

Unemployment benefit profile, monitoring and active labor market policies: The role of normative criteria*

Bruno Van der Linden
Fonds National de la Recherche Scientifique and
Institut de Recherches Economiques et Sociales†

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Abstract

The design of the unemployment insurance system critically depends on the choice of the evaluation criterion. Indicators of labor market performance, welfarist and non-welfarist criteria are compared. They often lead to very different conclusions. This paper also highlights that the distributional consequences of reforms should attract attention. A declining time profile of benefit payments dominates a scheme with a constant replacement ratio. According to welfarist and non-welfarist criteria, this profile should be skill-specific. For reasonable values of the monitoring cost, relating this profile to job-search effort produces positive but limited effects. Analytical and simulation results show that the design of the UI system is affected by the presence of active programs.

Keywords: unemployment insurance; sanctions; policy complementarities; wage bargaining; equilibrium unemployment; equilibrium search.

JEL classification : J65.

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†Department of Economics, Université catholique de Louvain, Place Montesquieu, 3, 1348 Louvain-la-Neuve, Belgium. Tel : 32.10.47.34.33, Fax : 32.10.47.39.45, Email: vanderlinden@ires.ucl.ac.be Homepage: http://www.ires.ucl.ac.be/CSSSP/home_pa_pers/Vanderlinden/Vanderlinden.html

1 Introduction

Since evaluations of active labor market policies (ALMPs) reach mixed conclusions (see e.g. Martin and Grubb, 2001, Calmfors, Forslund and Hemström, 2002), more and more countries expect to alleviate their unemployment problem through a reform of their unemployment insurance (UI) system. The current debate in Germany is a clear example (see Institute for the Study of Labor, 2002, Sinn, 2003, and the proposals in the “Agenda 2010”). Reforms can however have very different effects according to the criterion used to evaluate them. Moreover, since the labor force is heterogeneous, the distribution of the impact should be preferred to an average effect. This paper deals with three questions. First, to what extent should unemployment benefits decline with unemployment duration when the unemployment pool is made of groups with different intrinsic probabilities of exit to a job? Second, following the recent literature about sanctions, should there be a relationship between the time-profile of unemployment benefits and the level of search effort? Third, how does the presence of ALMPs affect the design of UI?

To deal with these questions, this paper develops a general equilibrium model based on a matching framework where individuals are risk averse, search effort and participation are endogenous and wages are bargained over (Pissarides, 2000). Workers have heterogeneous skills and their utility when inactive is distributed. The paper develops both analytical results and simulation exercises for a country plagued with a pervasive unemployment problem.

The related literature is quite large. Due to space limitation, it is only possible to present a selective and highly condensed review of some contributions. The reader is referred to Fredriksson and Holmlund (2003) for a survey. After a lot of research in partial equilibrium (e.g. Shavell and Weiss, 1979 and Hopenhayn and Nicolini, 1997), the design of unemployment insurance schemes has recently been studied in equilibrium search models with wage bargaining by Cahuc and Lehmann (2000), Fredriksson and Holmlund (2001) and Coles and Masters (2001). By carefully developing a strategic wage bargain between an individual job seeker and a firm, the latter focus on the relationship between the profile of duration dependent UI payment schemes and the level of wages. Assuming automatic renegotiation of individual wages and adopting a utilitarian criterion, Fredriksson and Holmlund (2001) show that a declining time profile of benefits dominates an insurance system characterized by indefinite payment of a constant replacement ratio if there is no discounting. With discounting, whether the sequencing of benefits should or not be declining remains an unsettled issue. Cahuc and Lehmann (2000) assume that insiders bargain at the firm level about the wage paid to all workers. These insiders are eligible to unemployment insurance. A declining time profile of UI raises their fall-back position. Numerical analyses by Fredriksson and Holmlund (2001, 2002) conclude that the wage pressure effect of declining unemployment benefits is not strong enough to compensate the effect of a declining benefit sequence on search incentives. Cahuc and Lehmann (2000) agree but they also stress that the loss in welfare for the long-term unemployed is highly dependent on the level of the discount factor. The present paper will revisit this literature in a generalized framework with active schemes and discounting.

In the recent past, a new branch of the literature has looked at the effects of sanctions.

Sanctions are reductions or withdrawals of unemployment benefits due to some misconduct of the unemployed (see Grubb, 2001). Insufficient search for a job is the main example considered in the recent literature. Boadway and Cuff (1999), Boone and van Ours (2000) and Boone, Fredriksson, Holmlund and van Ours (2002) (henceforth, ‘BFHvO’) are major contributions to this literature. The message of the latter is that sanctions allow to raise aggregate welfare for reasonable estimates of monitoring costs and without discounting. Sanctions can be seen as a particular mechanism by which the sequencing of benefits is declining. The specificity comes from the role played by the (imperfect) observation of search efforts on the rate at which benefits decline. Hence, it seems natural to merge the literature about the optimal sequencing of benefits and the one about sanctions by allowing for a dependency between the profile of unemployment benefits and the level of search. This is also done by Fredriksson and Holmlund (2002). The present paper disentangles the intricate effects of relating the profile of benefits to search effort. To the best of my knowledge, the interactions between the design of UI and ALMPs have not been studied yet.

The rest of the paper is organized as follows. Section 2 develops the model and the analytical properties. Section 3 presents comparative static properties. A numerical analysis is conducted in Section 4. Section 5 concludes the paper.

2 The Model

A markovian model is developed in a continuous-time setting and in steady state. A unique good (the numeraire) is sold on a perfectly competitive market. Each firm uses one and only one type of skill n under constant returns. For simplicity, a representative firm made of filled and vacant occupations will be modeled for each skill. Different skill groups can have different preferences. Workers are risk averse and have no access to capital markets. Let C denote consumption and s effort. Their instantaneous utility function is by assumption separable and written $\ln(C) - \psi_n \frac{s^{\xi_n}}{\xi_n}$, with $\psi_n \geq 0$ and $\xi_n > 1$. Effort in employment is fixed and normalized to a constant (zero).

To avoid non stationarity, several authors have assumed a stochastic two-tired framework (see e.g. Fredriksson and Holmlund, 2001, henceforth ‘FH’). The two unemployment states will be denoted respectively by U_n and X_n .¹ Unemployed people flow from U_n to X_n a rate $\pi \geq 0$. The latter state could be an assistance scheme (Ortega and Rioux, 2002). In the literature, the rate π is a feature of the UI legislation. It is not a function of the individual level of search intensity. Following the literature about sanctions, it is here assumed that the rate (π) at which state U_n ends can be a function of $s_{U,n}$. Observing $s_{U,n}$ requires a (costly) monitoring. For simplicity, let us take a linear relationship $\pi_n \equiv \pi_0 - \pi_1 s_{U,n}$ with $\pi_0 \geq 0, \pi_1 \geq 0$.² BFHvO provide a rationale for such a specification. In their paper, unemployed people are monitored at a given rate (here, π_0). Conditional on an inspection,

¹These upper-case symbols will simultaneously designate the states and the stocks.

²These parameters could be skill-specific. As it is rarely so in observed unemployment legislation, π_0 and π_1 will not be indexed by n . I return to that issue in Section 4.

the rate of sanction is a linearly decreasing function of the observed level of search (here, this rate is equal to $1 - (\pi_1/\pi_0) s_{U,n}$). If $\pi_1 > 0$, it is assumed that $\pi_0/\pi_1 \geq \max[s_{U,l}, s_{U,h}]$. Figure 1 summarizes the flows in this economy.

T_n designates an ALMP. Active programs are seen as short-duration schemes that do not enhance the level of skill but can raise the matching effectiveness of participants and reduce the training cost incurred by employers. Counseling programs or short-duration training schemes are examples.³ The unemployed receive training offers at a rate γ_n .⁴ A training program ends at an exogenous rate λ_n . Participation to an ALMP is costlessly observed. Hence, one assumes directed search. E_n denotes salaried employment when coming directly from unemployment and $E_{T,n}$ when coming from an ALMP. The matching function is unique, increasing, concave and homogeneous of degree 1. The flows of hires, M_n and $M_{T,n}$, are a function of an indicator of the number of job-seekers, S_n and $S_{T,n}$, and of the number of vacancies, V_n and $V_{T,n}$: $M_n = m(S_n, V_n)$ and $M_{T,n} = m(S_{T,n}, V_{T,n})$. $\theta_n \equiv \frac{V_n}{S_n}$ and $\theta_{T,n} \equiv \frac{V_{T,n}}{S_{T,n}}$ measure tightness. The rate at which vacant jobs become filled is $q(\theta_n) \equiv M_n/V_n = m(\frac{1}{\theta_n}, 1)$, $q'(\theta_n) < 0$ (respectively, $q(\theta_{T,n}) \equiv m(\frac{1}{\theta_{T,n}}, 1)$).

Search intensity is *endogenous* and denoted $s_{U,n}$, $s_{X,n}$ and $s_{T,n}$. A growing literature shows that duration dependence is largely spurious in Continental Europe (see Machin and Manning, 1999). True duration dependence is therefore assumed to be a negligible phenomenon in this economy. A unique *exogenous* matching effectiveness parameter c_n is then associated to states U_n and X_n . For participants to the ALMP, this parameter can be different and will be denoted $c_{T,n}$. It is assumed that $c_{T,n} \geq c_n > 0$. So, $S_n \equiv c_n(s_{U,n}U_n + s_{X,n}X_n)$ and $S_{T,n} \equiv c_{T,n}s_{T,n}T_n$. An ‘efficient job-seeker’ moves into employment according to a Poisson process with rate $\alpha(\theta_n) \equiv \frac{h(S_n, V_n)}{S_n} = \theta_n q(\theta_n)$, with $\alpha'(\theta_n) > 0$ (respectively, $\alpha(\theta_{T,n}) \equiv \theta_{T,n} q(\theta_{T,n})$). The rate at which jobless people flow into employment is obtained by multiplying the level of search by the appropriate value of α .

