Modeling Financial Incentives to Get the Unemployed Back to Work

by

JAN BOONE AND JAN C. VAN OURS*

We model how unemployment benefit sanctions – benefit reductions that are imposed if unemployed do not comply with job search guidelines – affect unemployment. We find that benefit sanctions are more effective in reducing unemployment than an across-the-board reduction in the replacement rate, for a given loss in welfare for the unemployed. We decompose the effects of a sanction system into micro, crowding-out, spillover, and tax effects. (JEL: H 55, J 65, J 68)

1 Introduction

Workers that collect unemployment benefits have to comply with administrative rules. In many countries, to remain eligible for unemployment benefits, workers have to be available to start work at short notice, they have to provide proof of job search efforts (*e.g.*, recent job applications), they are not allowed to reject job offers too easily, and they have to attend interviews and training courses as required by the public employment services. Enforcement of eligibility criteria may occur through the imposition of benefit sanctions.

In some OECD countries benefit sanctions are not used very often, but in other countries they are used frequently. As the population in OECD countries ages and the labor market becomes tight, benefit sanctions – *i.e.*, reductions in unemployment benefits – may become attractive from a political point of view. Indeed, monitoring of the search intensity of unemployed workers may be the most direct way to address the moral-hazard problems associated with unemployment insurance and to reconcile efficiency and equity.

In this paper we model the effects of financial incentives to get the unemployed back to work. We focus on benefit sanctions. Within the framework of a Mortensen–

* The authors want to thank Jim Albrecht, Zvi Eckstein, Peter Fredriksson, Bertil Holmlund, Susan Vroman, and especially Lans Bovenberg for useful comments on previous versions of the paper. The first author gratefully acknowledges financial support from NWO (grants 016.025.024 and 453.03.606). Proofs of results are available in the appendix of the working-paper version of this paper, which can be found at http://center.uvt.nl/staff/boone.

Pissarides type of macro model of the labor market[1] we analyze the effects of benefit reductions that are imposed if the unemployed do not comply with job-search guidelines. As discussed in more detail below, there is micro evidence on the effects of financial incentives on the transition from unemployment to employment, but the implications of a system of benefit sanctions for total unemployment are not clear. There are several issues that cannot be studied in a micro context. First, it is difficult to study changes in the structure of the system. Since all unemployed face the same structure, it is unclear what will happen if the parameters of the system are changed. Furthermore, there may be an *ex ante* effect of a benefit system; the mere possibility that unemployed workers may get a sanction affects their search behavior even before a sanction actually is imposed. And there are crowding-out effects. If all unemployed increase their search intensity, the effect for an individual unemployed person is substantially smaller than in the case that only a few unemployed increase their search intensity. There are also macro spillover effects. If the unemployed search more intensively, it is worthwhile for employers to open more vacancies, which will reduce unemployment. Finally, there are tax effects. If unemployment goes down, taxes or social security contributions will be reduced, which will stimulate economic activities and further reduce unemployment.

This paper presents a macro model that allows us to identify and quantify each of these macro effects. The main message of the paper is that if financial incentives have to be stimulated, the introduction of a system of sanctions is a good alternative to lowering the level of benefits in general.

Our study is related to a variety of previous studies analyzing the optimal sequencing of unemployment benefits. Shavell and Weiss [1979] and Hopenhayn and Nicolini [1997] argue that unemployment benefits should fall over the duration of unemployment to induce unemployed workers to search harder for a job. Fredriksson and Holmlund [2001] is also in this tradition but uses a search and matching framework to analyze the effects of falling unemployment benefits over time. Davidson and Woodbury [1997] analyze spillover effects between unemployed workers with and without an entitlement to unemployment benefits. If the benefit level is raised, unemployed without an entitlement search more intensely for a job, because the unemployed who are entitled to unemployment benefits reduce their search efforts. This is related to what we call the crowding-out effect (see below). Cahuc and Lehmann [2000] argue that it is optimal to have constant unemployment benefits over the unemployment spell. They focus on the following wage-bargaining effect: If unemployment benefits fall with increasing length of the unemployment spell, the bargaining position of insiders and short-term unemployed is strengthened while the position of long-term unemployed is weakened. This can raise wages and unemployment. Davidson and Woodbury [1993] analyze an unemployment bonus program. The idea is that unemployed who find a job within a certain time span after losing their job receive a bonus. They estimate that such

[1] See Mortensen and Pissarides [1999] for a general overview.

a bonus system can have substantial displacement effects (up to 60% of the gross employment effect).

None of these studies, however, analyzes the effects of the government directly monitoring unemployed's behavior and imposing sanctions if efforts are deemed insufficient. LJUNGQVIST AND SARGENT [1998] do analyze a policy where unemployed are sanctioned when they refuse to accept a job that the government sees as suitable. They do this in the context of human-capital depreciation due to unemployment, but they do not derive the optimal sanction policy. Finally, BOONE *et al.* [2001] give a detailed comparison of the results derived by FREDRIKSSON AND HOLMLUND [2001] and the conclusions derived here.

The paper is organized as follows. In section 2 we give an overview of benefit sanctions in OECD countries and we discuss empirical research related to our study. In section 3 we present our model of the labor market including sanctions. Section 4 analyzes a baseline model where there are no sanctions and the only policy instrument is the replacement rate. Section 5 gives the results of simulations in which we change the structure of financial incentives, including sanctions. Section 6 concludes.

2 *Financial Incentives and the Labor Market*

2.1 *Benefit Sanctions in OECD Countries*

Table 1 gives an overview of sanction rates, replacement rates, and unemployment rates across a number of OECD countries. The sanctions refer to behavior during benefit periods.[2] The sanction rates range from very low in Sweden to quite high in the Netherlands and Switzerland. The Swedish system is sometimes considered as one where there is pressure on the unemployed, including possible denial of benefit, to both look for work and accept suitable job offers. Nevertheless, BJÖRKLUND AND HOLMLUND [1991] report that the yearly benefit denials amount to no more than approximately 1% to 2% of all who receive unemployment compensation during a year. As shown in Table 1, in recent years it was even less than that. So, whereas the Swedish system is known for its active labor-market policy, in terms of benefit sanctions Sweden is the least strict of all the OECD countries represented in Table 1, and it has the highest replacement rates.

In principle, there may be two reasons why observed sanction rates in a country are low. First, it may be that sanctions are hardly imposed because the system is lax and not credible. Second, the low sanction rate can be due to the (equilibrium) reaction by workers to comply with the search guidelines. In the case of Sweden there are indications that the first reason is the real one. Since the sanction is a 100%

[2] Apart from that, there are, for example, sanctions because of lack of effort to prevent job loss (voluntary unemployment). In terms of the flow of initial benefit claims, these sanctions range from 3.4% in Finland to 13.5% in the U.S. See GRUBB [2000] for details on the system of benefit sanctions in various countries.

Table 1
Sanctions, Benefits and Unemployment in OECD Countries

Country	Sanction rate[a]	Replacement rate[b]	Benefit duration[c] UI	Benefit duration[c] UA	Unemployment rate[d]
Belgium	0.8	51	no limit	–	8.8
Denmark	2.1	71	60	–	5.1
Finland	10.2	65	25	no limit	11.4
Germany	1.1	35	12	no limit	7.8
Netherlands	36.0	70	60	24	4.0
Sweden	0.6	76	15	15	8.2
Switzerland	38.5	70	7	–	3.8
U.K.	5.5	18	6	no limit	6.3
U.S.	35.4	27	6	–	4.5

Note: [a] Sanctions and benefit refusals for behavior during benefit periods as a percentage of the average stock of benefit claims, 1997–1998. The numbers refer to labor-market behavior conditions (not to administrative infractions). *Source:* GRUBB [2000], except for the Netherlands (authors' calculations). [b] Gross replacement rates: benefit entitlement before tax as a percentage of previous earnings before tax, single workers in the first year of their unemployment spell, 1995 (except U.S. 1994). *Source:* MARTIN [1996]. [c] Benefit duration in months (UI = unemployment insurance; UA = unemployment assistance, which generally succeeds unemployment insurance when UI is exhausted; often UA is means-tested), 1999. *Source:* OECD [2002]. [d] OECD standardized unemployment rate, 1998.

reduction in the unemployment benefit, monitors are very reluctant to impose it (see BJÖRKLUND AND HOLMLUND [1991] for details).

The Dutch and Swiss systems seem to be the most strict in terms of sanction rates, but they have relatively high replacement rates. In the U.S. high sanction rates are combined with low replacement rates. Note that there are not only differences in replacement rates across countries, but also differences in benefit duration. As indicated, in some countries the period of unemployment insurance benefits is followed by a period of means-tested unemployment assistance benefits. The unemployment benefits in the first period are related to the previous wage; the benefit in the second period often has no relationship to the previous wage but is based on a social minimum standard. For some countries the overall benefit period is indefinite. In other countries the total benefit duration is short, as in the U.S., where the maximum benefit duration is 6 months (see OECD [2002] for details).

