Comments on William Dickens' Paper

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It is fitting that there should be a paper on the Beveridge curve at this conference. Like the Phillips article, the original paper on the Beveridge curve was also published in 1958, by Dow and Dicks-Mireaux in Oxford Economic Papers. The article was mainly about measurement and made the case for a good correlation between vacancies and unemployment, using British historical data. It offered no theory. It launched a literature, known as UV-analysis, on the measurement of vacancies and unemployment and on their relation to "excess demand" in the labor market. It was concerned with the problem of finding how much unemployment can be reduced with Keynesian demand management policy, given the frictions in the labor market, and in this sense it was a precursor of the later critiques of the Phillips curve. Lipsey (1965) brought the Phillips curve and UV-analysis together, in a paper that addressed many of the issues addressed in Bill Dickens' paper.

Commenting on this paper has become, in Bill's words, an attempt to hit a "moving target". In order to avoid writing a comment that may turn out to be irrelevant I have therefore decided to comment less directly on what Bill says, and focus instead on the problem that Bill has posed and discuss some thoughts on how to go about modeling it.

Bill suggests using information derived from the Beveridge curve to calculate changes in the NAIRU. I totally agree with this objective - ever since its inception, the Beveridge curve has been used to "classify" reasons for changes in unemployment. These exercises were a precursor to Bill's task. Bill's question can be rephrased to the question, did unemployment between t and $t+1$ change because of a change in the NAIRU, or because of nomi-

nal shocks? Or, more generally, did unemployment change because of a real shock or because of a nominal shock?

I do not find the framework that Bill is using to model the interaction between the Beveridge and Phillips curves a particularly helpful one. I also do not find his estimated equations the best specifications that can be used to extract the values of the key structural parameters.

Distinguishing between changes in the NAIRU and other changes in unemployment requires two equations. One is the Beveridge curve, which is an equilibrium equation that summarizes the speed of structural change and the frictions in the labour market. The other equation is essentially an equation for the demand for labor. In my view, the best way to think about the Beveridge curve is in terms of the flows in and out of unemployment. By definition, the change in unemployment between period t and $t+1$ is,

$$u_{t+1} - u_t = \text{inflows in } t - \text{ outflows in } t, \tag{1}$$

with the stocks measured at the beginning of the period. For the flow terms we can write,

$$\text{inflows} = \text{new entry} + \text{job separations}, \tag{2}$$

$$\text{outflows} = \text{exits} + \text{job acceptances}. \tag{3}$$

The Beveridge curve is defined as the combination of unemployment and vacancies that equate the inflows with the outflows. Writing a theory of the Beveridge curve amounts to modeling each one of the four terms in (2) and (3), and tracing the combinations of vacancies and unemployment that maintain the equality between the inflows and the outflows in the absence of shocks.

Perhaps surprisingly at first, but on reflection not so surprisingly, we get a good approximation to the dynamics of unemployment if we treat unemployment as if it were always on the Beveridge curve (Pissarides, 1986, Shimer, 2007). It might be surprising at first because, with the change in unemployment given by the difference between inflows and outflows, and the Beveridge curve defined as the locus of equality between inflows and outflows, how does unemployment change if we are always on the Beveridge curve? The best way to think about this conundrum is in terms of speeds of adjustment and the length of the period. Treat unemployment as the only unknown in the inflows = outflows condition and assume the period is a quarter. If one of the four terms in (2) and (3) changes because of a shock, unemployment

changes fast to restore equality between the new inflows and outflows. In other words, although the labor market is characterized by frictions, given the size of the shocks that we normally observe, the frictions are sufficiently small that unemployment jumps between one flow equilibrium and the next within a quarter.[1]

