Economics Letters 25 (1987) 91–94
North-Holland

THE NATURE OF UNEMPLOYMENT IN SEGMENTED LABOR MARKETS

Dimitrios G. DEMEKAS *

Columbia University, New York, NY 10027, USA

Received 20 April 1987

In a segmented labor market, if the total supply of labor is variable, some of the resulting equilibrium unemployment is involuntary, in the sense that it consists of workers with reservation wages below the lowest offered wage.

1. Introduction

A segmented labor market is characterized by a dichotomy. In one part of the market, usually referred to as the protected sector, jobs are rationed. In the other, the free sector, tâtonnement guarantees market clearing. Almost all the literature in the area [Todaro (1969), Mincer (1976), Calvo (1978), and McDonald and Solow (1985)] is based on a simple model with a fixed total number of risk-neutral workers with identical utility functions defined over income only. If the protected sector jobs open regularly and on-the-job-search is impossible, then some workers will queue for these jobs. At equilibrium, which obtains when the free wage equals the expected wage from queing, unemployment will be positive.

A different approach is taken in Harberger (1974) and Edwards (1984, 1986), who focus on differences in the reservation wages among the workers. This means that there are some workers who decide to queue for jobs in the protected sector but do not accept jobs in the free sector. Those of them who do not find jobs remain unemployed. Intuition suggests that this is because they have supply prices 'between' the two wages offered in the market – hence the characterization of the unlucky among them (those who did not win protected jobs in the lottery) as 'voluntarily unemployed' [Harberger (1974, p. 168)].

In this note I develop a model of a segmented market with workers with different tastes for labor and leisure and show that the previous intuition is misleading: some of the workers with supply prices below the free sector wage (who would otherwise work at that wage) now would rather queue for protected sector jobs. Part of the resulting unemployment, in other words, is involuntary.

2. The model

Consider a population $\psi = 1, 2, 3, \ldots, i, \ldots$ of workers with individual utility functions $U^i(Y, L)$ defined over income $Y = wl$, and leisure $L = 1 - l$. The i worker's supply price or reservation wage v^i

* I have benefited from conversations with Assar Lindbek, Ruth Klinov and Eric Bartelsman. Financial support by the Onassis Foundation is gratefully acknowledged.

0165-1765/87/$3.50 © 1987, Elsevier Science Publishers B.V. (North-Holland)

is the wage which, if actually offered, would leave the i worker indifferent between working and not working. In other words,

$$U^i(V^i l, 1-l) = U^i(0, 1). \tag{1}$$

It is assumed for simplicity that workers are risk neutral; their indifference curves between income and leisure are linear and, therefore, only corner solutions exist to the maximizing problem; and different workers have different reservation wages.

The total supply of labor in this population is the cumulative distribution $S(v^i)$, defined as

$$S(\bar{v}^i): \quad \text{All } s \quad \text{with} \quad v^i \leqslant \bar{v}^i. \tag{2}$$

I assume for simplicity that it is a one-to-one function and normalize so that $S(0) = 0$.

In the experiments that follow, different jobs open randomly at different wages. I assume that all of these jobs are identical, open simultaneously, information about them is instantaneous for all the workers, and hiring is based on a lottery among those who decide to get (costless) tickets. Holding tickets for more than one lottery is not allowed. All those who get tickets are, therefore, participants in the labor force, whether they win and work or lose and stay at home. It is also assumed initially that jobs in all sectors are rationed; in other words, there is no free sector, in the sense of market clearing. This assumption will be relaxed later.

Proposition 1. Let L number of jobs open randomly at a wage w. All workers with reservation wages $v^i \leqslant w$ participate in the labor force.

Proof. For all i for which $v^i \leqslant w$, it is true that $U^i(wl, 0) \geqslant U^i(0, 1)$. Then $pU^i(wl, 0) + (1-p)U^i(0, 1) \geqslant U^i(0, 1)$, for any $p \in (0, 1]$.

If p is defined as the objective probability of winning one of the L jobs, which is $L/S(w)$, Proposition 1 shows that everybody with a supply price less than or equal to w will buy a ticket, no matter what the odds are (because of risk neutrality). If L is less than $S(w)$, unemployment will result. This unemployment would be called 'involuntary' in traditional terms, because the workers are willing to work at the going wage but there are not enough jobs.

Proposition 2. Let L_k jobs open randomly at a wage w_k and L_m jobs open randomly at a wage w_m. Assume that $w_k \geqslant w_m$. Then all workers i with reservation wage $v^i \leqslant w_k$ participate in the labor force.

Proof. It follows directly from Proposition 1. For some i not to participate it must be that

$$pU^i(w_k l, 0) + (1-p)U^i(0, 1) \leqslant U^i(0, 1).$$

This, however, is not possible if $v^i \leqslant w_k$.