Firms post vacancies and this costs a fixed amount K_n per unit of time. Jobless workers search for a job or stay out of the labor force (state I_n). The firm incurs a match-specific fixed cost $H_{T,n}$ if the recruited worker has benefited from an ALMP and H_n otherwise ($H_{T,n} < H_n$). In Continental Europe, collective bargaining is widespread. So, following Cahuc and Lehmann (2000), it is assumed that the current wage is bargained over by incumbent employees on behalf of all workers. At this stage, $H_{T,n}, H_n$ are a sunk cost. The fall-back level for these ‘insiders’ is the intertemporal discounted utility of an unemployed entering state U_n .⁵ If an agreement is reached, production occurs and the total surplus is shared. An exogenous fraction ϕ_n of the matches is destroyed ($\phi_n \leq \lambda_n, \forall n$). The workers who occupied these jobs

³The model is not well-suited for skill-enhancing training, nor for direct job creation or workfare (about the latter see Fredriksson and Holmlund (2002)).

⁴As it is observed in several countries, participation to active programs is a sufficient condition to become eligible to high benefits again.

⁵In a one-firm-one-job setting, an alternative setting would be to assume that the initial wage (individually) negotiated when workers enter the firm is automatically renegotiated (see Fredriksson and Holmlund, 2001, and Coles and Masters, 2001, for a critique).

enter insured unemployment⁶ and these jobs become vacant.

Let $b_{\iota,n}$ be the level of benefit received ($\iota = U, X, T$). As such, levels of unemployment benefits are not a function of the skill. However, when they are (to some extent) indexed on wages, a dependency with n appears via the wage. The following very plausible ranking is assumed: $b_{T,n} > b_{U,n} > b_{X,n} > 0$. Van der Linden (2003) (henceforth, ‘VdL’) shows that in equilibrium all workers endowed with skill n receive the same wage w_n and that the levels of intertemporal utility in employment are the same whether the worker flows out of an ALMP or not. Moreover, VdL shows that $V_{E,n} > V_{T,n} > V_{U,n} > V_{X,n}$, where $V_{\iota,n}$ designate the intertemporal utility in state $\{\iota, n\}$. Let $v_{\iota,n} \equiv \ln(b_{\iota,n}) - \psi_n \frac{(s_{\iota,n})^{\xi_n}}{\xi_n}$, $\iota \in \{U, X, T\}$. Holding a job yields an intertemporal utility $V_{E,n}$ that solves the following Bellman equation :

$$rV_{E,n} = \ln(w_n) + \phi_n(V_{U,n} - V_{E,n}), \quad (1)$$

where r is the discount rate of workers and firms. Focussing on states U_n and X_n ,⁷ at each moment, an individual i with skill n chooses his (her) search effort without internalizing the consequences of this choice on unemployment and eventually on the tax rate. One has:

$$rV_{U,n}^i = \max_{s_{U,n}^i} \{v_{U,n} + c_n s_{U,n}^i \alpha(\theta_n)(V_{E,n} - V_{U,n}^i) + \gamma_n(V_{T,n}^i - V_{U,n}^i) + \pi(V_{X,n}^i - V_{U,n}^i)\}, \quad (2)$$

$$rV_{X,n}^i = \max_{s_{X,n}^i} \{v_{X,n} + c_n s_{X,n}^i \alpha(\theta_n)(V_{E,n} - V_{X,n}^i) + \gamma_n(V_{T,n}^i - V_{X,n}^i)\}. \quad (3)$$

Since only symmetric equilibria are considered, superscript i will be ignored. The optimal levels of search effort are respectively given by the following (sufficient) first-order conditions:

$$\psi_n (s_{U,n})^{\xi_n - 1} = c_n \alpha(\theta_n)(V_{E,n} - V_{U,n}) - \pi_1(V_{X,n} - V_{U,n}), \quad (4)$$

$$\psi_n (s_{X,n})^{\xi_n - 1} = c_n \alpha(\theta_n)(V_{E,n} - V_{X,n}), \quad (5)$$

In a partial equilibrium perspective (i.e. when θ_n and the V ’s are given), increasing π_1 raises $s_{U,n}$, while π_0 has no effect. From (4) and (5),

$$s_{X,n} \gtrless s_{U,n} \Leftrightarrow (c_n \alpha(\theta_n) - \pi_1)(V_{U,n} - V_{X,n}) \gtrless 0. \quad (6)$$

Since, $V_{U,n} - V_{X,n} > 0$, condition $c_n \alpha(\theta_n) - \pi_1 \geq 0$ says that the marginal effect of search effort on the exit rate out of unemployment should be at least as high as its marginal effect, π_1 , on the rate π_n at which benefits decline. This condition is obviously fulfilled if $\pi_1 = 0$ and should still hold for moderate values of π_1 . The exact meaning of the latter condition is clearly dependent of the skill-specific matching effectiveness (c_n). Even, for populations with high matching effectiveness, sufficiently high values of π_1 should imply that $s_{X,n}$ becomes lower than $s_{U,n}$ for it will later be shown that the equilibrium value of tightness decreases with π_1 . To sum up, for each skill n , one can expect that $s_{X,n}$ be higher or equal to $s_{U,n}$ as long as π_1 is sufficiently small. This can be called the ‘*ex-post effect*’ of declining benefits.

⁶This assumption is a good approximation for several countries but clearly not for all of them.

⁷For similar expression in state T_n , see VdL.

The firm's discounted expected return from an occupied job is denoted $\Pi_{E,n}$ if this firm hires type n workers (respectively, $\Pi_{E,n|T}$ if a former participant is occupied). The discounted expected return of vacant job is $\Pi_{V,n}$ (respectively, $\Pi_{V,n|T}$). Due to space limitation, the formulas below focus only on $\Pi_{E,n}$ and $\Pi_{V,n}$ (see VdL for a more extended presentation). Let y_n be the constant marginal product of a filled vacancy. As many authors, assume that $K_n \equiv k_n y_n$. Similarly, assume that the fixed hiring costs are proportional to y_n : $H_n \equiv \kappa_n y_n$, $H_{T,n} \equiv \kappa_{T,n} y_n$ ($\kappa_n > \kappa_{T,n}$). For each skill n , the discounted expected returns verify the following conditions:

$$r\Pi_{E,n} = y_n - (1 + \tau_n)w_n + \phi_n (\max [\Pi_{V,n}, \Pi_{V,n|T}] - \Pi_{E,n}), \quad (7)$$

$$r\Pi_{V,n} = -k_n y_n + q(\theta_n) (\Pi_{E,n} - \kappa_n y_n - \Pi_{V,n}). \quad (8)$$

where τ_n is the constant marginal tax rate.

Assuming free entry of vacancies, in equilibrium, $\Pi_{V,n|T} = \Pi_{V,n} = 0$. These properties combined with (7), (8) yield the 'vacancy-supply curves' for each n :

$$w_n = VS(\theta_n) \equiv \frac{y_n \left(1 - (r + \phi_n) \left(\frac{k_n}{q(\theta_n)} + \kappa_n \right) \right)}{1 + \tau_n}, \quad (9)$$

with $\frac{\partial VS}{\partial \theta_n} < 0$ and $\frac{\partial VS}{\partial \tau_n} < 0$.

Insiders of type n bargain over w_n . Nash bargaining is assumed. This assumption per se is not essential, though rent sharing is essential. For each n , the Nash maximization program can be written as:

$$\max_{w_n} (V_{E,n} - V_{U,n})^{\beta_n} (\Pi_{E,n} - \max [\Pi_{V,n}, \Pi_{V,n|T}])^{1-\beta_n}, \quad (10)$$

where the bargaining power β_n is exogenous ($0 < \beta_n < 1$). The assumption of a single representative firm does not imply that the wage bargain is centralized (see Kreiner and Whitta-Jacobsen, 2002). So, insiders and the representative firm do not take care of the equilibrium effects of wages on tightness and tax levels. The first-order condition is then:

$$w_n = \frac{1}{1 + \tau_n} \frac{\beta_n}{1 - \beta_n} \frac{\Pi_{E,n} - \max [\Pi_{V,n}, \Pi_{V,n|T}]}{V_{E,n} - V_{U,n}}. \quad (11)$$

In a symmetric equilibrium with free entry, this equation can be rewritten as

$$\ln(w_n) = rV_{U,n} + \frac{\beta_n}{1 - \beta_n} \left(\frac{y_n}{w_n(1 + \tau_n)} - 1 \right). \quad (12)$$

Combining (7), (9), (11) and the free-entry conditions allows to rewrite $V_{E,n} - V_{U,n}$ as:

$$\mathcal{V}(\theta_n) \equiv \frac{\beta_n}{1 - \beta_n} \frac{\left(\frac{k_n}{q(\theta_n)} + \kappa_n \right)}{\left(1 - (r + \phi_n) \left(\frac{k_n}{q(\theta_n)} + \kappa_n \right) \right)} \text{ with } \frac{\partial \mathcal{V}}{\partial \theta_n} > 0. \quad (13)$$

Using this property, the vacancy-supply curve and the the definitions of the V 's, an explicit (net) ‘wage-setting curve’ can be derived from (12), namely:

$$\begin{aligned}
\ln(w_n) &= WS(\theta_n, \theta_{T,n}, s_{T,n}, s_{U,n}, s_{X,n} \mid Z_n, B_n) \equiv \\
&\frac{[r + c_{T,n} s_{T,n} \alpha(\theta_{T,n}) + \lambda_n][r + \gamma_n + c_n s_{X,n} \alpha(\theta_n)]}{\Delta_{a,n} \Delta_{b,n}} [v_{U,n} + c_n s_{U,n} \alpha(\theta_n) \mathcal{V}(\theta_n)] \\
&+ \frac{\gamma_n}{\Delta_{b,n}} [v_{T,n} + c_{T,n} s_{T,n} \alpha(\theta_{T,n}) \mathcal{V}(\theta_n)] \\
&+ \frac{\pi[r + c_{T,n} s_{T,n} \alpha(\theta_{T,n}) + \lambda_n]}{\Delta_{a,n} \Delta_{b,n}} [v_{X,n} + c_n s_{X,n} \alpha(\theta_n) \mathcal{V}(\theta_n)] + (r + \phi_n) [\mathcal{V}(\theta_n)],
\end{aligned} \tag{14}$$

where $\theta_{T,n} = \mathcal{T}(\theta_n)$,⁸ $\Delta_{a,n} \equiv r + \pi_n + c_n s_{X,n} \alpha(\theta_n) + \gamma_n$ and $\Delta_{b,n} \equiv r + c_{T,n} s_{T,n} \alpha(\theta_{T,n}) + \lambda_n + \gamma_n$. The ‘wage-setting curve’ (14) is upward-sloping in a (θ_n, w_n) space. FH and Lehmann and Van der Linden (2002) have shown that such a curve is not affected by marginal changes in search effort levels.

