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Wage-Rate Subsidies for Dislocated Workers

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Wage-Rate Subsidies for Dislocated Workers

Abstract

An array of innovative policies has been suggested to address more effectively the needs of dislocated workers. In this paper, we model and simulate the impacts of a wage-rate subsidy (or salary supplement) program in which a dislocated worker who becomes reemployed would receive a payment equal to one-half the difference between the wage previously earned and the wage currently earned. The simulations are based on a search model that is institutionally rich and that provides estimates of the impacts of a wage subsidy by incorporating empirical results from the reemployment bonus experiments that were conducted in the mid- to late-1980s. The model includes several groups of workers other than dislocated workers and therefore provides estimates of the degree to which these other workers might be crowded out of jobs by the wage subsidy program.

The results suggest that a wage-rate subsidy paid for two years after reemployment would shorten the unemployment spells of dislocated workers by nearly 2 weeks, and would increase employment of dislocated workers by about 900 to 1000 per 100,000 in the labor force. But the simulations also raise the possibility that the gains for dislocated workers could come at the expense of other groups of workers; that is, other groups of workers could experience small increases in unemployment duration, and decreases in employment levels that almost fully offset the gains for dislocated workers. Three factors may mitigate these crowding-out results -- crowding out is widely dispersed over various groups of non-dislocated workers, the structural changes that result in dislocation of some workers (and drive the need for a policy like a wage subsidy) benefit non-dislocated workers, and the crowding-out results are quite sensitive to one of our assumptions. We also compare the wage-rate subsidy program with a reemployment bonus, and show that the two can be structured so as to give identical results.

Wage-Rate Subsidies for Dislocated Workers

I. Introduction

Since the recession of the mid-1970s, there has been growing concern about dislocated workers and interest in policies that might assist them. Dislocated workers are workers who have lost a job as a result of a plant closing or mass layoff that resulted in turn from some form of economic restructuring, such as technological change, changes in product demand, or changing patterns of international trade. Such workers usually earned high wages and had considerable seniority in their former job. Most had accumulated much firm- and occupation-specific human capital. After dislocation, they face bleak prospects--low-wage jobs, long spells of unemployment, and difficulty gaining reemployment. As a result of dislocation, they suffer large loses of human capital and lifetime income.[1]

The magnitude of the losses suffered by dislocated workers has been clarified recently by Jacobson, LaLonde, and Sullivan (1993a,b,c), who assembled a very large data base of dislocated workers from administrative wage records. Their findings suggest that the average dislocated worker suffers lifetime earnings losses totalling $80,000. Moreover, they find that nearly three-quarters of the losses occur because earnings after reemployment are permanently lower for these workers.

The losses suffered by dislocated workers pose a major challenge for public policy. Existing policies to assist dislocated workers form a patchwork that does not come close to compensating dislocated workers for their losses (Jacobson, LaLonde, and Sullivan 1993a, chapter 7).[2] Unemployment Insurance (UI) -- the largest and most important program providing assistance to dislocated workers -- has served as an effective "first line of defense" against the hardship suffered by workers experiencing short spells of unemployment or temporary layoff. But UI has been criticized by some for providing benefits that are too stingy to compensate dislocated workers for their losses and too brief to provide dislocated workers the opportunity to complete education and training programs that would prepare them for good jobs (U.S. Department of Labor 1993; Advisory Council on Unemployment Compensation 1994, chapters 1 and 2). Others have noted that UI creates especially strong disincentives for dislocated workers to find reemployment, since they face low-wage jobs but usually receive the maximum UI benefit amount (Jacobson, LaLonde, and Sullivan 1993a, pp. 150-152).

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[1]The literature on dislocated workers has grown dramatically in the past decade. Hamermesh (1989) and Seitchik (1991) discuss the difficulties in defining dislocated workers. Hamermesh (1989) and Jacobson, LaLonde, and Sullivan (1993a, chapter 2) review past evidence on the costs of worker dislocation.

2These policies include income replacement from Unemployment Insurance (UI) and (for some) Trade Adjustment Assistance (TAA), job search assistance from the Employment Service, and subsidized training programs (for example, Economic Dislocation and Worker Adjustment Assistance, or EDWAA).

An array of innovative policies has been suggested to address more effectively the needs of dislocated workers. Some have been or are in the process of being implemented -- extended UI benefits are provided to certain workers enrolled in approved training under the Trade Adjustment Assistance program, and intensive job search assistance is being implemented through the UI system in the form of worker profiling. Others are under serious consideration -- self-employment incentives and the reemployment bonus are included in the Clinton Administration's Reemployment Act.

The wage-rate subsidy--or salary supplement--for dislocated workers is a promising possibility that has received relatively little attention.[3] In this paper, we model a wage subsidy program in which a dislocated worker who becomes reemployed would receive a payment equal to one-half the difference between the wage previously earned and the wage currently earned.[4] We model both a wage subsidy that is paid in perpetuity, and one that is limited to the 2 years following reemployment. This policy, which could also be thought of as a salary supplement or earnings insurance, has been suggested and discussed recently by several researchers, including Jacobson, LaLonde, and Sullivan, 1993a, pp. 160-169), Baily, Burtless, and Litan (1993, pp. 194-197), and Parsons (1994).

The wage-rate subsidy we consider has much to commend it. It would induce dislocated workers to search harder for jobs and accept employment that they might otherwise refuse; hence, it would shorten their duration of unemployment and increase their employment. It would redistribute income toward dislocated workers, who have suffered losses through no fault of their own (and possibly through government action such as trade liberalization). Private and social benefits would derive from the policy because output would increase, workers' general skills would be maintained, and new skills would be acquired on-the-job. The costs of a wage subsidy would be (at least partially) offset by reduced spending on public income support and training programs, which would otherwise provide income and services to the subsidized workers. Jacobson, LaLonde, and Sullivan point out that the wage subsidy, by supplementing earnings after reemployment, attacks the source of nearly three-quarters of the wage losses suffered by dislocated workers. They, and Baily, Burtless and Litan, stress the reemployment incentive effects of the wage subsidy and its potential to reduce resistance to structural change, such as trade liberalization.[5]

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[3]Greenwood (1994) reports on the design of a wage-rate subsidy experiment that is underway in Canada. Jacobson (1994) examines the impact of the wage-rate subsidy that is part of the Trade Adjustment Assistance program and finds that TAA's wage-rate subsidy was very lightly used.

[4]Jacobson, LaLonde, and Sullivan (1993) specify a somewhat more complicated subsidy formula. Baily, Burtless, and Litan (1993) would limit the subsidy payments to the two years following dislocation, and would link the size of the subsidy to a worker's age and previous job tenure.

[5]An alternative to the wage-rate subsidy is the wage-bill subsidy, which would pay a subsidy to an employer who hires a dislocated worker. Existing evidence on wage-bill subsidies suggests that they suffer from very low participation rates (see, for example, the evidence on the Employer Bonus in Woodbury and Spiegelman 1987).

But the benefits of a wage subsidy would not come without a potential cost. The direct effect of the wage subsidy is to increase the search intensity of dislocated workers and thereby increase their employment. But the increased search intensity of dislocated workers also has an indirect crowding-out effect--if dislocated workers search harder for jobs, then dislocated workers may beat other (non-dislocated) workers to job vacancies. As a result, job vacancies that would normally be available to other workers are filled by dislocated workers, and the other workers don't get jobs that they would otherwise obtain. This crowding-out effect of a wage subsidy to dislocated workers, if large, could be an important drawback of the policy.[6]

Little is known about the potential effectiveness of a wage subsidy that is offered to dislocated workers.[7] In this paper, we model and simulate both the direct and indirect impacts of such a program. In the next section, we develop a search model that is institutionally rich and that provides estimates of the impacts of a wage subsidy by incorporating empirical results from the reemployment bonus experiments that were conducted in the mid- to late-1980s. The model includes several groups of workers other than dislocated workers and therefore provides estimates of the degree to which these other workers might be crowded out by the wage subsidy program. The results, which are presented in section III, suggest that the wage subsidy program would indeed provide gains to dislocated workers, but also raise the possibility that these gains would come at the expense of other groups of workers. Section III also compares the wage subsidy program with a reemployment bonus, and shows that the two can be structured so as to give identical results. Although a reemployment bonus would yield a given impact at lower cost than a wage subsidy, bonuses have the disadvantage that worker must act within 6 to 12 weeks of claiming UI benefits.

II. The Model

To investigate the impact of wage-rate subsidies on the reemployment of dislocated workers, we use a partial equilibrium search model in the spirit of work by Diamond (1982), Mortensen (1982) and Pissarides (1990). The model can be thought of as one in which workers flow through various labor market states, with rates of transition between states depending in part on the search behavior of workers. We assume that unemployed workers search randomly across firms for a job vacancy, and that firms with vacancies randomly select workers from the pool of applications they receive. Each unemployed worker chooses search intensity--the number of firms contacted--in an effort to maximize expected lifetime utility. Increasing search intensity raises the probability of reemployment but is also costly. A steady-state equilibrium is generated in such a model by equating the flows into and out of each labor market state.

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[6]Effects of a similar nature have been considered by Levine (1993), who examined the spill-over of UI on UI-ineligibles. Our earlier work considered the crowding-out effects of a reemployment bonus on workers not offered a bonus (Davidson and Woodbury 1993).

[7]Jacobson (1994) appears to be the sole exception. In contrast, there is much evidence on the effectiveness of the wage subsidy as an anti-poverty program targeted on disadvantaged workers. See, among others, Bishop (1977), Hurd and Pencavel (1981), Betson and Bishop (1982), Lerman (1982), and Haveman (1988, pp. pp. 165-168).

Worker dislocation is considered in the model by assuming that there are two employment sectors--high-wage and low-wage--and that the economy experiences a one-time shock that causes part of the high-wage sector to shut down. Dislocated workers in our model are former employees of the high-wage sector who must now search for a low-wage job. In contrast, high-wage workers who experience a regular layoff search for (and eventually find) a high-wage job.

A. The Unemployed

Since we are interested in the crowding-out effects of the wage subsidy program, it is necessary to model the behavior of all unemployed workers, not just the dislocated workers directly affected by the program. Figure 1 summarizes the categories of unemployed workers we examine in the model. We begin by dividing the unemployed into two classes--unemployed workers who are eligible for UI benefits and those who are not. We refer to workers in the latter class as "UI-ineligibles" and use U_i to denote the total number of such workers in steady-state equilibrium. This class consists mainly of new entrants and reentrants into the labor force, as well as workers with a weak attachment to the labor force, and typically accounts for approximately 60% of unemployed workers (Blank and Card 1991, table 1). We denote by q the fraction of unemployed workers who are UI-ineligibles.

Next, we divide the class of UI-eligible workers into two sub-classes -- those who claim UI and those who do not. We refer to workers in the latter subclass as "UI-eligible non-claimants" and use U_k to denote the total number of such workers in the steady-state equilibrium. Why these workers fail to claim benefits has concerned policy-makers and puzzled researchers (Burtless and Saks 1984, Corson and Nicholson 1988, Vroman 1991, Blank and Card 1991, Anderson and Meyer 1993). Among the various explanations for the failure of these workers to collect benefits for which they are eligible, the most likely is that they expect to find reemployment fairly rapidly. Hence, the costs of filing for and obtaining UI exceed the expected benefits. We use k to denote the UI take-up rate--that is, the fraction of unemployed UI-eligible workers who choose to claim their benefits. Based on the work of Blank and Card (1991), we set $k = .75$.[8]

Finally, we divide the sub-class of UI-eligible claimants into three categories--high-wage, low-wage, and dislocated workers. The total number of high-wage UI-eligible claimants in the t^{th} period of search is represented by $U_{h,t}$ while $U_{\ell,t}$ and $U_{d,t}$ play the same roles for low-wage and dislocated workers, respectively. In line with the discussion of dislocated workers in the introduction, we define dislocated workers as workers who earned a wage premium in their former job, but who can gain reemployment only in a low-wage job.[9] The wage premiums earned

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[8]Blank and Card report a range of roughly .65 to .75 for the UI take-up rate. The results reported below are essentially invariant to changes in k in the range of .65 to .75.

