On the structure of unemployment benefits in shirking models

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Abstract

An increase in unemployment compensation is commonly argued to raise unemployment in a shirking model of efficiency wages. This prediction is based on the assumption of a uniform benefit level. However, if differential benefits for shirkers and non-shirkers exist, higher unemployment compensation for non-shirkers will reduce unemployment. In the long-run, this effect is amplified. Therefore, not only the level of benefits influences unemployment in an efficiency wage economy but also eligibility conditions, the effectiveness with which benefits are administered and, more generally, the institutional design of the unemployment insurance system. © 2000 Elsevier Science B.V. All rights reserved.

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1. Unemployment benefits in efficiency wage models

An increase in unemployment compensation raises unemployment. This is a central prediction of most efficiency wage models and especially shirking approaches. The negative relationship between benefits and employment exists in the model by Shapiro and Stiglitz (1984), who assume a dichotomous choice of effort, and can also be derived in settings with a continuous relationship between effort and wages (see, for example, Pisauro, 1991; Drago and Heywood, 1992). How-
ever, there is only a single category of unemployment benefits. Thus, changes in benefit levels affect unemployed shirkers and non-shirkers alike. Yet, in the real world, the entitlement to unemployment compensation is often conditional. In particular, eligibility rules usually restrict payments to those unemployed who have caused the job loss themselves (OECD, 1991). Shirking can be interpreted as a reason for a self-induced job loss, implying a reduction in unemployment benefits.

Therefore, the starting point for the subsequent analysis is the assumption that it is possible to differentiate (imperfectly) between unemployment due to shirking and owing to other reasons. Moreover, different levels of unemployment benefits for shirkers and non-shirkers are allowed for. On this basis, it can be shown that higher unemployment benefits for non-shirkers raise employment since the opportunity costs of shirking rise. To provide an intuition for the result, note that the utility of a non-shirking employee consists of the weighted sum of the utility on the job and the utility derived from unemployment, where the weights are given by the probability of being fired for reasons other than shirking. If non-shirkers obtain higher benefits, the utility from non-shirking will rise relative to that from shirking, ceteris paribus. Employees work harder and the wage premium which ensures a profit maximising level of effort falls. This increases employment. Moreover, the increase in effort raises labour demand for a given wage. Hence, labour demand and wage setting effects of higher benefits for non-shirkers reinforce each other in promoting employment.

In Section 2, a simple static shirking model is outlined. Also, the wage setting and the aggregate employment schedule are derived. The above intuitive argument regarding the effects of unemployment benefits is formalised in Section 3. Given differential employment effects of changes in unemployment benefits for shirkers and non-shirkers, it is shown in Section 4 that a lenient application of eligibility rules or a positive probability of misjudging the individual causes of unemployment can invalidate or mitigate the employment enhancing impact of higher benefits for non-shirkers. In Section 5, the analysis is extended to the long-run by endogenising the number of firms. The details of the main results of the paper are summarised in Section 6: reductions in unemployment cannot only be achieved by a lower level of unemployment compensation but also by an appropriate change in its structure.

2. Shirking framework

2.1. Employees

Efficiency wages are paid because employees’ effort or productivity cannot be monitored perfectly such that there is an incentive to provide less effort than the
firm desires. Suppose, the (indirect) utility $z^e$ of an employed worker can be depicted as $z^e = v(w) - e$, where $w$ represents the wage and $e$ measures the disutility due to the exertion of effort. More specifically, $e$ is the fraction of the total working time during which effort is supplied. Working time is given exogenously and normalised to unity. Thus, shirking implies $e < 1$. The function $v$ is strictly concave in income, $v' > 0$, $v'' < 0$, $v(0) = 0$. An unemployed worker obtains utility $z^u = v(b) = b > 0$, where $b$ is the monetary value of unemployment or, for short, unemployment compensation. Moreover, $z^e > z^u$ holds to satisfy the participation constraint.

