From Social Experiment to Program

Reemployment
Bonuses
in the
Unemployment
Insurance
System

Evidence
from
Three Field
Experiments

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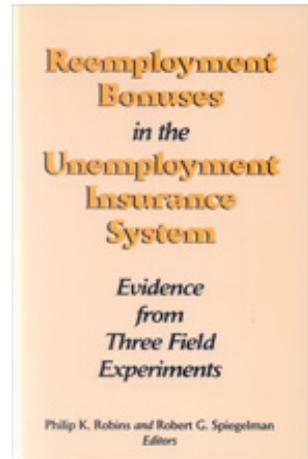
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From Social Experiment to Program

The Reemployment Bonus

Carl Davidson and Stephen A. Woodbury

This chapter examines the problem of transferring the results obtained in the Illinois, Pennsylvania, and Washington reemployment bonus experiments to an actual reemployment bonus program. The results presented in the preceding three chapters suggest that a reemployment bonus program could reduce the duration of insured unemployment without adverse consequences for workers offered the bonus. On the whole, the results appear to be "internally valid"—that is, comparisons between the treatment and control groups generally provide unbiased estimates of the bonus impacts.

Experimental results alone, however, do not indicate whether implementing a reemployment bonus program would be desirable. Important questions still exist about the extent to which bonus experiments are "transferable" and give an accurate picture of what would happen if a bonus program were actually adopted. In any social experiment, whether experimental results are transferable to an actual program ("externally valid") is distinct from whether the results are valid on their own grounds (internally valid). The first section of this chapter develops a model-based classification of the problems that impede the transfer of experimental results to a policy setting.

In the second section, we characterize an equilibrium-matching model of the labor market that provides an organizing framework for analyzing the problems of transferring the reemployment bonus experiments' results to the setting of an actual program. (The full model is presented in the chapter appendix.) This section also presents the main results on spillover effects, classification changes, and behavioral changes that could follow adoption of a bonus program. The third sec-

tion explores how the outcomes of a program that offered a bonus only to dislocated workers could differ from those observed in the bonus experiments. We also discuss how exogenous changes in economic and labor market conditions may alter the effectiveness of a reemployment bonus program. The final section summarizes the chapter's methods and main results.

THE TRANSFERABILITY PROBLEM IN THE REEMPLOYMENT BONUS EXPERIMENTS

A well-designed social experiment can offer a high degree of control over the variables that influence outcomes such as unemployment duration and earnings after reemployment, and as a result can yield unbiased, readily understandable, and convincing estimates of the impact of an economic incentive on behavior. A variety of problems may hamper the transfer of experimental results to what could be expected of an actual program, however. Existing treatments of the transferability of experimental results include Aigner (1985), Spiegelman and Woodbury (1990), Garfinkel, Manski, and Michalopoulos (1992), Moffitt (1992a), Davidson and Woodbury (1993), and Meyer (1995). However, there is no generally accepted categorization of problems underlying the transferability of experimental results. Accordingly, we offer the following catalog of transferability problems, based on the labor market model that we use to investigate those problems.

Briefly, the results of implementing an actual program may differ from the effects of a treatment as estimated in a social experiment for five reasons.

1) Spillover effects—the possibility that workers who respond to the bonus program would make it more difficult for other workers to find employment (that is, would crowd out or displace other workers from employment).

2) Classification changes without efficiency implications—in particular, the possibilities that if a program were adopted, more bonus-qualified workers would actually collect a bonus and more work-

ers eligible for unemployment insurance (UI) would claim bene-
fits in order to collect a bonus.

3) Behavioral changes with efficiency implications—the possibility
that under an actual bonus program, an increasing share of bonus-
offered workers would participate and respond to the bonus offer
by increasing their job-search intensity.

4) Scale effects—the possibility that program outcomes would differ
from experimental outcomes if a bonus program were offered to a
different population or adopted on a different scale than the
experiments.

5) Exogenous economic changes—the possibility that different eco-
nomic or labor market circumstances, which may not have been
adequately controlled for in the experiments, would yield pro-
gram outcomes that differed from the experimental outcomes.

Table 6.1 lists these five transferability problems and notes the features
of the model that allow us to account for them. Each problem is dis-
cussed in turn.

Spillover Effects

Experimental impacts are usually estimated only for the subgroup
of the population that would be eligible for the program, but a program
may have indirect or spillover effects on other groups of workers. For
example, an experimental training program to upgrade the skills of
workers could improve the employment and earnings of the program's
participants at the expense of workers who don't participate and who
would have gotten jobs in the absence of the program. This "crowding
out" of nonparticipants by participants is especially likely if the train-
ing program were implemented in a local labor market where there
were few job vacancies.

A reemployment bonus has the clear potential for a spillover or
crowding-out effect. Reemployment bonuses are intended to increase
the search intensity of the UI claimants who have been offered
bonuses. An effective bonus offer would drive bonus-offered claimants
to find job vacancies earlier (on average) than otherwise. As a result,
part of the improved labor market performance of bonus-offered work-

Table 6.1 Transferability Problems and Features of the Model that Allow Them to Be Analyzed

Effect or change considered	Features of the model
Spillover effects	Multiple groups of workers/parameters characterizing workers' behavior and responses to changing incentives
Classification changes without efficiency implications	Multiple groups of workers
Behavioral changes with efficiency implications	Parameters characterizing workers' behavior and responses to changing incentives
Scale effects	Multiple groups of workers/parameters characterizing workers' behavior and responses to changing incentives
Exogenous economic changes	Parameters characterizing the labor market and constraints facing workers

ers would be at the expense of workers who were not offered bonuses. Some non-offered workers would, in effect, be crowded out of employment as a result of the bonus program and would experience longer spells of unemployment and a higher unemployment rate.[1]

Because of the difficulties in estimating crowding out in an experimental design, we have modeled the crowding out of a reemployment bonus program using an equilibrium search and matching model (Davidson and Woodbury 1993, 2000). In the model discussed in the appendix, which is based on our earlier work, the crowding-out effects of the reemployment bonus differ across various groups of job seekers. In particular, we distinguish among crowding out of job seekers who are offered the bonus but don't respond to it, job seekers who have been offered a bonus but whose bonus qualification period has expired (that is, UI-eligible job seekers whose spells of unemployment extend beyond the bonus qualification period), and job seekers who are never offered the bonus (both UI-eligible nonclaimants and UI-ineligible job seekers, such as new labor force entrants and re-entrants). We also check the sensitivity of the crowding-out estimates to variation in the

UI take-up rate and the *bonus take-up rate*—that is, to changes in the proportion of UI-eligible workers who claim their benefits and changes in the proportion of bonus-qualifiers who actually collect a bonus for which they qualify.

Spillover effects have real consequences for employment, unemployment, resource allocation, and efficiency. That is, spillovers imply that the economic prospects of those who do not participate in a program are harmed by the improved situation of program participants. For that reason, spillover effects are more serious than, for example, classification changes (such as changes in the bonus take-up rate, the proportion of bonus-qualified workers who collect a bonus), which have measured impacts but do not have economic or efficiency impacts. Spillover effects are discussed further on pp. 188–190.

Classification Changes without Efficiency Implications

A program's take-up rate may differ from the take-up rate observed in an experiment; that is, a greater percentage of individuals who are eligible to receive a benefit may choose to collect the benefit once a permanent program is implemented. These are classification changes without efficiency implications because they represent changes in the way workers classify themselves but require no change in underlying economic behavior (such as a change in job-search intensity). Although they will change the government's cost of financing a program, classification changes have no effect on economic outcomes or resource allocation.

It is well-known that less than 100 percent of the individuals who are eligible to collect benefits under social programs actually do so. For example, available estimates suggest that only between 55 and 75 percent of workers who are eligible to claim UI benefits do so, and it was seen in Chapter 3 that only one-half to two-thirds of the workers who qualified for a bonus in the Illinois, Pennsylvania, and Washington experiments actually collected a bonus.

The concern is that some workers would reclassify themselves in one of two ways if a bonus program were adopted. Consider first UI-eligible workers with short expected durations of unemployment who used to find that the costs of claiming UI outweighed the benefits. After adoption of a bonus program, these UI-eligible nonclaimants

could, with no change in job-search intensity or timing of reemployment, become UI-eligible claimants and receive both UI benefits and a bonus. This would be observed as increases in the UI take-up rate (the proportion of UI-eligible workers who claim benefits), the bonus take-up rate, and the financial cost of providing benefits and bonuses to claimants. Second, once a bonus program were adopted, a higher percentage of workers who qualify for a bonus might collect one. This would be observed as increases in the bonus take-up rate and the financial cost of providing bonuses. Both of these are "classification changes" because either could occur if workers reclassified themselves; that is, if they claimed benefits or collected a bonus *without any change in job-search behavior or the timing of reemployment*.

Classification changes pose a problem for the validity of experimental estimates of the financial cost of a bonus program. If either the UI take-up rate or the bonus take-up rate increased after program adoption, the government's cost of the UI program would increase. In other words, classification changes would lead to measurable differences between the financial cost of the experiments and the financial cost of a program.

However, classification changes would not lead to differences between the employment and unemployment outcomes of an experiment and those of a bonus program. The reason, as already noted, is that no change in economic behavior—job-search intensity or timing of reemployment—would be required in order to effect these classification changes. Unlike spillover effects and the other effects considered, classification changes have only measured impacts on the government's cost of the program. They have no consequences for resource allocation and efficiency. Classification changes without efficiency implications are discussed further on pp. 191–195.

Behavioral Changes with Efficiency Implications

The responses of workers to an actual program may differ from their responses during an experiment for several reasons (which are not necessarily mutually exclusive). First, social experiments are inevitably of limited duration. If participants' planning horizons exceed the length of an experiment, then the behavior of participants during the experiment may differ from what it would be if the program were

adopted. This can be thought of as a time-horizon effect. Time-horizon effects posed a concern for the income maintenance experiments of the 1960s and 1970s because participants may have been reluctant to give up jobs and adjust their labor supply in response to an experimental (and hence short-term) negative income tax system. If a negative income tax program were adopted, participants might make long-term adjustments that differed from the short-term adjustments observed during the experiment.

The time-horizon problem could be a concern in transferring the results of the reemployment bonus experiments to an actual program. For example, it is possible that bonus-offered claimants viewed the experimental bonus offer as evanescent—an offer that would be available only during the current spell of unemployment and never again. If so, then claimants might be prone to respond to and collect a bonus under the experiment, whereas they might not do so under a bonus program. As a result, the bonus effects estimated in an experiment could be larger than those in an actual program, although it is difficult to gauge by how much.