For given values of taxes and of benefits, the equilibrium values of w_n and θ_n are unique and characterized by (9) and (14), or by:

$$F(\theta_n, s_{T,n}, s_{U,n}, s_{X,n}) \equiv \ln(VS(\theta_n)) - WS(\theta_n, \mathcal{T}(\theta_n), s_{T,n}, s_{U,n}, s_{X,n}) = 0 \tag{15}$$

One can now express search effort as a function of tightness. Let $\delta_{\iota',n} \equiv v_{\iota,n} - v_{\iota',n}$, $\iota, \iota' \in \{U, X, T\}$, $\iota \neq \iota'$. First, $V_U - V_X$ has to be reformulated in terms of $V_E - V_U$. Second, the latter can be replaced by expression (13). Finally, the first-order conditions (4) and (5) can respectively be reformulated as follows:

$$\Sigma_U(\theta_n, s_{U,n}, s_{X,n}) = 0 \tag{16}$$

$$\text{with } \Sigma_U \equiv \Delta_{a,n} \psi_n s_{U,n}^{\xi_n - 1} - \pi_1 \delta_{UX,n} - c_n (\Delta_{a,n} + \pi_1 [s_{U,n} - s_{X,n}]) \alpha(\theta_n) \mathcal{V}(\theta_n)$$

$$\Sigma_X(\theta_n, s_{U,n}, s_{X,n}) = 0 \tag{17}$$

$$\text{with } \Sigma_X \equiv \Delta_{a,n} \psi_n s_{X,n}^{\xi_n - 1} - c_n \alpha(\theta_n) [\delta_{UX,n} + (\Delta_{a,n} + c_n [s_{U,n} - s_{X,n}]) \alpha(\theta_n)] \mathcal{V}(\theta_n)$$

It can be checked that $\frac{\partial \Sigma_U}{\partial s_{X,n}} = \frac{\partial \Sigma_X}{\partial s_{U,n}} = 0, \forall n$.

Finally, the participation rate can be endogeneized in a simple way. Let \mathcal{P}_n (respectively, L_n) denote the exogenous size of the workforce (respectively, the endogenous labor force) endowed with skill n . Ignoring sickness and handicap, inactive people have an arbitrage condition: Staying inactive or entering the labour force as a job searcher. In many OECD countries, people who are ready to take a job and have no income are eligible to a minimum income guarantee. The latter is typically related to the lowest level of unemployment benefits. So, entering the labour force means here entering state X_n . The lower the expected intertemporal utility in state X_n , $V_{X,n}$, the lower the participation rate $p_n \equiv L_n / \mathcal{P}_n$. The level of

⁸Free entry leads to such an implicit equation, namely $\kappa_n - \kappa_{T,n} = k_n \left(\frac{1}{q(\theta_{T,n})} - \frac{1}{q(\theta_n)} \right)$. Therefore, $\theta_{T,n} > \theta_n$.

intertemporal utility in inactivity, $V_{I,n}$ is assumed to be uniformly distributed on $[V_{1,n}, V_{2,n}]$, with $0 < V_{1,n} < V_{2,n} < +\infty$. The participation rate is then simply given by $p_n = \frac{V_{X,n} - V_{1,n}}{V_{2,n} - V_{1,n}}$ with $\frac{\partial p_n}{\partial V_{X,n}} > 0$. The participation rate does not affect the variables introduced up to now. Participation however influence the tax rate when the budget of the State has to clear.

3 General equilibrium effects of the design of UI

This section disentangles the various effects of a marginal increase in the “parameters of interest”, namely π_0 , π_1 and the level of benefits. The tax rate is here taken as exogenous. This assumption is relaxed in the next section, where the role of the parameters of interest on participation is also introduced.

3.1 Direct impact on stocks in steady state

Let lower case letters e_n, u_n, x_n, t_n, v_n and $v_{T,n}$ be the rates obtained by dividing the absolute numbers by L_n (e.g. $e_n \equiv \frac{E_n}{L_n}$, $v_n \equiv \frac{V_n}{L_n}$). The equalities between exits and entries in each state allows to compute the levels of stock in steady state. In particular,

$$\begin{aligned} e_n + e_{T,n} &= [[c_{T,n}s_{T,n}\alpha(\theta_{T,n}) + \lambda_n](c_n s_{U,n}\alpha(\theta_n)[c_n s_{X,n}\alpha(\theta_n) + \gamma_n] + \pi_n c_n s_{X,n}\alpha(\theta_n)) \\ &+ \gamma_n c_{T,n}s_{T,n}\alpha(\theta_{T,n})[\pi_n + c_n s_{X,n}\alpha(\theta_n) + \gamma_n]]\Delta_{c,n}^{-1}. \end{aligned} \quad (18)$$

where $\Delta_{c,n} \equiv [c_{T,n}s_{T,n}\alpha(\theta_{T,n}) + \lambda_n]([c_n s_{U,n}\alpha(\theta_n) + \phi_n][c_n s_{X,n}\alpha(\theta_n) + \gamma_n] + \pi_n [c_n s_{X,n}\alpha(\theta_n) + \phi_n]) + \gamma_n [c_{T,n}s_{T,n}\alpha(\theta_{T,n}) + \phi_n][\pi_n + c_n s_{X,n}\alpha(\theta_n) + \gamma_n]$. It can be checked that $e_n + e_{T,n}$ increases with $\theta_n, \theta_{T,n}, s_{U,n}, s_{X,n}, s_{T,n}$ and is unaffected by the level of the benefits. Moreover,

Proposition 1. *For each skill n ,*

$\frac{\partial e_n + e_{T,n}}{\partial \pi_0} \geq 0$	<i>and</i>	$\frac{\partial e_n + e_{T,n}}{\partial \pi_1} \leq 0$	<i>if</i>	$s_{X,n} \geq s_{U,n}$
$\frac{\partial e_n + e_{T,n}}{\partial \pi_0} < 0$		$\frac{\partial e_n + e_{T,n}}{\partial \pi_1} > 0$	<i>if</i>	$s_{X,n} < s_{U,n}$

Proof.

$$\begin{aligned} \frac{\partial e_n + e_{T,n}}{\partial \pi_0} &= \frac{\phi_n(c_{T,n}s_{T,n}\alpha(\theta_{T,n}) + \lambda_n)}{\Delta_{c,n}^2} [c_{T,n}s_{T,n}\alpha(\theta_{T,n}) + \lambda_n + \gamma_n][c_n s_{X,n}\alpha(\theta_n) + \gamma_n] \\ &+ c_n [s_{X,n} - s_{U,n}]\alpha(\theta_n), \text{ whose sign is the one of } s_{X,n} - s_{U,n}, \\ \text{sign} \left[\frac{\partial e_n + e_{T,n}}{\partial \pi_1} \right] &= -\text{sign} \left[\frac{\partial e_n + e_{T,n}}{\partial \pi_0} \right] \end{aligned}$$

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These partial effects should clearly be understood as conditional on tightness and search effort. How these variables change is the subject of the following subsections. From (9), it should be obvious that the parameters of interest do not affect the vacancy-supply curve.

3.2 Effects on wages and on tightness in equilibrium

The parameters of interest have clear-cut effects on the position of the wage-setting curve:

Proposition 2. *For each skill n , the wage-setting curve (14) shifts upwards when $(b_{U,n}, b_{X,n})$ and π_1 increases. This curve shifts downwards when π_0 increases.*

Proof. The marginal impact of the b_i 's is obvious from the definition of the v_i 's (for $\iota = \{T, n\}, \{X, n\}, \{U, n\}, n \in \{l, h\}$). In addition, one has:

$$\frac{\partial WS}{\partial \pi_0} = -\frac{[r + c_{T,n} s_{T,n} \alpha(\theta_{T,n}) + \lambda_n][r + \gamma_n + c_n s_{X,n} \alpha(\theta_n)]}{\Delta_{a,n} \Delta_{b,n}} (V_{U,n} - V_{X,n}) < 0, \quad (19)$$

$$\frac{\partial WS}{\partial \pi_1} = -s_{U,n} \frac{\partial WS}{\partial \pi_0} > 0. \quad (20)$$

■

From this proposition, the impacts on wages and tightness in equilibrium is straightforward:

Proposition 3 *For each skill n , the equilibrium net wage w_n (respectively, the level of tightness θ_n) increases (respectively, decreases) with $b_{U,n}, b_{X,n}$ and π_1 . The equilibrium net wage w_n (respectively, the level of tightness θ_n) decreases (respectively, increases) with π_0 . The marginal tax rate τ_n has a negative effect on the equilibrium wage and on tightness.*

The favorable effect of π_0 on the employment rate (if $s_{X,n} > s_{U,n}$; see Proposition 1) is here reinforced by a positive effect on the equilibrium level of tightness. The opposite holds for π_1 . Therefore, the rationale for making π_n vary with search effort $s_{U,n}$ heavily depends on the effect of π_1 on search effort in equilibrium.