The sanction rates only give a rough idea of the sanction systems. It is not only the percentage of benefit recipients that get a sanction imposed that is important. The strictness of labor-market eligibility criteria and the type of criteria also matter. In Denmark and Finland, for example, criteria with respect to job search intensity are not enforced very strictly, but these countries have very strict rules for young workers when it comes to targeted labor-market programs. In Switzerland the rules with respect to what type of job an unemployed worker should accept are not very strict, meaning that the unemployed are allowed to refuse job offers outside their direct specialization; but the Swiss are very strict on the search process. As in the U.K., in Switzerland there are explicit guidelines about the reporting process and the minimum acceptable frequency of job applications or other acts of job search (see GRUBB [2000] for further details).

Despite all the variation in sanction systems, the sanction rates do give some indication about the strictness of the way eligibility criteria are enforced. Table 1 also shows that there is a large variation in unemployment rates, from a low of 4% in the Netherlands to a high of 11.4% in Finland. All in all, there seems to be a positive relation between the replacement rate and unemployment, and there seems to be a negative relation between the sanction rate and unemployment. Of course, the number of observations is too small to make strong statements about these types of relations, but they are in line with the observations in NICKELL AND VAN OURS [2000] that reduced benefits and stricter work tests are important elements of the decline in unemployment in both the U.K. and the Netherlands.

2.2 *Related Empirical Studies*

The relevance of a system of monitoring and benefit sanctions has been shown in many studies. According to MEYER [1995] unemployment insurance experiments show that economic incentives affect the speed with which people leave unemployment. The economic incentives refer not only to cash bonuses but also to increased enforcement of work search rules and a strengthening of the work test. From recent micro studies on the effect of benefit sanctions in the Dutch labor market we know that a reduction of unemployment benefits may have a substantial effect on the outflow from unemployment to a job. ABBRING, VAN DEN BERG, AND VAN OURS [2005] study the effect of financial incentives by comparing the unemployment duration of individuals that have faced a benefit reduction with that of similar individuals that have not been penalized. They find that benefit sanctions have a positive effect on individual transition rates from unemployment to a job. The job-finding rates double after a sanction has been imposed. VAN DEN BERG, VAN DER KLAAUW, AND VAN OURS [2004] perform a similar study for welfare recipients in the city of Rotterdam. Although this group of unemployed has a labor-market position that is often considered to be very weak, they too find that benefit sanctions stimulate the transition from welfare to work. Again, the job-finding rate doubles on the imposition of a sanction. For the Swiss labor market similar effects of benefit sanctions are found. From an analysis of Swiss data on benefit sanctions LALIVE, VAN OURS, AND ZWEIMÜLLER [2005] conclude that on imposing a benefit sanction the unemployment duration decreases by roughly three weeks.

In a study for five U.S. states BURGESS [1992] finds that the usual rate of noncompliance with unemployment-insurance job-search regulations is very low, about 2%. If monitoring is intensified, however, the real noncompliance rate turns out to be in the neighborhood of 20%. So noncompliance is only revealed with intense monitoring. ASHENFELTER, ASHMORE, AND DESCHÊNES [2005] present an analysis of a field experiment in four U.S. states to investigate whether stricter enforcement and verification of work search behavior decreases unemployment claims and benefits paid. No effects are found.[3]

Benefit sanctions are assumed to be effective because of the financial incentive related to them. It is not clear that this is the only way in which they work. In a study on unemployment in the Netherlands, GORTER AND KALB [1996] find that just by giving attention to unemployed workers, employment offices stimulate them to find a job more quickly. VAN DEN BERG AND VAN DER KLAAUW [2001] conclude that more intense job search assistance increases the exit rate from unemployment to work. DOLTON AND O'NEILL [1996] find effects of the so-called Restart experiments in the U.K., where unemployment-benefit claimants were obliged to attend meetings with a counselor to receive advice on (for example) search behavior and training courses. Dolton and O'Neill conclude that such interventionist government policy can lead to a substantial reduction in time spent unemployed.

3 Baseline Model

This section presents our model of the labor market, first from the point of view of the workers, then from the point of view of the firms, and finally with respect to the bargaining between workers and firms.

3.1 Workers

An unemployed worker adopts search intensity $s \in [0, 1]$ in looking for a job. The disutility of searching at intensity s equals $\gamma(s)$, with $\gamma(0) = 0$, $\gamma'(0) = 0$, $\gamma'(s) > 0$, $\gamma''(s) > 0$, and $\lim_{s\to 1} \gamma'(s) = +\infty$. In the simulations below, we use the following search cost function, due to ULPH AND KATSOULACOS [1998]:

$$\gamma(s) = \frac{1 - (1 - s)^{1-\kappa}}{1 - \kappa} - s \tag{1}$$

with $0 < \kappa < 1$. The Poisson arrival rate of a new job equals μs for the unemployed both with and without a sanction. As explained in the macro part below, μ is increasing in the number of vacancies. That is, the more vacancies are posted, the higher the return to search s.

For simplicity we assume that all jobs offer the same wage w net of taxes while unemployed workers receive unemployment benefits bw, where $w > bw > 0$ with b

[3] BLACK *et al.* [2003] investigate mandatory employment and training programs for unemployed workers. The study finds that some unemployed workers that are informed about the mandatory character leave unemployment before they have to enter a program. Apparently these unemployed consider the programs as sanctions they want to avoid. Note however that this is different from the *ex ante* effect in our study in that benefit sanctions are probabilistic, while the programs were mandatory.

the replacement rate. From this it follows that each worker who finds a job accepts it. Thus the unemployed have only one instrument of search, their search intensity. We could introduce a second instrument of search, the reservation wage, by assuming a distribution of wages. Then the unemployed could also determine the optimal reservation wage. However, the basic results of our model would not change to a large extent.[4] One can think of two reasons why introducing a reservation wage can strengthen the effects we emphasize in this paper. First, if workers can decide along two dimensions (and the government monitor along these dimensions), these decisions tend to become more sensitive to changes in incentives. Second, monitoring the unemployed's acceptance decision regarding job offers actually made by firms tends to be less noisy than monitoring search effort. An optimal-contracting approach (see, for instance, MILGROM AND ROBERTS [1992]) would suggest that less noisy signaling of unemployed's efforts allows for higher-powered incentives. Thus, our conjecture is that introducing reservation wages would actually strengthen our result that introducing a sanction system is welfare-enhancing.

Agents value money income w with a concave felicity[5] function $w^{1-\zeta}/(1-\zeta)$ with $\zeta \geq 0$. We assume that workers cannot save and hence consume their income each period. This assumption rules out the possibility that agents save to insure themselves against the loss of income due to unemployment. Since the sanction system is most relevant for workers close to the bottom of the labor market (who save very little, if at all), this assumption does not seem to be too restrictive. The case $\zeta = 0$ corresponds to risk neutrality; for $\zeta > 0$ the agents are risk-averse. Note that if the agents are risk-neutral the optimal unemployment benefit level is zero. Note also that due to the concavity of the felicity function, agents on a low income have a bigger incentive to increase this income than agents on a high income (that is, they have decreasing marginal utility of income). We assume that the marginal utility of income, $w^{-\zeta}$, is increasing in ζ, which is equivalent to assuming that $w < 1$.

Our model captures the idea that the government may want to punish the lack of search effort of the unemployed in order to give them a higher incentive to find a job. We start from the observation that in OECD countries the government provides unemployment insurance. In principle, it may be possible (or even better) that unemployment insurance is provided by private firms or that individuals save money in the capital market to insure themselves against employment loss. Our model sheds no light on who should provide the insurance. But as long as agents share the risk of unemployment through insurance, the moral-hazard problem with respect to

[4] With a reservation wage, the worker has two dimensions along which he can raise the probability of getting a job: increase his search intensity, and lower the reservation wage. In this case, the monitoring process that will be introduced in the next section should also check these two dimensions. To keep the model tractable, we consider only one dimension along which a worker can raise the probability of becoming employed: his search intensity.

[5] We use the term *felicity function* to denote the per-period valuation by workers of money income. The *utility function* incorporates intertemporal effects and disutility of search effort.

search intensity exists. To reduce this problem one can reduce the replacement rate or introduce sanctions. The intuition is that the unemployed overlook two positive external effects. When an unemployed agent finds a job, this reduces government expenditure on unemployment benefits and hence allows a reduction in distortional tax rates. Second, the private incentive to find a job is determined by the net wage, while the social value of the job is determined by the gross wage. Both effects cause the social value of employment to exceed the private value. This motivates our analysis to increase the private incentives to find a job.