A second reason for differences between behavior during an experiment and under an actual program is the learning effect. Learning effects are changes in behavior that may occur as program participants learn more about the workings of a program. Such changes may occur as participants become more convinced of the authenticity and permanence of a program, as they become increasingly aware of the consequences of their behavior under the program, or because it takes time for participants to make adjustments and rearrangements in response to new incentives.[2]

If a program is subject to learning effects, then a short-term experiment may be an incomplete guide to what could be expected under an actual program. In general, the existence of learning effects implies that experimental results will underestimate the long-run response to a fully implemented program because, under an actual program, participants would have enough time to understand fully and respond to the incentives created by a program. There is some evidence that learning effects may have been a problem in the Illinois bonus experiment. In a follow-up survey of a random sample of UI claimants who were offered the Illinois bonus, about one-third of those who refused to participate in the experiment indicated that failure to understand or trust

the experiment was the reason for refusal (Spiegelman and Woodbury 1987, Chapter 7). This was the case even though the bonus offer was simple to understand, its credibility was easily established, and participants needed little time to adapt or respond to the program.

A third reason for behavioral changes after adoption of a program would be changes in norms that occur over time after adoption of a program. Especially with an income transfer program like welfare, social norms may make it difficult for many individuals to participate, at least when a program is first adopted. It is possible that some bonus-offered claimants chose not to respond to the bonus offer because they felt some stigma attached to doing so—they would be taking a bribe to accept a job, perhaps. However, there is little evidence of such stigma in the responses to follow-up questions that were put to bonus-offered workers in Illinois (Spiegelman and Woodbury 1987, Chapter 7).

As with spillover effects, behavioral changes have consequences for employment, unemployment, and efficiency. For example, if a higher proportion of bonus-offered workers responded to a bonus by increasing their job-search intensity, then bonus-offered workers as a group would experience shorter spells of unemployment and increased employment. Such behavioral changes with efficiency implications are discussed further (pp. 192–195).

Scale Effects

There may be differences between an experiment and a program that result because a program is adopted on a different scale (either larger or smaller) than the scale on which the experiment was conducted. Scale effects could result because a program is adopted across a wider (or narrower) geographical area than in an experiment or because it is implemented for different groups of individuals (or more or fewer groups of individuals) than in an experiment. Such differences in scale may again result in differences between experimental results and the outcomes of an actual program.

Typically, the scale of an actual program is larger than that of an experiment, as would occur if bonus offers were made to all new UI claimants rather than only to randomly assigned claimants in certain geographic areas. Increased scale could affect the outcomes of a reemployment bonus program, for example, by changing the likelihood of

crowding out, or by extending the bonus offer to groups of workers who had been ineligible for experimental bonus offers and whose behavioral responses differed from the groups who were tested.

However, a reemployment bonus program could also be adopted on a smaller scale than the experiments. For example, it would be feasible (and consistent with the goals of a bonus offer) to limit bonus offers to dislocated workers or workers who are believed to be potential UI exhaustees. An important feature of the Washington reemployment bonus experiment was to test whether dislocated and other workers responded differently to the bonus offer. The results suggested no important difference between the two groups (Spiegelman, O'Leary, and Kline 1992), but there could be scale effects if, by offering the bonus to a relatively small group of workers, the overall increase in job-search intensity induced by the bonus program were relatively small. A small increase in search intensity would lead to a relatively small increase in overall employment and the possibility of greater crowding out of workers who are not offered a bonus. These implications are developed further on pp. 195–198.

Exogenous Economic Changes

The economic conditions under which a program is implemented may differ from the economic conditions that prevailed during an experiment. Fully controlling for differences in economic conditions during an experiment may be difficult or impossible, but failing to do so may lead to experimental estimates that differ from the outcomes of the program.

In terms of the model used below, exogenous economic changes amount to changes in parameters that characterize the labor market. In principle, adequate data and modeling should allow us to explain differences across the experiments in Illinois, Pennsylvania, and Washington and to predict the circumstances under which the bonus will be most effective.

Results presented in Chapter 4 of this volume (Table 4.6) suggest that, in Pennsylvania and Washington, the effect of a reemployment bonus offer was greater at sites where labor market conditions were good. This finding poses a puzzle—the bonus impact was greater in Illinois than in either Pennsylvania or Washington, even though labor

market conditions appear to have been worst in Illinois. The issue of labor market conditions and the efficacy of the reemployment bonus are discussed further on pp. 198–201.

Remarks on Internal Validity

The five problems discussed above all come under the heading of external validity or transferability. Other pitfalls in social experimentation involve internal validity; that is, ensuring that the comparison between the control and experimental groups is unbiased. Internal validity is prior to the questions of transferability; it is a necessary but not sufficient condition for transferability of experimental results to a program setting. The most commonly cited problem of internal validity is the so-called Hawthorne effect, which occurs if subjects respond to an unintended treatment rather than to the designed treatment. The Hawthorne effect takes its name from experiments at the Hawthorne plant of Western Electric Company (in Chicago), where changes in lighting and room color were made to determine their effects on productivity. The experimenters found that productivity improved, but they discovered that the improvements resulted from the increased attention that was paid to workers whose work spaces were changed rather than from the tested changes in lighting and color.

A Hawthorne effect could have existed in the reemployment bonus experiments if participants increased the intensity of their job search because they felt they were being watched or wanted to please those conducting the experiment, rather than in response to the bonus offer. A Hawthorne effect seems unlikely in the reemployment bonus experiments for two reasons. First, in the Illinois bonus experiment, there were actually two treatments: the claimant bonus (in which new UI claimants were offered a $500 bonus to become rapidly reemployed) and an employer bonus, in which a random sample of new UI claimants was instructed to tell each prospective employer that he or she (the prospective employer) would receive a $500 bonus for hiring the claimant within 11 weeks of the initial claim. This employer bonus showed quite small effects, whereas the bonus offer to claimants showed significant effects (Woodbury and Spiegelman 1987). If the impacts of the bonus offer to claimants were merely a Hawthorne effect, then the employer bonus should have turned up significant

effects. Hence, the Illinois experiment itself provides evidence that the impacts of the bonus offer to claimants were not the result of a Hawthorne effect. Second, in both the Pennsylvania and Washington experiments, several treatments were offered, with various bonus amounts and qualification periods. As discussed in Chapter 4, the bonus treatments were related to outcomes in predictable ways that suggest that economic incentives, rather than Hawthorne effects, were at work in the experiments.

SPILLOVER EFFECTS, CLASSIFICATION CHANGES, AND BEHAVIORAL CHANGES FOLLOWING ADOPTION OF A BONUS PROGRAM

In the chapter appendix, we develop a model that provides a framework for evaluating and quantifying the differences between the outcomes of the reemployment bonus experiments and what could be expected in an actual program. The model considers four well-defined groups of workers who exhibit optimizing behavior. It includes parameters characterizing the labor market and various constraints facing workers and parameters characterizing the preferences of workers and governing their responses to changed incentives. Changes in behavior that were observed in the reemployment bonus experiments are used to calibrate the model; that is, the behavioral impacts of the bonus experiment are used to gauge important and otherwise unobservable behavioral parameters. Once the model is calibrated, it is possible to simulate how various outcomes—such as unemployment duration and employment—would be altered if groups other than bonus-offered workers were affected by a bonus program or if bonus-offered workers behaved differently in a program than during the experiment. Direct observation of these effects, were it possible, would be preferable to the modeling approach taken here. Absent direct observation, however, the model provides a framework for analyzing the transferability problem and for roughly quantifying impacts that cannot be observed in an experiment.[3]

In the model, the bonus offer increases the opportunity cost of unemployment for bonus-offered workers, and some bonus-offered

workers respond by increasing the intensity of their job search. This increase in search intensity has the following implications. First, there is an increase in overall steady-state employment. That is, more of the total available jobs are filled as the bonus-offered workers who respond to the offer search harder for jobs and accept jobs that would otherwise have remained vacant. Second, reemployment probabilities and employment levels rise for bonus-offered workers who respond to the offer, and they fall for all other workers, who are beaten to vacancies and crowded out of the labor market by the more aggressive workers who respond to the bonus offer. In general, the larger the increase in overall steady-state employment, the less crowding out will occur.[4]

These impacts of the bonus offer can be thought of respectively as a *gross employment effect* and *a crowding-out effect*. Note that the gross employment effect is an increase in total employment that is driven by the increase in search effort of workers who respond to the bonus offer. The increase in employment of these responders is offset at least partially by decreases in employment of other groups of workers—the crowding-out effect.

From the standpoint of analyzing the transferability of the bonus experiments' results to an actual program, the model has three main features. First, it breaks workers into four groups: 1) UI-ineligibles, 2) UI-eligibles who claim their benefits and respond to the bonus, 3) UI-eligibles who claim their benefits and fail to respond to the bonus, and 4) UI-eligible nonclaimants (see Figure 6.A1 and the accompanying discussion in the appendix). This breakdown lets us consider the impact of the bonus on groups other than those offered the bonus (UI-ineligibles and UI-eligible nonclaimants) and on workers who, although offered the bonus, do not respond. As a result, the model provides a way of understanding spillover effects. In the case of the reemployment bonus, crowding out is the most important spillover; that is, the bonus program tends to prolong the unemployment spells and reduce the employment of workers who are not offered or do not respond to the bonus.

Second, the model allows for variation in the UI take-up rate, defined as the proportion of UI-eligible unemployed workers who claim their benefits (denoted by k in the model). A concern raised about a reemployment bonus program is that it could lead to an increased UI take-up rate, which has hovered around 65 percent for the

past 20 years. Increased UI take-up would involve the reclassification of workers, increasing the government's cost of the reemployment bonus program but leaving the real economic outcomes of the program unchanged. Because the UI take-up rate is a parameter in the model, the model provides a way of showing that the real economic outcomes of a bonus program would be unchanged if the UI take-up rate were to rise.

Third, the model specifies and distinguishes between the reemployment bonus response rate (defined as the proportion of bonus-offered workers who respond to the bonus by increasing their search intensity, denoted by ρ in the model) and the reemployment bonus take-up rate (defined as the proportion of workers who qualify for a bonus who actually collect it, denoted by τ in the model). The bonus response rate cannot be observed, but inclusion of the bonus take-up rate (which is observable) in the model allows us to identify and solve for the bonus response rate. Once solved for, the bonus response rate can be varied exogenously to gauge how the outcomes of a bonus program would differ if the bonus response rate increased. This allows examination of how an important behavioral change would affect the outcomes of a bonus program.

Because we refer to the above three parameters frequently in the following discussion, their definitions are repeated here:

k—the UI take-up rate, defined as the proportion of UI-eligible unemployed workers who claim their UI benefits;

ρ—the reemployment bonus response rate, defined as the proportion of bonus-offered workers who respond to the bonus by increasing their search intensity;

τ—the reemployment bonus take-up rate, defined as the proportion of workers who qualify for a bonus who actually collect it.

