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DECLINING RESERVATION WAGES AND TEMPORARY EMPLOYMENT

by

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Declining Reservation Wages and Temporary Employment

It is often argued that the reservation wage declines with the duration of a spell of unemployment (see, for example, Kasper (1967), Burdett (1979), Danforth (1979), Keifer and Neumann (1979), Lancaster (1980)). The argument used is seductive if you accept the not unreasonable restriction that the situation faced by an unemployed worker deteriorates with the duration of unemployment. A common reason given for such a deterioration is that with many unemployment insurance (UI) systems in use UI payments decline with the duration of unemployment. Given such an assumption it follows quite naturally that an offer which was unacceptable when initially unemployed may become acceptable after a long duration of unemployment.

The objective of this note is to show that the above argument rests heavily on the implicit restriction that an offer made to an unemployed worker is either rejected, or accepted as permanent employment (where the worker plans to remain at the firm at least until there is some change in the conditions faced). It will be shown that with the form of UI system quite commonly in use today, the temporary employment option, where a worker accepts a job but plans to quit in the future, plays a significant role in an unemployed worker's strategy..

There are two elements common in many UI systems in use. First, UI payments decline with the duration of unemployment and secondly, workers who quit jobs are eligible for UI payments (although some penalty may have to be paid). We show that, given the this form of UI system, the strategy of a unemployed worker which maximizes expected discounted lifetime income can be described by two reservation wage functions; the permanent employment reservation wage function, R(t), and the temporary employment reservation wage function, N(t), where t indicates the time since becoming unemployed. The specific optimal strategy derived can be described as follows. Suppose a worker receives an offer w at time t since becoming unemployed. If $w \geq R(0)$, then it is accepted as a permanent job, if $R(0) > w \geq N(t)$, then it is accepted as a temporary job, whereas if $w <$

N(t), then it is rejected. It should be noted that although N(t) declines with t, at least initially, the relevant permanent employment reservation wage is independent of t. Hence, although an unemployed worker will accept less attractive offers aaas the duration of employment increases, such offers are only accepted as temporary employment.

The intuition behind the result is reasonably straightforward. Suppose a worker has been unemployed for twenty–five weeks and six days when she receives an offer. Assume the UI system is such that workers receive UI payments for only the first twenty–six weeks of a spell of unemployment, and then receive nothing until a job is found. Further, suppose a worker can quit a job after (say) six weeks of employment and then be fully reinstated in the UI system. It is clear in such a situation this worker may accept a low wage offer only to quit in six weeks, as this will allow her another twenty–six weeks of UI payments. Of course very higher wage offers will be accepted and the worker will not quit later.

There are two crucial element to the UI system which generates the above result. First, UI payments decline with the duration of unemployment. Although this is the case with most systems in use it is not universal. Second, workers who quit jobs can receive UI payments with perhaps a small penalty when compared to laid off workers. For example, in many countries workers who quit their jobs not not receive UI payments for the first couple of weeks of unemployment.

The Model

The job search model used is kept as simple as possible to highlight the issues under consideration. For example, the following standard assumptions will be maintained throughout:

(a) the unemployed worker expects to live forever,

(b) any job offer can be fully described by the wage it entails,

(c) there are no recall of offers rejected, and

(d) employed workers do not receive job offers.

From time to time the unemployed worker under consideration receives a wage

offer. Let β denote the arrival rate of wage offers, where β is the parameter of a Poisson process. Thus, βh is the probability an offer is received in any small time interval h when unemployed, i.e., the arrival rate of offers is assumed to be independent of the duration of unemployment. Any wage offer is envisaged as a random draw from a known distribution of wage offers, F. All the above is a reasonably standard.specification of a job search model. We now turn to a critical element of the model: the specification of the UI system.

The flow of UI payments is assumed to decline with duration of unemployment. This restriction appears to be satisfied by many UI system in use. For example, in the US UI payments are stopped after twenty six weeks of continuous unemployment, whereas in many parts of Europe that element of the UI payments related to the worker's previous wage is stopped after a given period of unemployment. Of course, there are many other elements to UI systems, such as the maximum number of weeks of payment in a given year, these, however, will be ignored in what follows.To formalize the above, let u(t) denote the flow of UI payment received at time t since becoming unemployed and assume

$$u'(t) = \begin{cases} \leq 0, \text{ if } t < t^* \\ = 0, \text{ if } t \geq t^* \end{cases} \qquad (1)$$

with $u(0) > u(t^*)$. Hence, UI payments are assumed to decrease until t^* in a spell of unemployment and then remain constant until a job is found. It should be stressed that t refers to the time since becoming unemployed and not historical time. There is another important aspect of the UI system under consideration that should be mentioned. A worker who quits before some given time interval s in employment is penalized in that UI payment flow $u(t^*)$ is received throughout the next spell of unemployment. A worker who quits employment not before time interval s is not penalized and receives UI payments as

indicated by (1).The particular role these two restrictions play will become clear later.