[9]In the model (as in fact), only a fraction of high-wage workers who become unemployed are dislocated -- namely, those whose unemployment stems from a plant closing or similar restructuring. Most high-wage workers experience short spells of unemployment and are recalled or find reemployment at a high wage.

before dislocation could result from collective bargaining agreements, firm-specific human capital, a good job match, and/or efficiency wage considerations. We do not model the source of the premium, but rather take it as given.

For our purposes, then, a dislocated worker is a victim of a shrinking high-wage sector--that is, a worker who earned a high wage in his previous job and, after separation, has no alternative but (eventually) to accept a low-wage job.[10] In our model, the only difference between low-wage and dislocated workers (once they are unemployed) is that the dislocated workers receive wage subsidies from the government after they are reemployed, while low-wage workers do not. We use h to denote the fraction of UI-eligible claimants who earn high wages, and d denotes the fraction of low wage workers who have been dislocated from the high-wage sector.

B. The Equations

Figure 2 depicts the model we use, which is based on a model we developed in earlier work (Davidson and Woodbury 1993). The model characterizes flows through the labor market by specifying stocks of workers in various states of employment and unemployment, and then quantifying the transition rates between those states. We measure time in two-week intervals (since UI claimants are typically certified for 2 weeks of benefits at a time) and assume that all UI-eligible claimants exhaust their benefits after 27 weeks (i.e., 14 periods) of insured unemployment.[11] Essentially, the model follows workers as they flow through the possible states of employment and unemployment, and uses steady-state conditions to characterize an equilibrium.

There are two differences between the model used in our earlier work and the one used here. First, in the earlier model, the UI take-up rate was assumed to equal 100%. In this model, we relax that assumption and allow the UI take-up rate to be less than 100% (i.e., $k < 1$). Second, in the earlier model, workers and jobs were homogeneous. In this, model, we allow for heterogeneity of jobs and workers by dividing UI-eligible claimants into high-wage, low-wage, and dislocated workers.

The model consists of five sets of equations. The first set consists of three accounting identities. We let T denote the total number of jobs available, use J to represent the total number of jobs that are filled, and use V to represent the number of job vacancies in the steady-state equilibrium. Since all jobs are either filled or vacant, the first identity is $T = V + J$. The second

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[10]In fact, dropping out of the labor force is another option for dislocated workers. However, the model does not explicitly treat flows into and out of the labor force, which implies an assumption that those flows are constant and that the stock of individuals not in the labor force is in steady state.

[11]That is, we assume that UI-eligible claimants can receive 26 weeks of benefits after a waiting week. We also assume that all UI recipients experience a single spell of unemployment during their benefit year, and that they do not accept part-time employment that would result in partial benefit payments. These assumptions fit the majority of UI recipients.

identity states that all workers must be either employed or unemployed. If we let L denote the total number of workers in the labor force and use U to represent total unemployment, then our second identity is $L = J + U$.

The third identity sums unemployed workers over the five categories shown in Figure 1 and over the time periods in which they are unemployed. If we use $U_{h,e}$ to denote the number of high-wage UI-eligible claimants who have exhausted their UI benefits (that is, have been unemployed for more than 14 periods) and define $U_{\ell,e}$ and $U_{d,e}$ analogously for low-wage and dislocated workers, then this identity can be written as $U = U_i + U_k + \sum_{t=1,14} (U_{h,t} + U_{\ell,t} + U_{d,t}) + U_{h,e} + U_{\ell,e} + U_{d,e}$.

The second set of equations, the steady-state conditions, equate the flows into and out of each state of employment or unemployment. If these equations are satisfied, then total unemployment and its composition remain constant over time. Consider, for example, the flow of workers out of employment and into UI-ineligible unemployment. We use s to denote the separation rate, or fraction of jobs that turn-over in each period. Thus, sJ workers lose their job in a given period. If we let q denote the fraction of unemployed workers who are UI-ineligible (as noted above, we set $q = .6$), then qsJ UI-ineligible workers lose their jobs.[12] It follows that the flow into state U_i is qsJ. To calculate the flow out of this state, let m_i denote the reemployment probability (or job match probability) for any UI-ineligible worker. Then $m_i U_i$ unemployed UI-ineligible workers find jobs in any given period, and this represents the flow out of state U_i. These flows are shown in the northwest quadrant of Figure 2. In a steady-state equilibrium, U_i must remain constant over time. Therefore, we must have $qsJ = m_i U_i$. There is an analogous steady-state equation for each possible state of unemployment. Figure 2 shows the flows into and out of each state and, for completeness, all of the steady-state conditions are written out in the Appendix.

We refer to the third set of equations as the reemployment probability equations. They define the probability of reemployment for any given unemployed worker as a function of the search effort of all workers and the number of vacancies.[13] Let $p_{j,t}$ denote the search effort of an unemployed type j UI-eligible claimant in the t^{th} period of search, where the subscript j can take one of three values--h for high-wage workers, ℓ for low-wage workers, or d for dislocated workers. The terms p_i and p_k refer to the search effort of unemployed UI-ineligible and UI-eligible non-claimants, respectively. Search effort corresponds to the probability of contacting a firm (alternatively, the number of firms contacted) in any given period by the worker seeking employment. Assuming that workers apply to firms at random, the probability that any given firm has a vacancy is V/T. If we let λ denote the average number of job applications received by each firm, then the probability that a worker gets a job conditional on applying at a firm with

[12]The remaining (1-q)sJ newly unemployed workers are UI-eligible.

[13]Note that in the reemployment probability equations in the Appendix [(11)-(14)], eachgroup's own search intensity (p_j) enters directly, and the search effort of all other groups of workers enters indirectly throughλ.

a vacancy is $(1-e^{-\lambda})/\lambda$ (see Davidson and Woodbury 1993). Thus, the probability that an unemployed type j UI-eligible claimant in the t^{th} period of search finds a job is given by $m_{j,t} = p_{j,t}(V/T)[(1-e^{-\lambda})/\lambda]$. As shown in equations (11)-(14) in the Appendix, there is a reemployment probability equation for each state of unemployment (see also Figure 2).

As noted above, the probability of reemployment increases with search effort. But increasing search effort is costly. We assume that the cost of search effort is given by cp^z, with $z > 1$ denoting the elasticity of search costs with respect to search effort. We assume that c differs between UI-eligible and UI-ineligible workers, but that z is the same for all workers.

Our fourth and fifth sets of equations are used to calculate the optimal search effort of unemployed workers. In the fourth set, we calculate the expected lifetime income of workers in each possible state of unemployment and employment. Then, in the fifth set, we calculate the level of search effort that maximizes these expected lifetime incomes.

Expected lifetime income is calculated by considering both the current and future prospects faced by the worker. For example, let $V_{j,t}$ denote the expected lifetime income of an unemployed type j UI-eligible worker in the t^{th} period of search, $V_{j,w}$ the expected lifetime income for an employed type j UI-eligible worker, w_j the type j wage, and x biweekly UI benefits. (As above, the subscript j can take on one of three values -- h for high-wage workers, ℓ for low wage workers, or d for dislocated workers). Then, an unemployed type j UI-eligible claimant in the t^{th} period of search receives current net income equal to UI benefits less the cost of search, or $x-c(p_{j,t})^z$. With probability $m_{j,t}$ this worker finds a job yielding net future income of $V_{j,w}$. With the remaining probability, $1-m_{j,t}$, the worker remains unemployed and can expect net future income of $V_{j,t+1}$. Therefore,

$$V_{j,t} = x - c(p_{j,t})^z + [m_{j,t}V_{j,w} + (1 - m_{j,t})V_{j,t+1}]/(1 + r).$$

Note that future income is discounted, with r denoting the interest rate. In the Appendix, equations (16)-(19) state the conditions describing the expected lifetime income for workers in each state of unemployment.

To calculate $V_{j,w}$, the expected lifetime income for an employed type j UI-eligible claimant, we follow the same procedure. Current income is equal to the worker's wage, w_j. In addition, with probability (1-s) this worker keeps his job for another period and continues to earn $V_{j,w}$. With probability s the worker loses his job and has to search for new employment, resulting in a future income of $V_{j,1}$. Therefore,

$$V_{j,w} = w_j + [sV_{j,1} + (1-s)V_{j,w}]/(1 + r).$$

Again, the Appendix shows the conditions describing expected lifetime income for workers in each state of employment--see equations (20)-(21).

Finally, for each unemployed worker, search effort is chosen to maximize expected lifetime income. Therefore, there is an equation defining optimal search effort for each possible state of unemployment--see equations (22)-(24) in the Appendix--with one exception. The exception is made for UI-eligible non-claimants. Presumably, these workers do not claim UI benefits because they do not expect to be unemployed for a significant length of time--that is, they expect to be able to find jobs with relatively little effort. Therefore, we treat these workers differently by assigning them a high reemployment probability and ignoring their search decision. Provided that their reemployment probability is set high enough (so that their expected duration of unemployment is roughly half the expected duration of high-wage UI-eligible claimants), our results are not sensitive to this treatment.

To investigate the impact of wage subsidies paid to dislocated workers, we solve the model first assuming that there are no wage subsidies. In the absence of wage subsidies, low-wage workers and dislocated workers face the same wage: that is, $w_\ell = w_d$. We then introduce a wage subsidy paid to dislocated workers that equals half the difference between the wage earned before dislocation (w_h) and the market opportunity wage now facing the worker (w_ℓ). This implies a subsidy paid to dislocated worker of $(w_h - w_\ell)/2$, so that, w_d increases to $(w_h + w_\ell)/2$. With this change, we resolve the model, and compare the results.

Intuitively, the wage subsidy increases the opportunity cost of unemployment for dislocated workers, resulting in an increase in search effort by these workers. The increased search effort lowers their duration of unemployment, increases their steady-state employment level, and may decrease the employment of other workers. By solving the model for different wage subsidy programs, we can gauge the magnitude of these different impacts. However, to do so, we must first set the values of the parameters of the model.

C. The Parameters

The key endogenous variables in the model are employment (J), the number of unemployed workers in the different states of unemployment (the U measures), the reemployment (or job match) probabilities for unemployed workers in different states of unemployment (the m terms), and search effort (or employer contact probability) for unemployed workers in different states of unemployment (the p terms). The key parameters are the fraction of unemployed workers who are ineligible for UI benefits (q), the UI take-up rate (k), the job separation or turnover rate (s), the interest rate (r), total available jobs (T), the size of the labor force (or the total number of workers, L), biweekly UI benefits (x), the biweekly wages (w_h, w_ℓ, w_d and w_i), the search-cost parameters (c, c_i, and z), the fraction of UI-eligible claimants who earn high wages (h), and the fraction of low-wage UI-eligible claimants who are dislocated workers (d).

In specifying the parameters, we follow the approach adopted in our earlier work (Davidson and Woodbury 1993). It is useful to specify a set of parameters that can be taken as a reference case, although it is important to test the sensitivity of our results to variation in the parameters, since the existing research suggests a range of values for each of the parameters. We begin by obtaining values of parameters that are available in existing research. For example, as noted above, we set q, the proportion of the unemployed who are UI-ineligible, equal to .6, and k, the proportion of UI-eligibles who claim their benefits, equal to .75.

For s, the separation rate, we turn to research by Ehrenberg (1980), Clark and Summers (1982), and Murphy and Topel (1987). Their results suggest a biweekly value for s that falls somewhere in the range of .006-.014 (the mean appears to be .01 with a standard error of about .004). For r, the interest rate, we consider biweekly values in the range .002-.02, which translates into annual discount rates that range in value from 5% to 67%.