Distinctions among these three parameters are important and worth highlighting. A change in the bonus response rate (ρ) represents a change in behavior that has implications for employment, unemployment, and earnings—that is, implications for real economic outcomes and efficiency. In other words, changes in ρ are behavioral changes with efficiency implications. Changes in the UI and bonus take-up rates (k and τ), on the other hand, result in measured changes only,

such as changes in bonus payouts and (consequently) the government's cost of financing UI or a reemployment bonus program. In other words, changes in k and τ are classification changes without efficiency implications.

Spillover Effects

In the context of a reemployment bonus, the main spillover effect that has concerned policymakers is crowding out. Our goal is to gauge the seriousness of crowding out and to illustrate the extent to which variations in the UI take-up rate (k) and the bonus take-up rate (τ) affect estimates of crowding out. To do so, we solve the model for various values of k and τ and compare the results. The results are reported in Table 6.2.

Column 1 of Table 6.2 shows the model's predictions of how a bonus program would affect employment and the duration of unemployment, assuming that all UI-eligible workers claim benefits and all who qualify for a bonus collect it.[5] Both of these underlying assumptions are clearly unrealistic. In this case, for every job gained by UI-eligibles, 0.39 job is lost by UI-ineligibles (138/351 = 0.39). We refer to this as the *crowding-out ratio*—the ratio of employment losses suffered by groups that lose employment to employment gains of the group that benefits from the bonus offer. Note also that the average spell of unemployment of UI-ineligibles would lengthen by 0.27 week. These results suggest that, although a bonus program would entail some crowding out, the amount would be rather small.

Column 2 reports results when we assume (more realistically) that the UI take-up rate is 65 percent, and (still unrealistically) that the bonus take-up rate is 100 percent. Column 2 suggests that crowding out is now more serious: for every job gained by UI-eligible claimants, 0.60 job is lost by the losers (i.e., the crowding-out ratio is now (96 + 78)/292 = 0.60). Note that the employment losses suffered by those not offered the bonus are split about equally between UI-eligible non-claimants and UI-ineligibles.

Column 3 reports results when we again assume a UI take-up rate of 65 percent but now assume a bonus take-up rate of 55 percent (as occurred in the Illinois bonus experiment). Crowding out is now even greater: for every job gained by bonus-offered workers who respond to

Table 6.2 Changes in Employment and in Duration of Unemployment Resulting from a $500 Reemployment Bonus[a]

UI take-up rate (k) 100%	65%	65%	65%
Bonus take-up rate (τ) 100%	100%	55%	55%
Worker group (1)	(2)	(3)	(4)
UI-eligibles	351*	196	194	328
	(−0.741)	(−0.398)	(−0.393)	(−0.482)
Claimants	—	292*	297	455
		(−0.714)	(−0.714)	(−0.877)
Respond to bonus	—	—	415*	599*
			(−1.718)	(−1.652)
Ignore bonus	—	—	−118	−144
			(0.223)	(0.286)
Nonclaimants	—	−96	−103	−127
		(0.188)	(0.204)	(0.251)
UI-ineligibles	−138	−78	−94	−115
	(0.269)	(0.152)	(0.185)	(0.228)
Net increase in employment (J)	213	118	100	213
Crowding-out ratio[b]	0.39	0.60	0.76	0.64
ρ (bonus response rate)[c]	—	—	0.488	0.55

[a] The top number in a pair of values is the change in employment per 100,000 labor-force participants; the number in parentheses is the change in unemployment duration in weeks. The group that gains from the reemployment bonus offer in each case is shown by an asterisk (*). Values are based on simulations described in the text.

[b] The crowding-out ratio is the ratio of employment losses suffered by groups that lose employment to employment gains of the group that benefits from the bonus offer.

[c] In column 3, the bonus response rate (ρ) is retrieved from the observed bonus impacts; in column 4, it is set to 0.55, the calibration from column 3 is retained, and the employment changes and changes in duration of unemployment are solved.

the bonus, 0.76 job is lost by bonus-offered workers who ignore the bonus offer, UI-eligible nonclaimants, and UI-ineligibles (that is, the crowding-out ratio is [118 + 103 + 94]/415 = 0.76). Again, the employment losses suffered by those not offered the bonus are split about equally among the three groups of losers.

Why does the crowding-out ratio progressively increase as the assumptions are made more "realistic"? Consider first column 1. In

this case, we assume that all UI-eligible workers claim their benefits and respond to the bonus. This means that 40 percent of all unemployed workers increase their search effort during the first six 2-week periods of unemployment. A direct result of this increase in search effort is an increase in overall employment; that is, more of the economy's total available jobs (F) are filled—J rises and V falls. This increase in employment allows the UI-eligibles to obtain jobs with relatively little crowding out of UI-ineligibles.

The results in column 2 suggest that crowding out would be larger in the presence of a UI take-up rate of only 65 percent. Because, in this case, 35 percent of UI-eligibles do not claim their benefits, fewer workers are offered the bonus, and there is less scope for the bonus offer to alter behavior. In other words, fewer workers have increased their search effort as a result of the bonus offer. When fewer workers claim their UI benefits and respond to the bonus offer, employment increases by less as a result of the bonus offer (that is, J rises by less and V falls by less), and more of the increase in UI-eligible employment must come at the expense of other workers.

Finally, in column 3, it is again the case that 35 percent of UI-eligible workers do not claim their benefits (and hence are never offered the bonus). In addition, of the UI-eligible workers who do claim benefits and qualify for a bonus, only 55 percent collect the bonus. This implies that even fewer workers increase their search effort as a result of the bonus, and employment increases relatively little as a result. It follows that even more (over 75 percent) of the increase in employment for bonus recipients comes at the expense of other workers. The results reported in column 3 indicate that the UI-eligible claimants who do not respond to the bonus suffer the largest drop in employment. Why? Because these workers are receiving UI, they do not search as hard as UI-ineligibles. Also, they face a harder time finding a job than UI-eligible nonclaimants (because, by assumption, UI-eligible nonclaimants have higher reemployment probabilities). Thus, the workers who make the least effort to find a job are harmed the most.

Changes in the UI Take-Up Rate:
Classification Change without Efficiency Implications

Only 55 to 75 percent of the unemployed workers who are eligible to receive UI benefits actually claim them (Blank and Card 1991; Vroman 1991). Meyer (1995, pp. 108–110) argued that adoption of a bonus program could induce more UI-eligible workers to claim their benefits and hence would increase the UI take-up rate. In particular, for a worker expecting a short spell of unemployment and facing a low UI replacement rate, the existence of the bonus for rapid reemployment might make it worthwhile to claim benefits where, in the absence of a bonus, the benefits of claiming UI benefits might not outweigh the costs. Meyer referred to this as an "entry effect" because workers would in effect enter the UI program in response to a change in the program. He suggested that a bonus the size of the Illinois bonus would lead to a 7 to 12 percent increase in the UI take-up rate.[6]

We previously referred to such effects generally as classification changes without efficiency implications. This is because workers who newly chose to claim UI benefits (that is, reclassified themselves from UI-eligible nonclaimants to UI-eligible claimants) in order to take advantage of the bonus offer would behave no differently after the change than they did before. Workers who claimed UI benefits in response to the bonus would generally be workers with short expected durations of unemployment for whom the advantages of claiming benefits were previously not enough to outweigh the costs.[7] For such workers, the bonus offer tips the benefit-cost balance in favor of claiming benefits, but no change in behavior (apart from claiming benefits) is needed for these workers to receive benefits and collect a bonus—they would behave as they would have in the absence of a bonus, experiencing a short spell of unemployment.[8]

Another way of viewing this point is to compare columns 1 and 2 of Table 6.2. The net increase in employment resulting from the bonus is estimated to be 213 per 100,000 labor-force participants when the UI take-up rate is 100 percent (column 1) but only 118 per 100,000 when the UI take-up rate is 65 percent (column 2). It is tempting to argue that, if the UI take-up rate increased following adoption of a bonus program, then the benefits of the bonus program (in terms of increased employment) would rise, but that would not be correct. Workers classi-

fied as UI-eligible nonclaimants in column 2 would be reclassified as UI-eligible claimants if they claimed benefits in response to the bonus offer, but their job-search behavior would be unchanged. As a result, employment gains among UI-eligible claimants would fall, as would employment losses among UI-eligible nonclaimants. These offsetting changes would be measured changes only—there would be no real change in economic outcomes.

It follows that, although the increased UI take-up rate that would result from adopting a bonus program would increase the total payout of the UI system (weekly benefits plus bonuses), it would not affect efficiency or resource allocation. That is, it would not reduce the real economic benefits of the bonus program, which stem from employment increases that are induced by the bonus. Although the cost of the UI program would rise as a result of increased UI take-up, the increase would amount to an income transfer—a cost to the program but not to society.[9]

Changes in the Bonus Response and Take-Up Rates

Fewer than half of the individuals who are eligible to participate in social programs such as Aid to Families with Dependent Children and job training programs actually do so. Why this is true is one of the least understood aspects of social programs (Moffitt 1992a,b; Heckman and Smith 1995). Similarly, only 55 percent of the workers who qualified for a bonus in the Illinois bonus experiment chose to collect the bonus. It is difficult to explain why this should be the case, as was seen in Chapter 3. Moreover, there is no way of directly observing the proportion of workers who changed their behavior in response to the bonus offer and intensified their job search.

These points lead to one of the most difficult issues in analyzing the transferability of the bonus experiments' results to an actual policy—the possibility that the response to an actual bonus program would be greater (or less) than occurred during the experimental demonstrations. Changes in response, which we define as changes in the proportion of workers who show a behavioral response to the bonus offer, could occur with the adoption of a reemployment bonus program for a variety of reasons. If there are learning effects associated with a bonus offer—for example, it takes time for some UI claimants to

understand or trust the bonus offer, as suggested by the available survey evidence—then response to a bonus program might be greater than response to the experiments. In our discussion of transferability problems in the first section of this chapter, these problems came under the heading of behavioral changes with efficiency implications because in the context of our model they will take the form of a change in a behavioral parameter, ρ, defined as the proportion of workers who respond to the bonus by increasing their job search intensity.

As already noted, the model includes the bonus take-up rate (τ, the proportion of bonus qualifiers who collect a bonus) as a parameter. Unlike ρ (the bonus response rate), τ can be observed. Inclusion of the bonus take-up rate in the model allows us to identify the bonus response rate. To see this, note first that Equation 27 in the appendix defines τ as the ratio of a) those who responded to and collected the bonus to b) those who qualified for a bonus by receiving 11 or fewer weeks of UI benefits. Next, recall that about 55 percent of the workers who qualified for the $500 reemployment bonus in Illinois actually collected it. This observation allows us to impose an additional constraint on the model that identifies the bonus response rate.