Suppose the worker receives wage offer w after being unemployed exactly time t. In the job search literature to date it has been assumed the worker either rejects the offer and remain unemployed, or accept it and works at the firm forever (or at least until laid off). Another option will be considered here; the temporary employment option. With this option the worker accepts the offer but plans to quit the firm at some time in the future. Not surprisingly, a worker who plans never to quit a firm will be said to choose the permanent employment option.

Let $V_0(t)$ denote the maximum expected discounted lifetime income (the expected return) to a worker who has been unemployed for time t, given he or she will remain unemployed at least until the next wage offer. The expected return to the permanent employment option at wage w is indicated by $V_1(w)$. It follows immediately that

$$V_1(w) = w/r \tag{2}$$

where r is the instantaneous rate of discount. Let $V_2^k(w,s)$ denote the expected return to a worker who accepts offer w for time interval k and then returns to unemployment. If k is at least as great as s, then he or she faces $V_0(0)$ when becoming unemployed, if, however, k is less than s, the worker faces expected return $V_0(t^*)$ when becoming unemployed. It follows that

$$V_2^k(w,s) = \begin{cases} \int_0^k w\, e^{-rx}\, dx + e^{-rk} V_0(0), & \text{if } k \geq s \\ \int_0^k w\, e^{-rx}\, dx + e^{-rk} V_0(t^*), & \text{if } k < s \end{cases} \tag{3}$$

The obvious result that $V_0(0) > V_0(t^*)$ is all that is required about $V_0(t)$ at present.

The equations of (3) can be written as

$$V_2^t(w,s) = \begin{cases} w/r + e^{-rk}[V_0(0) - w/r], & \text{if } k \geq s \quad (4a) \\ w/r + e^{-rk}[V_0(t^*) - w/r], & \text{if } k < s \quad (4b) \end{cases}$$

Note that $V_0(t)$ is independent of any current wage offer received, whereas $V_1(.)$ increases with it. This, of course, guarantees at any time t during a spell of unemployment spell there exists a number, R(t) (the permanent employment reservation wage at time t) such that

$$(5) \qquad V_1(x) \gtrless V_0(t) \text{ as } x \gtrless R(t)$$

Thus, given a particular duration of unemployment t, any wage offer received at that date that is at least as great as R(t) implies the worker prefers permanent employment to unemployment. The expected returns to permanent employment and temporary employment change as the wage offer faced changes. In particular, from (2) and (4) it follows they are both linear in the wage offered and for $k' < k$

$$(6) \qquad \partial V_1(w)/\partial w > \partial V_2^k(w,s)/\partial w > \partial V_2^{k'}(w,s)/\partial w$$

for all w.

Consider for the moment those temporary employment strategies that imply the worker does not plan to quit employment before time interval s, i.e., those that can be expressed by (4a). It follows immediately from (2) and (4a) that

$$(7) \qquad V_1(R(0)) = V_2^{k'}(R(0),s) = V_2^{k'}(R(0),s) \text{ for all k and k'}$$

where k, k' $\geq$ s. Comparing the expected return to permanent employment with the expected returns to those temporary employment strategies with a k at least as great as s, it follows from (6) and (7) that

(8a) $V_2^s(w,s) > V_2^k(w,s) > V_1(w)$, if $w < R(0)$ and $k \geq s$

(8b) $V_1(w) > V_2^k(w,s)$, if $w > R(0)$ and $k \geq s$

Thus, the temporary employment option in which the the worker plans to quit employment exactly after time interval s dominates all others the worker plans to quit employment after at least time interval s. Where the expected return to this strategy is less than that of other temporary employment strategies which imply quitting the job after a time interval greater than s, all such temporary employment options are dominated by the permanent employment option. This result is illustrated in Figure 1.

Consider now those temporary employment options in which the worker plans to quit employment before time s, i.e., those considered in (4b). From (4b) and (2) it follows that $V_1(w) = V_2^k(w,s)$ if and only if $w = R(t^*)$ when $0 < k < s$. Further, as $\partial V_1(w)/\partial w > \partial V_2^k(w,s)/\partial w$, it can be seen that $V_1(w) > V_2^k(w,s)$, if $w > R(t^*)$ and $V_0(t) > V_2^k(w,s)$, if $w < R(t^*)$, given $k < s$. Hence the temporary employment options in which the worker plans to quit before time s are always dominated by other options and thus never used. In particular, if $k < s$, $V_0(t^*) > V_2^k(w,s)$, if $w < R(t^*)$, and $V_1(w) > V_2^k(w,s)$, if $w > R(t^*)$. Such relationships are illustrated in Figure 1.