Consider next T and L. We first note that the model is homogeneous of degree zero in T and L so that we may set $L = 100$ without loss of generality. We then note that as T varies with L held fixed, the model generates different values for U and V. Research by Abraham (1983) suggests that U tends to be close to 2V, although it varies over the business cycle. Although the actual value depends on the other parameters, our model predicts that $U = 2V$ when T is approximately 96.25 and that for values of T ranging from 95 to 97.5, U ranges from 1.5V to 3V.

The considerations to this point suggest specifying a reference case in which $s = .01$, $r = .008$, and $T = 96.25$. As we show below, the results are remarkably insensitive to variation in s, r, and T within the ranges described above.

For the remainder of the observable parameters, we turn to data collected to analyze the Illinois Reemployment Bonus Experiment.[14] In the Illinois experiment, the average biweekly UI-benefit was $245. We set the biweekly wage earned by "high-wage" workers equal to $846, and the biweekly wage earned by "low-wage" workers equal to $538. Therefore, $x = \$245$, $w_h = \$846$, and $w_\ell = \$538$.[15]

This leaves the unobservable parameters associated with the cost function (c, c_i, and z), h, and d. For c, c_i, and z we use the approach taken in our earlier work (Davidson and Woodbury 1993), with some modifications. In the earlier work, we found values of c and z that made the model's predictions match the results observed in the Illinois experiment.[16]

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[14]In the Illinois experiment, a randomly assigned group of new UI claimants were offered a $500 cash bonus if they found a new job within 11 weeks and held the job for 4 months. Their behavior was compared with that of a randomly assigned control group. The design and results of the experiment are described in Woodbury and Spiegelman (1987).

[15]It is impossible to distinguish dislocated workers from other workers in the Illinois experimental data, so we turn to the Washington Reemployment Bonus experiment (Spiegelman, O'Leary, and Kline 1992), in which data on worker dislocation were gathered. In the Washington experiment, 15% of enrollees were dislocated by the standard BLS criteria (that is, employed by the same employer for at least 3 years prior to job loss), and the base period earnings of these dislocated workers were 57% higher than the base period earnings of other workers. Hence, $w_h = 1.57w_\ell$. In the Illinois experiment, the average base period earnings of all workers in the control group was $584. This allows us to write $\$584 = .15(1.57w_\ell) + .85(w_\ell)$. Solving yields $w_\ell = \$538$ and $w_h = \$846$.

Specifically, we found values of the search cost parameters such that (a) the duration of unemployment predicted by the model in the absence of a reemployment bonus matched the observed duration of unemployment in the Illinois control group, and (b) the change in unemployment duration due to the bonus predicted by the model matched the actual change observed in the Illinois experiment. To find c_i, we used estimates by Katz and Meyer (1990) and Woodbury (1991) of the increase in the expected duration of unemployment brought about by a 1-week extension of UI benefits.[17] Using these estimates and the expected duration of unemployment for the control group in Illinois, we could infer the expected duration of unemployment for UI-ineligibles and then choose c_i such that the model's prediction matched that inferred value.

As noted above, the model used here differs from the model in our earlier work in two respects--here we assume that the UI-take up rate is less than 100% and that there are high- and low-wage workers. We therefore extended the previous model and followed the same approach to obtain estimates of the search cost parameters. For the reference case, we find that $z = 1.381$, $c = 157.8$, and $c_i = 102.8$.

The last two parameters are h, the proportion of UI-eligible claimants who are high-wage workers, and d, the proportion of low-wage UI-eligible claimants who are dislocated workers. In treating these parameters, we follow two approaches, each reflecting an extreme assumption. At one extreme, we assume that all unemployed workers (both high- and low-wage) compete for the same jobs so that, effectively, there is a single labor market. In other words, workers are heterogeneous but jobs are homogeneous.[18]

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[16]The $500 Illinois bonus reduced the duration of insured unemployment by .714 week in the case of workers who were eligible for 26 weeks of state regular benefits. The bonus impact in the case of workers eligible for an additional 12 weeks of Federal Supplemental Compensation (FSC) appears to have been much greater. The impact of .714 week is smaller than that reported by Woodbury and Spiegelman (1987), which is 1.13 weeks for state-regular eligibles and FSC-eligibles combined. The .714-week estimate, however, is appropriate to our model (which allows for 26 weeks of UI benefits), and is similar to estimates of bonus impacts obtained in similar trials in Pennsylvania and Washington State (Decker and O'Leary 1992). Evidence on impacts of the Illinois bonus under different potential benefit durations is developed elsewhere (Davidson and Woodbury 1991).

Note that we assume the impact of a bonus on dislocated workers is the same as on workers generally. This accords with the evidence obtained in the Washington Reemployment Bonus Experiment, where dislocated workers' response to the bonus offer did not differ from the response of other workers. See Spiegelman, O'Leary, and Kline (1991).

[17]Katz and Meyer estimate that eligibility for 1 additional week of UI benefits increases the expected duration of unemployment by .16 to .2 week; Woodbury estimates a larger increase -- .4 week. Our results turn out to be insensitive to which estimate we use.

[18]This appears to violate the law of one price -- high-wage workers get a high wage even though jobs are all identical. As mentioned earlier, the high wages paid to high-wage workers may stem from any of several non-competitive forces such as collective bargaining, firm-specific human capital, or efficiency wage payments.

In the case of a single labor market, once we know h we can infer d. To see how, let U_{HO} denote the total number of high-wage UI-eligible claimants before the high-wage sector shrinks (leading to worker dislocation), and let U_H denote the total number of high-wage UI-eligible claimants after the dislocated workers lose their jobs. Dislocated workers are defined to be workers who previously earned high wages and then, after losing their job, can only find reemployment at the low wage. Suppose that 15% of the UI-eligible claimants who initially earned high wages fit this profile (that is, $h = .15$).[19] Then, the number of dislocated workers will be $.15U_{HO}$ and the number of high-wage UI-eligible claimants ex-post will be $U_H = .85U_{HO}$. Finally, since d is defined as the fraction of low-wage UI-eligibles who are dislocated workers, we have $d = .15U_{HO}/U_L$, where U_L denotes the total number of low-wage UI-eligible claimants after the dislocated workers have lost their jobs. Substituting from above for U_{HO} yields $d = (.15/.85)U_H/U_L$. This expression can be simplified further by using the fact that $U_H/U_L = h/(1-h)$. Substitution then yields $d = 3h[17(1-h)]$. For each wage subsidy program that we consider, we report results for values of h ranging from .5 to .1 (and, therefore, d ranges from .176 to .002). As we show below, our results are similar for all such values.

The other extreme is to assume that high- and low-wage workers compete in different sectors of the labor market. That is, we assume the existence of a dual labor market in which there are two kinds of workers and two kinds of jobs. If high-wage unemployed workers compete only for high-wage jobs and low-wage unemployed workers compete only for low-wage jobs, then crowding-out will be confined to the low-wage sector--the dislocated workers (formerly high-wage workers now forced to look for low-wage jobs) are offered a wage subsidy and search in the low-wage sector. The notion of a dual labor market can be captured by setting $h = 0$, which essentially splits off the high-wage sector (the northeast quadrant of Figure 2) and implies that dislocated and low-wage workers compete only for low-wage jobs.

In modelling the dual labor market, we also need to make an assumption about the sector in which UI-eligible non-claimants seek jobs. One extreme possibility is that they compete for jobs only in the high-wage sector, which we can model by setting $k = 1$. Setting $k = 1$ implies that all low-wage workers who are eligible for UI benefits claim those benefits; there are no UI-eligible non-claimants in the low-wage sector, and any UI-eligible non-claimants in the economy are seeking high-wage jobs. The alternative possibility is that UI-eligible non-claimants compete for jobs in the low-wage sector, which we can model by setting $k = .75$ as before.

To examine the impact of wage subsidies in the dual labor market model, we allow d to vary between .15 and .05. These are (approximately) the values of d that correspond with values

[19]The 15% figure is probably an upper bound on the percentage of previously high-wage workers who become dislocated. Data on worker dislocation that were gathered in evaluating the Washington Reemployment Bonus Experiment suggest that, using the BLS definition of job loss after 3 or more years working for the same employer, 15% of new UI recipients were dislocated. Washington State's criteria, which include considerations such as the industry in which a worker was employed and whether the UI claim resulted from a plant closing, suggest a figure closer to 5%. Using the Displaced Worker Surveys over the period 1979-1986, Seitchik (1991) finds that about 10% of all unemployed workers were dislocated (that is, lost their job due to plant closing, slack work, or job abolition).

of h in the range of .5 to .1 (see the right-most columns of Table 1A). In all cases, we compare the steady-state equilibria with and without a wage subsidy in order to gauge the impact of the wage subsidy.

By considering these two extreme cases--a single labor market and a dual labor market--we should obtain upper and lower bounds on the impacts of wage subsidies. Cases in which high- and low-wage workers compete for some, but not all, of the same jobs should fall between our two extreme cases. In addition, cases in which UI-eligible non-claimants compete for jobs in both the high- and low-wage sectors should fall between the two sets of estimates we obtain using the alternative dual labor market models.

D. Summary of the Model

The basic set up of the model can be visualized by referring to Figures 1 and 2. Figure 1 shows the groups of workers we consider--high-wage UI-eligible claimants, low-wage UI-eligible claimants, dislocated workers, UI-eligible non-claimants, and UI-ineligibles. Several key parameters are defined in Figure 1: k is the UI take-up rate (set at .75); h is the proportion of UI-eligibles who are high-wage workers (which we allow to vary between .1 and .5); d is the proportion of low-wage UI-eligibles who are dislocated (which we allow to vary between .02 and .176); and q is the proportion of all unemployed workers who are UI-ineligible (set at .6). Much of the model's complexity stems from the number of sub-groups of workers we consider and from the number of states of unemployment through which each of these groups can flow. It is important to consider these various groups of workers so that crowding-out can be gauged, and equally important to consider multiple states of unemployment, since incentives facing a worker can change during a jobless spell.

Figure 2 shows the various labor market states and the flows through the labor market that are specified by the model. The flows from state to state are quantified by transition rates, which depend on reemployment probabilities (or match probabilities, m). These reemployment probabilities depend in turn on search behavior and the search technology, and are the outcome of an optimizing choice. Three sets of equations--for reemployment probability, expected lifetime income, and optimal search effort--specify this optimization. Steady-state equilibrium in the model is obtained by equating the flows into and out of each labor market state. The complete structure of the model is set out in the Appendix.

We model worker dislocation by assuming that there are two employment sectors--high-wage and low-wage--and that the economy experiences a one-time shock that shuts down part of the high-wage sector. Dislocated workers are formerly high-wage workers who must now search for a low-wage job.

In the model, the total number of jobs available (T) is fixed, but employment (J, or the number of jobs that are filled) varies with job turnover (the separation rate, s) and the effectiveness of job search and matching (m). For example, if the rate at which workers separate from jobs (s) increases, then fewer jobs will be filled and unemployment will rise. If the search intensity of unemployed workers (p, the probability that a workers contacts a firm) is high, then more jobs will be filled and unemployment will be lower.

III. Results

We consider the impacts of two different wage-rate subsidy programs. In each, the government pays a subsidy to each dislocated worker who gains reemployment equal to half the difference between the high wage received before dislocation (w_h) and the low wage after reemployment (w_ℓ). As a result, the net wage (including the subsidy) received by a dislocated worker who finds reemployment is $w_d = (w_h + w_\ell)/2$. In the first program, which we call the "temporary" program, the worker receives the subsidy for two years after gaining reemployment. In the second program--a "permanent" program--the worker receives the wage subsidy for as long as employment continues.