Column 3 of Table 6.2 shows the results of setting the bonus take-up rate (τ) equal to 55 percent (rather than 100 percent as in columns 1 and 2) and then solving the model to obtain an estimate of ρ. The estimate is about 49 percent—that is, roughly half of the UI claimants who were offered the $500 bonus in the Illinois experiment actually changed their behavior as a result of the bonus offer. This is an estimate of the proportion of workers who responded to the bonus offer whether or not they succeeded in shortening their spell of unemployment enough to qualify for the bonus. The estimate also accounts for (that is, excludes) workers who collected a bonus without responding—that is, workers who would have been unemployed for less than 11 weeks in any event and for whom the $500 bonus was a windfall.[10]

Column 3 also yields an estimate of the average reduction in unemployment duration of the workers who responded to the bonus. This estimated reduction is 1.7 weeks, more than twice the 0.7-week reduction for all workers who were offered the bonus. Bonus-offered workers who ignored the bonus offer had slightly longer spells of unemployment, according to the model.

The model can also be used to gain insight into what would happen if the bonus response rate were to rise after adoption of a bonus program. To do so, the bonus response rate (ρ) is treated as a parameter and imposed exogenously rather than solved for as in column 3. In column 4, a bonus response rate of 55 percent is imposed—about 6 percentage points (or 10 percent) higher than our estimate of ρ from column 3. The higher bonus response rate significantly changes program outcomes. With a higher response rate, the employment increases of claimants who respond to the bonus are much larger (599 per 100,000 rather than 415 per 100,000), although in absolute terms the crowding out of other groups of workers is also greater. In relative terms, though, crowding out is less when the bonus response rate is higher; the crowding-out ratio is 0.64 in column 4 versus 0.76 in column 3.

Note also that, with the 10 percent increase in the bonus response rate, the net increase in jobs more than doubles from 100 per 100,000 to 213 per 100,000. These gains occur because, when the response to the bonus is larger, job vacancies are filled more quickly and steady-state employment increases. All of these gains go to UI claimants who respond to the bonus.

Note that existing data provide no way of estimating how (or whether) either the bonus take-up rate (τ) or the bonus response rate (ρ) would change if a bonus program were adopted. Nevertheless, some observations can be made about what would occur if either τ or ρ changed following adoption of a bonus program. First, a change in the τ is a classification change without efficiency implications. An increased bonus take-up rate implies that more of the workers who qualify for the bonus actually collect it. It implies no change in the job-search intensity or timing of reemployment of bonus-offered workers and hence has no effect on "real" program outcomes, such as employment or crowding out. An increase in the bonus take-up rate increases the payout of bonuses to UI claimants, leads to additional income transfers, and increases the UI system's costs. In other words, increases in the bonus take-up rate are like the increases in the UI take-up rate (k)—they have implications for the finances of the bonus program but no implications for efficiency or resource allocation.

In contrast, an increase in the bonus response rate is a behavioral change with efficiency implications; that is, an increase in ρ changes

real program outcomes. An increased response to the bonus leads to larger increases in net employment and reduced crowding out (compare columns 3 and 4 in Table 6.2). In other words, the results suggest that increases in the bonus response rate would improve the functioning of the program by leading to both greater employment gains and reduced crowding out.

DISLOCATED WORKERS AND
EXOGENOUS ECONOMIC FACTORS

Limiting a Bonus Program to Dislocated Workers

If a bonus program were implemented, one likely option would be to offer bonuses only to specific groups of workers, such as dislocated workers (that is, workers who had seniority of at least three years with the employer who laid them off). Indeed, administrative rules proposed by the Clinton Administration in 1994 enabled state employment security agencies to offer a reemployment bonus to workers who meet the state's "profiling" criteria—that is, to workers predicted to have a high probability of exhausting their UI benefits.[11]

Implementing a bonus program on such a restricted basis poses a potentially serious problem for transferring the results of the bonus experiments to actual policy. In all three of the bonus experiments, bonuses were offered to most new UI claimants. To restrict a bonus program to dislocated workers would imply significant changes in the type of workers eligible to participate in the program, since dislocated workers tend to be older and earn higher wages than the average UI claimant. Also, restricting a bonus program to dislocated workers would mean implementing the program on a smaller scale than occurred during the experiments.[12]

A variant of the model developed in the previous section can provide insight into whether a bonus program that was available only to dislocated workers would yield different results than were observed in the reemployment bonus experiments. That is, it is possible to model both the change in the population of workers who would be offered the bonus and the change in the scale of the program (relative to the exper-

iment) by adding appropriate subgroups to the model and assuming the bonus is offered only to a specific (and relatively small) group of workers.

To consider dislocated workers, we use a model similar to that developed in the appendix, but with one main difference. Rather than assume that the labor market has a single sector, we assume the existence of two employment sectors—high wage and low wage. Worker dislocation is treated by assuming that the economy experiences a one-time shock that causes part of the high-wage sector to shut down. Dislocated workers in the model are former employees of the high-wage sector who must now seek low-wage employment. In contrast, high-wage workers who experience a regular layoff search for (and eventually find) a high-wage job. Hence, in this model, there are three groups of UI-eligible claimants: 1) low-wage UI-eligible claimants, 2) high-wage UI-eligible claimants, and 3) dislocated UI-eligible claimants.[13]

In this modified model, the bonus offer to dislocated workers increases the opportunity cost of unemployment for dislocated workers and results in increased search effort on their part. For example, in a model in which half of all UI-eligible claimants are high-wage workers and 15 percent of all initial claimants for UI are dislocated, the search effort of dislocated workers increases by approximately 30 percent. This increase in search effort of dislocated workers has the same employment and crowding-out effects that were discussed on pp. 185–186. However, the employment effect is smaller than when the bonus is offered to all UI claimants because the group being offered the bonus—dislocated workers—is a relatively small portion of the labor force. The model's results suggest that the crowding-out effects of a bonus program for dislocated workers would be far greater than the crowding-out effects of a bonus program for most UI claimants precisely because of this smaller employment effect.

Table 6.3 shows the impacts of a reemployment bonus targeted on dislocated workers (column 1) and comparable results from a bonus offer to all UI claimants (column 2). In both sets of results, we assume that 60 percent of all unemployed workers are ineligible for UI ($q = 0.6$) and that 65 percent of UI-eligible workers claim their benefits ($k = 0.65$). The results in column 1 are based on the assumptions that half of all workers are high-wage workers and that 17.6 percent of low-wage UI-eligible claimants were dislocated from the high-wage

Table 6.3 Changes in Employment and in Duration of Unemployment Resulting from a $500 Reemployment Bonus Offered Only to Dislocated Workers[a]

Worker group	(1)[b]	(2)[b]
UI-eligible claimants	202	292*
	(–0.116)	(–0.714)
Dislocated	447*	—
	(–0.894)	
High wage	–93	—
	(0.016)	
Low wage	–152	—
	(0.025)	
UI-eligible nonclaimants	–93	–96
	(0.015)	(0.188)
UI-ineligibles	–105	–78
	(0.017)	(0.152)
Net increase in employment (J)	4	118

SOURCE: Figures in column 1 come from Davidson and Woodbury (2000, Tables 7A and 7B). Figures in column 2 are repeated from Column 2 of Table 6.2.

[a] The top number in a pair of values is the change in employment per 100,000 labor-force participants; the number in parentheses is the change in unemployment duration in weeks. The group that gains from the reemployment bonus offer in each case is shown by an asterisk (*).

[b] In column 1, the bonus offer is made to dislocated workers only. In column 2, the offer is made to all UI claimants.

sector. As we have shown in Davidson and Woodbury (2000, Tables 7A and 7B), the results in column 1 are robust to significant variation in both the percentage of the labor market that is high wage and the percentage of workers who are dislocated. Note that we have not divided dislocated workers into those who respond to the bonus offer and those who do not respond. This could be done at a cost of considerable added complexity, but the main points made presently would not change.

The main result is that a reemployment bonus targeted on dislocated workers would increase employment of dislocated workers (by 447 per 100,000 labor force participants) and decrease their unemployment duration (by about 0.9 week), but these gains for dislocated work-

ers come almost entirely at the expense of other groups of workers, all of whom suffer employment reductions as a result of the bonus offer to dislocated workers. The net increase in employment resulting from a bonus offered only to dislocated workers is just 4 jobs per 100,000 in the labor force, as compared with a net gain of 118 per 100,000 when the bonus is offered to all UI claimants. Crowding out is virtually complete in the case of a bonus program targeted on dislocated workers (the crowding-out ratio equals 0.99).

Crowding out is nearly complete in this case because the employment gains that result from offering a bonus to a small percentage of unemployed workers (in this case, dislocated workers) are correspondingly small. Recall that, in this model, employment gains occur through increases in the search intensity of workers who are offered an inducement (such as a bonus) 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 a bonus, employment rises only modestly.[14]

If the crowding-out effects of the bonus to dislocated workers are as large as our results suggest, then such a bonus fails miserably the Pareto criterion. However, for three reasons, we would not conclude that a bonus program for dislocated workers should be ruled out. First, worker dislocation results from structural changes in the economy that presumably benefit the majority of workers and society at the expense of dislocated workers. It is the burden of structural change, which itself fails the Pareto criterion, that the reemployment bonus is intended to redress. Second, as discussed in detail elsewhere (Davidson and Woodbury 2000, section III.E), the crowding-out results outlined above are quite sensitive to the assumption that full employment (or the total number of available jobs, F) is fixed and exogenous. Specifically, we find that if employers responded to a bonus for dislocated workers by increasing labor demand by just 0.025 to 0.03 percent, there would be no crowding out of nondislocated workers.

Exogenous Economic Factors and Differences among the Illinois, Pennsylvania, and Washington Experiments

Chapter 4 showed that the reemployment bonus experiments in Illinois, Pennsylvania, and Washington produced varied results. In Illi-

nois, a $500 cash bonus offer for finding reemployment within 11 weeks of claiming unemployment benefits resulted in a reduction of the expected duration of unemployment of 0.7 week for claimants eligible only for state regular benefits (that is, ineligible for FSC). In the Pennsylvania and Washington experiments, similar bonus offers reduced the expected duration of unemployment by 0.6 and by 0.34 week, respectively. Also, in the Illinois experiment, the impact of the bonus offer varied greatly depending on the potential duration of UI benefits. For workers eligible for 38 weeks of benefits as a result of Federal Supplemental Compensation (FSC), the bonus offer reduced the expected duration of unemployment by 1.75 weeks, whereas for otherwise similar workers eligible only for state regular benefits, it reduced unemployment duration by only 0.7 week (Davidson and Woodbury 1991).