From the above it follows that the only temporary employment strategy that has a possibility of being chosen by an unemployed worker is that where he or she plans to quit employment after exactly time interval s. Let N(t) be defined by

(9) $V_2^s(w,s) \gtrless V_0(w)$ as $w \gtrless N(t)$

Thus, N(t) is the temporary employment reservation wage at t time in a spell of unemployment. All other temporary employment options will henceforth be ignored. Any wage offer received at time t in a spell of unemployment that is at least as great as N(t), implies the worker prefers the temporary employment option (planning to quit after time interval s) to remaining unemployed. Further, as the slope of $\delta V_1(w)/\delta w > \delta V_2^s(w,s)/\delta w$ for all w, we have R(0) = N(0) and

(10) $\quad R(t) > N(t)$ for all t such that $s > t > 0$.

We are now in a position to specify the expected return to unemployment. Specifically, using standard dynamic programming techniques it can be shown that

(11) $V_0(t) = b/r + (\beta/r)[\text{Emax}\{V_0(t+1), V_1(x), V_2^s(w,s)\} - V_0(t)] + V_0'(t)/r$

It can be shown that $V_0(t)$ strictly declines with t until t* and is then a constant (see, for example, Burdett, Kiefer and Sharma (1985) for a detailed proof). From (8) and the definitions of the two reservation wages in (5) and (9) the following conclusion can be reached:

(a) R(t) declines with t, if $t < t^*$, and $R(t) = R(t^*)$, if $t \geq t^*$, and

(b) N(t) declines with t, if $t < t^*$, and $N(t) = N(t^*)$ if $t \geq t^*$.

Hence, both the permanent and temporary reservation wages decline with the duration of a spell of unemployment if the duration is less than t*.Further, as the slope of $\delta V_1(w)/\delta w > \delta V_2^s(w,s)/\delta w$ for all w and (7) established that R(0) = N(0), we have

(12) $\quad R(t) > N(t)$ for all t such that $s > t > 0$.

The above consequences are illustrated in Figure 2. Consider a worker who has been unemployed exactly time t' in a spell when receiving an offer. From Figure 2 it follows that if the offer is less than R(0) (= N(0)) but greater than N(t'), the worker will prefer the temporary employment strategies to all others.

he above analysis implies the strategy that maximizes an unemployed worker's expected discounted lifetime income can be fully described. Suppose a worker receives offer w after time t since becoming unemployed:

(a) accept and become permanently employed if and only if $w \geq R(0)$;

(b) accept and become temporarily employed if and only if $R(0) > w \geq N(t)$;

c) reject if and only if $w < N(t)$.

How the temporary employment reservation wage changes with the duration of employment can be considered in greater detail. Specifically, from (11), (7) and (5) we have

$$(13) \qquad N(t) = b + (\beta/r)\int_{R(0)}^{\bar{w}} (x-R(t))\, dF(x)$$

$$(\beta/r^2)(1-e^{-rs}) \int_{N(t)}^{R(0)} (x - N(t))\, dF(x) + N'(t)[1-e^{-rs}]$$

where $N'(t) < 0$ if and only if $t < t^*$.

Suppose there is a reduction in s, i.e., a reduction in the time interval in employment required before full UI rights are reinstated. It is straightforward to check that $\partial V_2^s(w,s)/\partial w \partial s < 0$ for all w, and $\partial V_0(t)/\partial t > 0$ for all t. Hence, a reduction in s increases both the permanent employment reservation wage, R(0), and the temporary employment function, N(t) for all t.

The essential element of the above results is that there is a significant difference between the reservation wage used for temporary employment decisions and the reservation

wage used for permanent employment decisions. Given the assumed form of the UI system, this result will hold under most of the standard job search specifications. Assuming workers have only finite lives, the can recall offers previously rejected, or can receive offers when employed will not disturb the basic results.

The results, of course, are sensitive to change in the UI system. In particular suppose the same UI system as before holds with the added restriction that $s = \infty$, i.e., any worker who quits receives UI payment $u(t^*)$ during the next spell of unemployment. In this case, the expected return to any temporary employment option is such that $V_2^k(R(t^*),\infty) = V_1(R(t^*))$. Hence, all temporary employment options will never be used and the permanent reservation wage, $R(t)$, declines with t until t^*. It should be stressed that few, if any, actual UI systems satisfy this restriction. Some UI systems have the following structure. If a worker quits a job he or she is not eligible for UI payments for a given period of time (say two weeks); the worker becomes eligible after this period if still unemployed. It can be shown that such a system does not change the basic conclusions reached above.