Consider now the shocks that might make unemployment change in the context of the Beveridge curve. The search and matching theory makes the job acceptance flow the key to the entire framework (Pissarides, 2000, chapter 1). In its simplest form it assumes constant job separation rates $s(1-u_t)$, either zero or constant entry and exit rates, and that the rate of job acceptance is given by the aggregate matching function, $m(u_t, v_t)$. The matching function gives the number of new jobs formed as a function of the workers available to take new jobs, and the number of vacant jobs, v_t. Let f_t denote the average rate of job finding, defined by $f_t = m(1, v_t/u_t)$, and assume that entry and exit is zero. The Beveridge curve is

$$u_t = \frac{s}{s + f(v_t/u_t)}. \tag{4}$$

If nominal shocks have any influence on unemployment in this framework, the channel through which they have it is the vacancy rate v_t. The vacancy rate is given by the second equation of the system, the demand for labor. If, for example, a positive nominal shock that raises inflation increases the demand for labor because of nominal stickiness somewhere in the system, the vacancy rate increases above trend and unemployment falls. The implied negative relation between unemployment and inflation is the essence of the Phillips curve, and the channel that links the change in the demand for labor with unemployment is the vacancy rate and the matching function.

In terms of the Beveridge diagram derived from (4) the fall in unemployment induced by the nominal shock is represented by a movement along the Beveridge curve. If one were to accept the simple framework underlying equation (4) as a complete characterization of the dynamics of unemployment, the vacancy rate is the only channel through which nominal shocks can be transmitted to unemployment. Any other changes in unemployment,

[1] In my examination of British and other European data, the only time that the assumption of flow equality in quarterly data was not a good working assumption was the two-year period of the large "Thatcher shock", 1979-1981. See Pissarides (1986) and Petrongolo and Pissarides (2008). Shimer (2007) does not report any period when this assumption was badly violated for the United States.

for given vacancies, are changes in the NAIRU. These changes are associated with changes in the rate of labor turnover, s, changes in the matching efficiency of the labor market, shifts in $f(.)$ for given v_t/u_t, and with changes in the rate of entry into and exit from the labor force. For example, demographics shift the NAIRU, potentially by changing all terms in (4), the rate of labor turnover, the matching efficiency of the labor market and the rate of entry and exit from the labor force. Unemployment insurance shifts the NAIRU by changing the intensity of search and the efficiency of matching; and so on.

In my view, the best way to uncover changes in the NAIRU associated with shifts in the matching efficiency of the labor market is not to estimate the entire Beveridge relation, as Bill has attempted to do, but to estimate the matching function directly (or the job finding rate). When I did this for Britain in 1986 I found that most of the changes in unemployment were associated with changes in the NAIRU, although changes in the vacancy rate also played a role. This was to be expected, given that when unemployment was trending up between the late 1960s and the early 1980s the vacancy rate was fluctuating around a flat trend. Several estimates of matching functions by other authors can be used to decompose changes in unemployment between changes due to the vacancy rate and changes due to other factors.[2] The US experience since 2001, when reliable vacancy data became available through JOLTS, is probably unique in that it attributes virtually all changes in unemployment, save for a small error term, to changes in the vacancy rate, a property that has been emphasized in some of Shimer's recent influential work (e.g., Shimer 2005, 2008).

Bill finds something similar in his estimated Beveridge curves. However, this finding does not necessarily imply a constant NAIRU, even in the simple framework of equation (4). Because there might be causes of changes in the vacancy rate, which keep the Beveridge curve fixed, and which are real and associated with changes in the NAIRU. For example, consider material shocks. If the price of raw materials goes up and real wages are subject to inertia, vacancies might fall dramatically. Unemployment rises through a movement down the Beveridge curve. The Beveridge curve has no obvious reason to shift in this case.

This is why we need to estimate a second equation, preferably simulta-

[2]See Blanchard and Diamond (1979) for early US estimates and Petrongolo and Pissarides (2001) for a survey of several estimates.

neously with the matching function, before we can confidently calculate the NAIRU. The second equation is a demand for labor equation and is derived from a conventional model of the firm with costs of adjustment due to frictions. The difference between investment-type quadratic adjustment costs and matching frictions is that the costs of adjustment with frictions depend on the "tightness" of the labor market. At high vacancy to unemployment ratios they are higher, because there is more competition between firms for the pool of unemployed workers. The implication of this property is that we can write the dynamic demand for labor equation as a "vacancy supply" equation and estimate it in terms of all the conventional labor demand regressors, including price misperceptions (Pissarides, 1986, Yashiv, 2000).