In both programs, the wage subsidy increases the opportunity cost of unemployment for dislocated workers and results in increased search effort on their part. For example, in the reference case of the permanent program when half of all UI-eligible claimants are high-wage workers (that is, $h = .5$), search effort increases by approximately 30% for all dislocated workers. This increase in search effort of dislocated workers has the following implications:

- *There is an increase in overall steady-state employment. That is, more of the total available jobs are filled as dislocated workers are induced to search harder for and accept jobs that would otherwise have remained vacant. This increase in total employment is small, since the wage-rate subsidy is offered to a small portion of the labor force (dislocated workers).*

- *Reemployment probabilities and employment levels rise for dislocated workers and fall for all other workers, who are beaten to vacancies and crowded out of the labor market by the more aggressive dislocated workers. (The larger the increase in overall steady-state employment, the less crowding out occurs.)*

- *As the reemployment probabilities of non-dislocated workers change, their optimal search effort changes. That is, as it becomes more difficult for the non-dislocated workers to find jobs, their search effort adjusts.*

These three impacts of the wage subsidy can be thought of respectively as a <u>gross employment effect</u>, a <u>crowding-out effect</u>, and a <u>rivalry effect</u>. Note that the gross employment effect is an increase in total employment that is driven by the increase in search effort of dislocated workers. The increase in employment of dislocated workers is offset at least partially by decreases in employment of some other groups of workers. This offset is the crowding-out effect. The rivalry effect is the most subtle of the three effects -- it implies that the increased search intensity of dislocated workers, who are now offered a wage subsidy, is taken into account by other workers when they choose their optimal search intensity. Since dislocated workers make up only a small fraction of the total labor force (and of job seekers), the rivalry effect turns out to be extremely small. For example, in the reference case of the permanent program with $h = .5$, no non-dislocated worker alters search effort by more than .5% as a result of the wage subsidy.[20] Accordingly, we focus on the gross employment and crowding-out effects of the wage subsidy from here on.

A. Impacts on Dislocated Workers

Tables 1A and 1B show the simulated impacts of the temporary wage subsidy -- that is, one that is paid during the first 2 years after reemployment -- in the reference case as h (the fraction of UI-eligibles who are high-wage workers) and d (the fraction of low-wage UI-eligibles who are dislocated) vary. The results suggest that a wage subsidy lasting 2 years would reduce a dislocated worker's expected duration of unemployment by nearly 2 weeks, and would increase employment of dislocated workers by about 900 to 1,000 per 100,000 labor force participants (see the "Dislocated workers" columns in Tables 1A and 1B).

As the tables indicate, the simulated impacts of the temporary wage subsidy are robust to changes in h and d. Also, there is little difference between the impacts simulated using a single labor market model and those simulated using a dual labor market model.

Whether these impacts on expected duration of unemployment and employment are large or small is a question that can only be answered in a relative sense. In section III.D below, we compare the impacts of the wage subsidy with impacts of a $500 reemployment bonus offered to workers who gain reemployment within 12 weeks. The results suggest that, compared with such a reemployment bonus, the temporary wage subsidy would have roughly twice the impact on the duration of unemployment and level of employment of dislocated workers. We discuss the significance of these relative impacts further in section III.D.

Tables 2A and 2B show the impacts of a wage subsidy that is paid in perpetuity to a dislocated worker who gains reemployment. The results suggest that a permanent program would reduce a dislocated worker's expected duration of unemployment by nearly 5 weeks, and would increase employment of dislocated workers by about 2,200 to 2,400 per 100,000 in the labor force. These impacts are roughly two and a half times the impacts estimated for the temporary wage subsidy. In results not reported in the tables, we have examined the sensitivity of the difference between the temporary and permanent programs to different discount rates (r). Not surprisingly, we find that the differences between the temporary and permanent programs decrease at higher discount rates, but only slightly.[21] That is, when distant wage subsidy

[20]It is not surprising that the rivalry effect is so small in the case of a wage subsidy to dislocated workers. In our work on the displacement (or crowding-out) effects of a reemployment bonus, we also found small rivalry effects, and the program we were modelling was offered to a far larger proportion of unemployed workers (Davidson and Woodbury 1993).

payments are discounted more heavily, the impact of the permanent program is slightly closer to the impact of the temporary program. It is unclear whether the discount rate we are using in the reference case--.008, or about 20% annually--should be considered particularly high. Given the nature of social programs, participants could well discount future benefits promised by a permanent wage subsidy program at even higher rates.

Tables 2A and 2B indicate that, as with the temporary wage subsidy, the simulated impacts of the permanent wage subsidy are robust to changes in h and d. Also, it makes little difference whether we assume that there is a single labor market or a dual labor market model.

B. Crowding-Out Effects

Although the wage subsidy considered here is provided only to dislocated workers, it has the potential to affect the unemployment duration and employment prospects of other workers. The reason is that if the wage subsidy does increase the search intensity of dislocated workers, then job vacancies will be filled more quickly than otherwise by dislocated workers, and vacancies that otherwise would have been available to non-dislocated workers will vanish. In effect, the wage subsidy will motivate dislocated workers to beat other workers to the vacancies, lengthening the unemployment duration and reducing employment of other workers. If the improved well-being of dislocated workers did come at the expense of other workers, then the wage subsidy would be a far less attractive policy than if such costs were not imposed on other workers.

Tables 1A and 1B show impacts of the wage subsidy on the other groups of workers considered in the model--high-wage UI-eligible claimants, low-wage UI-eligible claimants, UI-eligible non-claimants, and UI-ineligibles. The extent to which these groups of workers are crowded out by the wage subsidy to dislocated workers can be considered in two ways--first by looking at impacts on the duration of unemployment, and second by looking at impacts on steady-state employment.

By the first criterion--impact on unemployment duration--the model suggests that the crowding-out effects of the wage subsidy to dislocated workers are rather small. The results shown in Table 1A suggest that the impacts on unemployment duration are largest for low-wage UI-eligible claimants, but even these low-wage UI-eligibles would suffer at worst an additional half day (.0806 to .0965 week) of unemployment per spell as a result of the wage subsidy to dislocated workers. In other words, any crowding-out effects of the wage subsidy are dispersed so that they do not fall heavily on any particular group of workers.

But by the second criterion--impact on employment of workers other than dislocated workers--the simulations suggest that crowding out is virtually complete (see Table 1B). That is, nearly all of the employment gains experienced by dislocated workers come at the expense of

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[21]This is true when we apply the values of the search cost parameters (c, $ç_1$, and z) used in the reference case to models that use different interest rates.

non-dislocated workers. For example, in the reference case for the single labor market and h = .5, the employment of dislocated workers rises by 989 per 100,000 workers in the labor force, but employment of other workers combined falls by 982 per 100,000. Similar results hold for the other cases displayed in Table 1B.

Crowding out is nearly complete in this model because the employment gains that result from offering a wage subsidy to a small percentage of unemployed workers (in this case, dislocated workers) are correspondingly small. Employment gains occur in this model through increases in the search intensity of workers who are offered an inducement (such as a wage subsidy) to search harder. When search intensity increases, vacancies disappear and more of the total available jobs in the economy are filled. If only a few workers are offered such an inducement, employment rises only modestly. Recall that the wage subsidy can increase employment even though the total number of available jobs (T) is fixed in the model. Since $T = V + J$ (total available jobs equal the sum of vacancies and jobs that are filled), inducements to search harder cause V to fall and J to rise.

To illustrate the dependence of the crowding out results on the fact that the wage subsidy is offered only to a few workers, we have run a simulation in which a temporary (two-year) wage subsidy is offered to all low-wage UI-eligible claimants, rather than just to dislocated workers. We find that employment of low-wage UI-eligible claimants increases by 868 per 100,000 in the labor force, and that the total decrease in employment of other groups (high-wage UI eligible claimants, UI-eligible non-claimants, and UI-ineligibles) is only 314. In other words, when the wage subsidy is offered to 12.4% of the unemployed (all low-wage UI-eligible claimants), only .36 job is crowded out by each job gained. When the wage subsidy is offered to just 2.6% of the unemployed (dislocated workers only), nearly 1 job is crowded out by each job gained.

Although nearly all the gains accruing to dislocated come at the expense of other workers, it is nevertheless clear that no particular group of workers is especially burdened by the crowding-out effects of the wage subsidy. That is, as was clear in Table 1A, the crowding-out effects of the wage subsidy are dispersed widely over the various groups of non-dislocated workers.

Tables 2A and 2B show the crowding-out effects of a permanent wage subsidy. Table 2A suggests that the permanent wage subsidy would increase the unemployment duration of non-dislocated workers by more than twice as much as the temporary wage subsidy. For example, the most affected group--low-wage UI-eligible claimants--would experience up to an additional day or so (.2024 to .2431 week) of unemployment per spell as a result of the permanent wage subsidy. Again, however, the crowding-out effects of the permanent wage subsidy are dispersed across the various groups of non-dislocated workers. This cost of the permanent wage subsidy is offset by a proportionate benefit to dislocated workers.[22]

[22]We would need to introduce an explicit social welfare function if we wanted to draw conclusions about whether the temporary or permanent program has greater social benefits. We are currently pursuing work along these lines.

To summarize, the simulations suggest that the crowding-out effects of the wage subsidy are virtually complete for all cases we consider. In our reference case, 99% of the increased employment of dislocated workers comes at the expense of other workers. Crowding out is nearly complete because the wage subsidy is offered to only a small segment of the unemployed, and hence generates only small employment gains. (A wage subsidy offered to all low-wage workers is accompanied by much less crowding out, in contrast to a wage subsidy offered to dislocated workers only.) Although crowding out is nearly complete, the crowding out of non-dislocated workers by dislocated workers is spread quite evenly over the various groups of non-dislocated workers, so that no single group bears the brunt of the wage subsidy's crowding-out effect. That is, each group of non-dislocated workers experiences a slight increase in unemployment duration and a slight decrease in employment level.

C. Sensitivity Analysis

The results to this point have all focussed on the reference case in which $r = .008$, $s = .010$, and $T = 96.25$. We now explore the sensitivity of the results to changes in the separation rate s and the total number of jobs available T. We focus on variations in these two parameters because doing so may give insight into how the effects of a wage subsidy would vary over the business cycle. Slack labor markets are associated with fewer total available jobs (T) and a lower job separation rate (s). So by examining how the impacts of the wage subsidy behave as T and s fall, we can learn how a recession might alter the outcomes that could be expected from a wage subsidy.

Tables 3 and 4 show the simulated effects of a wage subsidy with a higher and a lower separation rate s. In Tables 3A and 3B, we have set s equal to .006, whereas in Tables 4A and 4B, $s = .014$. Together Tables 3 and 4 show that when separation rates are higher, the wage subsidy causes smaller reductions in the unemployment duration of dislocated workers, but causes larger increases in their employment. This ambiguity occurs because there are two effects of a higher separations rate, s. First, when s is higher, the duration of jobs is shorter. This implies that the wage subsidy is worth less to a worker who receives it (because jobs are less enduring), so workers who could receive the subsidy respond less strongly--that is, their search effort increases by less. It follows that a higher s implies smaller reductions in unemployment duration of dislocated workers. Second, when s is higher, there are more job vacancies. Hence, even though workers' search effort increases by less (as just noted), even the moderated increase in search effort generates more employment. So the additional vacancies implied by a higher s mean that the wage subsidy leads to larger employments gains for dislocated workers.