Before looking at this issue, it is useful to come back to the major result in Cahuc and Lehmann (2000). This result can be restated and generalized⁹ as follows. Keep the tax parameters fixed and imagine that a marginal decrease in the lower level of benefits ($b_{X,n}$) is compensated by a marginal increase in the highest level of benefits ($db_{U,n} = -db_{X,n} > 0$). This is called “front-loading” the benefit system. A steeper profile will only affect the wage-setting curve through its effect on the inter-temporal utility of those entering unemployment, $V_{U,n}$. Since only marginal changes are considered here, the adjustment of search effort levels can be neglected as long as one only looks at the impact on wages and tightness. Therefore, differentiating (14) with respect to $b_{U,n}$ and $b_{X,n}$, it can be checked that the direction of change of the net wage w_n is given by the sign of the following expression:

$$\frac{r + \gamma_n + c_{X,n} s_{X,n} \alpha(\theta_n)}{\pi_n} - \frac{b_{U,n}}{b_{X,n}}. \quad (21)$$

⁹The following result is more general for three reasons: Search effort is here endogenous, active programs are taken into account and the rate at which unemployed people enter the low-benefit state is a parameter (or a function of $s_{U,n}$ if $\pi_1 \neq 0$).

The equilibrium value of tightness varies in the opposite direction. The higher the rate π_n , the lower the intertemporal utility in the state of entry after a job loss. So, front-loading leads more probably to wage moderation if π_n is high. The levels of the discount rate r and of the exit rate out of state X_n ($c_{X,n} s_{X,n} \alpha(\theta_n) + \gamma_n$) have the opposite effect. If the first ratio in (21) is higher than one, then in the neighborhood of a situation where $b_{U,n} = b_{X,n}$, the equilibrium value of tightness will *decrease* (wages will increase). Front-loading the benefit system is then expected to raise tightness only when the ratio $b_{U,n}/b_{X,n}$ is already sufficiently high. *Consequently, a short expected period in the high benefit state and a low rate of entry into training schemes should be recommended if one intends to raise the number of vacancies per (efficient) job-seeker through a steeper profile of unemployment benefits.* Of course, front-loading the benefit system will also affect search effort.

3.3 Effects on search effort

Intermediate results can be obtained by differentiating equations (16) and (17). These properties should be interpreted cautiously. Equalities (16) and (17) are based on (13). The latter comes from the properties of the wage bargain and the optimal behavior of firms. However, θ_n is a free variable in (16) and (17). An interpretation would be that the number of vacancies is optimally chosen by the employers but S_n is adjusted to keep θ_n unchanged. In a next step, one needs to take the adjustment of θ_n and $\theta_{T,n}$ into account.

parameter	$s_{U,n} \mid \theta_n^\circ$	$s_{U,n}^*$	$s_{X,n} \mid \theta_n^\ddagger$	$s_{X,n}^*$
$b_{U,n}$	0 if $\pi_1 = 0$ + if $\pi_1 > 0$	-	+	?
$b_{X,n}$	0 if $\pi_1 = 0$ - if $\pi_1 > 0$	-	-	-
π_0	0 if $\pi_1 = 0$ - if $\pi_1 > 0$	+	-	?
π_1	+	?	+	?

[°] i.e. $s_{U,n}$ solving $\Sigma_U(\theta_n, s_{U,n}, s_{X,n}) = 0$.

[‡] i.e. $s_{X,n}$ solving $\Sigma_X(\theta_n, s_{U,n}, s_{X,n}) = 0$.

* means that the adjustment of θ_n (and $\theta_{T,n}$) in equilibrium is taken into account.

Table 1. Marginal effects of the parameters of interest on search effort.

If $\pi_1 = 0$, $s_{U,n}$ increases with θ_n . Otherwise, this relationship is ambiguous. Search effort $s_{U,n}$ increases with π_1 .¹⁰ If $\pi_1 > 0$, $s_{U,n}$ increases with $b_{U,n}$ and it decreases with $b_{X,n}$ and π_0 . Otherwise, $s_{U,n}$ is independent of $b_{U,n}$, $b_{X,n}$ and π_0 . The separability of the instantaneous utility function and the fact that $V_{E,n} - V_{U,n}$ is replaced by $\mathcal{V}(\theta_n)$ in (16) explain why the unemployment benefit $b_{U,n}$ can only influence $s_{U,n}$ if the rate π_1 is positive. Then, a higher

¹⁰VdL shows that the equilibrium is unique if $\pi_1 = 0$. By an argument of continuity, the same property should hold if π_1 is sufficiently low so that $s_{U,n}$ still increases with θ_n .

$b_{U,n}$ raises the difference $V_{U,n} - V_{X,n}$ and therefore pushes $s_{U,n}$ upwards. The argument for $b_{X,n}$ and π_0 is similar.

$s_{X,n}$ increases with $b_{U,n}$ and π_1 and it decreases with π_0 (the so-called ‘entitlement effect’ due to Mortensen, 1977). By an ‘entitlement effect’, one here means that the prospect of higher or longer benefits in the first unemployment stage (U_n) stimulates search effort in the other states because entering a job is now more interesting taking the risk of a future layoff into account. VdL shows that $s_{T,n}$ and $s_{X,n}$ adjust in similar ways.

Table 1 also presents the comparative static properties *when the adjustment of θ_n and $\theta_{T,n}$ is taken into account*. The impact of the parameters on the equilibrium value of search in the first state (column ‘ $s_{U,n}^*$ ’ in Table 1) is only given when $\pi_1 = 0$ (otherwise, net effects become ambiguous). If $\pi_1 = 0$, because of the adjustment of tightness levels, $s_{U,n}^*$ is declining with the level of each of the three benefits and it is increasing with π_0 . The latter effect can be called an ‘*ex-ante effect*’ of declining benefits. Interestingly, π_1 has an ambiguous effect on search effort $s_{U,n}^*$: Conditional on tightness, as π_1 starts increasing search effort reacts positively but at the same time tightness is affected negatively (Proposition 3). As far as $s_{X,n}^*$ is concerned, one cannot determine whether the ‘entitlement effect’ is more than offset by the impacts of $b_{U,n}$, π_0 , π_1 on equilibrium tightness.

3.4 Summary

If $\pi_1 = 0$, increasing π_0 has a direct positive effect on the employment rate. Moreover, it induces higher tightness and more search effort among the unemployed benefiting from $b_{U,n}$. However, via a negative entitlement effect, increasing π_0 reduces the incentive the other types of job seekers have. So, in general the net effect of an increase in π_0 cannot be signed analytically. If π_1 becomes positive but sufficiently small,¹¹ increasing this rate would have two negative marginal effects, a direct one on the employment rate and an indirect one on tightness. Nevertheless, conditional on tightness, increasing π_1 gives an incentive to search more (conditional on tightness). Finally, a short expected period in the high benefit state and a low rate of entry into training schemes should be recommended if one intends to raise the number of vacancies per (efficient) job-seeker through a two-tiered benefit system. Otherwise, increasing the difference between $b_{U,n}$ and $b_{X,n}$ could be detrimental to employment.

4 A numerical analysis

4.1 Calibration

Belgium where long-term unemployment is a major problem is the country considered here. The period 1997-1998 is appropriate for the calibration. Typically, more than 60% of the stock is unemployed for more than a year. Negative duration dependence is very strong but Cockx and Dejemeppe (2002) and Dejemeppe (2003) have shown that it is largely spurious.

¹¹So that $s_{X,n}$ remains higher than $s_{U,n}$ and the relationship between search effort $s_{U,n}$ and θ_n remains positive.

The level of skill is one of the major characteristics that explain differences in unemployment duration. Holding at most a lower-secondary degree captures relatively well the notion of being ‘low-skilled’, the other workers being ‘(high-)skilled’. Indexes l and h are used below. Low-skilled workers then represent about 34% of the labor force and 64% of the unemployed. See the first lines of Table 2 for more details and Table 3 for a comparison with Germany.

Turning to the Belgian institutional setting, there is an initial period of one year where unemployment benefits stay constant. For about two thirds of the insured unemployed, the level of benefits decreases afterwards. Unemployed people in charge of a family or living alone can receive insurance benefits for an indefinite length. In 1998, less than 2% of the unemployed have lost their entitlement to UI. The end of entitlement and sanctions are here ignored because they are relatively minor phenomena.

Administrative data and various surveys have been used to calibrate the model.¹² This section presents an overview of the calibration (see VdL for more details). The month is the unit of time. The discount rate is fixed at 0.004 (5% on an annual basis). Within the stochastic framework presented in the Section 2, the expected duration of the period during which $b_{U,n}$ is collected amounts to a year. Hence, π_0 is equal to 0.0833. Furthermore, $\pi_1 = 0$. The level of unemployment benefits is proportional to the previous wage, with upper- and lower-bounds. Table 2 indicates the replacement ratios and the average net wages. Short-duration vocational training for the unemployed is the ALMP taken into account here. Various reports of the PES allow to evaluate the rates t_n and to calibrate the parameters $b_{T,n}$, γ_n and λ_n .

In accordance with several econometric analyses, I assume the following Cobb-Douglas matching function: $m(S_n, V_n) \equiv m_0 S_n^{1-\mu} V_n^\mu$ and $m(S_{T,n}, V_{T,n}) \equiv m_0 S_{T,n}^{1-\mu} V_{T,n}^\mu$ with $\mu = 0.5$. Parameter m_0 is a scaling factor for the various c_i . m_0 is set to 0.5. Since the model intends to represent the behavior of private firms, the calibration assumes that the endogenous numbers of vacancies, V_n and $V_{T,n}$, are multiplied by a coefficient that takes into account the existence of vacancies created by the public sector and by non-profit organizations. The number of vacancies posted by these sectors is kept fixed during the simulations.