The scheme works as follows. Once a worker becomes unemployed, he receives an unemployment benefit that is constant over the unemployment spell unless he suffers a sanction. If he is found to be searching too little, he is punished with a sanction, that is, a permanent (until he finds a new job) reduction in the unemployment benefit he receives. We assume that a worker can only be punished once during his unemployment spell. This is in line with the empirical observation that multiple sanctions are rare (ABBRING, VAN DEN BERG, AND VAN OURS [2005]).

In our model we omit nonpecuniary effects and assume that a sanction works through the financial stimulus. Along the line of BECKER [1968], we assume that whether or not an unemployed person complies with job search guidelines depends on the balance of benefits and costs. This means that the unemployed will comply if the punishment is severe or the expected probability of being caught is high.

The benefit level of someone that has been confronted with a punitive benefit reduction equals $b_p = (1 - p)bw$, where p is the size of the penalty. The sanction system is modeled in the following way. First, the probability that an unemployed agent's search intensity is monitored is modeled as a Poisson arrival rate that is increasing in the number of monitoring civil servants per unemployed agent. In particular, we assume that each administrator can monitor ϕ unemployed agents per period. Let e_g denote the number of government administrators monitoring the unemployed, and let u_u denote the number of unemployed agents without a sanction. Then the Poisson arrival rate of being monitored for an unemployed agent equals $\phi e_g/u_u$.[6] Next, we want to capture the idea that monitoring search intensity is not straightforward. That is, any search monitoring system is likely to be imperfect in the sense that, on the one hand, agents who search at the socially optimal level can be punished with a sanction, while, on the other hand, agents who do not search enough can get away with it unpunished. The point is that it is hard to measure an agent's search intensity in practice. However, it is reasonable to assume that the higher an agent's search intensity, the lower the probability that he will be punished.

We model the probability of being sanctioned, conditional on being monitored, as $\sigma - \lambda s$, with $\lambda, \sigma > 0$ and in equilibrium $\sigma - \lambda s \geq 0$. This will always hold if $\sigma - \lambda \geq 0$. We view the parameters σ and λ as exogenously given. They are determined by the capabilities of the monitoring government officials, by what people view as fair, and by what the courts would view as lawful. For instance,

[6] Note that since a worker can only be punished once, unemployed agents with a sanction are not monitored.

increasing σ too much means that people will get a punishment anyway, almost independent of their search intensity. This will generally be seen as unfair, and the courts may not uphold such a penalty. In the simulations below, we work with $\sigma = \lambda = 1$. This choice of parameter values simplifies the simulations, as $s \in [0, 1]$ implies $\sigma - \lambda s \in [0, 1]$. Further, since the socially optimal search intensity is strictly lower than 1, this can give rise to errors of both type I and type II, which seems realistic.[7]

Now one can derive the following Bellman equations for the agents, where V_u (V_p) denotes the expected discounted value for an agent without (with) a penalty:

$$\rho V_u = \max_{0 \le s \le 1} \left[\frac{(bw)^{1-\zeta}}{1-\zeta} - \gamma(s) + \mu s (V_e - V_u) + \frac{e_g \phi}{u_u} (\sigma - \lambda s)(V_p - V_u) \right], \tag{2}$$

$$\rho V_p = \max_{0 \le s \le 1} \left[\frac{[(1-p)bw]^{1-\zeta}}{1-\zeta} - \gamma(s) + \mu s (V_e - V_p) \right], \tag{3}$$

where ρ is the discount rate and, as mentioned, μs is the job-finding rate. The value of unemployment in (2) consists of three parts: the flow of utility during unemployment (utility of benefits minus search costs), the expected flow of additional income when a job is found, and the expected (negative) income change when a sanction is imposed. The value of unemployment after a sanction is imposed is given in (3) and consists of two parts: the flow of utility during unemployment, which is now lower because of the penalty, and the expected flow of additional income after a job is found. As shown by Lemma 1 in the appendix, we find the following intuitive ordering: $V_e > V_u > V_p$. The value of being employed exceeds the value of being unemployed without a sanction, which exceeds the value of being unemployed with a sanction.

The difference between s_p and s_u is referred to as the *ex post* effect.[8] That is, it measures the increase in search intensity of an unemployed worker after a sanction is imposed. Now rewrite (2) as

$$\begin{aligned} \rho V_u = {} & \frac{(bw)^{1-\zeta}}{1-\zeta} + \frac{e_g \phi}{u_u} \sigma (V_p - V_u) \\ & + \max_{0 \le s \le 1} \left\{ -\gamma(s) + \mu s (V_e - V_p) + \left(\lambda \frac{e_g \phi}{u_u} - \mu \right) s (V_u - V_p) \right\}. \end{aligned}$$

Then using the ordering mentioned above ($V_u > V_p$) and comparing this equation with (3) yields that the *ex post* effect is positive ($s_p > s_u$) if and only if $\lambda (e_g \phi)/u_u < \mu$. Note that the sign of the *ex post* effect does not depend on the size of the penalty p. It depends on the difference between the marginal effect of the search effort s on the job arrival rate μ, and the marginal effect of s on the arrival rate of a sanction,

[7] Also note that Table 4 reports sensitivity analyses showing that changing the values for σ and λ does not affect the main result that a sanction system dominates a system without sanctions in terms of both (higher) welfare and (lower) unemployment.

[8] Recall that the *ex ante* effect is defined as the difference between s_u with a sanction system and s_u before a sanction system is introduced.

$\lambda(e_g\phi)/u_u$. The intuition for this inequality is as follows. When an unemployed worker with a sanction finds a job, the gain in discounted utility equals $V_e - V_p$, which exceeds the gain $V_e - V_u$ made by an unemployed worker with full benefits. The marginal return to s on this term equals μ. However, unemployed without a sanction still face the risk of a sanction being imposed. This risk can be reduced by raising s, and the marginal effect here equals $\lambda(e_g\phi)/u_u$. If $\lambda(e_g\phi)/u_u$ is small, the latter effect is dominated by the former and the *ex post* effect is positive.

The optimal search intensities are given by

$$\gamma'(s_u) = \mu(V_e - V_u) + \frac{e_g\phi}{u_u}\lambda(V_u - V_p)\,, \tag{4}$$

$$\gamma'(s_p) = \mu(V_e - V_p)\,. \tag{5}$$

Furthermore, the expected discounted value of being employed is given by

$$\rho V_e = \frac{w^{1-\zeta}}{1-\zeta} + \delta(V_u - V_e)\,, \tag{6}$$

where δ is the job separation rate. Equation (6) says that the value of being employed for a worker equals the utility from the wage he receives each period plus the probability δ that the match is dissolved, in which case he becomes unemployed and receives V_u instead of V_e.

We assume that government jobs are never destroyed: $\delta_g = 0$. Therefore, the discounted value of having a government job as monitor equals $\rho V_g = w_g^{1-\zeta}/(1-\zeta)$. The wage w_g that the government pays its monitoring officials is determined by the condition that workers are indifferent between a government job and a job in the private sector: $V_e = V_g$. Since in the private sector a worker runs the risk of losing a job, such jobs pay a higher wage than government jobs.

3.2 *Firms*

We denote the value for the firm of employing a worker (of posting a vacancy) by J_e (J_v). Then these values satisfy the following Bellman equations:

$$\rho J_e = y - (1+\tau)w - \tau_a + \delta(J_v - J_e)\,, \tag{7}$$

$$\rho J_v = -c + \frac{\mu(\theta)}{\theta}(J_e - J_v)\,, \tag{8}$$

where y denotes the per-period output of the worker–firm combination, the total taxes paid by the firm equal $\tau w + \tau_a$, the (per-period) cost of posting a vacancy equals c, and θ denotes labor-market tightness. This variable θ is endogenized in the macro part of the model. Here one should note that the probability that a firm is matched with a worker, $\mu\theta/\theta$, is decreasing in the labor-market tightness θ. The tax instruments τ (marginal wage tax) and τ_a (match-specific tax) are the ones usually introduced in the labor-market literature. To ease notation below, we choose $\tau_a = 0$. Boone and Bovenberg [2002] derive conditions under which this is in fact the optimal tax.

Equation (7) gives the value for a firm of employing a worker. This equals the value of output y minus total wage costs $(1+\tau)w$ plus the probability δ that the match is dissolved and the firm has to post a vacancy. The value for the firm of posting a vacancy is given by (8). It equals minus the cost of posting a vacancy, c, plus the probability that the firm is matched with a worker, in which case it receives J_e instead of J_v. We assume free entry into the job-creation business, that is, $J_v = 0$.