In this study we have stressed the role of the UI system in obtaining our results. Nevertheless, even with constant UI payments to unemployed workers, the basic logic behind the results will still hold if, say workers face liquidity constraints. In this case an unemployed worker may accept a job temporarily to build up his or her liquid assets.

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FIGURE 1

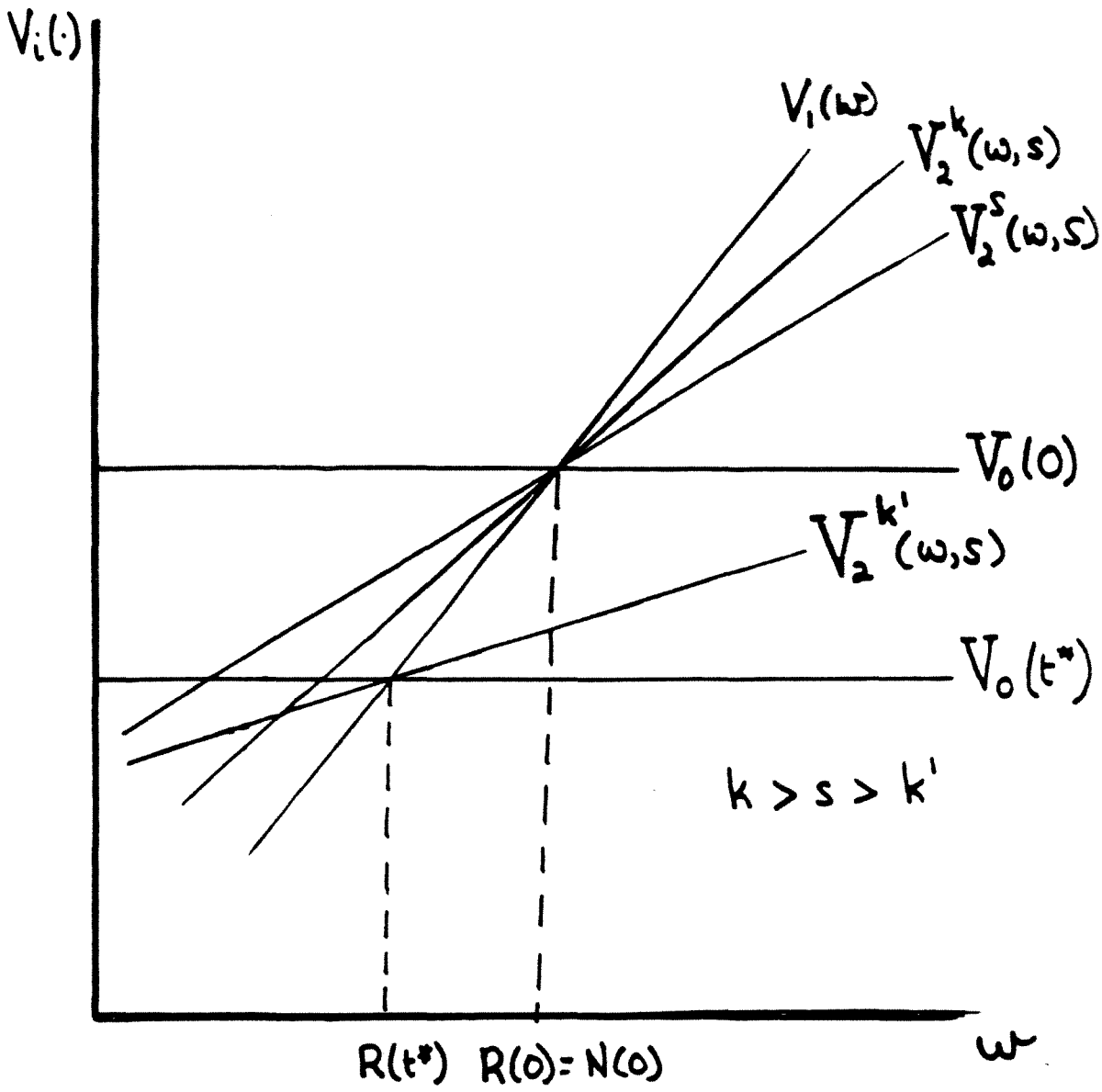
$V_i(\cdot)$
$V_1(\omega)$
$V_2^k(\omega,s)$
$V_2^s(\omega,s)$
$V_0(0)$
$V_2^{k'}(\omega,s)$
$V_0(t^*)$
$k > s > k'$
$R(t^*)$
$R(0) = N(0)$
ω

FIGURE 2