On the basis of the aforementioned surveys, half of the vacancies are open in the low-skilled segment. The expected duration of a vacancy (2.5 month) and the share of the low-skilled in the total number of recruitments (0.38) is used to calibrate $\theta_n, n \in \{h, l\}$. The ‘vacancy-supply curves’ (9) are then used to calibrate k_n . At this stage, assumptions about the unobserved parameters y_n and κ_n are needed. Starting from initial values, one has iterated until the complete calibration yields reasonable values for the total number of vacancies and produces the observed share of vacancies open for the low-skilled. The flow equilibrium conditions are used to fix the products $c_i s_i, i = \{T, n\}, \{X, n\}, \{U, n\}, n \in \{l, h\}$. Conditional on the values of these products, the calibration then fixes the c_i ’s, the s_i ’s, ξ_n, ψ_n and the bargaining power of the workers β_n . This part of the calibration is based on equations (14), (16), (17), a similar equation for $s_{T,n}$ and on additional equations stipulating a value for the elasticity of unemployment duration with respect to the level of unemployment benefits.¹³

¹²Simoens, Denys and Denolf (1998), Denolf, Denys and Simoens (1999) and Delmotte, Van Hootegem and Dejonckheere (2001).

¹³No microeconomic evaluation exists for Belgium. According to Meyer (2002), an elasticity of 0.5 would

As Table 2 shows, skilled workers have higher matching effectiveness parameters and they search more intensively. The difference between $s_{U,n}$ and $s_{X,n}$ is not very large. Moreover, preferences are similar for both types of workers. The calibrated values also imply that the wage elasticity of salaried employment amounts to reasonable values, namely -0.72 for low-skilled workers and -0.25 for skilled ones. The parameters appearing in the participation rate are derived from its observed level and from an elasticity of p_n with respect to w_n assumed to be equal to 0.25.

The budget constraint of the State (including the Social Security system) is taken into account. This constraint links the labor markets to each other. It can be written as follows:

$$Q + \sum_n (b_{U,n} + C_1)U_n + b_{X,n}X_n + (b_{T,n} + C_2)T_n = \sum_n \tau_n w_n (E_n + E_{T,n}), \quad (22)$$

where Q is an exogenous level of net expenses, C_1 is the per capita cost of monitoring (if $\pi_1 > 0$) and C_2 is the per capita cost of the active program. In Table 2, average tax rates reflect the actual tax burden. Hence, Q is chosen according to (22). When (22) is taken into account during the simulations, all tax rates τ_n vary in the same proportion.

4.2 Normative criteria

The utilitarian criterion of FH is defined as the weighted sum of intertemporal utility levels and intertemporal returns on filled and vacant jobs, multiplied by the interest rate. In this sum, the weights are the numbers of individuals in each state divided by the (exogenous) size of the active population. Adding utility levels and returns (or profit levels) implicitly means that firms are owned by risk-neutral agents whose intertemporal utility coincide with intertemporal profits. Using the rates of people in each state to weight utilities or returns is quite common in economics. Yet, other weights could be advocated. I consider that group-specific indicators of welfare are more informative for a normative analysis. It is also more useful in a political economy perspective. State-specific intertemporal utility levels will be measured in certainty equivalents. With the assumed utility function, $\exp[rV]$ will denote the certainty equivalent of the intertemporal utility V (in EURO/month).

The limit case where $r \rightarrow 0$ is required to get analytical results. When $r \rightarrow 0$, a normative analysis based on a comparison of steady-state values is justified. Here, I focus on the more plausible case where the discount rate is positive. A generalization of the model out of steady state seems therefore necessary. Given the emphasis on state-specific intertemporal utility levels, it is actually not. For given taxes and under standard assumptions in this literature,¹⁴ tightness and wages immediately jump to their new steady-state values after a permanent and unexpected change in a parameter (see Pissarides, 2000). Consequently, intertemporal

be a benchmark. However, no solution can be found to the system of equations when such a value is imposed. A *tâtonnement process* leads to the conclusion that the highest elasticity allowing a solution to the system of equations is 0.28 for the skilled workers. For the low-skilled, this elasticity equals 0.16.

¹⁴Decisions are based on forward-looking calculations and there are no adjustment or menu costs. Hence, the free-entry condition holds all along the adjustment path and wages can be renegotiated at any time.

utility levels are also jump variables and a comparison of their steady-state values make sense even when $r > 0$.

Some of the simulations presented below take care of the budget constraint (22). The tax rates are then functions of the stocks in each state. So, tightness, wages and hence intertemporal utility levels become in principle functions of these stocks. This leads to multiple steady-state equilibria (Rocheteau, 1999). VdL shows that the steady-state equilibrium value of tightness is however independent of these stocks if $\pi_1 = 0$ and the replacement ratios are constant. Therefore, the unicity of the steady-state equilibrium still holds when tax rates clear the budget of the State. The same property should hold for positive values of π_1 as long as $s_{U,n}$ remains an increasing function of θ_n . So, following the previous argument, tightness, wages and intertemporal utility levels remain jump variables and a comparison of these levels in steady state is valid in this context, too.

Do policy makers care about the unemployed’s search effort? In a related context, Besley and Coate (1995) argue that the answer is negative. The European Employment Strategy and the Social Policy Agenda adopted by the Nice European Council express a clear concern for the quantity and the quality of jobs but one can hardly argue that there is a (negative) value attributed to search effort. So, the following simulations result will also feature a non-welfarist normative criterion indexed by “NW” which measures the certainty equivalent of the intertemporal utility V when search effort is not taken into consideration (i.e. $\psi_n = 0, \forall n$).

4.3 Simulation results

This section studies reforms concerning parameters π_0 , π_1 , $b_{U,n}$ and $b_{X,n}$. Relative risk aversion of the workers is kept equal to 1 throughout.

Let first π_0 increase when the replacement ratios, the tax rates and π_1 are kept at their calibrated values. To ease comparisons with the existing literature, let us ignore training schemes ($\gamma_n = \lambda_n = 0, \forall n \in \{h, l\}$). Theory predicts that the wage-setting curve shifts downwards, equilibrium tightness θ_n and search effort $s_{U,n}$ increase and the net wage rate w_n decreases. Due to space limitation, Figure 2 illustrates these results only for $n = l$. Search effort $s_{U,l}$ and the employment rate of the low-skilled (resp., the aggregate unemployment rate $u + x$) are sharply increasing (resp., decreasing) with π_0 . The improvement in the latter indicators becomes however negligible above $\pi_0 \approx 0.1$ (i.e. a first period of relatively high benefits that is expected to last 10 months). The rather low values of ξ_h and ξ_l imply that search effort strongly responds to changes in its pay-off (see (4) and (5)). The strong effects observed as π_0 becomes very small can be understood by looking at (19). The shift in the wage-setting curve when π_0 declines is larger as π_0 tends to zero. Since the vacancy-supply curve is relatively flat, the effect on tightness is big and the one on wages is moderate. As far as search effort levels $s_{X,n}$ are concerned, the ‘entitlement effect’ broadly cancels out the improvement in tightness. Interestingly, lower wages and more search effort in states U_n have a larger impact on intertemporal utilities than the higher hiring rates, so that the $\exp[rV_{\cdot,n}]$ indicators are decreasing with π_0 for all groups. Because it does not value the increase in $s_{U,n}$, the non-welfarist criterion lead to a different conclusion, namely that a small but positive

value of π_0 should be recommended. This first set of results highlights a phenomenon that often occurs in the simulations, namely that *performance indicators of the labor market, welfarist and non welfarist criteria lead to very different conclusions.*

For a range of values of the discount rate and in the case of a log utility function, simulations made by FH lead to the conclusion that employed workers and the (average) unemployed person would prefer a declining profile of benefits. These authors assume that the budget constraint of the State has to be balanced through an adjustment of the tax wedge. As π_0 increases, employment is higher and public spending for the unemployed is lower. So taxes can be cut, enhancing welfare. One can however wonder whether the conclusion of FH is verified when workers are heterogeneous. Two values of the discount rate have been considered, namely $r = 0.004$ and $r = 0.008$.¹⁵ For these values, I conclude that $\pi_0 = 0$ is not desirable since the welfare indicators of each type of agent and labor market indicators are improving when π_0 is raised from zero. More interestingly, *the optimal value of π_0 strongly varies with the normative criterion used.* This property is clearer in the case where $r = 0.008$ (see Figure 3). If the objective is to maximize the low-skilled employment rate, not much is to be gained by raising π_0 much above 0.1. On the contrary, from the viewpoint of the intertemporal utility of a low-skilled entering unemployment, Figure 3 indicates that π_0 should be close to 0.03 (an somewhat above 0.1 if search effort is not valued). For skilled workers, the recommended value of π_0 would be much larger. So, if such an approach is feasible in reality, this analysis points to the need of rates π_0 that are skill-specific.

Consider now the possibility of a link between search effort and the length of time during which the highest level of benefit is paid. To ease comparisons, let again $\gamma_h = \gamma_l = 0$. The discount rate, π_0 and the replacement ratios remain at their calibrated values. The tax rates τ_n are adjusted to keep the budget of the State balanced. Increasing π_1 means that the evaluation of search effort in state U_n matters more when the PES has to decide whether or not the first period of benefit payment stops. BFHV0 interpret this as an increase in the precision of the inspection. Hence, the cost of monitoring increases with π_1 as more human resources are devoted to the control of search effort.¹⁶ An alternative interpretation of a rise in π_1 would be that the rules of the PES become more tough without any improvement in the “inspection technology”. Then, it is also plausible that the cost of the monitoring rises with π_1 , yet for an other reason: It is likely that more and more unemployed will appeal against the decision to sanction them. As BFHV0, I assume that the cost of the monitoring is the product of the inspection rate (π_0), the stock of unemployed ($U_h + U_l$), the wage cost of skilled workers and a linearly increasing function of π_1 , namely $\eta \cdot \pi_1$. On the basis of statistics about the PES staff, they conclude that η should be in the range [0.01; 0.02] in the case of Sweden. From an evaluation of the PES (OECD, 1997) and from data about sanctions in Belgium, I end up with $\eta = 0.05$. This approach is appropriate if π_1 is interpreted as the precision of

¹⁵Since the calibration is conditional on a given value of r , the model has been calibrated again for $r = 0.008$.

