The Remarkable Place of the UV-Curve in Economic Theory

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1 Dow and Dicks-Mireaux's UV-curve

The UV-curve originated from the work of two British economists, Dow and Dicks-Mireaux (hereafter DDM) in 1958. In their seminal 1958 paper they suggested using data on vacancies and data on unemployment in order to measure excess demand in the labour market as an indicator for the excess demand in the goods market. DDM argue that, though there are good reasons to have some distrust in vacancy numbers, there are also reasons to have a certain confidence in the variation in vacancy numbers. The recording of vacancies might be incomplete, they argue, but the *behaviour* of vacancies shows that vacancy statistics can be considered as rather reliable indicators. They presented the data is presented in an Unemployment-Vacancy (UV) space and connected successive observations (Figure 1). An important feature that DDM assumed about the behaviour of unemployment is that unemployment above a certain level would be decreasingly sensitive to demand. That is, a further increase in demand should lead to a disproportionately small decline in unemployment rates (and vice versa for vacancies). Following this rationale, DDM derive an idealized UV-curve as a rectangular hyperbola (Figure 2).



Figure 1: Relation between unemployment and vacancy rates in a UV-space Source: DDM, 1958: 4.



Figure 2: Idealized UV relation [where v/s = adjusted vacancy rate] Source: DDM, 1958: 4.

The curve shows, first, an inverse relation between vacancy and unemployment rates. When the economy is in recession, it experiences high unemployment rates and low vacancies rates (point 1).

In an upswing (point 3), the reverse is true: there is a high vacancy rate with a low unemployment rate. Each point on the UV-curve represents a different degree of aggregate demand, and, across the various stages of the business cycle, the economy moves along the idealized UV-curve. Secondly, the hyperbolic and convex shape of the UV-curve represents the feature that a further increase in demand leads to a disproportionately small decline in unemployment rates. This "increasing insensitivity of unemployment", as DDM called it, clearly resembles the neoclassical idea of decreasing returns to input factors found in production and utility functions. Later empirical studies estimate this hyperbolic UV relation as $\log v = \beta_0 + \beta_1 \log(1/u) + \varepsilon$.

2 The impact of the UV-curve on economic theory

The UV-curve was put forward by DDM as a practical measurement device to guide economic policy. Its place in economic theory was therefore not immediately clear. The UV-curve obviously had some attractive features, in the sense that it provides a macro-framework that shows that unemployment and vacancies coexist simultaneously in the absence of excess demand, or that some unemployment will exist even at very high levels of demand, but its explanatory power was low since it provided no new insights, other than those that already existed, about what mechanisms caused the simultaneous existence of unemployment and vacancies. And more importantly, although the UV-curve was empirically supported, there was no theoretical foundation for it.

In retrospect, several effects of the introduction of the UV-curve in economics can be distinguished. The most important ones seem to be the following. Firstly, it introduced a method, which later became known as UV-analysis, for the decomposition of unemployment into different types for the guidance of economic policy. Using this UV-analysis economists were able to decompose unemployment into deficient-demand (or cyclical) unemployment and structural unemployment. This was clearly consistent with DDM's purpose of doing measurement for guiding Keynesian policies. Later economists of NIESR¹ developed the UV-analysis further so that they could decompose unemployment into the non-deficient demand component of unemployment into a structural and a frictional component of unemployment, so that a classification arises that corresponds to the 'traditional' classification; that is, a division of unemployment into frictional, structural, and deficient demand unemployment.

¹ National Institute of Economic and Social Research in London

Secondly, the simultaneous coexistence of unemployment and vacancies was at odds with neoclassical notions of market clearing. It was, for example, not clear how this UV-curve should be explained in a simple Marshallian supply and demand analysis. The growing awareness that labour markets may not clear instantaneous as other markets necessitated a theory of simultaneous coexistence of unemployment and vacancies in equilibrium. This was solved by, among others, Hansen (1970), who incorporated the UV-curve in a Marshallian supply and demand framework by integrating elements of Gordon (1966) and Holt and David (1966). In this way he provided a comprehensive, neoclassical theory of friction in a Marshallian supply and demand framework, and showed that unemployment and vacancies can coexist

And thirdly, both the UV-curve and the Phillips-curve were used to clarify the post-war policy debate on 'full employment' that was instigated by Keynes' General Theory and Beveridge' 1942 report on social security as both curves provided macroeconomic notions of equilibrium in markets, though they were inconsistent and conflicting.