Bill has a second equation in his model but it is not a labor demand equation. His equation is similar to the one that featured in the very first models of the Beveridge curve (Dow and Dicks-Mireaux, 1958). It is essentially the 45 degree line through the origin, which defines the locus of equality points between u and v as the equilibrium points. Modern approaches to the Beveridge curve derive the second equation from optimizing models of the firm and show that the slope of the second curve is a function of the model's parameters.

A more important point about the second equation, however, is this. Are we justified in focusing on the vacancy rate as the only variable that can transmit nominal shocks to unemployment? In the context of Phillips curve analysis we are asking whether all shocks to the unemployment rate other than those acting through the vacancy rate are shocks to the NAIRU. In the context of Beveridge curve analysis the question is whether the simple framework in (4) is sufficient.

There has been a lot of work on this issue recently, with reference mainly to business cycle fluctuations in unemployment. These "high frequency" fluctuations are also the ones that Bill studies in his paper. The upshot of the discussion is that business cycle fluctuations in unemployment are driven both by fluctuations in the inflow rate and the outflow rate (see Shimer, 2007, Fujita and Ramey, 2007, Petrongolo and Pissarides, 2008). Moreover, for cyclical fluctuations one can ignore the movement in and out of the labor force and focus on movements between employment and unemployment. In that context, the consensus is that about two-thirds of fluctuations are due to the outflow rate, for which the matching function approach serves us well, and another third to the inflow rate. The inflow rate in (4) is the parameter s. The recent empirical literature on the ins and outs of unemployment says that

s should not be a parameter but a cyclical variable. A complete model of the NAIRU derived from the Beveridge curve should account for the endogeneity of job separations.

Although good theoretical models of the endogeneity of job separations exist, it is much more difficult to find good empirical, or quantitative models of separations.[3] I think this is likely to be the main sticking point in the task that Bill set himself. Because job separations vary and are negatively correlated with job accessions, it is plausible to assume that they are driven by the optimizing decisions of firms and workers in response to shocks. Some of those shocks are nominal, and if there are nominal rigidities of the kind analyzed in Phillips curve models, some changes in the parameter s in (4) are changes associated with nominal shocks, namely, not changes in the NAIRU. But changes in s shift the Beveridge curve. It follows that in a general model of the NAIRU there are changes in unemployment that are not caused by changes in vacancies, and which are not changes in the NAIRU. Identifying therefore all changes in unemployment that take place for given vacancy rate as changes in the NAIRU would be a mistake.

A challenge that is facing both search and matching theory and modern Phillips curve analysis is how to explain the fact that on average about a third of fluctuations in unemployment are due to shocks to job separations (or, at least, to the unemployment inflow rate) and yet for long stretches of time the vacancy-unemployment scatter of points is tightly distributed around a fixed Beveridge curve. As far as I know there is no paper in the literature yet that does that, and so there is no model that can convincingly be used to provide a framework for the estimation of the NAIRU from Beveridge curve analysis. But following the approach that I outlined in this comment, under the assumption that all non-random shifts in the Beveridge curve are changes in the NAIRU, is a good first approximation to the data.[4]

[3]For the theory see Mortensen and Pissarides (1994) and Caballero and Hammour (1996). For more discussion of the empirics of job separations see Davis and Haltiwanger (1999).

[4]See Ebrahimy and Shimer (2008) for a promising attempt at explaining simultaneously the tightly distributed points in Beveridge space and the variance in the separation rate. They focus on the psot-2001 data, when there are no shifts in the Beveridge curve. The problem of reconciling periodic shifts with long periods of tightly distributed $u - v$ points remains.

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