3.3 Bargaining

To determine the wage, we use the Nash bargaining solution. The bargaining power of the firm is denoted by $\beta \in \langle 0, 1\rangle$, and the bargaining power of the worker by $1-\beta$. Then the net wage w solves

$$\max_w (V_e - V_u)^{1-\beta}(J_e - J_v)^{\beta} . \tag{9}$$

We assume that the unemployment benefit level $b_u = bw$ is defined on the economywide average wage w. Then an individual worker's choice of wage w does not affect the unemployment benefit he will receive when he becomes unemployed. That is, $\partial V_u/\partial w = 0$ in the Nash bargaining function. This simplifies the analysis but has no major effect on our results. Further, we assume that the worker and firm bargain a renegotiation-proof wage. Because an unemployed worker with a sanction becomes entitled again to the full benefit after losing a job, the outside option for both types of unemployed is V_u. The first-order condition for w can now be written as

$$\beta(1+\tau)\left(\frac{w^{1-\zeta}}{1-\zeta} - \rho V_u\right) = (1-\beta)w^{-\zeta}[y-(1+\tau)w] , \tag{10}$$

or equivalently

$$\frac{w^{1-\zeta}}{1-\zeta} = \frac{\beta}{1-(1-\beta)\zeta}\rho V_u + \frac{1-\beta}{1-(1-\beta)\zeta}\,\frac{y}{1+\tau}w^{-\zeta} . \tag{11}$$

The higher the worker's bargaining power (the lower β), the higher his share of the after-tax surplus $y/(1+\tau)$. In case the workers have full bargaining power ($\beta = 0$), the wage is equal to the total after-tax surplus. In case the employers have full bargaining power ($\beta = 1$), the wage is such that the utility derived from it equals the discounted value of unemployment $[w^{1-\zeta}/(1-\zeta) = \rho V_u]$.

3.4 Closing the Model

To close the model, the macro variables tightness θ and unemployment $u = u_u + u_p$ (sum of unemployed without and with a penalty) are endogenized. Let v denote the number of vacancies created. Then the tightness of the labor market, defined as $\theta \equiv v/(s_u u_u + s_p u_p)$, is determined by the free-entry condition $J_v = 0$. Assuming that the matching function is of the Cobb–Douglas form $m(s_u u_u + s_p u_p, v) = A(s_u u_u + s_p u_p)^{1-\eta} v^{\eta}$ with $\eta \in \langle 0, 1\rangle$, the parameter μ in the equations above equals $\mu(\theta) = m(s_u u_u + s_p u_p, v)/(s_u u_u + s_p u_p) = A\theta^{\eta}$.

Normalizing the size of the labor force to 1 ($e_g + e + u_u + u_p = 1$), we have for the labor-market steady state[9]

$$u_u = \frac{\delta(1-e_g)}{\mu s_u + \delta} - \frac{e_g \phi(\sigma - \lambda s_u)}{\mu s_p} \frac{\mu s_p + \delta}{\mu s_u + \delta}, \tag{12}$$

$$u_p = \frac{e_g \phi(\sigma - \lambda s_u)}{\mu s_p}. \tag{13}$$

The marginal wage tax τ is adjusted endogenously in the simulations to satisfy the government budget constraint

$$e\tau w = u_u bw + u_p b(1-p)w + e_g w_g, \tag{14}$$

where on the right-hand side in the total government expenditures the costs of the monitoring system are included.

Finally, welfare W is defined as the weighted average of the expected discounted utilities:

$$W = u_u V_u + u_p V_p + e(V_e + J_e) + vJ_v + e_g V_g, \tag{15}$$

where $J_v = 0$ by the free-entry condition.[10]

Note that we consider a steady state with infinite-lived agents. In reality, workers retire and young workers enter the labor force. In most unemployment insurance systems, these young workers are not yet entitled to unemployment benefits. By finding a job, they (after some time) become entitled to unemployment benefits. The value of this entitlement can be summarized by the value V_u of being unemployed without a sanction. As we show below, the sanction system yields a higher value for V_u than a system without sanctions and the welfare-maximizing replacement rate.[11] Hence, taking such newcomers to the labor market into account could strengthen the case for a sanction system.

4 Simulations with Replacements Rates: Baseline Model

We first consider the baseline model without sanctions, *i.e.*, $e_g = u_p = 0$. We then have a model with 10 equations in 10 endogenous variables: s_u, V_u, V_e, w, J_e, v, u_u, θ, μ, and τ. To illustrate the working of the model we perform a number of simulations with the following parameter values:[12] The replacement rate equals $b = 0.7$, and the parameter of risk aversion $\zeta = 2$. These values are chosen to cause the optimal replacement rate from a welfare point of view to lie below the actual replacement

[9] To see this, note that the equations of motion in the labor market are given by $\dot{u}_u = \delta e - [\mu s_u + (e_g\phi/u_u)(\sigma - \lambda s_u)]u_u$ and $\dot{u}_p = (e_g\phi/u_u)(\sigma - \lambda s_u)u_u - \mu s_p u_p$, and that the steady state is defined as $\dot{u}_u = \dot{u}_p = 0$.

[10] Because of the value of the risk-aversion parameter, W and V_u are negative numbers. For reasons of presentation we added 60 to the simulated values of W and V_u. Since W and V_u are indices, this does not affect the nature of the simulation results.

[11] Compare column (2) of Table 2 with column (4) of Table 3.

[12] In Table 4 below we present sensitivity analyses for different parameter values.

rate. The value of the discount rate ρ is set to 0.025, which is 10% on an annual basis. The parameter κ of the search cost function in (1) is set to 0.5. The parameter η of the matching function is set to its usual value of 0.5, which implies that unemployment and vacancies have similar effects on the flow of filled vacancies.[13] The parameter A of the matching function is set to 1. This value is chosen in order to have a plausible unemployment duration. The parameter β of the wage negotiation process is set to 0.5. Not only is this a very common assumption, it also implies that the parameter of the wage negotiation process is equal to the parameter of the matching function, so that the efficiency condition of HOSIOS [1990] is fulfilled. The production y is set to 1, so the values of related variables like wages and vacancies costs are normalized. The vacancy costs c are set to 2, implying that in every period the costs of having a vacancy are twice the value of production. Of course, the total cost of a vacancy also depends on the average vacancy duration. Finally, the job destruction rate δ is set to 0.04, which implies that on an annual basis 16% of the jobs are destroyed. This number is in line with the number of workers that start on a new job each year. The marginal wage tax τ is adjusted endogenously in the simulations to satisfy the government budget constraint (14), which here boils down to $e\tau w = ubw$.

The simulation results of our baseline model are shown in the first column of Table 2. The unemployment rate is 8.7%, and the vacancy rate is 2.1%. The average vacancy duration $[\theta/\mu(\theta) = \sqrt{\theta}]$ is about 8 weeks, so that the cost per vacancy is about 1.2. This means that the cost of a vacancy is about 1.2 quarters of production value. The average unemployment duration $[1/\mu(\theta) = \theta^{-1/2}]$ is about 1.7 quarters.

Table 2
Simulation Results: Baseline Models[a]

	(1)	(2)
b	0.70	0.63
s	0.712	0.771
V_u	9.97	9.79
u	8.73	7.31
θ	0.345	0.433
v	2.14	2.44
w	0.866	0.871
τ	0.067	0.050
W	12.39	12.54

Note: [a] Column (1) is the baseline specification, and column (2) presents parameter values that generate maximum welfare; for reasons of presentation we added 60 to the values of V_u and W.

[13] BROERSMA AND VAN OURS [1999] give an overview of recent empirical studies on the matching function. They find that a value $\eta = 0.5$ is a reasonable approximation.

Under these conditions the net wage is equal to 0.87. Taking the taxes into account, this means that the wage costs are equal to 0.94, which is quite high compared to the value of production. The main reason for this is the free-entry condition $J_v = 0$. This implies that employers only need to cover the wage costs and the expected cost of opening a vacancy. Had we included capital in the production process, the employers would need a larger share of the value of production in order to cover their investment in capital. However, the basic results of our simulations would not change because of this.

Figure 1 indicates how changes in the replacement rate affect the steady-state welfare W and the value of being unemployed, V_u. As shown, V_u has a maximum at a replacement rate of about 0.70, while the total welfare is at its maximum level at a replacement rate of about 0.63. If the replacement rate gets very high, both total welfare and V_u drop substantially. It is obvious that starting from a replacement rate of 0.70, the total welfare can be increased by reducing the replacement rate.