Employees are identical from the firm’s point of view and choose an optimal level of effort, given the wage which they are offered by the firm. The relation between effort and income defines the effort function which the company takes into account when maximising profits. The probability $p$ of being caught shirking is proportional to the time during which an employee has not exerted effort, $p = 1 - e$. Detection implies the immediate loss of the job. However, an employee might also lose the job for exogenous reasons. The respective probability is denoted by $q$, $0 < q < 1$. Thus, with a probability $(1 - p)(1 - q)$ a shirker remains in the firm, while a non-shirker retains its job with the probability $(1 - q)$. With a probability $u$, where $u$ is the aggregate unemployment rate, a worker who has been fired finds no new job and receives unemployment compensation. With the opposite probability $(1 - u)$ s/he obtains a job in which the same wage is paid as before, since all firms are identical. Because employees shirk in equilibrium, being unemployed is no indication of a productivity level below average, and having been fired for shirking does not reduce one’s chances of obtaining another job. The size of the labour force is normalised to unity and total employment is denoted by $N$ such that $u = 1 - N$ holds.

Unemployment compensation $b$ can take two different values in accordance with the cause of unemployment, where superscripts indicate the causality. An amount $b^s$ is paid to an employee who has lost the job because s/he has been caught shirking. An amount $b^e$ is paid to an employee who has been fired for exogenous reasons. It seems reasonable to assume $0 \leq b^e \leq b^s$, while $b^e > 0$, that is, the benefit office is paying non-shirkers at least as much as shirkers, and might even suspend unemployment compensation for shirkers. This assumption reflects the notion that benefit entitlements will be forfeited for some time or will be reduced if an employee was fired for misconduct such as shirking (Atkinson, ...
Initially, it is assumed that the benefit office is able to distinguish perfectly between different causes of unemployment. Since $p$ and $q$ are defined as unconditional probabilities, an employee might lose the job because of exogenous reasons and simultaneously because of shirking. In such a case $s$ he only receives benefits $b^s$, that is, if there are competing claims with probability $pq$, the benefit office will pay the lower rate $b^s$, instead of $b^e$. If all unemployed workers obtain the same level of benefits, it will be denoted by $b = b^c = b^e$. To bring out more clearly the effects which result from variations in the two types of benefits, contributions to the unemployment insurance fund are not considered here. However, this simplification does not affect the results since it is always possible to alter the two benefit levels $b^e$ and $b^s$ simultaneously and in opposite directions such that the budgetary effects cancel out. Moreover, there is no discounting and the dynamic programming aspects, for example, of the Shapiro/Stiglitz model are absent. Under the above assumptions, the expected utility of an employee $EU$ is given by:

$$EU = (1 - p)(1 - q)[v(w) - e] + (1 - (1 - p)(1 - q))(1 - u)$$

$$\times [v(w) - e] + u[(1 - q)p + pq]v(b^e) + q(1 - p)v(b^s)]$$

Substituting for the probability $p = 1 - e$ and maximising $EU$ with respect to the optimal choice of effort $e$, for a given wage, yields:

$$e = \frac{1}{2} \left[ v(w) - \frac{v(b^e) - qv(b^s)}{1 - q} - \frac{1 - u}{u(1 - q)} \right]$$

This effort function is characterised by the usual properties: effort rises with the wage at a diminishing rate ($e_u > 0$, $e_w < 0$) and declines with aggregate employment ($e_N < 0$) since $N = 1 - u$. In addition, effort decreases with the level of benefits $b^s$ which shirkers obtain ($e_s < 0$). However, an increase in unemployment compensation for non-shirkers $b^e$ raises effort ($e_s > 0$). Moreover, marginal effort $e_u$ is independent of unemployment benefits ($e_{ub^e} = e_{ub^s} = 0$). In equilibrium, the optimal value of effort $e$ lies in the interval $[0, 1]$. If $e = 0$, the level of output would be zero. Hence, $e = 0$ cannot represent an equilibrium. A value of $e > 1$ is impossible given the interpretation of $e$ as the fraction of working time during which effort is supplied. For the subsequent analysis, it is, therefore, assumed that effort is positive but less than unity.