3 The UV-curve stability debate

The work of DDM as well as theoretical analyses by Holt and David (1966) and Gordon (1966) inspired a series of empirical studies in the late 1960s and throughout the 1970s, estimating the relation between unemployment and vacancies. Cohen and Solow (1967) found a stable relationship between unemployment and vacancies, however, almost immediately after Cohens and Solows publication other empirical studies found supposed 'breakpoints' in the UV-curve, suggesting shifts of the curve further or closer to the origin corresponding to higher or lower levels of structural unemployment. This obviously raised questions about the stability of the UV-relation and the usefulness of the UV-curve as a structural relation for economic analysis and measurement, and resulted in an enormous amount of empirical studies since the 1970s with an abundance of specifications of the UV-curves all of which incorporate additional variables, dummy variables or lagged variables. The discussion took place roughly speaking following national boundaries: in the USA and in Great-Britain. For the British UV-curve studies all find 'breakpoints' or shifts of the UV-curve for the period 1958-1971, but disagree about what causes the shifts². Econometric analysis usually provided no or only very little evidence for the alternative hypotheses tested and after three

² Bowers, Cheshire and Webb, 1970), Gujarati (1972a, 1972b, 1973), Taylor (1972), Foster (1973), Knight and Wilson (1974), Evans (1975, 1977), Holden and Peel (1975, 1977), Warren (1977), Parikh (1977), Bewley (1979), almost all in *The Economic Journal* and *Applied Economics*.

decades of testing and specifying the UV-curve Jackman et al (1989: 392) admits that: "we must remain agnostic as to the causes of the change", rendering the UV-curve as an unstable relationship.

4 A new paradigm: towards flows and microfoundations

In the 1970s, UV-analysis reached the highest stage of its popularity, and most studies date from this era. In the 1980s, studies using UV-analysis became rare. Opponents of the UV-analysis were found in a neoclassical paradigm which finally took over Keynesian, macroeconomic thinking on unemployment and was labelled as 'search theory', 'flow approach' or 'new microeconomics'. Characteristic of search theory is that it analyses equilibrium unemployment in terms of flows in and out of unemployment rather than a static difference stocks as the UV-analysis did. Unemployment and vacancy figures alone are not informative about structural unemployment since the duration of unemployment has to be taken into account as well. A reduction of the velocity of circulation in the pool of unemployed will increase the number of long-term unemployment and hence the UV-analysis. The problem of unemployment duration became a central research question in the late 1970s and early 1980s when unemployment rose sharply and most notably European countries experienced persistent long-term unemployment. This led to the formation of new theories of unemployment such as hysteresis theory.

The key idea of matching models is that the complicated and stochastic process of job search is captured in one single, well-behaved, aggregate, mathematical function, called the matching function. The idea of a labour market divided in frictionless submarkets is abandoned and replaced by one mathematical function accounting for the flows in the labour market. In it most elementary form the matching function is: M = m (U, V). This function expresses matches between unemployed and vacancies in a discrete, aggregate way. Thus without explicit reference of the source of friction the equilibrium outcome is defined in a small set of variables. In a UV-space the matching function is stable, convex to the origin and exhibits diminishing returns to the input factors; i.e. it corresponds with the empirically found UV-curve. The role of the matching function is to provide a framework for analysing flows of unemployed without bothering about the underlying matching process. How the matching function only gives an aggregate outcome. The underlying frictions in the labour market and their effect on unemployment is not analysed individually, but the outcome effect as a whole is considered. It is therefore used in a similar way as production and utility functions.

reason as for production or utility functions often a Cobb-Douglas type of matching function is assumed. After unemployed and vacancies are brought together by this stochastic matching technology, matching models focus consequently on the division of the outcome of this productive match, often as a bargaining process, where the surplus is divided according to a surplus-sharing rule. Two equilibrium-generating mechanisms are usually explored: the effect of wage adjustments and the effects of labour tightness adjustment. The equilibrium outcome, i.e. the values of the variables U, V and W (wage) are determined by equilibrium conditions and is at the intersection of the stable UVcurve and the job creation curve, a straight line with as slope θ , the labour market tightness.