The wage subsidy's impact on unemployment duration of dislocated workers is not especially sensitive to changes in s in the range of .006 to .014--the variation is on the order of 25 to 33%. (See, for example, the top rows of Tables 3A and 4A: for $s = .006$, the wage subsidy's impact on unemployment duration is -2.378 weeks, whereas for $s = .014$, the impact is -1.778 week.) But the wage subsidy's impact on <u>employment</u> of dislocated workers varies greatly with changes in s in the range of .006 to .014--on the order of 75 to 90%. (See the top rows of

Tables 3B and 4B: for s = .006, the wage subsidy increases employment by 713 per 100,000, whereas for s = .014, the impact is 1243 per 100,000.) In either case, however, crowding-out of non-dislocated workers is nearly complete (over 99%), and most of the employment gains of dislocated workers come at the expense of other workers.

Tables 5 and 6 show the simulated effects of a wage subsidy when total available jobs are higher and lower than the reference case. In Tables 5A and 5B, T is set at 95, whereas in Tables 6A and 6B, T = 97.5. Tables 5 and 6 show that when there are more jobs available, the wage subsidy causes both smaller reductions in the unemployment duration of dislocated workers and smaller gains in employment.[23] However, the changes in T we consider (95 to 97.5) lead to relatively small changes in the wage subsidy's impact on both unemployment duration and employment of dislocated workers--on the order of 7 to 11%. (Regarding unemployment duration, for example, the top rows of Tables 5A and 6A show that for T = 95, the wage subsidy's impact on unemployment duration is -2.077 weeks, whereas for T = 97.5, the impact is -1.877 weeks. Regarding employment levels, the top rows of Tables 5B and 6B show that for T = 95, the wage subsidy increases employment by 1038 per 100,000, whereas for T = 97.5, the impact is 937 per 100,000.) It follow that the crowding-out effect is basically invariant to changes in the total number of jobs available.

We conclude that the basic results described for the reference case do not change appreciably when the separation rate (s) and total jobs available (T) vary over a fairly significant range. The direct impacts of the wage subsidy on dislocated workers change ambiguously with variation in s, but unambiguously increase with increases in T. Crowding out is virtually unaffected by changes in either s or T, and is virtually complete in all cases.

D. Comparisons with a Reemployment Bonus

The Clinton Administration's Reemployment Act (REA) would enable state employment security agencies to offer a reemployment bonus to dislocated workers.[24] Such a reemployment bonus program would offer a lump-sum cash payment to dislocated workers who find reemployment within about 3 months of losing their job, and who hold that new job for at least 4 months.

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[23]The wage subsidy's impacts are smaller when T is larger because when T is high, jobs are available and unemployment is low. As a result, workers are able to find jobs quickly even without searching hard. In effect, search effort is less important to job search outcomes when jobs are abundant. Since the wage subsidy increases search effort, it has a smaller impact when T is high.

[24]Actually, the bonus would be offered to workers who meet the state's "profiling" criteria -- that is, to workers who are predicted to have a high probability of exhausting their UI benefits. Conceptually, the correspondence between workers who meet the profiling criteria and dislocated workers is incomplete. But in our model, dislocated workers are those who have lost high-wage jobs and have little expectation of returning to such jobs. Hence, they have long expected durations of unemployment and would meet most conceivable profiling criteria. In other words, the correspondence between the model's dislocated workers and profiled workers is reasonably good.

The similarities between a reemployment bonus and a wage rate subsidy invite comparison. Both attempt to encourage the reemployment of dislocated workers by offering a financial inducement to dislocated workers to seek and accept a new job. The main difference between the two is in the way the financial inducement is structured. The reemployment bonus is a relatively large one-time payment provided about 7 months after job loss, whereas the wage subsidy is a smaller but continuing payment provided over a longer period of time. Also, the wage subsidy does not require workers to find reemployment within as short a time as 3 months.

Two obvious questions arise about reemployment bonuses and wage subsidies. First, how do their direct and indirect impacts differ? Second, can a reemployment bonus and a wage subsidy be structured so as to have identical incentives and impacts?

Tables 7A and 7B display the impacts of a $500 cash bonus offered to dislocated workers who find a new job within 12 weeks. The flat $500 bonus is a natural one to examine because it was tested in the Illinois experiment, the results of which we have used to calibrate our model. Also, the $500 bonus represents 3 to 4 times the average weekly benefit amount received by UI recipients in the Illinois experiment, and the reemployment bonus programs enabled by the proposed Reemployment Act call for a bonus of similar size. To obtain the results shown in Tables 7A and 7B, we used the model, method of calibration, and solution algorithm described in section II. Also, the parameters used are the same as those used in the standard case underlying Tables 1A and 1B, so differences between the wage subsidy and the reemployment bonus can be understood by comparing Tables 1 and 7.

The figures displayed in Tables 7A and 7B are remarkable because they suggest that the direct impacts of the $500 bonus are uniformly about one-half the impacts of a wage subsidy. For example, the bonus-induced reduction in the unemployment duration of dislocated workers--about .9 weeks--is about half the reduction induced by the wage subsidy (see Table 1A). The bonus-induced increase in employment of dislocated workers -- about 450 to 470 per 100,000--is about half the increase induced by the wage subsidy (see Table 1B). With both the reemployment bonus and the wage subsidy, the employment gains of dislocated workers are offset nearly one for one by employment losses for other workers. (For example, in the first row of Table 7B, dislocated workers' employment gain of 447 is offset by a loss of 443 for other workers. In the first row of Table 1B, the gain of 989 is offset by a loss of 982. So in both case, relative crowding-out is virtually complete.)

We conclude that the direct impacts of a reemployment bonus are qualitatively the same as those of a wage subsidy--the differences are a just matter of scaling. It follows that it should be possible to structure a reemployment bonus and a wage subsidy so that they have identical incentives and impacts. Using our model, it is straightforward to find the bonus amount that would have the same impact as the wage subsidy for our reference case. For the single labor market model with $h = .5$, we find that a bonus of $1,104 would have direct and indirect impacts identical to the temporary wage subsidy.

We concluded above that the temporary wage subsidy has an impact that is about twice that of the $500 reemployment bonus. On the other hand, the wage subsidy's impact comes at considerably more that twice the expense. Since the wage subsidy amounts to $154 biweekly [($846-$538)/2 = $154], the amount paid in wage subsidies to a worker would exceed the $500 bonus payment after only two months.[25]

This added expense of the wage subsidy needs to considered in light of the loses experienced by dislocated workers. Jacobson, LaLonde, and Sullivan (1993) have argued that the case for a wage subsidy is not so much improved efficiency as greater equity. That is, the purpose of a wage subsidy is to redistribute income to workers who have lost their jobs due to economic restructuring, in addition to getting dislocated workers back to work.

The wage subsidy could be viewed as a better method of transferring income to dislocated workers than the reemployment bonus because the bonus is paid only to workers who are fortunate enough to find reemployment within about 3 months. The wage subsidy, on the other hand, would be paid to a dislocated worker regardless of when he or she gained reemployment.

E. Extensions: Firm Behavior

The model we have used makes no attempt to model firm behavior. In fact, our firms are quite passive--when they have a vacancy they randomly choose from the pool of applicants and pay a wage that is determined outside of the model. Moreover, the total number of jobs available (T) is fixed, so that we do not allow the demand for labor to change as the result of the wage subsidy. (The number of steady-state vacancies is endogenous and falls with the implementation of the wage subsidy. That is why crowding out of non-dislocated workers is not quite complete.)

We begin this section by indicating the reasonableness of the assumptions that the wage and T are exogenous. However, we also describe how our model could be extended to make the wages and T endogenous, and discuss the sensitivity of our results to these assumptions.

There are several reasons to expect that wage rates would not change after the implementation of the wage subsidy program. First, the wage subsidy is offered to a small fraction of the unemployed and it is not likely that a change in the behavior of a fraction of the unemployed could have significant aggregate wage effects. This is exactly why so few jobs are created by the wage subsidy in the first place -- even though all dislocated workers search harder, there are too few of them to have a large aggregate impact. Second, experimental evidence suggests strongly that a reemployment bonus program induces no change in wage rates (Woodbury and Spiegelman 1987; Decker and O'Leary 1992). Since the reemployment bonus and wage subsidy programs have similar behavioral impacts, one would expect them to have similar wage effects. Third, in an early version of our work on the crowding-out (or displacement) effects of reemployment bonuses, we developed a model similar in flavor to the one

[25]These figures take account of the break-up of jobs in calculating the total expense of a wage subsidy.

used here, except that it allowed for endogenous wage rates (see Davidson and Woodbury 1990). We did so by introducing two profit functions for firms--one that calculates the expected lifetime profit for a firm with a filled job and one that calculates the expected lifetime profit for a firm with a vacancy. We then assumed that wages are negotiated once the worker and firm make contact and that the resulting wage divides evenly the surplus created by the job. Our model predicted that the reemployment bonus would have almost no impact on wages, which is exactly what happened in the reemployment bonus experiments. It follows that if we extended the model presented in this paper in a similar manner, we would again obtain the prediction that wage subsidies to dislocated workers should produce no significant changes in wage rates. The cost of extending the model in such a manner is rather high, however, in that the model would more than double in size.

It is also possible to extend our model so that T is endogenously determined. To do so, we could follow Pissarides (1990) and assume that firms create vacancies until the expected profit from doing so equals the cost of creating the vacancy.[26] Since the wage subsidy increases search effort, it reduces the expected duration of a vacancy, thereby making it more profitable for firms to create vacancies. Thus, if T does change as the result of the wage subsidy, it should increase, which would reduce the amount of crowding-out suggested by our simulations. We would expect, however, that any change in T would be quite small since the wage subsidy changes the behavior of so few workers.

To test the sensitivity of our results to the assumption that T (total available jobs) is exogenous, we have calculated the increase in T that would be necessary to completely reverse our crowding-out results. That is, we calculate the change in T that would need to result from the wage subsidy to dislocated workers so that employment would be unchanged for other workers. Although the exact value varies with the parameters, we find that T would have to increase somewhere between .025 and .03 percent for there to be no crowding out. This is quite a small increase--in the neighborhood of 30,000 to 40,000 jobs for the U.S. labor market. Whether this is plausible is an open question. The apparent sensitivity of crowding out to changes in total jobs available weakens our crowding-out results considerably, and suggests the potential importance of extending the model to make T endogenous. This is the focus of our work in progress.

IV. Discussion and Conclusions

This examination of a wage bill subsidy paid to dislocated workers has focussed on the subsidy's impacts on the duration of unemployment and levels of employment of dislocated and other workers. Our main results can be summarized as follows. The temporary wage subsidy program, which provides a subsidy for two years after gaining reemployment, has large direct

[26]Although this extension of the model is straightforward theoretically, calibration would be difficult. Given the limited amount of vacancy data available, it would be difficult to pin down the cost of creating a vacancy.

impacts on the unemployment duration and employment level of dislocated workers. The results of our reference case suggest that the two-year subsidy would shorten the unemployment spells of dislocated workers by nearly 2 weeks, and would increase employment of dislocated workers by about 900 to 1000 per 100,000 in the labor force. (These findings are summarized in Tables 1A and 1B.) A wage subsidy paid in perpetuity would have impacts on dislocated workers that are about two and a half times those estimated for the temporary wage subsidy (see Tables 2A and 2B).

Wage subsidies to dislocated workers could also have indirect impacts on workers other than dislocated workers. Specifically, our results suggest that the wage subsidy leads to small increases in the unemployment duration, and decreases in employment, of non-dislocated workers. These decreases are relatively evenly dispersed across the various groups of non-dislocated workers we examine--high- and low-wage UI eligibles, UI-eligible non-claimants, and UI-ineligibles. But on net, virtually all of the employment gains experienced by dislocated workers as a result of the wage subsidy come at the expense of other workers (see Tables 1B and 2B).

These main results appear to be quite robust to changes in the parameters that must be supplied in order to obtain our simulations (as shown in Tables 3, 4, 5, and 6). The crowding-out results, however, are very sensitive to the assumption that the total number of available jobs (T) is fixed and exogenous. As we report in section III.E, if employers responded to a wage subsidy for dislocated workers by increasing labor demand by just .025 to .03 percent, there would be no crowding out of non-dislocated workers.