Figure 1
Effect of Replacement Rate on Welfare and V_u

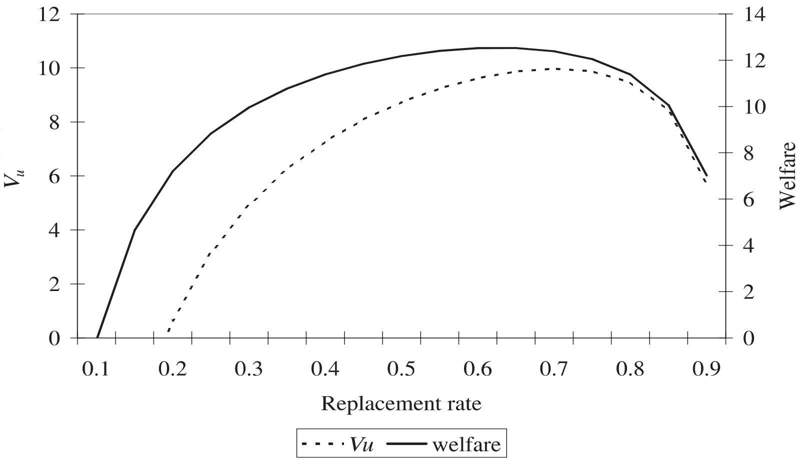
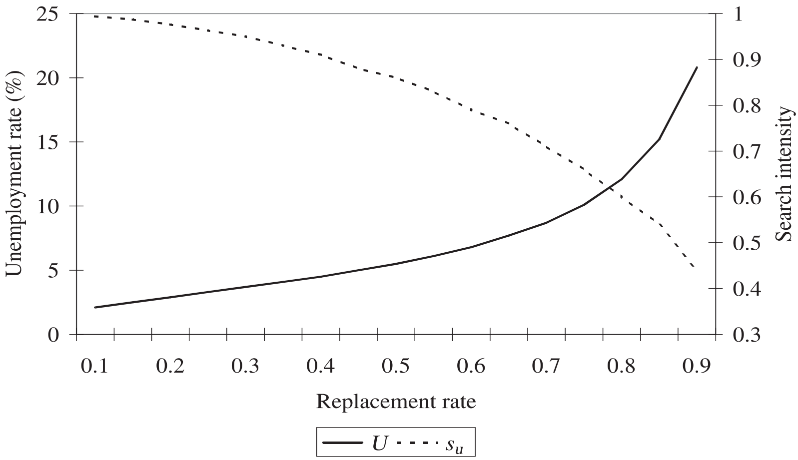


Figure 2 shows what happens to the search intensity and the unemployment rate if we vary the replacement rate. We know that lowering the replacement rate increases the search intensity and reduces unemployment. At higher replacement rates, the search intensity s_u becomes very low and the unemployment high. Further, reducing the replacement rate reduces unemployment to a smaller extent as the replacement rate falls.

The second column of Table 2 gives the effects of a reduction of the replacement rate to 0.63, the value that is optimal from a welfare point of view. As is also clear from Figure 1, the value of being unemployed is lower with this lower replacement

Figure 2
Effect of Replacement Rate on U and s_u



rate. The search intensity goes up, and unemployment goes down to 7.3%, while the vacancy rate goes up to 2.4%. Table 2 also shows that the (after-tax) wage w goes up as the replacement rate falls, which has to do with the tax effect.

5 Simulations with Benefit Sanctions

When introducing a system of benefit sanctions we use the following additional parameter values. The monitoring capacity equals $\phi = 20$, that is, a supervisor deals with 20 unemployed workers. If he has a 40-hour-per-week job, he has on average about 2 hours per week for every unemployed worker under his or her supervision. This means quite intensive monitoring. We view this as a worst-case scenario. If a supervisor can deal with more than 20 unemployed workers per week (which seems likely), the sanction system becomes less expensive and thus more attractive. This strengthens our conclusion that introducing monitoring and sanctions increases welfare. With $\lambda = \sigma = 1$ the unemployed worker can only avoid benefit sanctions if his or her search intensity is at the maximum value ($s_u = 1$), which is not socially optimal.

Table 3 shows the effects of introducing a system of benefit sanctions.[14] The system is introduced by setting the number of supervisors equal to 0.2% of the population and the penalty p equal to 0.1. The sanction parameters have to be combined with the search intensity to find the effective sanction rate, which is equal to $(e_g\phi/u_u)(\sigma - \lambda s_u)$. If, for example, as in the first column of Table 3, the search

[14] In the discussion-paper version of this paper we show that an equilibrium exists in this extended model with sanctions and monitoring. We also derive conditions under which the equilibrium is unique.

Table 3
Simulation Results: Benefit Sanctions[a]

	(1)	(2)	(3)	(4)	(5)
b	0.7	0.7	0.7	0.7	0.63
p	0.1	0.5	0.5	0.5	0.5
e_g	0.002	0.002	0.0002	0.001	0.0006
s_u	0.776	0.931	0.765	0.878	0.866
s_p	0.772	0.926	0.927	0.926	0.939
V_u	10.02	9.85	10.07	10.03	9.72
V_p	9.73	7.50	7.12	7.50	7.01
$\overline{V}$[b]	9.95	9.68	10.01	9.87	9.61
u_u	5.90	5.59	7.77	6.16	6.00
u_p	1.90	0.45	0.17	0.41	0.25
u	7.80	6.04	7.94	6.57	6.25
θ	0.369	0.446	0.365	0.415	0.475
v	2.23	2.51	2.22	2.41	2.58
w	0.869	0.874	0.869	0.874	0.874
τ	0.060	0.045	0.060	0.049	0.042
W	12.53	12.67	12.57	12.72	12.63

Note: [a] Columns (1)–(3) are sensitivity analyses to illustrate the working of the system under different assumptions; columns (4) and (5) refer to a sanction system where the number of supervisors generates maximum welfare. For reasons of presentation we added 60 to the values of V_u and W. [b] $\overline{V}$ is defined as $\overline{V} = (u_u V_u + u_p V_p)/(u_u + u_p)$.

intensity $s_u = 0.78$ with an unemployment rate for agents without a sanction of 5.9%, then the effective sanction rate is equal to 0.12, implying a sanction rate of 15% per quarter. However, since the average unemployment duration is about 2.1 quarters, the share of unemployed workers that suffers a benefit sanction is not very large. As indicated in the first column of Table 3, the share of the unemployed with a benefit sanction is about 25%, which is even somewhat low compared to some numbers presented in section 2. The search intensity before a sanction is imposed goes up from 0.71 to 0.78, so the *ex ante* effect of a benefit sanction causes the search intensity to increase by 10%. The search intensity after a sanction is imposed goes down from 0.776 to 0.772, so the *ex post* effect is negative. In other words, the overall positive sanction effect is completely due to the *ex ante* mechanism. Recall that a negative *ex post* effect is due to the inequality $\mu < \lambda(e_g\phi/u_u)$. Papers that do not consider monitoring and sanctions have $e_g = 0$ and thus find a positive *ex post* effect. MORTENSEN [1977] calls this the entitlement effect. Unemployed who do not receive unemployment benefits search harder to become entitled to such benefits.

Column 2 gives the simulation results if p is increased to 0.5. The unemployment rate goes down to 6.0%. Now, the search intensity goes up to 0.93 in the pre-sanction period as well as after a sanction has been imposed. Because of the severity of the sanction, the search intensity is so high that the share of workers with a benefit sanction reduces substantially, to 7.5%. Again it is the *ex ante* effect that generates these results.

Column 3 of Table 3 gives the simulation results if the number of supervisors is reduced to 0.02% of the population. This also implies that the sanction rate decreases, so the probability that a worker suffers a benefit sanction decreases as well. Because of this there is a big difference in the distribution of the consequences of a sanction's *ex ante* and *ex post* effects. The pre-sanction search intensity is 0.76, which is only slightly higher than the search intensity of 0.71 in the baseline model. However, the postsanction search intensity now is 0.93. So the *ex ante* effect is 7.5%, and the *ex post* effect is 21%. The *ex post* effect now is also more important than the *ex ante* effect. Nevertheless, the *ex post* effects are still rather small compared to the effect found in microeconometric research. This could have to do with the fact that in reality many of the unemployed workers that suffer a benefit sanction have a high replacement rate, while they underestimate the probability that they will suffer a benefit sanction. The effective replacement rate for some unemployed workers may be much higher than the ones we use in our simulations. In many countries there is a so-called social minimum benefit. There, the replacement rate is higher when workers have a wage close to the social minimum.

We performed a simulation in the baseline model starting from a replacement rate of 0.95, which generates a search intensity of 0.30. The introduction of a system of benefit sanctions with parameters $e_g = 0.02$ and $p = 0.5$ generates $s_u = 0.40$ and $s_p = 0.89$. So in this case we find an *ex ante* effect of 35% and an *ex post* effect of 220%, which is more in line with the results of (for example) ABBRING, VAN DEN BERG, AND VAN OURS [2005].