This simply says that, no matter what the odds for the different lotteries are, everybody with a supply price less than or equal to the highest offered wage will join the labor force. If the total number of jobs is less than $S(w_k)$, unemployment will result again. Now, of course, the unemployed will be distributed among the two job queues, depending on the odds in each of them. Workers with high reservation wages will participate in the high wage lottery, whereas workers with low reservation wages will not jeopardize their probabilities of success by joining the queues for the high-wage jobs, but will choose the lower payoff lottery.

Proposition 3. *Let* L_m, w_m and L_k, w_k *be the two lotteries from the previous exercise and let* p_m, p_k *be the corresponding probabilities of finding a job. At equilibrium there will be some workers* i *with reservation wages* $v^i < w_m$, *who will be getting tickets for the k-lottery.*

Proof. Consider the worker(s) j for whom $v^j = w_m$. Then

$$p_m U^j(w_m l, 0) + (1 - p_m) U^j(0, 1) = U^j(0,1),$$

and

$$p_k U^j(w_k l, 0) + (1 - p_k) U^j(0, 1) > U^j(0, 1),$$

as follows from the definition of the reservation wage. It is obvious that the k-lottery makes the j worker(s) better off. For a worker to be indifferent between the two lotteries, the expected utilities must be equalized, namely

$$p_m U^i(w_m l, 0) + (1 - p_m) U^i(0, 1) = p_k U^i(w_k l, 0) + (1 - p_k) U^i(0, 1).$$

Rearranging and using the properties of the utility functions and (1), one can write

$$p_m w_m - p_k w_k = (p_m - p_k) v^i. \tag{3}$$

Proposition 3 shows that worker i, who, if the k-lottery did not exist, would participate in the m-lottery, now is better off buying tickets for a higher-wage job. This result means that the workers who queue for high-wage jobs are not only those whose supply price is between the two wages, but also some whose supply price is equal and, maybe, less than the low wage. Unemployed are now not only those who sneer at the low-wage jobs – and one has a harder time trying to justify the label 'voluntary'.

3. Equilibrium with a free sector

Assume now that the low-wage sector clears freely. Total supply depends again on the high wage, but eq. (3) is not enough to determine the cutoff point between the two groups of workers because w_m is now endogenous. Since excess supply in the free sector must be zero, p_m is one and (3) can be rewritten, after standard manipulations, as

$$w_m = p_k w_k + (1 - p_k) v^i. \tag{4}$$

Eq. (4) gives a one-to-one relationship between w_m and v^i, given w_k and p_k, that has to be satisfied at equilibrium. Using the definition of the probability p_k,

$$p_k = [L_k(w_k)/S(w_k) - L_m(w_m)]. \tag{5}$$

(4) can be solved for v^i:

$$v_i = \frac{w_m(S_k - L_m(w_m)) - w_k L_k}{S_k - L_m(w_m) - L_k}, \tag{6}$$

where $S_k = S(w_k)$. Given that the free sector supply consists of all the workers with reservation wages less than or equal to the one of the marginal worker, described by (6), the market clearing condition for the free sector is

$$L_m(w_m) = S(v^i). \tag{7}$$

Eqs. (6) and (7) describe fully the market equilibrium and determine simultaneously the free wage and the reservation wage of the marginal worker, below whom everybody works in the free sector and above whom everybody queues for protected sector jobs.

After the lottery, those among the unemployed with reservation wages below w_m can be characterized, as shown in Proposition 3, as involuntarily unemployed. They can be measured by $(1-p_k)[S(w_m) - L(w_m)]$. The term 'involuntary', however, should be used with care. These workers are unemployed as a result of maximizing their ex ante (before the lottery) utilities and deciding to participate in the lottery instead of accepting free sector employment.

When the protected sector wage changes, the impact on the equilibrium free wage is ambiguous. When w_k increases, total supply of labor increases, since more workers with high reservation wages find it profitable to buy lottery tickets. What low reservation wage workers do, however, is not clear. They may move from the free to the protected sector, if the possibilities of employment there improve, or vice versa. This is precisely the point which Mincer (1976) stressed about the effects of minimum wages when coverage is partial. The outcome of this determines, in turn, whether the new equilibrium free wage is higher or lower than before.

References

Calvo, G.A., 1978, Urban unemployment and wage determination in LDC's: Trade unions in the Harris–Todaro model, International Economic Review 19, no. 1, 65–81.

Edwards, A.C., 1984, Three essays on labor markets in developing countries, Unpublished Ph.D. dissertation (University of Chicago, Chicago, IL).

Edwards, A.C., 1986, The Chilean labor market 1970–1983: An overview, Discussion paper no. 152 (World Bank, Washington, DC).

Harberger, A.C., 1974, On measuring the social opportunity cost of labor, in: A.C. Harberger, ed., Project evaluation: Collected papers (Markham, Chicago, IL).

McDonald, I.M. and R. Solow, 1985, Wages and employment in a segmented labor market, Quarterly Journal of Economics C, no. 4, 1115–1142.

Mincer, J., 1976, Unemployment effects of minimum wages, Journal of Political Economy 84, no. 2, S87–S104.

Todaro, M.P., 1969, A model of labor migration and urban unemployment in less developed countries, American Economic Review 59, 138–148.