We find that a reemployment bonus can be structured so as to obtain impacts identical to the wage subsidy. Specifically, in our reference case, a reemployment bonus of about $1,100 offered to workers who gain reemployment within 12 weeks of losing their job would have direct and indirect impacts that are identical to a temporary (two-year) wage subsidy.

If the crowding-out effects of the wage subsidy are as large as our main results suggest, then a wage subsidy to dislocated workers fails the Pareto criterion because some workers could be hurt by the program. But there may be three mitigating factors. First, the structural changes that lead to worker dislocation presumably improve the lot of the majority at the expense of dislocated workers. It is the burden of structural change, which itself fails the Pareto criterion, that the wage subsidy is intended to redress. Second, the crowding-out impacts of the wage subsidy that we find in our main results are widely dispersed over various groups of non-dislocated workers. Third, as just mentioned, our crowding-out results are quite sensitive to the assumption that the total number of available jobs is exogenous, so they should be treated as provisional.

We have not attempted to treat the administrative or funding issues that would need to be addressed if a wage subsidy for dislocated workers were adopted. It is clear, however, that the UI system provides a natural administrative vehicle for a wage subsidy program, specifically through continued payment of benefits (or some portion of benefits) to dislocated workers after reemployment. This in turn suggests a method of funding based on a dislocated worker's maximum UI benefit entitlement. For example, in the simulations reported above, a biweekly subsidy of \$154 was paid to dislocated workers who were eligible for biweekly UI benefits of \$245. Hence, in this example, a worker's UI benefit entitlement could fund up to about 41 weeks of a wage subsidy. Funding a wage subsidy that lasted longer or that began after some weeks of UI benefits had already been paid would require additional funding sources, and it is unclear where such funding could be found given the severe budget restrictions currently facing the federal government.

In any event, these administrative and funding issues would be moot if the direct impacts of a wage subsidy paid to dislocated workers were small, and they may yet be moot given the possibility that the wage subsidy may have harmful indirect impacts on workers other than dislocated workers. Mitigating the crowding-out effects of the wage subsidy are three factors -- that the crowding-out effects are widely dispersed, that the structural changes that result in dislocation of some workers (and hence a need for a policy like the wage subsidy) benefit most other workers, and that our crowding-out results are quite fragile. Our main purpose has been to appraise the direct and indirect impacts of the wage subsidy, and we believe that the findings suggest that a wage subsidy for dislocated workers is well worth further consideration.

Appendix: Complete Statement of the Model

A. Identities

(1) $T = J + V$

(2) $L = J + U$

(3) $U = U_i + U_k + \sum_{t=1,14} (U_{h,t} + U_{\ell,t} + U_{d,t}) + U_{h,e} + U_{\ell,e} + U_{d,e}$

B. Steady-State Conditions

In each equation below, the left-hand-side represents the flow into a state and the right-hand-side represents the flow out of that state. The labor market state for each equation is listed to the right in parentheses.

(4) $qsJ = m_i U_i$ (state U_i)

(5) $(1-q)(1-k)sJ = m_k U_k$ (state U_k)

(6) $(1-q)khsJ = U_{h,1}$ (state $U_{h,1}$)

(7) $(1-q)k(1-h)(1-d)sJ = U_{\ell,1}$ (state $U_{\ell,1}$)

(8) $(1-q)k(1-h)dsJ = U_{d,1}$ (state $U_{d,1}$)

(9) $(1-m_{j,t-1})U_{j,t-1} = U_{j,t}$ (state $U_{j,t}$ for $2 \leq t \leq 14$, $j = h, \ell, d$)

(10) $(1-m_{j,14})U_{j,14} = m_{j,e}U_{j,e}$ (state $U_{j,e}$ for $j = h, \ell, d$)

C. Reemployment Probabilities

(11) $m_i = p_i(V/T)[(1 - e^{-\lambda})/\lambda]$

(12) $m_k = p_k(V/T)[(1 - e^{-\lambda})/\lambda]$

(13) $m_{j,t} = p_{j,t}(V/T)[(1 - e^{-\lambda})/\lambda]$ for $1 \leq t \leq 14$, $j = h, \ell, d$

(14) $m_{j,e} = p_{j,e}(V/T)[(1 - e^{-\lambda})/\lambda]$ for $j = h, \ell, d$

(15) $\lambda = (1/T)[p_iU_i + p_kU_k + \sum_{t=1,14}\sum_j p_{j,t}U_{j,t} + \sum_j p_{j,e}U_{j,e}]$

D. Expected Lifetime Income

(16) $V_i = -c_i(p_i)^z + [miV_{i,w} + (1-m_i)V_i]/(1+r)$

(17) $V_{j,t} = x - c(p_{j,t})^z + [m_{j,t}V_{j,w} + (1-m_{j,t})V_{j,t+1}]/(1+r)$ for $1 \leq t \leq 13$, $j = h,\ell,d$

(18) $V_{j,14} = x - c(p_{j,14})^z + [m_{j,14}V_{j,w} + (1-m_{j,14})V_{j,e}]/(1+r)$ for $j = h,\ell,d$

(19) $V_{j,e} = -c(p_{j,e})^z + [m_{j,e}V_{j,w} + (1-m_{j,e})V_{j,e}]/(1+r)$ for $j = h,\ell,d$

(20) $V_{i,w} = w_i + [sV_i + (1-s)V_{i,w}]/(1+r)$

(21) $V_{j,w} = w_j + [sV_{j,1} + (1-s)V_{j,w}]/(1+r)$ for $j = h,\ell,d$

E. Optimal Search Effort

(22) $p_i = \arg\max V_i$

(23) $p_{j,t} = \arg\max V_{j,t}$ for $1 \leq t \leq 14$, $j = h,\ell,d$

(24) $p_{j,e} = \arg\max V_{j,e}$ for $j = h,\ell,d$

(25) $p_k = p_{h,e}$

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Table 1A. Effects of a Temporary Wage Subsidy on Expected Duration of Unemployment, Reference Case

Model and Assumptions	Dislocated workers	High-wage UI-eligible claimants	Low-wage UI-eligible claimants	UI-eligible non-claimants	UI-ineligibles	h	k	d
Single Labor Market	-1.979	0.0348	0.0544	0.0164	0.0384	0.5	0.75	0.176
	-1.966	0.0272	0.0425	0.0127	0.0300	0.4	0.75	0.118
	-1.954	0.0199	0.0310	0.0095	0.0219	0.3	0.75	0.076
	-1.942	0.0128	0.0199	0.0064	0.0140	0.2	0.75	0.044
	-1.931	0.0064	0.0099	0.0031	0.0070	0.1	0.75	0.020
Dual Labor Market, with UI-eligible non-claimants in *low-wage* sector	-1.846	NA	0.0806	0.0245	0.0569	0	0.75	0.15
	-1.871	NA	0.0536	0.0163	0.0379	0	0.75	0.10
	-1.895	NA	0.0268	0.0081	0.0189	0	0.75	0.05
Dual Labor Market, with UI-eligible non-claimants in *high-wage* sector	-1.748	NA	0.0965	NA	0.0682	0	1	0.15
	-1.778	NA	0.0642	NA	0.0453	0	1	0.10
	-1.807	NA	0.0320	NA	0.0226	0	1	0.05

Notes: The wage subsidy modeled is one in which the wage paid to a reemployed dislocated worker (w_d) is half the difference between the wage earned before dislocation (w_h) and the market opportunity wage currently facing the worker (w_ℓ). Hence, $w_d=(w_h+w_\ell)/2$. The subsidy is limited to two years. Results shown are for the reference case in which the biweekly separation rate s=0.010, total jobs available T=96.25, and the biweekly interest rate r=0.008. h denotes the fraction of UI-eligible claimants who are high-wage workers; k denotes the UI take-up rate; and d denotes the fraction of low-wage UI-eligible claimants who are dislocated workers. In the single labor market model, $d=3h/[17(1-h)]$, as shown in the text. In the dual labor market models, d and k are independent.

Table 1B. Change per 100,000 in Employment under a Temporary Wage Subsidy, Reference Case

Model and Assumptions	Dislocated workers	Non-Dislocated Workers: High-wage UI-eligible claimants	Low-wage UI-eligible claimants	UI-eligible non-claimants	UI-ineligibles	Total	*h*	*k*	*d*
Single Labor Market	989	-213	-331	-201	-237	-982	0.5	0.75	0.176
	982	-214	-336	-198	-229	-977	0.4	0.75	0.118
	977	-207	-331	-207	-228	-973	0.3	0.75	0.076
	971	-226	-323	-194	-226	-969	0.2	0.75	0.044
	965	-193	-321	-193	-257	-964	0.1	0.75	0.020
Dual Labor Market, with UI-eligible non-claimants in *low-wage* sector	922	NA	-399	-237	-275	-911	0	0.75	0.15
	935	NA	-406	-246	-275	-927	0	0.75	0.10
	947	NA	-413	-295	-236	-944	0	0.75	0.05
Dual Labor Market, with UI-eligible non-claimants in *high-wage* sector	873	NA	-505	NA	-354	-859	0	1	0.15
	888	NA	-518	NA	-361	-879	0	1	0.10
	903	NA	-532	NA	-366	-898	0	1	0.05

Notes: See Table 1A.

Table 2A. Effects of a Permanent Wage Subsidy on Expected Duration of Unemployment, Reference Case

Model and Assumptions	Dislocated workers	High-wage UI-eligible claimants	Low-wage UI-eligible claimants	UI-eligible non-claimants	UI-ineligibles	*h*	*k*	*d*
Single Labor Market	-4.941	0.0870	0.1361	0.0822	0.0959	0.5	0.75	0.176
	-4.908	0.0680	0.1061	0.0644	0.0748	0.4	0.75	0.118
	-4.876	0.0498	0.0774	0.0474	0.0546	0.3	0.75	0.076
	-4.846	0.0321	0.0497	0.0306	0.0351	0.2	0.75	0.044
	-4.815	0.0160	0.0247	0.0153	0.0174	0.1	0.75	0.020
Dual Labor Market, with UI-eligible non-claimants in *low-wage* sector	-4.627	NA	0.2024	0.1232	0.1429	0	0.75	0.15
	-4.680	NA	0.1344	0.0818	0.0949	0	0.75	0.10
	-4.733	NA	0.0669	0.0408	0.0473	0	0.75	0.05
Dual Labor Market, with UI-eligible non-claimants in *high-wage* sector	-4.393	NA	0.2431	NA	0.1717	0	1	0.15
	-4.457	NA	0.1612	NA	0.1139	0	1	0.10
	-4.521	NA	0.0802	NA	0.0567	0	1	0.05

Notes: The wage subsidy modelled is one in which the wage paid to a reemployed dislocated worker (w_d) is half the difference between the wage earned before dislocation (w_h) and the market opportunity wage now facing the worker (w_ℓ). Hence, $w_d=(w_h+w_\ell)/2$. The subsidy is paid in perpetuity. Results shown are for the reference case in which the biweekly separation rate (s)=0.010, total jobs available (T)=96.25, and the biweekly interest rate (r)=0.008. h denotes the fraction of UI-eligible claimants who are high-wage workers; k denotes the UI take-up rate; and d denotes the fraction of low-wage UI-eligible claimants who are dislocated workers. In the single labor market model, $d=3h/[17(1-h)]$, as shown in the text. In the dual labor market models, d and k are independent.