It turns out that the welfare is highest for $p = 0.5$ and $e_g = 0.1$. Conditional on the size of the penalty and the productivity of the supervisor, the welfare implications are dependent on the number of supervisors. Figure 3 shows that from the point of view of the value of being unemployed, the optimal number of supervisors is about 0.02, while from a welfare point of view the optimum $e_g = 0.1$. The fourth column of Table 3 shows the full simulation results for the optimal benefit sanction system. The unemployment rate is now 6.6%, the vacancy rate is 2.4%, the pre-sanction search intensity is 0.88, and the postsanction search intensity is 0.93.

What is striking is that the overall welfare in any of the systems with benefit sanctions is higher than the welfare connected with the optimal replacement rate without benefit sanctions. Apparently, with a system of benefit sanctions, welfare can be increased beyond the level where any change of replacement rate can bring the economy. From a mathematical point of view, this is not surprising. Because introducing a sanction system gives the government new instruments (e_g, σ, and p) besides the replacement rate b, one would expect an increase in welfare.

Figure 4 shows that even in a situation where in a system without benefit sanctions the replacement rate is at its welfare-maximizing level of 0.63, there is a welfare improvement if benefit sanctions are introduced. The optimal number of supervisors

Figure 3
Effect of Supervisors on Welfare and V ($b = 0.7$, $p = 0.5$)

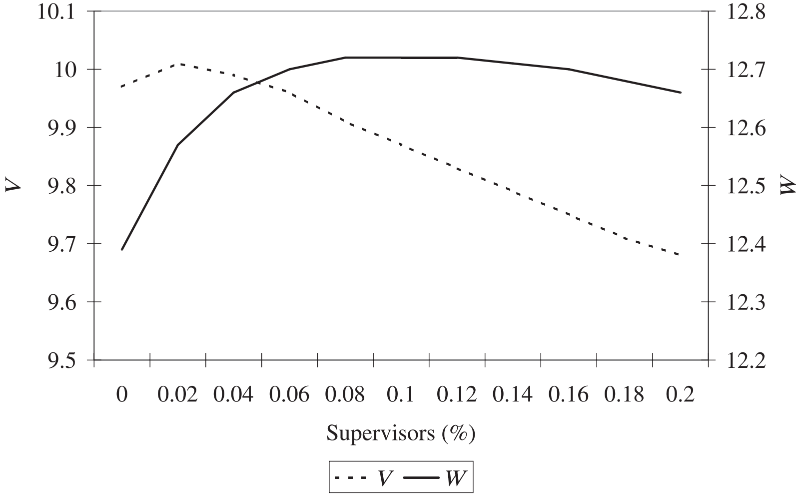
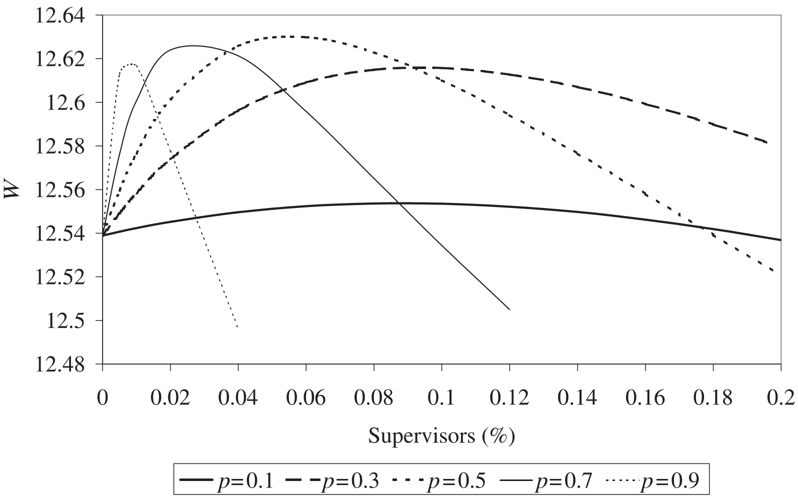


Figure 4
Welfare with Combinations of e_g and p ($b = 0.63$)



depends on the size of the penalty. If the penalty is high, the optimal number of supervisors is low. As the penalty is lowered, the optimal number of supervisors increases. Figure 4 also shows that welfare is highest when the penalty equals 0.5. With this penalty the optimal number of supervisors is equal to 0.06% of the population. Column (5) of Table 3 gives the full simulation results for this optimum. The introduction of benefit sanctions at this optimal replacement rate reduces the unemployment rate by 1 percentage point.

Our main result is that a system of benefit sanctions is welfare-improving. To investigate to what extent this result depends on particular parameter values, we performed sensitivity analyses in which the parameter values were changed one by one. Table 4 shows the outcomes of this exercise in terms of the effects on unemployment rate and welfare. The main conclusion of the sensitivity analyses is that a sanction system dominates a system without sanctions in terms of welfare and unemployment for a large range of parameter values. Also, if the Hosios condition is not satisfied, we still find that a system with sanctions does better than a system without sanctions. As shown, the effects of a system of benefit sanctions are quite large if the benefit replacement rate b is high and the efficiency of the matching process, A, is low. This indicates that a system of benefit sanctions may be more effective in a European-style labor market than in a U.S.-style labor market and may thus explain why in ASHENFELTER, ASHMORE, AND DESCHÊNES [2005] no sanction effect is found, while ABBRING, VAN DEN BERG, AND VAN OURS [2005] finds a large effect of benefit sanctions.

Table 4
Sensitivity Analysis: The Effects of the Introduction of a System of Benefit Sanctions on Unemployment and Welfare[a]

Parameter	Δu	ΔW	Parameter	Δu	ΔW
$b = 0.6$	−1.1	0.01	$b = 0.8$	−4.5	1.30
$\zeta = 0.5$	−2.8	0.63	$\zeta = 3$	−1.9	0.71
$\rho = 0.01$	−2.1	0.74	$\rho = 0.04$	−2.3	0.24
$\kappa = 0.25$	−1.1	0.20	$\kappa = 0.75$	−2.9	0.36
$\eta = 0.4$	−1.8	0.15	$\eta = 0.6$	−2.6	0.58
$A = 0.5$	−4.7	1.19	$A = 2$	−1.4	0.17
$\beta = 0.4$	−2.7	0.57	$\beta = 0.6$	−1.7	0.14
$c = 1$	−1.5	0.19	$c = 3$	−2.7	0.48
$\delta = 0.02$	−1.4	0.12	$\delta = 0.06$	−2.7	0.57
$\sigma = 0.75$	−1.2	0.49	$\sigma = 1.25$	−2.8	0.11
$\lambda = 0.75$	−2.7	0.11	$\lambda = 1.25$	−1.5	0.53

Note: [a] The numbers indicate the difference between a model with and a model without benefit sanctions, with $p = 0.5$ and $e_g = 0.001$. The parameters are according to the baseline model, and in the sensitivity analysis the parameters are changed one by one.

5.1 *The Anatomy of Benefit Sanctions*

As indicated above, we are not only interested in finding the overall effects of a benefit sanction system. We are also interested in the various components of the induced change in the labor market. Our point of reference is the introduction of a benefit sanction system with the optimal number of supervisors. In this subsection, we describe the way in which we can derive the various components. We start with the micro effects, that is, the effects if none of the macro variables change, and only the direct effect on individuals' search behavior is taken into account. The underlying idea of the anatomy is to move from the results of a local experiment with sanctions at, say, the city level to the results when the sanction system is adopted for the country as a whole. In other words, the decomposition moves from micro to macro. In our nonlinear model the order in which the different components are derived may be important, but we think that the way we deal with the decomposition is a sensible one.

To illustrate, if a city introduces a sanction system, the incentives of the unemployed in the city are directly affected. Hence the micro effects are expected to be big. Since the unemployed can apply for and find jobs outside the city, one would not expect crowding out among the unemployed (the effect that the unemployed are searching harder for a given number of jobs) to be important. Similarly, in response to such a small-scale sanction system one would not expect firms to start to post more vacancies (macro spillover effect) because the unemployed are searching harder. Finally, the effect on the government budget constraint (tax effect) is also expected to be small.

Now consider the case where a province or state introduces a sanction system. Then it becomes more likely that an unemployed worker experiences a negative externality from the increased search efforts of the other unemployed. There starts to be some crowding out of search efforts. Firms may respond to this by opening more vacancies. The tax effects of the sanctions will still be relatively small. Finally, if the whole country introduces a sanction system, foreign firms may be tempted to open a new factory in the country, since unemployed are motivated to find jobs and hence it is easy to fill vacancies. The macro spillover effect becomes important. Also, the reduction in unemployment will be big enough to reduce government expenditure to the extent that tax reductions become noticeable. More formally, we define these effects as follows.