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Evidence that benefit offices can differentiate the level of unemployment compensation for shirkers and non-shirkers is available for a number of countries. For Sweden, for example, Björklund and Holmlund (1991, 115) report the existence of rules which disqualify those from the receipt of unemployment compensation “who are dismissed for failure to perform their job”. In Germany, workers “who . . . are fired for misconduct are barred from receiving benefits for a period (usually 12 weeks)” (Hunt, 1995, 92). In Austria, “workers discharged for misconduct are subject to a waiting period of four weeks” (Winter-Ebmer, 1998, 35). In many countries, voluntary quitters also lose some or all of their benefit entitlements (OECD, 1991).
2.2. Firms

The economy consists of a large number of identical firms, \( \tau \gg 1 \), each characterised by a strictly concave production function \( f \) with effort \( e \) and the number of employees \( n \) as imperfectly substitutable arguments, \( f = f(en), f' > 0, f'' < 0, f(0) = 0 \). Firms are price takers in the output market. Let \( h \) be fixed costs. When analysing the long-run, firms can differ in these costs and they determine which firms enter or leave the market. In the short-run analysis of this and the next two sections, \( h \) is assumed to be the same across firms and the number of firms \( \tau \) is constant. Profits per firm are given by:

\[
\Pi = f(en) - wn - h
\]

The company replaces employees who are caught shirking without delay and costs. The first-order conditions for a profit maximum are given by \( \Pi_\nu = f'e_n - 1 = 0 \) and \( \Pi_\nu = f'e - w = 0 \).

The first-order condition \( \Pi_\nu = 0 \) can be used to show that employment per firm \( n \) decreases with the wage and will rise with effort \( e \), if \( f''en + f'e > 0 \) is presumed. This will, henceforth, be the case. \(^3\) The second-order conditions require \( e_{wn} < 0 \) and \( f'' < 0 \). The combination of the first-order conditions yields the Solow-condition or a shirking constraint \( \Psi \).

\[
\Psi = e_w w - e = 0
\]

The shirking constraint \( \Psi \) declines with the wage \( (\Psi_w = e_{ww} w < 0) \) and increases with aggregate employment \( (\Psi_N = -\tau N > 0) \). The aggregate employment schedule \( \Phi \) is defined by:

\[
\Phi = N - \tau n(w,e) = 0
\]

The aggregate employment schedule increases with the wage \( (\Phi_w = -\tau n_w = \tau ne_w/e > 0) \) and aggregate employment \( N \) \( (\Phi_N = 1 - \tau n_e n_e = 1 + \tau f''en + f'e) ne_e/(f''e^2) > 0) \). In the wage-employment space, the equilibrium levels of wages and employment are determined by the intersection of the upward sloping shirking constraint and the downward sloping aggregate employment schedule.

\(^3\) The change in employment per firm \( n \) owing to a rise in the wage \( w \) is given by:

\[
n_u = \frac{\partial n}{\partial w} = \frac{\Pi_{\nu w}}{\Pi_{\nu \nu}} = -\frac{f'ene_u + f'e_u - 1}{f'e^2} = -\frac{f'ene_u + \Pi_w}{f'e^2} = -\frac{ne_w}{e} < 0
\]

While, strictly speaking, employment is not a function of effort but of the arguments of the effort function, it is more convenient for the subsequent derivations to interpret employment per firm \( n \) as a function of \( e \). Obviously, this has no impact on the results. The change in \( n \) owing to a rise in \( e \) is found to be:

\[
n_e = \frac{\partial n}{\partial e} = \frac{\Pi_{\nu e}}{\Pi_{\nu \nu}} = \frac{f''en + f'}{f''e^2} > 0
\]
3. A change in the structure of unemployment compensation