The model developed in this chapter can provide some limited insight into why the bonus offers in Illinois, Pennsylvania, and Washington had such varied impacts. The exogenous economic factors that determine the efficacy of a bonus offer can be divided into supply and demand factors. On the supply side, we have anything that influences the job-search behavior of unemployed workers. The size of the bonus offer (and qualification period), the level and potential duration of UI benefits, and the expected reemployment wage all influence the search intensity of jobless workers. These supply factors provide at least a partial explanation of why the bonus offer had such a large impact on FSC-eligible workers in Illinois. When the potential duration of UI benefits is extended from 26 to 38 weeks (other things equal), as it was by the FSC program, optimal search intensity of UI recipients falls (that is, expected utility maximizing search intensity is reduced). This follows because an increase in the potential duration of UI benefits reduces the opportunity cost of being unemployed. If the marginal cost of search intensity increases with search intensity (that is, the opportunity cost of leisure is increasing), then in the absence of a bonus program, FSC-eligible workers would search less hard and face a lower marginal cost of search than workers who were eligible for only 26 weeks of benefits. Because FSC-eligible workers face a lower marginal cost of search, a bonus offer should induce a larger increase in their search intensity. The larger bonus-induced increase in search

intensity of the FSC-eligibles implies a larger bonus impact for these workers.[15]

On the demand side of the model, we have the job separation rate (s) and the total number of available jobs (F). Low separation rates (s) and rising availability of jobs (F) are both consistent with lower equilibrium unemployment rates, but low separation rates and rising availability of jobs have opposite implications for the effectiveness of a bonus program. When s is low, jobs do not turnover rapidly, so there are few vacancies (that is, unemployment is low because expected job duration is high). With few vacancies, it is difficult to find a job. So when s is low, a bonus offer will have a relatively small impact (Davidson and Woodbury 1993, Tables 1 through 4). On the other hand, when F grows, unemployment falls because there are a growing number of vacancies; so, jobs are easy to find and the increase in search effort induced by the bonus program should lead to a large reduction in unemployment duration (see again Davidson and Woodbury 1993, Tables 1 through 4).

So how can the differences across and within the Illinois, Pennsylvania, and Washington bonus experiments be explained? Across states, the bonus response was larger in Illinois, where the unemployment rate was high, than it was in Pennsylvania and Washington, where the unemployment rate was much lower. A possible explanation is that the Illinois experiment was conducted during the early stages of the 1980s recovery, whereas the Pennsylvania and Washington experiments took place after the recovery had matured. In Illinois, then, the separation rate (s) was falling from a high level and the number of available jobs (F) was growing as the recovery progressed. The high but falling separation rate would be consistent with a large but declining bonus impact, and the ready availability of jobs would be consistent with a large bonus impact. In Pennsylvania and Washington, on the other hand, separation rates were low and the number of available jobs, although high, was no longer growing rapidly. The low separation rate and slow growth of available jobs would both be consistent with a smaller bonus impact.

Within all three experiments, the bonus response was larger in areas with low unemployment. A plausible explanation is that differences in local unemployment rates are due to the massing of vacancies rather than to differences in local turnover rates. That is, within Illi-

nois, Pennsylvania, or Washington, differences in unemployment rates would result more from variation in the availability of jobs (F) across local labor markets than from variation in the separation rate (s). If so, then we would expect a larger bonus impact in local labor markets with low unemployment rates because low local unemployment rates reflect ready availability of jobs (rather than low turnover rates).

Although these explanations of the differences within and across the three experiments are connected to a consistent labor market model, they must be viewed as speculative in the absence of local labor market data on separation rates and job vacancies.

SUMMARY AND CONCLUSIONS

Designers of social experiments often pay little attention to whether the results of an experiment will be "externally valid" or transferable to a program setting. Clearly, the reason for devoting public funds to social experiments is to learn what would be the actual effects of programs that might be adopted. To ignore the transferability of an experiment is to invite experimental results that may say little about what policymakers want and need to know.

This chapter has examined the pitfalls in applying the results of the reemployment bonus experiments to what might be expected under a reemployment bonus program. The first section provides a model-based catalog of the problems that impede direct application of the results of an experiment to an actual program: spillover effects, classification changes without efficiency implications (including increases in the UI and bonus take-up rates), behavioral changes with efficiency implications (including changes in the bonus response rate), scale effects (including targeting a program on a specific group), and exogenous economic changes.

In the second section, we apply a model that is fully described in the chapter appendix to the five issues that are most important to transferring the results of the bonus experiments to a program setting. We examine the crowding-out effects of the bonus and find that increasingly realistic assumptions about the UI take-up rate and the bonus response rate suggest increasing degrees of crowding out. For exam-

ple, if all UI-eligible workers claim benefits and respond to the bonus, then for each job gained by bonus-offered claimants, only 0.39 worker who was not offered the bonus is crowded out of employment (we refer to this as a crowding-out ratio of 0.39). But, if we assume more realistically that only 65 percent of UI-eligible workers claim benefits and only 49 percent of the bonus-offered workers respond to the offer, the crowding-out ratio rises to 0.76. That is, the estimate of the crowding-out effect of the bonus program nearly doubles when we make realistic assumptions about the UI take-up rate and the bonus response rate. The reason for this increase in crowding out is that a reduced take-up of UI and less response to the bonus offer imply that fewer workers increase their search intensity as a result of the bonus offer. It follows that the net increase in employment resulting from the bonus offer is less, and the scope for crowding out is greater.

Pages 191–192 provide a fuller explanation of how an increase in the UI take-up rate would increase the government's cost of financing a bonus program but would have no implications for employment, unemployment, or the timing of reemployment. Accordingly, we refer to it as a classification change without efficiency implications. We also suggest that an increase in the UI take-up rate should not, in itself, be viewed as an adverse outcome of a bonus program.

On pages 192–195, we provide an estimate of the bonus response rate (ρ), which cannot be observed directly, but which can be solved for in the model. The estimate suggests that about half of all bonus-offered claimants responded to the bonus offer by increasing the intensity of their job search. Also, we estimate that these "bonus responders" shortened their unemployment spells by about 1.7 weeks on average, compared with an average reduction of 0.7 weeks among all workers who were offered the bonus. We also obtain results suggesting that a modest increase in the bonus response rate of about 10 percent (that is, from 49 percent to 55 percent) would greatly improve the outcomes of a bonus program: the net increase in jobs resulting from the bonus program would roughly double and the crowding-out ratio would drop from 0.76 to 0.64.

We also provide estimates of the likely impacts of a bonus program that targets dislocated workers (pp. 195–198). The results suggest that a bonus program for dislocated workers would increase the employment and reduce the duration of unemployment (by 0.9 week per spell)

of dislocated workers, but these gains for dislocated workers would be almost wholly at the expense of other (nondislocated) workers (crowding-out ratio = 0.99). The reason for this virtually complete crowding-out is that the net increase in employment resulting from a bonus program for dislocated workers would be negligible because dislocated workers are a relatively small group. That is, because a bonus program for dislocated workers would induce only a small group of workers to increase their job-search intensity, the resulting employment increases would be correspondingly small.

Finally, we attempt an explanation of the differences in observed bonus impacts across and within the Illinois, Pennsylvania, and Washington bonus experiments (pp. 198–201). First, similar bonus offers produced larger effects in Illinois (where the unemployment rate was high) than in Pennsylvania or Washington (where the unemployment rates were low). Second, within each state, better labor market conditions (lower unemployment rates in a local labor market) were associated with larger bonus impacts. We explain these two apparently conflicting observations by referring to the model and noting that a low job separation rate (s) and growing number of available jobs (F) are consistent with a low unemployment rate, but a high job separation rate (s) and a growing number of available jobs (F) are consistent with a large bonus impact. We speculate that the relatively large bonus effect in Illinois was due to the high (albeit falling) separation rate and growing availability of jobs during the Illinois experiment, which occurred during the most robust part of the expansion of the 1980s. Both the Pennsylvania and Washington experiments were conducted later in the expansion, when the separation rate would have been low and job growth relatively slow. Both conditions would be consistent with relatively small bonus effects. Also, we speculate that the inverse relation between the size of the bonus effect and the unemployment rate within each of the experiments is a result of variation in the availability of job vacancies across the experimental sites. That is, growth in the availability of jobs would be the main reason for the relatively large bonus effects that occurred in local areas where the unemployment rate was low.

Notes

1. In fact, crowding out could compromise the internal validity as well as the transferability of experimental results. In the bonus experiments, if the reemployment prospects of control group members were harmed by the increased search intensity of bonus-offered claimants, then the experimental results would overstate the effect of the bonus program. Because the number of bonus-offered claimants was small in relation to the labor markets in which bonus-offered workers were searching, and because there was no incentive for employers to hire bonus-offered claimants rather than other applicants, it seems unlikely that crowding out would have compromised the internal validity of the bonus experiments.

2. Learning effects and time-horizon effects, although related, are distinct. For example, an experiment could be long enough for participants to be convinced of the experiment's legitimacy, to understand the consequences of their behavior, and to have all the time needed to make adjustments. If their planning horizons exceed the experiment's duration, however, time-horizon problems could arise. Learning effects may also occur as a result of changes in the behavior of program administrators.

3. The model imposes three simplifying assumptions that need to be recognized. First, the total number of jobs available in the economy (or the demand for labor) is considered fixed; that is, there is no attempt to model employers' demand for labor. This could be an important shortcoming if a policy change could have a significant impact on labor demand. Second, the size of the labor force (L) is exogenous; that is, we do not model the labor force participation decision, although one could do so. Third, the wage rate is exogenous in the models we use below, although again one could endogenize the wage rate if thee were reasons for doing so. In an early version of the model, we did endogenize the wage in a bargaining framework (Davidson and Woodbury 1990).

4. There is also a third, relatively subtle effect: as the reemployment probabilities of workers who are not offered the bonus (or do not respond) change, their optimal search effort changes. As it becomes more difficult for the workers who are not offered the bonus (or do not respond) to find jobs, their search effort adjusts. We refer to this as the rivalry effect but do not discuss it in detail here because it turns out to be extremely small (see Davidson and Woodbury 2000).

5. With both take-up rates equal to 100 percent, the model is identical to the one used in Davidson and Woodbury (1993). The results reported in Table 6.2, column 1 are the same as in Table 2, column 4 of that paper.

6. Meyer (1995) also suggested three additional reasons for increased UI take-up in response to a bonus program. First, he wrote that voluntary job changers would claim UI benefits and prolong their jobless spells in order to receive the bonus (p. 109). However, since voluntary separations with reemployment within 3 months (the longest bonus qualification period that has been considered) are not eligible for UI, these workers would not be eligible for either UI or a bonus.

Second, Meyer was concerned about the significant number of dislocated workers who arrange a new job without an intervening spell of unemployment. The concern is that, with a bonus program, these workers would arrange for the new job to start a week or two after the old job ends, in order to receive a week of UI benefits and collect a bonus. This would be a clear abuse of the system because these workers could have obtained work earlier but chose not to. In effect, these workers would not satisfy the work-search test for UI—they would not be able, available, and searching for work—and hence should not be eligible for UI or a bonus.