Table 2B. Change per 100,000 in Employment under a Permanent Wage Subsidy, Reference Case

Model and Assumptions	Dislocated workers	Non-Dislocated Workers: High-wage UI-eligible claimants	Low-wage UI-eligible claimants	UI-eligible non-claimants	UI-ineligibles	Total	*h*	*k*	*d*
Single Labor Market	2469	-536	-833	-500	-583	-2452	0.5	0.75	0.176
	2453	-530	-834	-500	-576	-2440	0.4	0.75	0.118
	2437	-526	-809	-485	-607	-2427	0.3	0.75	0.076
	2422	-509	-826	-509	-572	-2416	0.2	0.75	0.044
	2407	-520	-780	-520	-584	-2404	0.1	0.75	0.020
Dual Labor Market, with UI-eligible non-claimants in *low-wage* sector	2311	NA	-990	-600	-695	-2285	0	0.75	0.15
	2339	NA	-1001	-609	-711	-2321	0	0.75	0.10
	2366	NA	-1014	-627	-716	-2357	0	0.75	0.05
Dual Labor Market, with UI-eligible non-claimants in *high-wage* sector	2193	NA	-1266	NA	-891	-2157	0	1	0.15
	2227	NA	-1297	NA	-906	-2203	0	1	0.10
	2260	NA	-1317	NA	-931	-2248	0	1	0.05

Notes: See Table 2A.

Table 3A. Effects of a Temporary Wage Subsidy on Expected Duration of Unemployment, Sensitivity Analysis with s=0.006

Model and Assumptions	Dislocated workers	High-wage UI-eligible claimants	Low-wage UI-eligible claimants	UI-eligible non-claimants	UI-ineligibles	h	k	d
Single Labor Market	-2.378	0.0486	0.0844	0.0447	0.0614	0.5	0.75	0.176
	-2.351	0.0378	0.0653	0.0349	0.0476	0.4	0.75	0.118
	-2.325	0.0276	0.0472	0.0257	0.0344	0.3	0.75	0.076
	-2.300	0.0177	0.0301	0.0166	0.0220	0.2	0.75	0.044
	-2.275	0.0879	0.0149	0.0080	0.0109	0.1	0.75	0.020
Dual Labor Market, with UI-eligible non-claimants in *low-wage* sector	-2.145	NA	0.1206	0.0651	0.0880	0	0.75	0.15
	-2.181	NA	0.0802	0.0433	0.0585	0	0.75	0.10
	-2.216	NA	0.0400	0.0216	0.0292	0	0.75	0.05
Dual Labor Market, with UI-eligible non-claimants in *high-wage* sector	-1.980	NA	0.1412	NA	0.1031	0	1	0.15
	-2.022	NA	0.0939	NA	0.0686	0	1	0.10
	-2.064	NA	0.0468	NA	0.0342	0	1	0.05

Notes: See Table 1A.

Table 3B. Change per 100,000 in Employment under a Temporary Wage Subsidy, Sensitivity Analysis with s=0.006

Model and Assumptions	Dislocated workers	Non-Dislocated Workers: High-wage UI-eligible claimants	Low-wage UI-eligible claimants	UI-eligible non-claimants	UI-ineligibles	Total	*h*	*k*	*d*
Single Labor Market	713	-148	-247	-138	-178	-711	0.5	0.75	0.176
	705	-138	-251	-138	-176	-703	0.4	0.75	0.118
	697	-139	-244	-139	-174	-696	0.3	0.75	0.076
	690	-133	-238	-133	-185	-689	0.2	0.75	0.044
	683	-171	-228	-113	-171	-683	0.1	0.75	0.020
Dual Labor Market, with UI-eligible non-claimants in *low-wage* sector	643	NA	-282	-156	-203	-641	0	0.75	0.15
	654	NA	-285	-154	-214	-653	0	0.75	0.10
	665	NA	-285	-166	-213	-664	0	0.75	0.05
Dual Labor Market, with UI-eligible non-claimants in *high-wage* sector	594	NA	-344	NA	-248	-592	0	1	0.15
	607	NA	-346	NA	-259	-605	0	1	0.10
	619	NA	-361	NA	-257	-618	0	1	0.05

Notes: See Table 1A.

Table 4A. Effects of a Temporary Wage Subsidy on Expected Duration of Unemployment, Sensitivity Analysis with s=0.014

Model and Assumptions	Dislocated workers	High-wage UI-eligible claimants	Low-wage UI-eligible claimants	UI-eligible non-claimants	UI-ineligibles	h	k	d
Single Labor Market	-1.778	0.0299	0.0441	0.0291	0.0303	0.5	0.75	0.176
	-1.770	0.0235	0.0346	0.0218	0.0237	0.4	0.75	0.118
	-1.762	0.0172	0.0253	0.0164	0.0174	0.3	0.75	0.076
	-1.755	0.0111	0.0163	0.0105	0.0112	0.2	0.75	0.044
	-1.747	0.0056	0.0081	0.0055	0.0056	0.1	0.75	0.020
Dual Labor Market, with UI-eligible non-claimants in *low-wage* sector	-1.679	NA	0.0665	0.0426	0.0458	0	0.75	0.15
	-1.699	NA	0.0443	0.0286	0.0305	0	0.75	0.10
	-1.719	NA	0.0221	0.0139	0.0152	0	0.75	0.05
Dual Labor Market, with UI-eligible non-claimants in *high-wage* sector	-1.604	NA	0.0806	NA	0.0555	0	1	0.15
	-1.629	NA	0.0537	NA	0.0369	0	1	0.10
	-1.654	NA	0.0268	NA	0.0184	0	1	0.05

Notes: See Table 1A.

Table 4B. Change per 100,000 in Employment under a Temporary Wage Subsidy, Sensitivity Analysis with s=0.014

Model and Assumptions	Dislocated workers	Non-Dislocated Workers: High-wage UI-eligible claimants	Non-Dislocated Workers: Low-wage UI-eligible claimants	Non-Dislocated Workers: UI-eligible non-claimants	Non-Dislocated Workers: UI-ineligibles	Non-Dislocated Workers: Total	*h*	*k*	*d*
Single Labor Market	1243	-277	-415	-264	-277	-1233	0.5	0.75	0.176
	1238	-275	-421	-259	-275	-1230	0.4	0.75	0.118
	1232	-280	-409	-258	-280	-1227	0.3	0.75	0.076
	1228	-272	-408	-272	-272	-1224	0.2	0.75	0.044
	1223	-271	-407	-271	-271	-1220	0.1	0.75	0.020
Dual Labor Market, with UI-eligible non-claimants in *low-wage* sector	1172	NA	-492	-321	-341	-1154	0	0.75	0.15
	1188	NA	-511	-325	-341	-1177	0	0.75	0.10
	1203	NA	-504	-347	-347	-1198	0	0.75	0.05
Dual Labor Market, with UI-eligible non-claimants in *high-wage* sector	1120	NA	-665	NA	-432	-1097	0	1	0.15
	1138	NA	-681	NA	-442	-1123	0	1	0.10
	1156	NA	-696	NA	-452	-1148	0	1	0.05

Notes: See Table 1A.

Table 5A. Effects of a Temporary Wage Subsidy on Expected Duration of Unemployment, Sensitivity Analysis with T=95

Model and Assumptions	Dislocated workers	High-wage UI-eligible claimants	Low-wage UI-eligible claimants	UI-eligible non-claimants	UI-ineligibles	*h*	*k*	*d*
Single Labor Market	-2.077	0.0404	0.0647	0.0380	0.0461	0.5	0.75	0.176
	-2.061	0.0315	0.0504	0.0297	0.0359	0.4	0.75	0.118
	-2.046	0.0231	0.0366	0.0218	0.0262	0.3	0.75	0.076
	-2.031	0.0149	0.0235	0.0137	0.0168	0.2	0.75	0.044
	-2.015	0.0074	0.0116	0.0067	0.0083	0.1	0.75	0.020
Dual Labor Market, with UI-eligible non-claimants in *low-wage* sector	-1.915	NA	0.0948	0.0559	0.0677	0	0.75	0.15
	-1.944	NA	0.0631	0.0370	0.0451	0	0.75	0.10
	-1.977	NA	0.0315	0.0181	0.0225	0	0.75	0.05
Dual Labor Market, with UI-eligible non-claimants in *high-wage* sector	-1.797	NA	0.1127	NA	0.0805	0	1	0.15
	-1.832	NA	0.0749	NA	0.0536	0	1	0.10
	-1.866	NA	0.0372	NA	0.0269	0	1	0.05

Notes: See Table 1A.

Table 5B. Change per 100,000 in Employment under a Temporary Wage Subsidy, Sensitivity Analysis with T=95

Model and Assumptions	Dislocated workers	Non-Dislocated Workers					*h*	*k*	*d*
		High-wage UI-eligible claimants	Low-wage UI-eligible claimants	UI-eligible non-claimants	UI-ineligibles	Total			
Single Labor Market	1038	-218	-359	-207	-250	-1034	0.5	0.75	0.176
	1030	-219	-356	-205	-246	-1026	0.4	0.75	0.118
	1023	-227	-359	-208	-246	-1040	0.3	0.75	0.076
	1015	-225	-338	-197	-253	-1013	0.2	0.75	0.044
	1008	-224	-336	-224	-224	-1008	0.1	0.75	0.020
Dual Labor Market, with UI-eligible non-claimants in *low-wage* sector	957	NA	-414	-242	-294	-950	0	0.75	0.15
	971	NA	-418	-248	-300	-966	0	0.75	0.10
	986	NA	-437	-246	-301	-984	0	0.75	0.05
Dual Labor Market, with UI-eligible non-claimants in *high-wage* sector	898	NA	-517	NA	-372	-889	0	1	0.15
	915	NA	-531	NA	-377	-908	0	1	0.10
	933	NA	-536	NA	-395	-931	0	1	0.05

Notes: See Table 1A.

Table 6A. Effects of a Temporary Wage Subsidy on Expected Duration of Unemployment, Sensitivity Analysis with T=97.5

Model and Assumptions	Dislocated workers	High-wage UI-eligible claimants	Low-wage UI-eligible claimants	UI-eligible non-claimants	UI-ineligibles	*h*	*k*	*d*
Single Labor Market	-1.877	0.0302	0.0459	0.0287	0.0319	0.5	0.75	0.176
	-1.867	0.0237	0.0360	0.0226	0.0250	0.4	0.75	0.118
	-1.858	0.0174	0.0263	0.0168	0.0183	0.3	0.75	0.076
	-1.849	0.0112	0.0169	0.0105	0.0118	0.2	0.75	0.044
	-1.840	0.0056	0.0084	0.0059	0.0059	0.1	0.75	0.020
Dual Labor Market, with UI-eligible non-claimants in *low-wage* sector	-1.769	NA	0.0689	0.0433	0.0480	0	0.75	0.15
	-1.790	NA	0.0458	0.0288	0.0319	0	0.75	0.10
	-1.811	NA	0.0229	0.0144	0.0159	0	0.75	0.05
Dual Labor Market, with UI-eligible non-claimants in *high-wage* sector	-1.688	NA	0.0832	NA	0.0580	0	1	0.15
	-1.713	NA	0.0553	NA	0.0386	0	1	0.10
	-1.739	NA	0.0276	NA	0.0193	0	1	0.05

Notes: See Table 1A.

Table 6B. Change per 100,000 in Employment under a Temporary Wage Subsidy, Sensitivity Analysis with T=97.5

Model and Assumptions	Dislocated workers	Non-Dislocated Workers					h	k	d
		High-wage UI-eligible claimants	Low-wage UI-eligible claimants	UI-eligible non-claimants	UI-ineligibles	Total			
Single Labor Market	937	-206	-310	-193	-219	-928	0.5	0.75	0.176
	933	-199	-314	-199	-215	-927	0.4	0.75	0.118
	928	-203	-315	-203	-203	-924	0.3	0.75	0.076
	924	-205	-307	-205	-205	-922	0.2	0.75	0.044
	920	-212	-283	-212	-212	-919	0.1	0.75	0.020
Dual Labor Market, with UI-eligible non-claimants in *low-wage* sector	883	NA	-373	-238	-259	-870	0	0.75	0.15
	894	NA	-379	-237	-269	-885	0	0.75	0.10
	905	NA	-400	-233	-267	-900	0	0.75	0.05
Dual Labor Market, with UI-eligible non-claimants in *high-wage* sector	842	NA	-486	NA	-339	-825	0	1	0.15
	855	NA	-499	NA	-344	-843	0	1	0.10
	869	NA	-503	NA	-360	-863	0	1	0.05

Notes: See Table 1A.