To find the *micro effects* of a policy change,[15] we keep θ, w, and τ at their baseline values, and $V_u, s_u, V_p, s_p, u_u, u_p, e$ are endogenous. These variables are obtained by solving the following equations:

$$\rho V_u = \frac{(bw)^{1-\zeta}}{1-\zeta} - \gamma(s_u) + \mu(\theta) su(V_e - V_u) + \frac{e_g \phi}{u_u}(\sigma - \lambda s_u)(V_p - V_u)\,,$$

$$\gamma'(s_u) = \frac{\mu(\theta)}{\rho+\delta}\left(\frac{w^{1-\zeta}}{1-\zeta} - \rho V_u\right) + \lambda \frac{e_g \phi}{u_u}(V_u - V_p)\,,$$

$$\rho V_p = \frac{[(1-p)bw]^{1-\zeta}}{1-\zeta} - \gamma(s_p) + \mu(\theta) s_p\left[\frac{1}{\rho+\delta}\left(\frac{w^{1-\zeta}}{1-\zeta} + \delta V_u\right) - V_p\right],$$

[15] In the discussion-paper version of this paper we derive a number of these comparative-static results analytically.

$$
\begin{aligned}
\gamma'(s_p) &= \mu(\theta)\left[\frac{1}{\rho+\delta}\left(\frac{w^{1-\zeta}}{1-\zeta}+\delta V_u\right)-V_p\right],\\
0 &= \delta e-\mu s_u u_u - e_g\phi(\sigma-\lambda s_u)\,,\\
0 &= e_g\phi(\sigma-\lambda s_u)-\mu s_p u_p\,,\\
1 &= u_u+u_p+e+e_g\,,
\end{aligned}
$$

where the last three equations are the steady-state relations on the labor market.

The difference between the solution to these equations and the baseline values of V_u, s_u, V_p, s_p, u_u, and u_p is reported in the column labeled "micro effect" in Table 5. This table identifies the different components of the introduction of a system of benefit sanctions. As shown, the micro effect is the main effect when it comes to the increase in search intensity. Similarly, the micro effect also has a large effect on the change in unemployment. As shown in Table 5, the micro effect alone reduces total unemployment by 1.5 percentage points.

Table 5
Decomposition of the Effects When a System of Benefit Sanctions Is Introduced[a]

	Before	Decomposition of the change: micro effect	crowding effect	spillover effect	tax effect	total change	After
b	0.70						0.70
p	0.0						0.5
e_g	0.000						0.001
s_u	0.71	0.15	0.00	0.02	0.00	0.17	0.88
s_p	0.71	0.21	0.00	0.01	0.00	0.22	0.93
V_u	9.97	−0.75	−0.06	0.03	0.84	0.06	10.03
V_p	9.97	−3.57	−0.10	0.28	0.92	−2.47	7.50
$\overline{V}$	9.97	−0.95	−0.06	0.07	0.84	0.41	9.87
u_u	8.73	−1.96	0.09	−0.68	−0.02	−2.57	6.16
u_p	0.00	0.51	0.02	−0.13	0.01	0.41	0.41
u	8.73	−1.45	0.11	−0.81	−0.01	−2.16	6.57
θ	0.345	0	−0.009	0.076	0.003	0.070	0.415
v	2.14	0	0	0.26	0.01	0.27	2.41
w	0.866	0	0	−0.007	0.015	0.008	0.874
τ	0.067	0	0	0	−0.018	−0.018	0.049
W	12.39	−0.47	−0.04	0.03	0.81	0.33	12.72

Note: [a] From column (1) of Table 2 to column (4) of Table 3.

The *crowding-out effect* can be phrased as follows. If more than one unemployed person starts to search harder for a job, the net benefit for each individual searcher is reduced: the unemployed crowd each other out. To find the crowding-out effects we solve the same system of equations as under micro effects, except now we keep v, w, and τ at their baseline values and θ is endogenous. Hence we solve for the previous equations and

$$\theta = \frac{v}{s_u u_u + s_p u_p}\,.$$

As shown in Table 5, the crowding-out effect is not very important. The search intensity is hardly affected by the crowding-out effect, and neither is the overall unemployment rate.

To find the *macro spillover* effects we only keep τ at the baseline value. That is, v is endogenous, and w is determined by Nash bargaining as in (9), but now V_u includes the sanction probability. Now we get the effect that the sanction system reduces the value of being unemployed, and hence the wage rate, because the workers' fallback position deteriorates in the wage bargaining process. This reduction in w reduces the benefits received by the unemployed, because the replacement rates (b and $(1-p)b$, respectively) are fixed. Hence V_u and V_p fall in this "macro spillover step." This is partly offset by the rise in vacancies v caused by the reduction in wages and consequent rise in profits. Note that the macro spillover effects on search, tightness, and unemployment are substantial. As indicated in Table 4, the vacancy rate increases by 0.26%, which causes the unemployment rate to go down by 0.81 percentage point.

Finally, the *tax effect* is found as the difference between the model in which we keep τ fixed and the model in which τ (and all other endogenous variables) varies to satisfy the government budget constraint (14). The tax effect is more important than the crowding-out or the macro spillover effect, but less important than the micro effect. Whereas the micro effect influences search intensity, unemployment, the value of being unemployed, and welfare, the tax effect mainly influences the value of being unemployed and welfare. The negative effect of the change in micro behavior on welfare is more than balanced by the positive tax effect. So it is the tax effect that causes the welfare change to be positive. Apparently, the reduction of benefit payments is much larger than the costs of the monitoring system.

All in all, the decomposition of the effects of the introduction of a benefit sanction system shows that it is the micro effect and the macro spillover effect that are the main components causing the changes in search intensity, unemployment, and labor-market tightness. Thus the effects found in the micro studies, cited in section 2, are an important first step in evaluating a sanction system, but the macro effects should not be neglected. With respect to welfare the micro effect and the tax effect are the most important components.

6 Conclusions

Unemployment is high in many countries that have reasonably generous benefits with very long periods of entitlement. However, it is not this characteristic in itself that is important. What matters is that there are active policies to monitor abuse of benefits and to push the unemployed back into work. In this respect a system of benefit sanctions could be very important.

Benefit sanctions are imposed mainly for two reasons. The first reason is psychological. Workers that do not obey administrative rules should face a penalty. The second and more important reason is that penalties affect the search behavior of the unemployed (even before they are actually sanctioned). Since penalties make unemployment less attractive and introduce an entitlement effect, workers increase their search intensity, thereby increasing their job-finding rate and reducing the duration of unemployment.

From micro studies there is evidence about the effects of benefit sanctions on the search behavior of unemployed workers. From these studies it appears that benefit sanctions substantially increase the transition from unemployment to work. However, in micro studies it is not possible to investigate the effect of a system of benefit sanctions *per se*, since it is not possible to study the behavior of the unemployed in the absence of such a system. Furthermore, in micro studies it is not possible to investigate the effect of an increase in sanction rate or penalty. It is also not possible to investigate possible crowding-out effects induced by the system or the way the increased search intensity of the unemployed affects vacancy creation by employers. To study these types of effects one needs a macro model. In this paper we present a macro model of the labor market that enables us to perform a more detailed analysis of the way benefit sanctions affect unemployment.

In our model we assume that the unemployed behave rationally. Conditional on the unemployment benefits, the sanction rate, the wage when employed, and the time preference, the unemployed choose an optimal level of search intensity. There is an *ex ante* and an *ex post* effect of benefit sanctions. The *ex ante* effect refers to the optimal search intensity of workers, which is higher than it would be if workers did not face the possibility of suffering a sanction. The *ex post* effect refers to the effect on search of having lower benefits once a sanction is imposed. In the labor market of our model, we assume that wages are determined by negotiations between workers and employers. Vacancies are created under the assumption of free entry, that is, until the value for the firm of posting a vacancy equals zero. The flows from unemployment to employment are determined by a matching process in the labor market.

In our simulations, we investigate to what extent labor-market indicators change as benefits are reduced or a system of benefit sanctions is introduced. We find that a lowering of the replacement rate lowers the unemployment rate. However, we also show that a system of benefit sanctions increases welfare, conditional on the parameter values that we work with. For some systems of benefit sanctions the *ex ante* effect turns out to be more important than the *ex post* effect, while for other systems the *ex post* effect is more important. The comparison between the two depends on the difference between the job arrival rate for workers and the intensity of monitoring. With a low monitoring intensity the possibility of suffering a sanction is small and the search of the unemployed will not be affected very much. The main effect is after the sanction is imposed. So in this case the *ex post* effect dominates.

With a high intensity of monitoring the unemployed will try to reduce the sanction rate by increasing their search intensity. Then, the main effect is the *ex ante* effect. It is even possible that the *ex post* effect is very small, which in micro research could lead to the erroneous conclusion that sanctions do not have an effect. They do, but the main effect is in the threat of a penalty, not because a penalty is imposed.