¹⁶This is clearly not an easy task since formal search channels and informal ones are substitute for each other and the latter are by definition hard to observe (see van den Berg and van der Klaauw, 2001). Furthermore, increasing the precision of the “inspection technology” is probably synonymous with more intrusion in the private live of jobless people. On the consequences of this, see Jacquet and Van der Linden (2003).

the inspection. Under the alternative interpretation, other data would be needed. Due to the uncertainty about the cost of rising π_1 , I develop a sensitive analysis with respect to η . The following results also extend those made by BFHV0 to the case of a positive discount rate. Some properties turn out to be very robust to changes in η , namely the strong reaction of search effort levels $s_{U,n}$ and the moderate adjustment in unemployment and employment (see Figure 4). Up to values of η close to 3, net wages and all welfarist and non-welfarist criteria increase monotonously with π_1 , yet to a small extent only.¹⁷ For higher values of η , net wages, welfarist and some of the non-welfarist indicators vary in a U-shaped way with π_1 . Figure 4 illustrates these properties for $\eta = 5$. So, one can conclude from this sensitivity analysis that establishing a link between the length of entitlement to ‘high’ UI benefits and search effort has presumably a favorable effect on a wide range of indicators. There are however two caveats to this conclusion. First, compared to changes in π_0 , the effects are much weaker and the more so as the cost of π_1 increases. Second, if this cost becomes very large, a sufficiently high value of π_1 is needed to yield a favorable effect on welfarist indicators. It should be noticed that because of the induced change in search effort one is then close to a system with indefinite payments of UI benefits.

Keeping π_0, π_1 , the discount rate and γ_n at their calibrated value, let us now look at the optimal degree of differentiation $b_{U,n}/b_{X,n}$. When simulating the effects of “front-loading” the benefit system, the level of unemployment benefits (not the replacement ratios) varies in the following way. Let ϵ be a positive parameter such that $b_{U,n} = \sqrt{\epsilon}b_{U,n}^c$, $b_{T,n} = \sqrt{\epsilon}b_{T,n}^c$ and $b_{X,n} = b_{X,n}^c/\sqrt{\epsilon}$, where superscript c denotes the calibrated values. Hence, $b_{U,n}/b_{X,n} = \epsilon(b_{U,n}^c/b_{X,n}^c)$, $\forall n \in \{h, l\}$. Figure 5 first displays how the level of benefits vary with ϵ . Since $b_{U,n}$ ($b_{T,n}$) and $b_{X,n}$ move in opposite directions the net effects on wages and on tightness are theoretically ambiguous. Let us here ignore the budget constraint of the State. By generalizing Expression (21), it can be checked that the sign of $\frac{dw_n}{d\epsilon}$ is given by the following expression:

$$(r + c_{T,n}s_{T,n}\alpha(\theta_{T,n}) + \lambda_n)(r + \gamma_n + c_n s_{X,n}\alpha(\theta_n) - \pi_n) + \gamma_n(r + \pi_n + c_n s_{X,n}\alpha(\theta_n) + \gamma_n)$$

The sign of this expression critically depends on the value of the parameters. For the calibrated values, it turns out that it is positive for skilled workers and negative for the other group. In this example, the wage-push effect of “front-loading” (Cahuc and Lehmann, 2000) only emerges for skilled workers.¹⁸ This effect is however not strong. Tightness varies in the opposite direction but again to a limited extent only. On the contrary, search effort levels $s_{X,n}$ are increasing a lot with ϵ . The combination of all these effects is a substantial increase in the low-skill employment rate, $e_l + e_{T,l}$. Conversely, the net effect on skilled employment is negligible. The net effect of lower wages, more search effort and better chances of being hired is a decline in the intertemporal utility of the low-skilled in all positions. So, “front

¹⁷Hence, there is no interior optimum. For the largest value of π_1 in Figure 4 (namely, 0.25), π_l (resp. π_h) equals 0.0363 (resp. 0.0125). This is equivalent to an expected duration of receipt of ‘high’ benefits of 28 (resp. 80) months instead of 12. The condition $\pi_0/\pi_1 \geq \max[s_{U,l}, s_{U,h}]$ is fulfilled everywhere.

¹⁸Unreported simulation results show that the same qualitative conclusions hold when $\gamma_h = \gamma_l = 0$. In accordance with the comment of Formula (21), wages are decreasing with ϵ for sufficiently high values of π_n .

loading” the benefit system can boost low-skilled employment but, in this example at least, it also lowers the welfare for the low-skilled. The conclusions are however much more favorable with a non-welfarist perspective. Since the instantaneous income of the unemployed declines in state X_n , this conclusion should nevertheless be sensitive to the discount factor.

One could finally adjust all replacement ratios proportionately, keeping $\pi_0 = 0.0833$ and $\pi_1 = 0$. Let σ be the coefficient of proportionality. The tax rates τ_n are adjusted to keep the budget of the State balanced. Lowering σ unambiguously raises the employment rates. The effect on net wages is hump-shaped for the better employment performances allow to reduce taxes. Due to space limitations, let us now assume that the optimal replacement ratio for the low-skilled unemployed should be decided on the basis of indicators of their well-being. Ignoring the presence of ALMPs (i.e. putting $\gamma_n = \lambda_n = 0$), a welfarist would conclude that the current replacement ratios are optimal (see Figure 6). A policy-maker who does not value search effort would instead prefer a much lower replacement ratio (see Figure 7). The choice of the normative criterion is clearly key. Interestingly, the optimal replacement ratio should be lower when there are active programs (compare Figures 8 and 6). The optimal replacement ratio is very sensitive to the discount rate (compare Figures 8 and 9).

5 Conclusion

The main conclusion of this paper is that evaluation criteria matter a lot in the current debate about the unemployment insurance (UI) system. This should be understood in two ways. First, focusing on indicators of performance of the labor market is misleading. One should recognize that an intertemporal measurement of the well-being of the individuals is preferable. This being done, a key question remains, namely whether effort to find a job should or not be valued. This paper has shown that the answer to that question can have huge policy implications. Second, for a given evaluation criterion, looking at the distribution of effects is essential. Heckman (2001) already stressed the same idea.

The simulation exercise confirms the conclusion of Fredriksson and Holmlund (2001) according to which a declining time profile of benefit payments dominates a scheme with a constant replacement ratio. However, if this is feasible, the two-tired benefit structure should be skill-specific since the optimal expected length of payment of high benefits can vary a lot in the population. For low-skilled workers with gloomy employment perspectives, this optimal length amounts to 2.5 years according to a welfarist criterion. For reasonable values of the monitoring cost, a reform that would relate this expected length to search effort produce positive but limited effects on a wide range of evaluation criteria. Analytical and simulation results show that the design of the UI system should take the existence of active programs into account.

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	Belgium	Germany
Public expenditures on ‘passive measures’ (%GDP)	2.4	2.3
Incidence of long-term unemployment (≥ 12 months)	61.7	52.6
Standardized unemployment rates	9.3	9.3
Less than upper secondary education (25-64):		
Employment/Population ratio	47.5	46.1
Unemployment rate	13.1	16.6
Labor force participation rate	54.6	55.3

Table 3. Labor market statistics for 1998 (%).

Sources : OECD’s Employment Outlook.

u	0.062	0.031
x	0.139	0.027
t	0.008	0.006
$e + e_T$	0.61	0.75
p	0.54	0.72
ϕ	0.009	0.006
y (EURO/month)	3200	5800
k	5.3	9.3
κ	7	18
w (EURO/month)	1308†	1650
$b_U/w‡$	0.51	0.51
b_X/w	0.40	0.37
b_T/w	0.52	0.52
τ	0.67	1.23
γ	0.006	0.02
λ	0.1	0.1
π	0.083	0.083
ψ	15.0	15.0
ξ	1.20	1.22
β^*	0.58	0.39
c	0.24	0.578
c_T	0.27	0.580
s_U	0.11	0.21
s_X	0.14	0.26
s_T	0.17	0.28
θ	2.22	0.83
θ_T	2.49	1.09
$\frac{V_T+V}{U+X+T}$	0.09	0.15

Table 2. Stocks, parameters and calibrated values of endogenous variables.

†This average wage is above minimum wages. The latter are taken into account during the simulations.

‡The replacement ratios are lower than reported values by the OECD on the basis of a range of earnings and family situations (see e.g. Table A.1 of OECD, 1999). However, for Belgium, these OECD statistics exclude some groups whose replacement ratio is quite low.

* Since workers are risk averse, the Hosios conditions $\beta_n = 0.5$ does not necessarily guarantee that a *laissez-faire* economy is optimal (see Lehmann and Van der Linden, 2002). One could wonder why $\beta_l > \beta_h$. In Belgium, unionization is a widespread phenomenon, especially among blue-collar workers. This can explain why the bargaining power of low-skilled workers is higher.

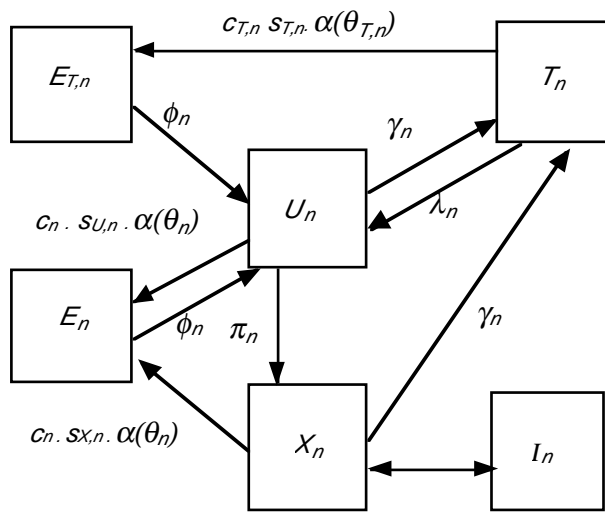


Figure 1: Labor market flows.