The strength of this new paradigm appears that it circumvents the problems inherent to UVanalysis. The new framework enables economists to analyse heterogeneous groups of workers with different characteristics in terms of probabilities of in- or outflow. Workers with a higher rate of job finding, experience shorter unemployment durations and lower rates of structural unemployment. So, workers and job vacancies are no longer considered as homogeneous and both therefore have to spend time and resources in order to find a good match. Even in the absence of deficient demand for labour, unemployment and vacancies coexist as a consequence of this time-consuming search process. So the new paradigm does not only provide a profound analysis of flows, in addition it provides a theoretical explanation for simultaneous coexistence of unemployment and vacancies.

5 Conclusions

The decline of the UV-analysis is usually attributed to methodological flaws. The UV-analysis had some drawbacks which made the method even in its heyday subject to debate. Advocates of the UV-analysis considered shifts of the UV-curve not a serious threat to the UV-analysis mainly because of the optimistic belief in the 1970s and 1980s that the underlying cause or causes of the shift of the UV-curve could be identified and could be accounted for in the specification of the UV-curve. The identification problem of the UV-curve had as consequence that it became impossible to distinguish between different movements of the UV-curve: movement along the UV-curve, necessary for measurement, deliberate attempts to move the UV-curve inwards by economic policy in order to reduce structural unemployment, and unintended structural shocks of the UV-curve for reasons yet unknown. The underdetermination of the UV-curve clearly makes measurement of classes a risky affair.

It is however remarkable and perhaps even ironic to see that matching models of unemployment, that succeeded the UV-analysis as a framework for analysis of unemployment also make critical use of the idea of the UV-curve as a structural, invariant relationship and don't seem to be hindered by underdetermination problems of the UV-curve. A first explanation might be that the UV-analysis was set up as a measurement device in the first place. Since the UV-curve couldn't be exactly identified, its use as a measurement device for classes of unemployment became dubious. A second explanation could well be the inability of the UV-analysis to deal with flows in and out of unemployment and changes in unemployment duration. Search theory, in contrast, is – under the assumption of equilibrium in and outflow – able to do so, and provides answers to questions that became relevant in the 1980s when long-term unemployment started to occur. On the other hand, search theory isn't able to deal with cyclical unemployment. These arguments seem not exhaustive, though. Clearly a paradigmatic element has to be taken into account too in the decline of UV-analysis. The UVanalysis was developed at a time when economists had a strong belief in the effectiveness of Keynesian, aggregate demand management. The main concepts that UV-analysis aimed to measure, such as excess demand and cyclical unemployment, are important Keynesian concepts, and they were measured in the first place for the guidance of Keynesian economic policy. Since this belief in Keynesianism was much more profound in Great Britain and continental, Western European countries than in the USA, it is no surprise to see that UV analysis gained popularity almost exclusively in Europe. In the USA, economists had a deeper suspicion to active Keynesian macroeconomic policies. Indeed, in the 1960s, American economists like Friedman and Phelps attacked the Keynesian disequilibrium theory that formed the foundation of UV-analysis and stressed the compatibility of unemployment with equilibrium by putting forward the idea of a natural rate of unemployment. With the fall of Keynesian thinking in the 1970s, measurement of Keynesian concepts, as offered by UV-analysis, became more or less redundant, and contemporary economics became less concerned with cyclical or deficient demand unemployment.

Finally, in retrospect, it can be argued that measurement with the UV-device had a significant impact on economic theory. The place of the UV-curve in economic theory was not immediately clear and competing notions derived from the UV- and Phillips-curve framework dominated macroeconomic thinking, particular in the 1960s. Current matching models of unemployment still apply the idea of structural co-movement of U and V data by using a matching function. The correlation between U and V data is therefore still valid, but economists are no longer seeking causal structure at the macro-level. And through a shift in paradigm the inductively established empirical

UV-curve became a deductively derived UV-curve, firmly rooted in and reinforcing neoclassical economics.

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