Finally, we find for the parameter values considered that the micro effect and the macro spillover effects are the two main components causing the changes in search intensity and unemployment. Welfare and the value of being unemployed are mostly affected by the micro and the tax effect. From our decomposition analysis we conclude that microeconometric studies are an important first step in evaluating a sanction system, but the macro effects should not be neglected.

Appendix: Proof of Lemma 1

LEMMA 1 *Suppose* $\mu, \theta, e_g\phi/u_u, c > 0$; $b, p \in \langle 0, 1\rangle$; $\tau \in [0, 1]$; *and* $\beta \in \langle 0, 1\rangle$. *Then*

$$\rho V_e > \rho V_u > \rho V_p > \frac{[(1-p)bw]^{1-\zeta}}{1-\zeta}\,.$$

PROOF By choosing $s = 0$ in (3), one finds $\rho V_p \geq [(1-p)bw]^{1-\zeta}/(1-\zeta)$. Further, by the properties of $\gamma(s)$ and the result below that $V_e > V_p$, one finds $\rho V_p > [(1-p)bw]^{1-\zeta}/(1-\zeta)$.

The inequality in the middle, $V_u > V_p$, can be proved by contradiction as follows. Suppose not, that is, suppose $V_u \leq V_p$; then one finds

$$\begin{aligned}
\rho V_u &= \frac{(bw)^{1-\zeta}}{1-\zeta} - \gamma(s_u) + \mu s_u(V_e - V_u) + \frac{e_g\phi}{u_u}(\sigma - \lambda s_u)(V_p - V_u) \\
&\geq \frac{(bw)^{1-\zeta}}{1-\zeta} - \gamma(s_p) + \mu s_p(V_e - V_u) + \frac{e_g\phi}{u_u}(\sigma - \lambda s_p)(V_p - V_u) \\
&> \frac{[(1-p)bw]^{1-\zeta}}{1-\zeta} - \gamma(s_p) + \mu s_p(V_e - V_p) = \rho V_p\,,
\end{aligned}$$

where the first inequality follows from the fact that s_p is not necessarily the optimal choice of search intensity for an unemployed person without a penalty; the second inequality follows from $p > 0$ and the initial assumption $V_u \leq V_p$. This set of inequalities contradicts the initial assumption $V_u \leq V_p$. Hence $V_u > V_p$.

Combining (11) with free entry ($J_v = 0$) yields

$$\text{(A1)}\qquad \frac{w^{1-\zeta}}{1-\zeta} = \rho V_u + \frac{1-\beta}{\beta(1+\tau)}(\rho+\delta)\frac{\theta c}{\mu}w^{-\zeta}\,.$$

Substituting this into (6) yields

$$\text{(A2)}\qquad V_e = V_u + \frac{1-\beta}{\beta}\frac{w^{-\zeta}}{1+\tau}\frac{\theta c}{\mu}\,.$$

Hence $0 < \beta < 1$ implies $V_e > V_u$. *Q.E.D.*

References

ABBRING, J. H., G. J. VAN DEN BERG, AND J. C. VAN OURS [2005], "The Effect of Unemployment Insurance Sanctions on the Transition Rate from Unemployment to Employment," *Economic Journal*, 115, 602–630.

ASHENFELTER, O., D. ASHMORE, AND O. DESCHÊNES [2005], "Do Unemployment Insurance Recipients Actively Seek Work? Evidence from Randomized Trials in Four U.S. States," *Journal of Econometrics*, 125, 53–75.

BECKER, G. S. [1968], "Crime and Punishment: An Economic Approach," *Journal of Political Economy*, 76, 169–217.

BJÖRKLUND, A., AND B. HOLMLUND [1991], "The Economics of Unemployment Insurance: The Case of Sweden," pp. 101–178 in: A. Björklund, R. Haveman, R. Hollister, and B. Holmlund (eds.), *Labour Market Policy and Unemployment Insurance*, Clarendon Press: Oxford.

BLACK, D., J. SMITH, M. BERGER, AND B. NOEL [2003], "Is the Threat of Training More Effective than Training itself? Evidence from Random Assignments in the UI System," *American Economic Review*, 93, 1313–1327.

BOONE, J., AND L. BOVENBERG [2002], "Optimal Labour Taxation and Search," *Journal of Public Economics*, 85, 53–97.

– –, P. FREDRIKSSON, B. HOLMLUND, AND J. C. VAN OURS [2001], "Optimal Unemployment Insurance with Monitoring and Sanctions," CentER Working Paper 01-85, Tilburg University.

BROERSMA, L., AND J. C. VAN OURS [1999], "Job Searchers, Job Matches and the Elasticity of Matching," *Labour Economics*, 6, 77–93.

BURGESS, P. L. [1992], "Compliance with Unemployment-Insurance Job-Search Regulations," *Journal of Law & Economics*, 35, 371–396.

CAHUC, P., AND E. LEHMANN [2000], "Should Unemployment Benefits Decrease with the Unemployment Spell?" *Journal of Public Economics*, 77, 135–153.

DAVIDSON, C., AND S. WOODBURY [1993], "The Displacement Effect of Reemployment Bonus Programs," *Journal of Labor Economics*, 11, 575–605.

– – AND – – [1997], "Optimal Unemployment Insurance," *Journal of Public Economics*, 64, 359–387.

DOLTON, P., AND D. O'NEILL [1996], "Unemployment Duration and the Restart Effect: Some Experimental Evidence," *The Economic Journal*, 106, 387–400.

FREDRIKSSON, P., AND B. HOLMLUND [2001], "Optimal Unemployment Insurance in Search Equilibrium," *Journal of Labor Economics*, 19, 370–399.

GORTER, C., AND G. R. J. KALB [1996], "Estimating the Effect of Counselling and Monitoring the Unemployed Using a Job Search Model," *Journal of Human Resources*, 31, 590–610.

GRUBB, D. [2000], "Eligibility Criteria for Unemployment Benefits," *OECD Employment Outlook*, 31, 147–184.

HOPENHAYN, H. A., AND J. P. NICOLINI [1997], "Optimal Unemployment Insurance," *Journal of Political Economy*, 105, 412–438.

HOSIOS, J. J. [1990], "On the Efficiency of Matching and Related Models of Search and Unemployment," *Review of Economic Studies*, 57, 279–298.

LALIVE, R., J. C. VAN OURS, AND J. ZWEIMÜLLER [2005], "The Effect of Benefit Sanctions on the Duration of Unemployment," *Journal of European Economic Association*, 3, 1386–1417.

LJUNGQVIST, L., AND T. J. SARGENT [1998], "The European Unemployment Dilemma," *Journal of Political Economy*, 106, 514–550.

MARTIN, J. P. [1996], "Measures of Replacement Rates for the Purpose of International Comparisons: A Note," *OECD Economic Studies*, 26, 99–115.

MEYER, B. D. [1995], "Lessons from the U.S. Unemployment Insurance Experiments," *Journal of Economic Literature*, 33, 91–131.

MILGROM, P., AND J. ROBERTS [1992], *Economics, Organization and Management*, Prentice Hall: Englewood Cliffs, NJ.

MORTENSEN, D. T. [1977], "Unemployment Insurance and Job Search Decisions," *Industrial and Labor Relations Review*, 30, 505–517.

– – AND C. A. PISSARIDES [1999], "New Developments in Models of Search in the Labor Market," pp. 2567–2627 in: O. Ashenfelter and D. Card (eds.), *Handbook of Labor Economics*, Vol. 3, North-Holland: Amsterdam.

NICKELL, S. J., AND J. C. VAN OURS [2000], "The Netherlands and the United Kingdom: A European Unemployment Miracle?" *Economic Policy*, 30, 137–175.

OECD [2002], *Benefits and Wages: OECD Indicators*, OECD: Paris.

SHAVELL, S., AND L. WEISS [1979], "The Optimal Payment of Unemployment Insurance Benefits over Time," *Journal of Political Economy*, 87, 1347–1363.

ULPH, D., AND Y. KATSOULACOS [1998], "Endogenous Spillovers and the Welfare Evaluation of Research Joint Ventures," Working Paper, University College, London.

VAN DEN BERG, G. J., AND B. VAN DER KLAAUW [2001], "Counselling and Monitoring of Unemployed Workers: Theory and Evidence from a Social Experiment," IZA Discussion Paper 374, IZA, Bonn.

– –, – –, AND J. C. VAN OURS [2004], "Punitive Sanctions and the Transition Rate from Welfare to Work," *Journal of Labor Economics*, 22, 211–241.

Jan Boone
Jan van Ours
Department of Economics
Tilburg University and CentER
P.O. Box 90153
5000 LE Tilburg
The Netherlands
E-mail:
j.boone@uvt.nl
vanours@uvt.nl