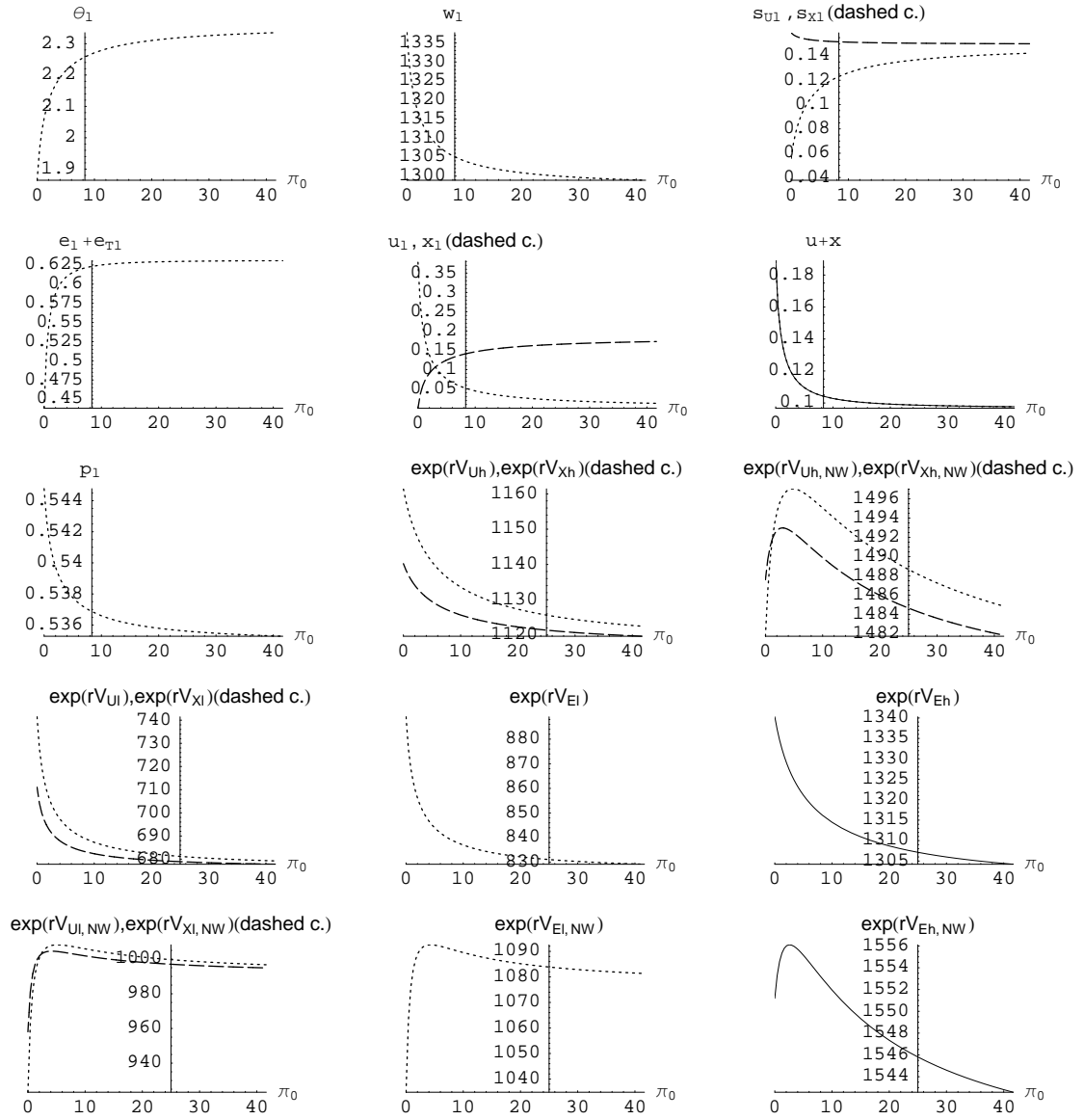


Figure 2: Steady-state effects of π_0 when the budget constraint of the State is ignored; $\gamma_n = \lambda_n = \pi_1 = 0$. Scale on the horizontal axis: $100 * \pi_0$.

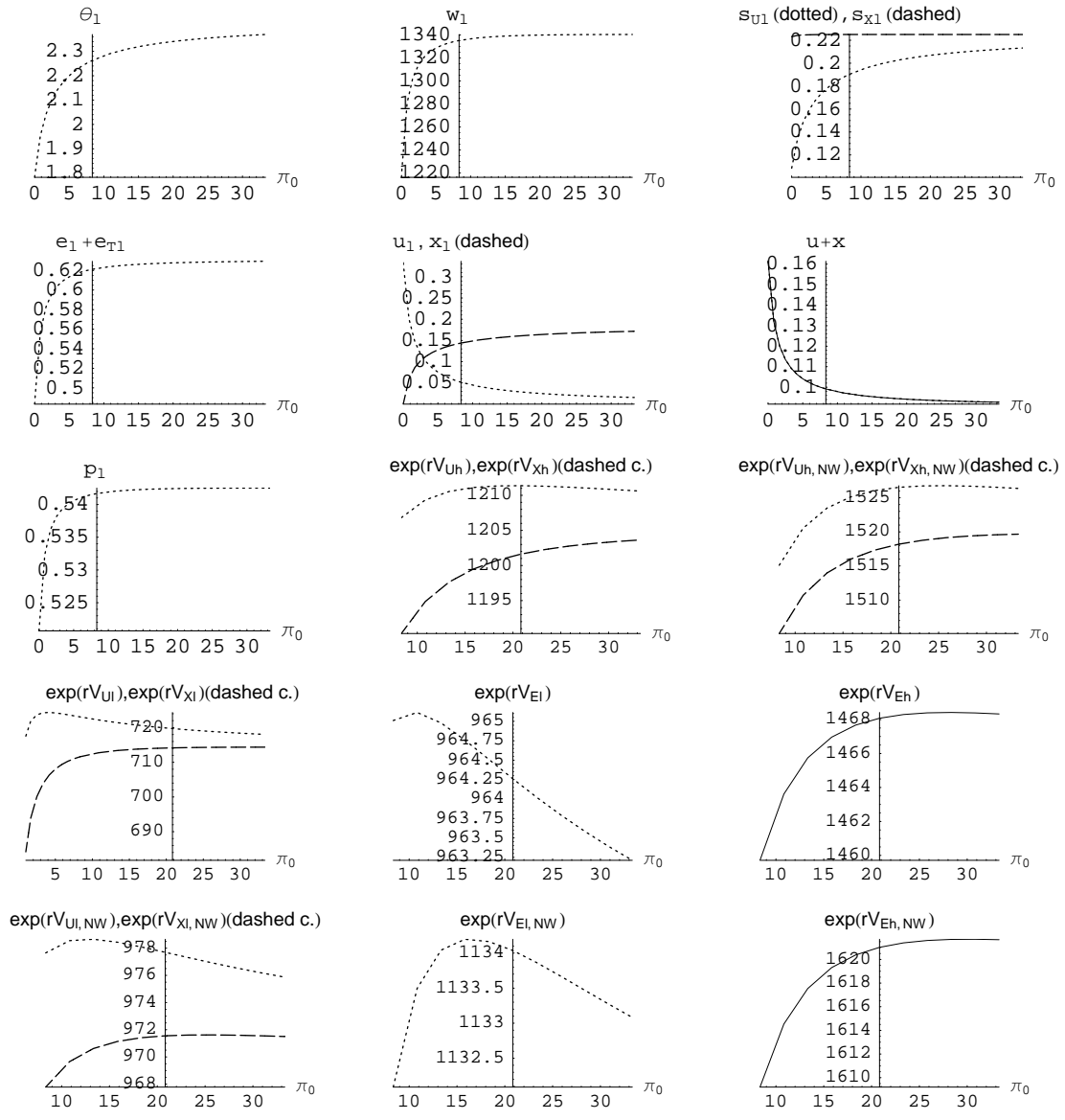


Figure 3: Steady-state effects of π_0 when the budget constraint of the State is binding; $\gamma_n = \lambda_n = \pi_1 = 0$ and $r = 0.008$. Scale on the horizontal axis: $100 * \pi_0$.

