research for the last two decades (from Mortensen [1970] to for example Mortensen [1989]) and of Christopher Pissarides Pissarides [1990].

[2]The implications of nominal wage setting and staggering for the relation between nominal, real wages, and labor market conditions have been explored at length. See Taylor [1980], or Blanchard [1990] for a recent survey. A fully worked out integration of nominal wage setting in an explicit "flow approach" model remains however to be done.

[3]See for example Caballero and Hammour [1991].

[4]This explanation for why high unemployment may have a decreasing effect on wages was first proposed by Layard and Nickell [1987].

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