Third, he wrote that firms would alter their temporary layoff behavior in response to implementation of a bonus (pp. 109–110). However, since recalled individuals would not receive a bonus by design, temporary layoff behavior would not be influenced by the presence of a bonus. (Meyer pointed out that about one-third of layoffs that start out as temporary end up as permanent, but the purpose of temporary layoff with recall is to keep the temporarily laid-off workers—workers with specific skills who the employer wants to rehire when demand recovers—from taking alternative employment. In cases where the employer's expectations were wrong, and the workers are not recalled, the bonus qualification period would have expired.)

The first two points above do raise issues of enforcement and fraud prevention. The existence of a bonus program would increase the importance of ensuring that workers who quit voluntarily did not receive benefits (and, possibly, a bonus). Also, the UI agency would need to verify that a worker who applied for a bonus had not arranged to delay a new job start so as to receive UI benefits and a bonus. Employers would generally be willing to cooperate in this kind of enforcement, since their payroll taxes are experience rates (that is, linked to the extent to which laid-off workers receive UI benefits). Clearly, these are real costs of administering a bonus program that require consideration.

7. This is consistent with existing evidence on take-up of UI. See, for example, Bland and Card (1991), Vroman (1991), and Anderson and Meyer (1994).

8. It is possible that some UI-eligible nonclaimants with an expected duration of unemployment of slightly longer than the qualification period might claim benefits and increase their job-search intensity in order to qualify for the bonus. This increased search intensity would imply an added real economic benefit of increased UI take-up, in return to the bonus expense. In contrast, it would make little sense for a UI-eligible nonclaimant with a long expected duration of unemployment (for example, a professional worker facing a low UI replacement rate) to become a claimant after adoption of a bonus program, since the bonus offer would not change the payoff to claiming UI benefits. (If the payoff to claiming were changed by the bonus offer and this worker did claim benefits, then the implication would be that the bonus offer would raise job-search intensity and have real economic benefits.)

9. There would be a social cost of the added transfers if the taxes levied to finance them distorted economic incentives in some way. The UI payroll tax may well

create such incentives (see, for example, the review by Topel 1990), but the amount of the transfers in question is not great in this case.

10. The estimate of 0.49 is similar to the proportion of bonus-offered workers in Illinois who found reemployment within 11 weeks and filed a Notice of Hire, which was 0.56 (Spiegelman and Woodbury 1987, Chapter 7). In Illinois, workers were asked to submit a Notice of Hire at the time of reemployment if they wanted to collect a bonus. The Notice of Hire was mainly a monitoring device that helped the experimenters to track the progress of the experiment and ensure that the bonus budget would not be exceeded. It also may have some behavioral content, however, as suggested by the correspondence between the proportion submitting a Notice of Hire and the estimated ρ.

11. The correspondence between workers who meet likely profiling criteria and dislocated workers is incomplete. In the 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.

12. Nevertheless, Spiegelman, O'Leary, and Kline (1992) found no difference between the bonus responses of dislocated and nondislocated workers in the Washington Reemployment Bonus experiment.

13. For a full description of the model, see Davidson and Woodbury (2000).

14. Recall that the bonus offer can increase employment even though full employment (or the total number of available jobs, F) is fixed in the model. Because $F = V + J$ (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.

15. By similar reasoning, workers who receive large weekly benefits and those who expect lower wages after reemployment would be expected to search less hard than workers who receive small weekly benefits or who face high wages after reemployment. Accordingly, the impacts of a bonus offer should increase with the weekly benefit amount and decrease with expected wages after reemployment.

Appendix: A Model for Transferring Experimental Results to an External Setting

This appendix provides a statement of the model that underlies the estimates given in Chapter 6. Following a discussion of our reasons for choosing the model we use, three sections offer a narrative development of the model. The final section is a full statement of the model's equations and notation.

The model we use is patterned after the "trade frictions" models of Diamond (1982), Mortensen (1982), and Pissarides (1984, 1990), among others. In such models, the number of contacts between workers and firms is determined by search effort, a matching (or search) technology, and equilibrium conditions stating that in steady state, the rate of job creation must equal the rate at which jobs break-up. In most models of this kind, job offers are never rejected (but see Diamond and Maskin [1979] for an exception).

The trade frictions approach we take contrasts with the approach to job search used more frequently in labor economics, in which unemployed workers choose a reservation wage and receive job offers that they are free to accept or reject. Job offers arrive randomly at an average rate (λ, say) and the wage offers come from a stationary cumulative distribution function $F(w)$. The rate of offer arrival and the distribution of wage offers are both exogenous, so that no attempt is made to model the firm's side of the labor market or to characterize the full labor market equilibrium. Because they consider only labor supply, models that rely on the reservation wage are commonly referred to as "partial-partial" models. In such models, unemployment is tied to the reservation wage and the rate of job rejection, whereas in the trade frictions approach, unemployment is determined by search effort and the matching technology.

We have two main reasons for choosing the trade frictions approach. First, it is relatively easy to incorporate institutional details of the UI system into a trade frictions model because this approach offers a natural way to model the progress of job search over time and to model changes in incentives that occur over the course of a spell of insured unemployment. The reemployment bonus and the UI system in which it is embedded both generate exogenous changes in search incentives that occur at discrete times during the unemployment spell, and it is essential that these be captured in our model. Atkinson et al. (1984) and Atkinson and Micklewright (1991) have also noted the difficulty of incorporating institutional detail in partial-partial models.

Second, it is very difficult to implement the partial-partial approach empirically because it places severe demands on our knowledge of the labor market—for example, knowledge of the wage-offer distribution, $F(w)$. In particular, quantitative predictions of partial-partial models are highly sensitive

to the wage-offer distribution and other underlying parameters. (See Marshall and Zarkin [1987] for a discussion of the importance of distinguishing the unobservable wage-offer distribution from the observable wage distribution.) Although in the trade frictions approach, different assumptions about underlying parameters (both observable and unobservable) generate different quantitative predictions, we show below that it is possible to estimate the underlying unobservable parameters. We find that the model's implications are quite robust to variations in those parameters.

ASSUMPTIONS, DEFINITIONS, AND NOTATION

This section gives a description of the variables and notation included in the full model, focusing on its main features. In describing the model, we make frequent reference to Figures 6A.1 and 6A.2, which depict the groups of workers treated in the model and the labor market flows analyzed in the model.

We begin by dividing all workers into four classes:

1) Employed workers—denoted by J.
2) Unemployed UI-ineligible workers—U_i. This group (about 60 percent of unemployed workers) includes mainly new entrants and re-entrants to the labor force and workers who have too little work experience during the last year or so to make them eligible for UI. The group also includes workers who are ineligible for UI benefits because they voluntarily quit their previous job or were terminated for cause.
3) Unemployed UI-eligible nonclaimants—U_k. These job seekers are eligible for UI benefits but choose not to claim them. This group appears to have grown dramatically over the past 15 years, and it has been the subject of considerable research and debate (Blank and Card 1991; Vroman 1991).
4) Unemployed UI-eligible claimants—$U_{j,\,t}$ and $U_{j,\,x}$. Four groups of UI-eligible claimants are considered in the model (see the upper left quadrant of Figure 6A.1). First, there are UI eligibles who respond to the bonus offer by increasing their search intensity and qualify for the bonus by gaining reemployment within 11 weeks. We denote these responders who qualify for the bonus by $U_{r,\,t}$ ($t \le 6$).[1] Second, there are UI-eligibles who fail to respond to the bonus offer (that is, do not increase search effort) but qualify for the bonus nonetheless by gaining reemployment within 11 weeks. We denote this group by $U_{nr,\,t}$ ($t \le 6$). Third, there are UI eligibles who respond to the bonus but fail to qualify because they don't gain reemployment within 11 weeks. We denote this group by $U_{r,\,t}$ ($t > 6$). (A subcategory of this third group is made up of workers who
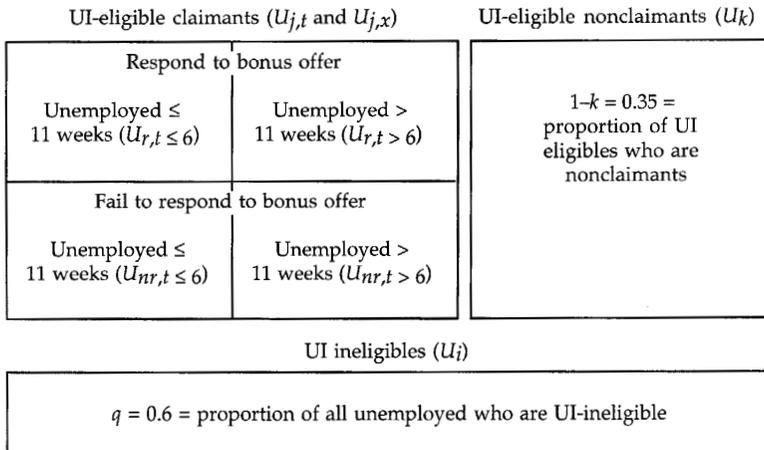
respond to the bonus but fail to qualify for the bonus and ultimately exhaust their UI benefits. We denote these workers by $U_{r,x}$.) Finally, there are UI eligibles who neither respond to the bonus offer nor find reemployment within 11 weeks, denoted by $U_{nr,\,t}$ $(t > 6)$. (A subcategory of this last group is made up of workers who don't respond to the bonus and ultimately exhaust their UI benefits, denoted by $U_{nr,x}$.)

The latter three categories of workers are depicted and summarized in Figure 6A.1.

Three issues relating to unemployed workers who are UI-eligible and claim their benefits (class 4 above) deserve further mention. First, note that all UI-eligible claimants are offered a cash bonus for rapid reemployment. To actually qualify for the bonus, a UI-eligible claimant must gain reemployment within 11 weeks of filing his or her UI claim. (In practice, a worker also needed to hold the job for four months in order to qualify for the bonus.)

Second, in modeling the reemployment bonus, we want to pay attention to two issues. The first is that the response to the reemployment bonus program was less than 100 percent, in that not all workers who were offered the bonus responded to the offer by increasing their search intensity. We denote the proportion of bonus-offered workers who did respond to the bonus offer by ρ; this *bonus response rate* cannot be observed, but can be solved for in the model. In Figure 6A.1, ρ equals the number of claimants in the upper two quadrants of UI-eligible claimants divided by all UI-eligible claimants. The second issue is

Figure 6A.1 Groups of Unemployed Workers Considered in the Model

UI-eligible claimants ($U_{j,t}$ and $U_{j,x}$)		UI-eligible nonclaimants (U_k)
Respond to bonus offer		
Unemployed $\leq$ 11 weeks ($U_{r,t \leq 6}$)	Unemployed $>$ 11 weeks ($U_{r,t > 6}$)	$1-k = 0.35 =$ proportion of UI eligibles who are nonclaimants
Fail to respond to bonus offer		
Unemployed $\leq$ 11 weeks ($U_{nr,t \leq 6}$)	Unemployed $>$ 11 weeks ($U_{nr,t > 6}$)	

UI ineligibles (U_i)

$q = 0.6 =$ proportion of all unemployed who are UI-ineligible

that not all workers who qualified for the bonus collected it. That is, the *bonus take-up rate* was less than 100 percent, as discussed in Chapter 3. We denote the bonus take-up rate, which can be observed, by τ, and set $\tau = 0.55$ based on the Illinois experiment (see Woodbury and Spiegelman 1987, Table 7). The parameter τ is not shown in Figure 6A.1, but equals the number of bonus recipients divided by the number of claimants in two left quadrants of UI-eligible claimants. (Note that it is possible for a worker to collect a bonus without responding to the bonus incentive.) As will be seen below, the ability to observe the bonus take-up rate allows us to identify the bonus response rate.