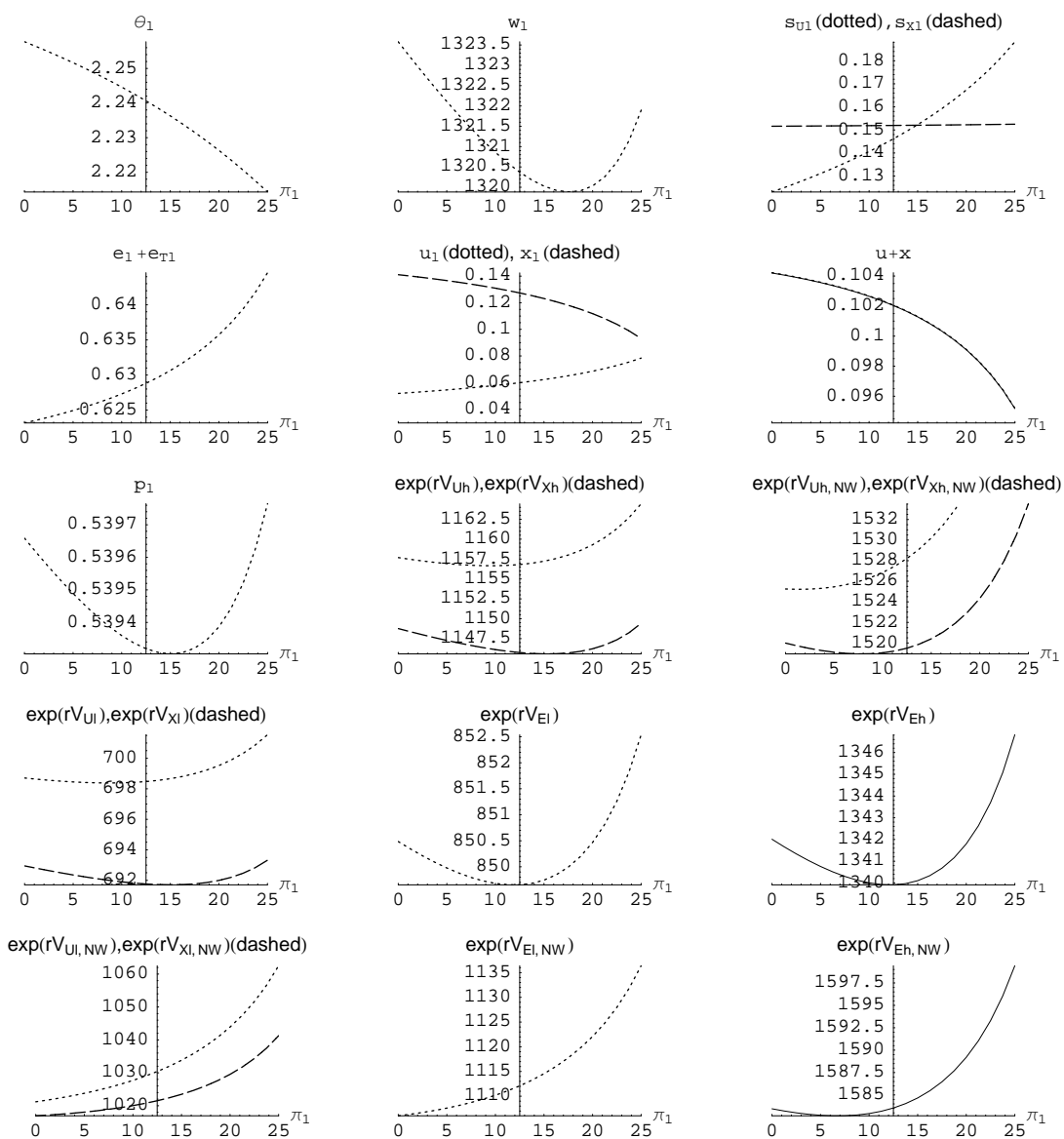


Figure 4: Steady-state effects of π_1 when the tax rates $\tau_{1,n}$ are adjusted to keep the budget of the State balanced; $\gamma_n = \lambda_n = 0, \pi_0 = 0.0833, \eta = 5$. Scale on the horizontal axis : $100 * \pi_1$.

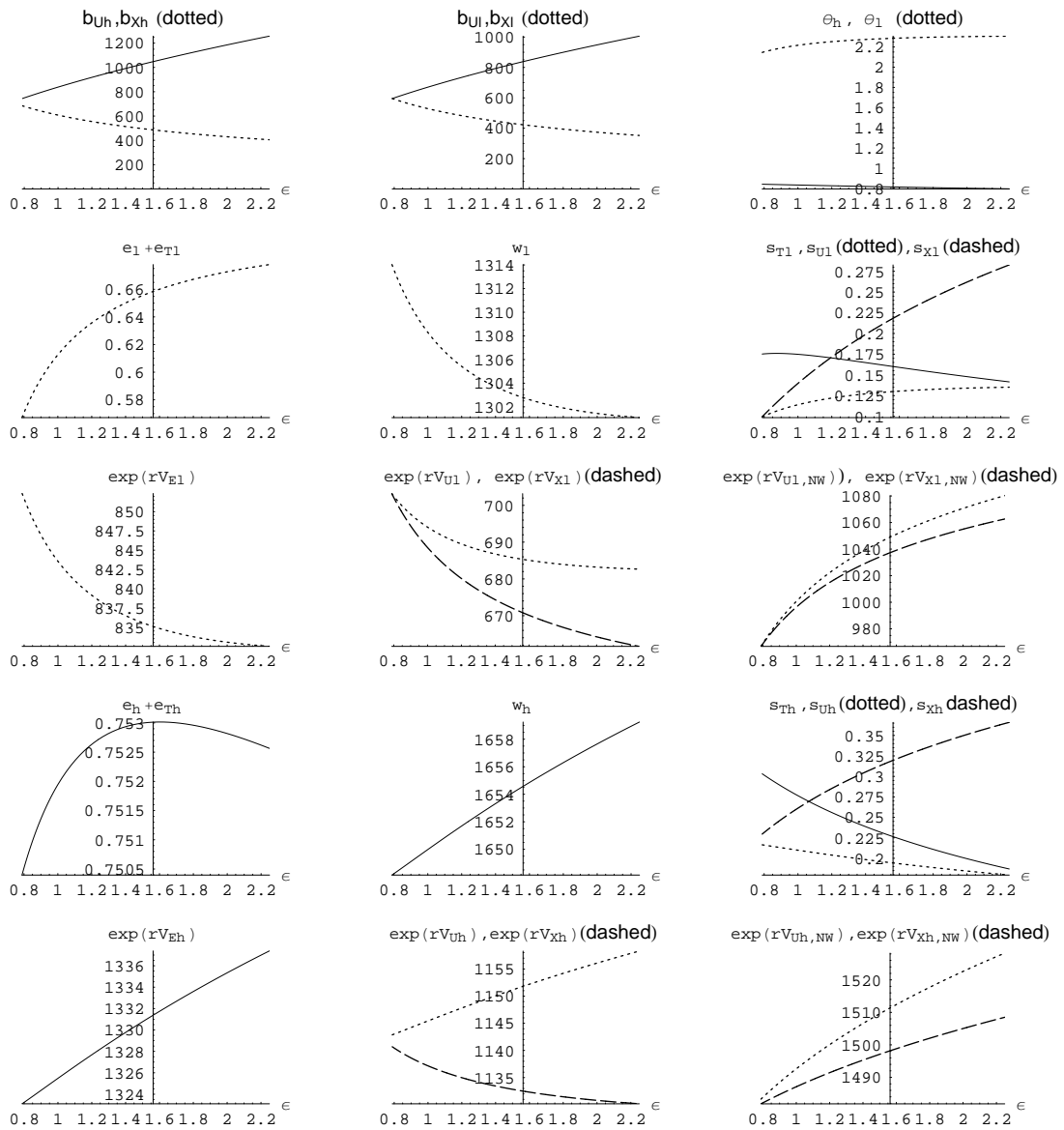


Figure 5: Steady-state effects of $\epsilon \equiv \frac{b_{U,n}/b_{X,n}}{b_{U,n}^e/b_{X,n}^e}$ when the budget constraint of the State is ignored; all other parameters fixed at their calibrated values.

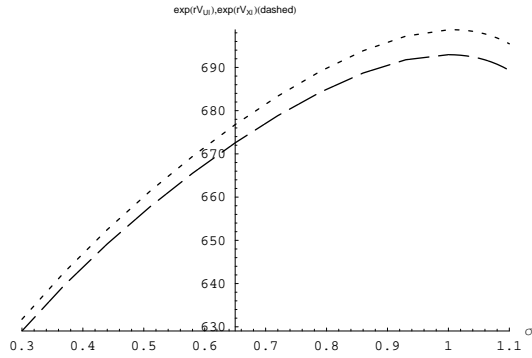


Figure 6: Steady-state effects of a balanced-budget proportionate change in all replacement ratios: Intertemporal utility of low-skilled unemployed. $\gamma_n = \lambda_n = 0, r = 0.004$.

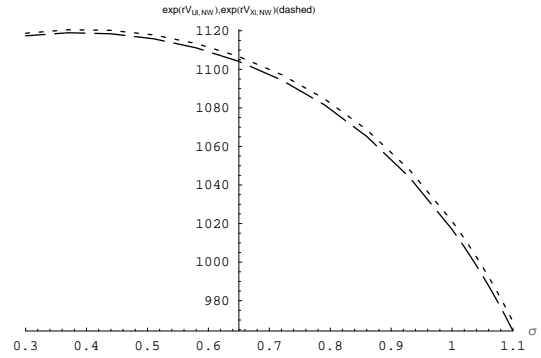


Figure 7: Steady-state effects of a balanced-budget proportionate change in all replacement ratios: Non-welfarist criterion for the low-skilled unemployed. $\gamma_n = \lambda_n = 0, r = 0.004$.

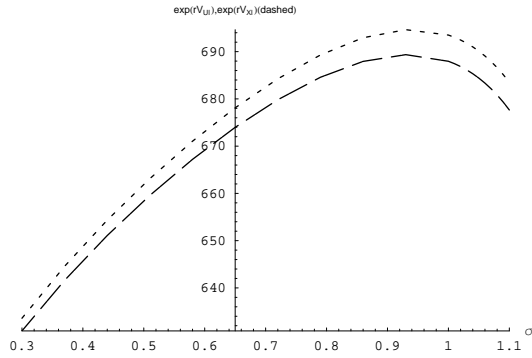


Figure 8: Steady-state effects of a balanced-budget proportionate change in all replacement ratios: Intertemporal utility of low-skilled unemployed. γ_n and λ_n at their calibrated values, $r = 0.004$.

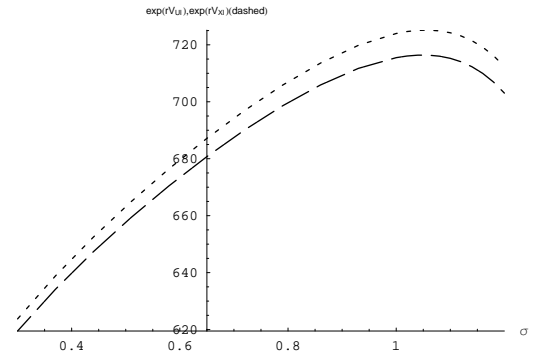


Figure 9: Steady-state effects of a balanced-budget proportionate change in all replacement ratios: Intertemporal utility of low-skilled unemployed. γ_n and λ_n at their calibrated values, $r = 0.006$.