Table 7A. Effects of a $500 Reemployment Bonus on Expected Duration of Unemployment, Reference Case

Model and Assumptions	Dislocated Workers	High-wage UI-eligible claimants	Low-wage UI-eligible claimants	UI-eligible non-claimants	UI-ineligibles	*h*	*k*	*d*
Single Labor Market	-0.894	0.0157	0.0248	0.0145	0.0174	0.5	0.75	0.176
	-0.903	0.0125	0.0199	0.0119	0.0138	0.4	0.75	0.118
	-0.913	0.0093	0.0145	0.0087	0.0102	0.3	0.75	0.076
	-0.921	0.0061	0.0094	0.0064	0.0067	0.2	0.75	0.044
	-0.930	0.0031	0.0048	0.0028	0.0034	0.1	0.75	0.020
Dual Labor Market, with UI-eligible non-claimants in *low-wage* sector	-0.898	NA	0.0392	0.0238	0.0277	0	0.75	0.15
	-0.912	NA	0.0261	0.0156	0.0185	0	0.75	0.10
	-0.925	NA	0.0131	0.0075	0.0923	0	0.75	0.05
Dual Labor Market, with UI-eligible non-claimants in *high-wage* sector	-0.903	NA	0.0498	NA	0.0327	0	1	0.15
	-0.920	NA	0.0332	NA	0.0235	0	1	0.10
	-0.937	NA	0.0166	NA	0.0117	0	1	0.05

Notes: The reemployment bonus modeled is one in which a lump sum of $500 is paid to a dislocated worker who finds a new job within 12 weeks and holds the job for 4 months. Results shown are for the reference case in which the biweekly separation rate s=0.010, total jobs available T=96.25, and the biweekly interest rate r=0.008. Hence, the results in this table should be compared with the wage subsidy impacts shown in Table 1A. h denotes the fraction of UI-eligible claimants who are high-wage workers; k denotes the UI take-up rate; and d denotes the fraction of low-wage UI-eligible claimants who are dislocated workers. In the single labor market model, $d=3h/[17(1-h)]$, as shown in the text. In the dual labor market models, d and k are independent.

Table 7B. Change per 100,000 in Employment under a $500 Reemployment Bonus, Reference Case

Model and Assumptions	Dislocated Workers	Non-Dislocated Workers					h	k	d
		High-wage UI-eligible claimants	Low-wage UI-eligible claimants	UI-eligible non-claimants	UI-ineligibles	Total			
Single Labor Market	447	-93	-152	-93	-105	-443	0.5	0.75	0.176
	452	-93	-155	-93	-109	-450	0.4	0.75	0.118
	456	-103	-145	-103	-103	-454	0.3	0.75	0.076
	461	-99	-164	-99	-99	-461	0.2	0.75	0.044
	465	-133	-133	-133	-66	-465	0.1	0.75	0.020
Dual Labor Market, with UI-eligible non-claimants in *low-wage* sector	449	NA	-193	-116	-135	-444	0	0.75	0.15
	455	NA	-196	-120	-135	-451	0	0.75	0.10
	462	NA	-201	-115	-144	-460	0	0.75	0.05
Dual Labor Market, with UI-eligible non-claimants in *high-wage* sector	451	NA	-262	NA	-181	-443	0	1	0.15
	460	NA	-267	NA	-188	-455	0	1	0.10
	468	NA	-279	NA	-186	-465	0	1	0.05

Notes: See Table 7A. The results in this table should be compared with the wage subsidy results in Table 1B.

FIGURES

Figure 1

The Unemployed

Figure 2

Labor Market Flows

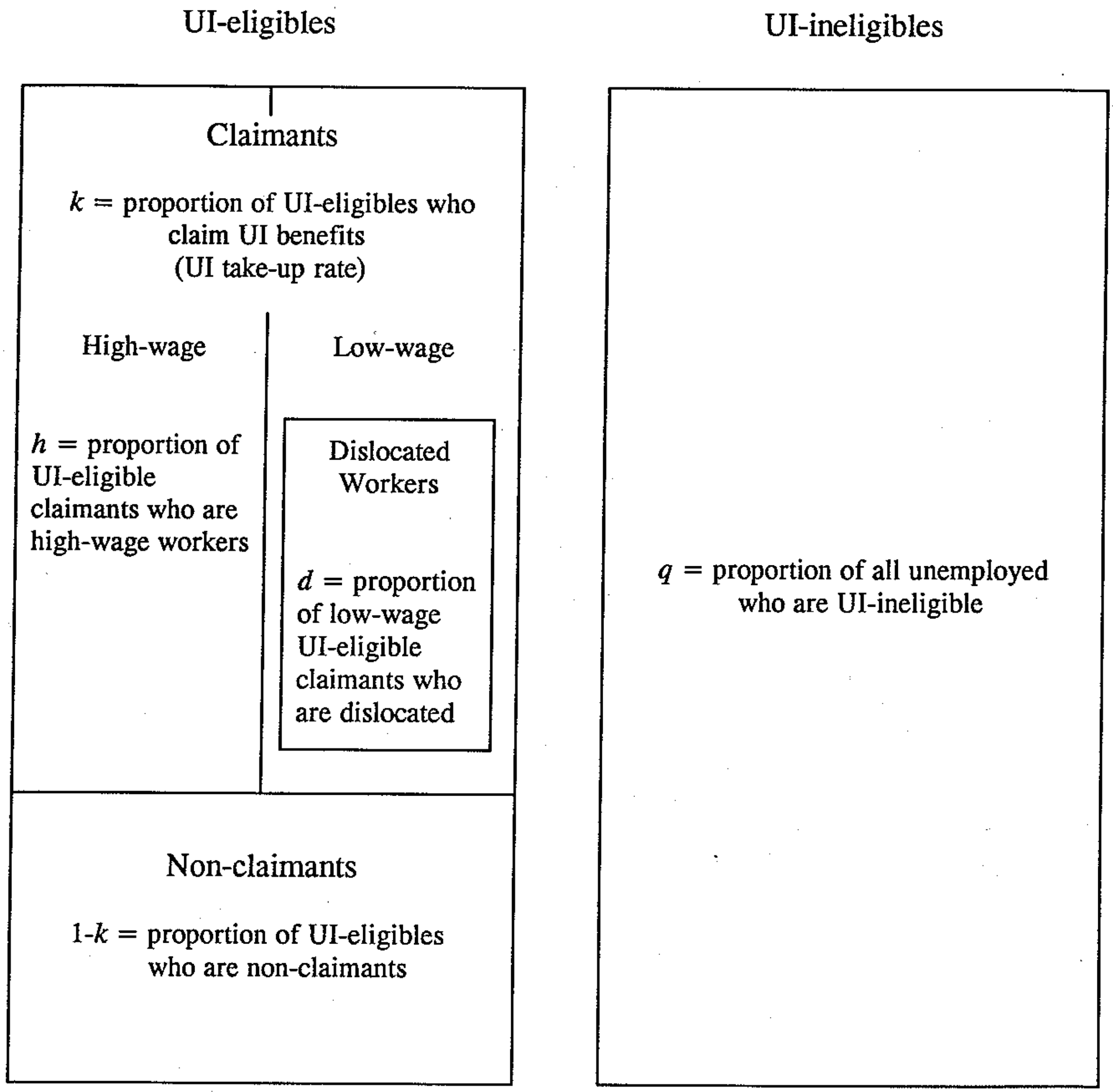

Figure 1
The Unemployed

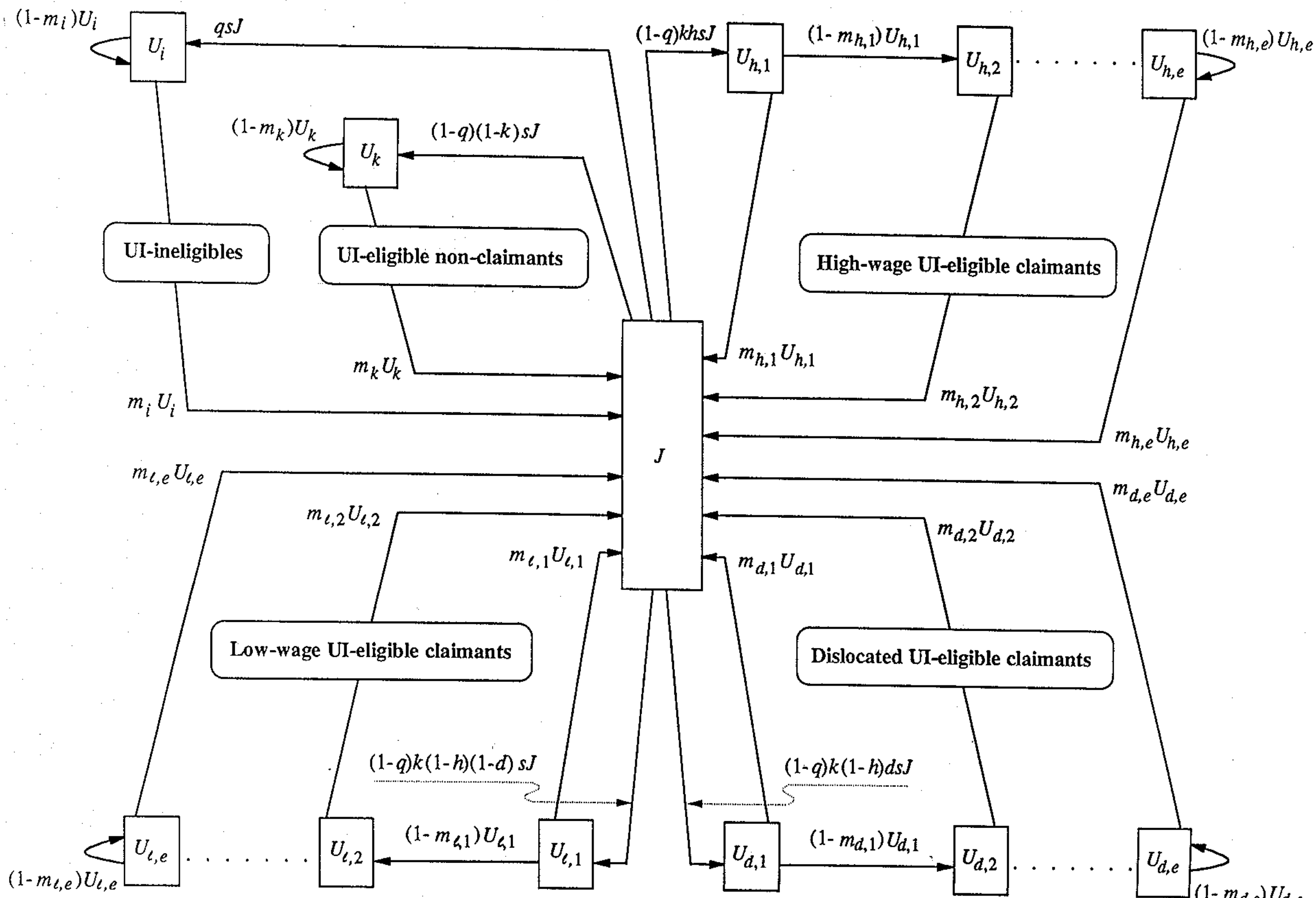

Figure 2
Labor Market Flows