Third, workers who have exhausted their entitlement to UI benefits are an important subgroup of UI-eligibles. We use $U_{j,\,x}$ (where $j = r$ for workers who respond to the bonus and $j = nr$ for workers who fail to respond) to denote the number of eligible claimants with $t > 14$. That is, we assume that UI claimants exhaust their benefit entitlement after a continuous spell of 28 weeks (14 two-week periods) of unemployment.[2]

It is also important to remark further on UI-eligible nonclaimants (class 3 above). Blank and Card (1991) found that only 65 to 75 percent of the unemployed workers who are eligible for UI benefits actually claim those benefits; Vroman (1991) obtained an even lower estimate of about 55 percent. Accordingly, we use k to denote the *UI take-up rate* and set $k = 0.65$. Thus, we make the appropriate assumption that only 65 percent of all UI-eligible workers claim their UI benefits. Also, we assume that the search behavior of UI-eligible nonclaimants is unaffected by changes in UI policy, such as changes in benefit amounts or the introduction of a bonus. This should be a relatively uncontroversial assumption, since it is unlikely that a worker who fails to claim UI benefits would behave as if he or she were receiving a weekly benefit.

Finally, we assume that workers who do not collect bonuses for which they qualify behave as if they were never offered a bonus. This assumption is more questionable, since it is possible that a bonus-offered worker might increase search intensity with the intention of collecting a bonus but never follow through.

EQUATIONS OF THE MODEL

The model consists of five sets of equations: accounting identities, steady-state conditions, reemployment probabilities, expected lifetime income, and level of search effort. For reference, these equations are written out on pp. 216–219. Figure 6A.2 depicts the flows of workers through various labor market states that are modeled. Stocks of workers in different states are shown as rectangles and the arrows indicate the transition rates of workers from one state to another.

Figure 6A.2 Labor Market Flows in the Model
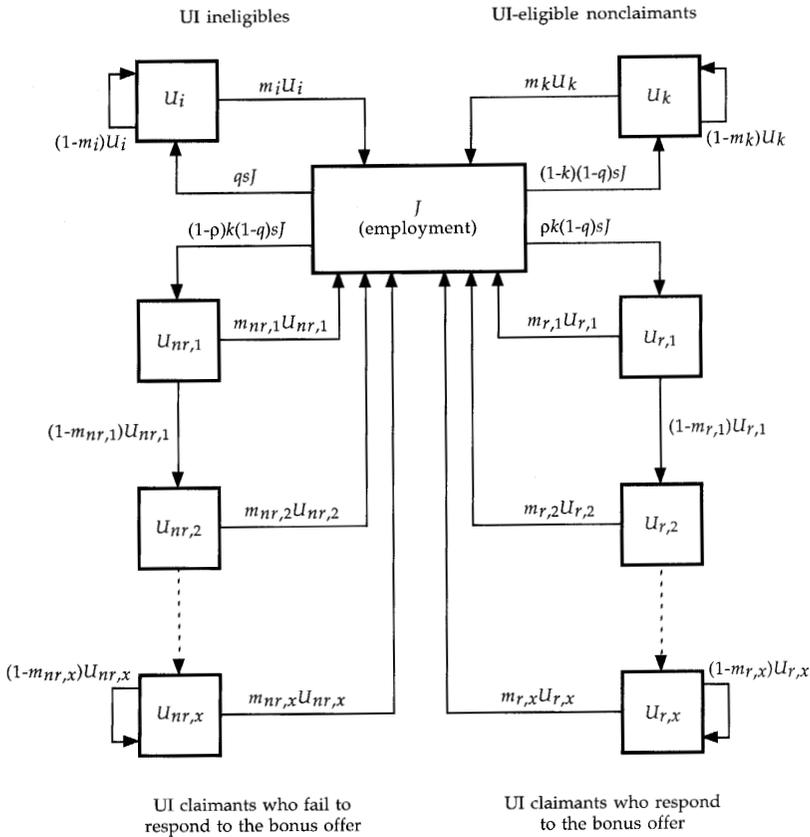
Accounting identities

Let F denote the total number of jobs available in the economy and let V represent the number of vacancies in the steady-state equilibrium. Since all jobs are either filled or vacant, the first identity is $F = J + V$ (Equation 1, p. 216). The second identity states that all workers must be either employed or unemployed. Letting L denote the total number of workers and U total unemployment, the second identity is $L = J + U$ (Equation 2). The third identity simply

states that total unemployment equals the sum of the various subgroups of unemployed (Equation 3).

Steady-state conditions

The steady-state equations (p. 216) equate the flows into and out of each employment state. If these equations are satisfied, then total unemployment and its composition remain constant over time. For example, consider the flow of workers into state U_i—UI-ineligible unemployment. We use s to denote the *separation rate*—the fraction of jobs from which workers separate (voluntarily or involuntarily) in each period. Thus, sJ workers lose their job in each period. If we let q denote the fraction of unemployed workers who are UI-ineligible ($q = 0.65$), then qsJ is the flow of workers into UI-ineligible unemployment, and $(1 - q)sJ$ is the flow of workers into UI-eligible unemployment. (This latter group is divided into UI-eligible nonclaimants, UI claimants who respond to the bonus offer, and UI claimants who fail to respond to the bonus offer.) To calculate the flow out of UI-ineligibility (state U_i), let m_i denote the reemployment probability for any UI-ineligible worker. Then m_iU_i unemployed UI-ineligible workers find jobs in any given period, and this represents the flow out of state U_i. In a steady-state equilibrium, U_i must remain constant over time. Therefore, we must have $qsJ = m_iU_i$ (Equation 4).

Consider next the three groups of UI-eligible workers. Again, the total flow of workers into UI-eligible unemployment is $(1 - q)sJ$. Since the proportion of UI-eligibles who claim benefits equals k, the proportion of UI-eligibles who do not claim benefits equals $1 - k$. Accordingly, the flow of workers into UI-eligible nonclaimant status (state U_k) is $(1 - k)(1 - q)sJ$ (see again Figure 6A.2). This flow must equal the flow of workers out of state U_k. Since the reemployment probability of UI-eligible nonclaimants is m_k, the flow out of U_k equals m_kU_k, and the steady-state condition is $(1 - k)(1 - q)sJ = m_kU_k$ (Equation 5).

Next, some UI claimants (a proportion ρ) respond to the bonus, whereas others $(1 - \rho)$ do not. As a result, the number of newly unemployed workers who respond to the bonus each period is $(1 - \rho)k(1 - q)sJ$, and the number of newly unemployed workers who do not respond to the bonus is $\rho k(1 - q)sJ$. These are the flows into states $U_{r,1}$ and $U_{nr,1}$. In steady-state, all workers in states $U_{r,1}$ and $U_{nr,1}$ at the beginning of a period flow out by the end of the period. Workers in state $U_{r,1}$ flow either back to J or into $U_{r,2}$, and workers in state $U_{nr,1}$ flow into either back to J or into $U_{nr,2}$. Hence, the flow out of $U_{r,1}$ in each period $[m_{r,1}U_{r,1} + (1 - m_{r,1})U_{r,1}]$ equals $U_{r,1}$, and the flow out of $U_{nr,1}$ in each period $[m_{nr,1}U_{nr,1} + (1 - m_{nr,1})U_{nr,1}]$ equals $U_{nr,1}$. It follows that the steady-state conditions for these two states are $(1 - \rho)k(1 - q)sJ = U_{r,1}$ and $\rho k \times (1 - q)sJ = U_{nr,1}$ (Equations 6 and 7).

The last two steady-state equations (8 and 9) are the analogous steady-state equations for all of the remaining states of unemployment.

Reemployment probabilities

Equations 10 through 14 define the probability of reemployment for any given unemployed worker as a function of the search intensity of both the given worker and all other workers, and the number of vacancies. We denote the reemployment probabilities by m (for match probability, with appropriate subscripts). Each reemployment probability is in turn a product of three other probabilities: the probability of a worker contacting a firm (this is the worker's job-search intensity), the probability that a contacted firm has a job vacancy, and the probability that the worker gets a job offer, conditional on applying to a firm that has a vacancy. For example, let p_k denote the probability that a UI-eligible nonclaimant contacts a firm in the tth period of search (or the number of firms contacted, if $p_k > 1$). (The terms $p_{j,t}$ and p_i refer to similar probabilities of UI-eligible claimants [with $j = r$ for claimants who respond to the bonus and $j = nr$ for claimants who fail to respond to the bonus] and UI-ineligibles, respectively.) Again, these contact probabilities are a measure of a worker's search intensity. Next, assuming that workers choose firms at random, the probability that any given firm has a vacancy is V/T. Finally, if we let λ denote the average number of applications filed per firm, then the probability that a worker gets a job conditional on applying at a firm with a vacancy is $(1 - e^{-\lambda})/\lambda$ (see Davidson and Woodbury 1993 for details). So the probability of an unemployed UI-eligible claimant in the tth period of search finding a job is given by the product $m_{j,t} = p_{j,t}(V/T)[(1 - e^{-\lambda}/\lambda)]$. There is an analogous reemployment probability equation for each state of unemployment (Equations 10 through 14).

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 a cost function—cp^z—where z (> 1) and c are search cost parameters. More precisely, z denotes the elasticity of search costs with respect to search effort and c is a constant that transforms the number of firm contacts (p) into cost units. The form of the cost function implies that search cost increases with search intensity at an increasing rate. We assume that c differs between UI-eligible and UI-ineligible workers but that z is the same for all groups of workers.

Expected lifetime income and level of search effort

The fourth and fifth sets of equations are used to calculate the optimal search effort of unemployed workers. In Equations 15 through 22, we calculate the expected lifetime income of workers in each possible state of unemployment

and employment. Then, in Equations 23 through 26, 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 $V_{r,t}$ denote the expected lifetime income for a UI claimant (one who responds to the bonus) in the tth period of unemployment, V_w denote the expected lifetime income for an employed UI-eligible worker, w the wage, B the bonus amount, and x the per-period UI benefit. This UI claimant in the tth period of search receives $x - c(p_{r,t})z$ (that is, UI benefits less the cost of search). With probability $m_{r,\,t}$ this worker finds a job and can expect to earn $V_{r,w}$ in the future, and if $t < 6$, this worker may also collect a bonus. With probability $1 - m_{r,t}$ the worker remains unemployed and can expect to earn $V_{r,t} + 1$ in the future. Therefore,

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

Note that future income is discounted at interest rate r. For $t > 6$, $V_{r,t}$ takes the same form as above, except that the worker cannot collect a bonus upon finding a job. An analogous condition describes the expected lifetime income for workers in every other state of unemployment and employment (again, see Equations 15 through 22).

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, with one exception. The exception is for UI-eligible nonclaimants. The most likely reason that some UI-eligible workers do not file for UI benefits is that they do not expect to be unemployed for a significant length of time—that is, they expect to be able to find jobs relatively easily and with little effort. For these workers, the cost of claiming benefits may well outweigh the value of the benefits that would be received. Therefore, we treat these workers differently, assigning them high reemployment probabilities and ignoring their search decision. Provided that their reemployment probabilities are set high enough (so that their expected duration of unemployment is roughly half the expected duration faced by UI-eligible claimants), our results are not sensitive to the assumption that their reemployment probability is high.[3]

MODEL SOLUTION

To examine the impact of the reemployment bonus program on groups of workers other than those offered the bonus, we first solve the model with the bonus amount set to zero ($B = 0$), then solve it again with the bonus amount set to $500 ($B = 500$), and compare the results. In solving the model, we make use of the data that were gathered for the Illinois reemployment bonus experiment

for as many of the model's variables and parameters as possible and use secondary data sources where necessary (for a discussion, see Davidson and Woodbury 2000). Also, we use the behavioral responses that were observed to the Illinois reemployment bonus in calibrating the model. The Illinois experiment was used to calibrate the model because the treatment impacts for FSC-ineligible workers were essentially similar to the average impacts in the Pennsylvania and Washington experiments (Davidson and Woodbury 1996). The details of this approach to solving the model follow.

The key endogenous variables in the model are employment (J), the number of each type of unemployed worker in each state of unemployment (the U terms), the reemployment probabilities for unemployed workers in each state of unemployment (the m terms), the search effort of unemployed workers in each state of unemployment (the p terms), and the proportion of UI-eligible claimants who respond to the bonus (ρ). The key parameters are the wage (w), the interest rate (r), the size of the bonus (B), the level of unemployment benefits (x), total jobs available (F), the total number of workers (L), the job separation rate (s), the fraction of unemployed workers who are ineligible for UI benefits (q), the UI take-up rate (k), and the search cost parameters (z and c). Except for the search cost parameters, estimates of all of these parameters can be obtained either from the data collected to analyze the Illinois experiment or from other sources.

To obtain estimates of the search cost parameters, we follow the procedure developed in earlier work (Davidson and Woodbury 1993). First, we note that in the absence of a reemployment bonus, the expected duration of unemployment for UI claimants was 22.4 weeks (this was the average unemployment duration for the control group in the Illinois experiment). We then arbitrarily choose a value of z and solve the model to find the value of c that is consistent with the model predicting the expected duration of unemployment (22.4 weeks) that was observed for UI claimants who were not offered a reemployment bonus (that is, for whom $B = 0$). This gives us a pair (z,c) for every z. Next, we solve the model again, but with $B = 500$ (the Illinois bonus offer) for each (z,c) pair and observe the reduction in the expected duration of unemployment for UI claimants that is predicted by the model. We then choose the pair (z,c) that generates a prediction that is consistent with the outcome observed in the Illinois experiment.[4]

The model developed and used here resembles models we have used previously to examine the crowding-out effects of reemployment bonuses and effects of wage-rate subsidies paid to dislocated workers (Davidson and Woodbury 1993, 2000). Two extensions are embodied in the model used here. First, the introduction of additional groups of workers, such as UI-eligible nonclaimants and UI claimants who fail to respond to the bonus offer, allows us to

consider spillover effects, classification changes, behavioral changes, and scale effects that could not be considered in a simpler model. Second, introducing the UI take-up rate (k) and the bonus take-up rate (τ) allows us to make appropriate assumptions about these rates, both of which are less than 100 percent. We show on pp. 195–203 that these extensions lead to markedly different predictions about the outcomes of adopting a reemployment bonus program. The introduction of τ is especially useful, because it allows us to identify the proportion of bonus-offered workers who responded to the bonus by increasing their search effort (ρ), which cannot be observed directly.

COMPLETE STATEMENT OF THE MODEL

Identities

(1) $F = J + V$

(2) $L = J + U$

(3) $U = \Sigma_{j=r,nr}\Sigma_{t=1,14}U_{j,t} + U_{r,x} + U_{nr,x} + U_k + U_i$

Steady-State Conditions

(4) $qsJ = m_iU_i$

(5) $(1-k)(1-q)sJ = m_kU_k$

(6) $\rho k(1-q)sJ = U_{r,1}$

(7) $(1-\rho)k(1-q)sJ = U_{nr,1}$

(8) $(1-m_{j,t-1})U_{j,t-1} = U_{j,t}$ for $j = r,nr$ $(t = 2, \ldots, 14)$

(9) $(1-m_{j,14})U_{j,14} = m_{j,x}U_{j,x}$ for $j = r,nr$

Reemployment Probabilities

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

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

(12) $m_{j,t} = p_{j,t}(V/F)[(1-e^{-\lambda})/\lambda]$ for $j = r,nr$ $(t = 2, \ldots, 14)$

(13) $m_{j,x} = p_{j,x}(V/F)[(1-e^{-\lambda})/\lambda]$ for $j = r,nr$

(14) $\lambda = (1/F)[p_i U_i + p_k U_k + \Sigma_{j=r,nr} \Sigma_{t=1,14} p_{j,t} U_{j,t} + p_{r,x} U_{r,x} + p_{nr,x} U_{nr,x}]$

Expected Lifetime Utility

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

(16) $V_{r,t} = x - c(p_{r,t})^z + [m_{r,t}(V_{r,w} + B) + (1 - m_{r,t})V_{r,t+1}]/(1 + r)$ for $t = 1, \ldots, 6$

(17) $V_{r,t} = x - c(p_{r,t})^z + [m_{r,t}V_{r,w} + (1 - m_{r,t})V_{r,t+1}]/(1 + r)$ for $t = 7, \ldots, 13$

(18) $V_{nr,t} = x - c(p_{nr,t})^z + [m_{nr,t}V_{nr,w} + (1 - m_{nr,t})V_{nr,t+1}]/(1 + r)$ for
$\quad t = 1, \ldots, 13$

(19) $V_{j,14} = x - c(p_{j,14})^z + [m_{j,14}V_{j,w} + (1 - m_{j,14})V_{j,x}]/(1 + r)$ for $j = r,nr$

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

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

(22) $V_{j,w} = w + [sV_{j,1} + (1 - s)V_{j,w}]/(1 + r)$ for $j = r,nr$

Optimal Search Effort

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

(24) $p_{j,t} = \arg \max V_{j,t}$ for $j = r,nr$ $(t = 1, \ldots, 14)$

(25) $p_{j,x} = \arg \max V_{j,x}$ for $j = r,nr$

(26) $p_k = p_{nr,x}$

Observed Bonus Take-Up Rate

(27) $\tau = \Sigma_{t=1,6} m_{r,t} U_{r,t} / [\Sigma_{t=1,6} m_{r,t} U_{r,t} + \Sigma_{t=1,6} m_{nr,t} U_{nr,t}]$

Summary of Notation

L = the size of the labor force

J = steady-state employment

U = steady-state unemployment

V = steady-state job vacancies

F = the total number of jobs available

subscripts: r = UI-eligible claimants who respond to the bonus

nr = UI-eligible claimants who do not respond to the bonus

x = UI-eligible claimants who have exhausted their benefits

i = UI-ineligible unemployed workers

k = UI-eligible nonclaimants

t = the period of search

w = employed workers

U_i = the number of UI-ineligible workers seeking employment

U_k = the number of UI-eligible non-claimants seeking employment

$U_{j,t}$ = the number of type j UI-eligible workers in their tth period of search ($j = r,nr$)

$U_{j,x}$ = the number of type j UI-eligible workers who have exhausted their UI benefits ($j = r,nr$)

q = the proportion of unemployed workers who are ineligible for UI

s = the job-separation rate

k = the proportion of UI-eligible workers who claim their benefits (that is, participate in the UI program)

ρ = the proportion of UI-eligible claimants who respond to the bonus

m_i = the reemployment probability for UI-ineligible workers

m_k = the reemployment probability for UI-eligible nonclaimants

$m_{j,t}$ = the reemployment probability for a type j UI-eligible claimant in the tth period of search ($j = r,nr$)

$m_{j,x}$ = the reemployment probability for a type j UI-eligible claimant who has exhausted UI benefits ($j = r,nr$)

λ = the average number of job applications received per firm

p_i = the search intensity of UI-ineligible workers (that is, the probability that a UI-ineligible worker contacts a firm, or if greater than 1, the number of firms contacted)

p_k = the search intensity of UI-eligible nonclaimants

$p_{j,t}$ = the search intensity of a type j UI-eligible claimant in the tth period of search ($j = r,nr$)

$p_{j,x}$ = the search intensity of a type j UI-eligible claimant who has exhausted UI benefits ($j = r,nr$)

V_i = expected lifetime utility of a UI-ineligible unemployed worker

$V_{j,t}$ = expected lifetime utility of a type j UI-eligible claimant in the tth period of search ($j = r,nr$)

$V_{j,x}$ = expected lifetime utility of a type j UI-eligible claimant who has exhausted UI benefits ($j = r,nr$)

$V_{j,w}$ = expected lifetime utility of an employed type j UI-eligible worker ($j = r,nr$)

$V_{i,w}$ = expected lifetime utility of an employed UI-ineligible worker

x = UI benefit per period

c, c_i = search cost parameters

z = the elasticity of search costs with respect to search effort

r = the interest rate

B = the reemployment bonus amount

w = the wage

τ = the observed bonus take-up rate (that is, of UI claimants who qualify for the reemployment bonus, the proportion who actually collect it)

Appendix Notes

1. In the model, a worker qualifies for bonus if $t \leq 6$, because we measure time in two-week intervals.
2. The assumption of continuous unemployment is not wholly correct because about 10 percent of UI recipients experience multiple spells of unemployment in a benefit year. Nevertheless, a single spell of unemployment characterizes most of the insured unemployed, so we maintain the assumption.
3. In other words, a lower reemployment probability could be assigned without substantially changing the results. The main point is that these workers don't respond to the reemployment bonus offer, so the bonus program raises employment by less than it would otherwise.
4. A different procedure was used to estimate c_i the cost parameter for UI-ineligibles because the expected duration for UI-ineligibles is not observable. See Davidson and Woodbury (1993, pp. 587–588) for details.

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