Changes in the level or structure of unemployment compensation have an impact on the aggregate employment schedule \( \Phi \) and on the shirking constraint \( \Psi \). The consequences of changes in the parameter \( x, x = b^r, b^s, b \), are given by \( dN/dx = (\Phi, \Psi - \Phi, \Phi) / D \) and \( dw/dx = (\Phi, \Psi / - \Psi, \Phi) / D \), where \( D = \Psi_N / \Phi_N - \Psi_N / \Phi_N < 0 \). The derivatives of the shirking constraint \( \Psi \) and the aggregate employment schedule \( \Phi \) with respect to \( b^r \) are:

\[
\Psi_{b^r} = -e_{b^r} = -\frac{q'u'(b^r)}{2(1 - q)} < 0
\]

\[
\Phi_{b^r} = -\tau n_c e_{b^r} = \frac{\tau(f^e e + f^f)q'u'(b^r)}{2(1 - q)f^e e^2} < 0
\]

Therefore, a rise in benefits \( b^r \) for those workers who have lost their position for exogenous reasons shifts the shirking constraint and the aggregate employment schedule to the right in the wage-employment space. These shifts imply more employment.

\[
\frac{dN}{db^r} = \frac{e_{b^r}(e_{wn} w_{wn} + n_w)}{e_{b^r}(e_{wn} w_{wn} + n_w) - e_{wn} w_{wn}}
\]

\[
= q'u'(b^r) e_{wn} w(f^r e + f^r e) + f^e e_{wn} \frac{2(1 - q) e}{2(1 - q) D} > 0
\]

Moreover, it can be shown that wages decrease.

\[
\frac{dw}{db^r} = \frac{\tau n_c e_{b^r} e_{b^r} + e_{b^r}(1 - \tau n_c e_{b^r})}{D} = \frac{q'u'(b^r)}{2(1 - q) D} < 0
\]

In its effects on the employees’ behaviour, the increase in \( b^r \) is tantamount to a reduction in the probability of being fired for exogenous reasons. This implies a less pronounced decline in the utility which an employee incurs when losing the job for no fault of his or her own. Therefore, the expected utility of not being fired for shirking increases, even if part of it derives from unemployment benefits \( b^s \). Effort rises for a given wage and, thus, induces a reduction in unemployment. The beneficial employment consequences of a rise in the benefit level \( b^r \) for non-

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4 If the restriction on technology \( (f^r e + f^r e) > 0 \) is dropped and replaced by the requirement that the aggregate employment schedule is downward sloping at the equilibrium \( \Phi_N > 0 \), the above results with respect to wages will not be affected. The employment prediction will continue to hold if \( 1 + \eta(1 + \theta) > 0 \), where \( \eta = (d \varepsilon / dw)(\psi / e_{wn}) \) is the elasticity of marginal effort with respect to wages, and \( \theta \) is the inverse of the elasticity of the marginal product with respect to effort, \( 1/\theta = (d \varepsilon / dm)(\psi / f^e) \).
shirkers result from an increase in the attractiveness of the no-shirking option, for
given levels of wages and employment. The employment effect is independent of
relative benefits, that is, employment will also expand with a rise in \( b^e \) if \( b^e < b^s \).
Moreover, if the benefit office is not only able to restrict unemployment compensa-
tion to a level \( 0 < b^e \leq b^s \), but can completely deny shirkers any
benefits, such that \( b^s = 0 \) applies, an increase in unemployment compensation
\( b = b^e \) will unambiguously raise employment and effort, while wages will fall. In
contrast to the assertion of Atkinson (1995, 197) “that the existence of unemploy-
ment insurance does not affect the incentive to shirk”, it might even reduce this
incentive.

The reduction in the wage owing to a rise in \( b^e \) is the consequence of two
opposing effects: since effort rises with \( b^e \), employment per firm and aggregate
employment increase. This tends to drive up wages. However, the increase in
benefits for non-shirkers allows the firm to reduce the efficiency wage for a given
level of unemployment. This negative wage effect dominates in the present
framework since marginal effort is independent of aggregate employment \( (e_{uN} = 0) \)
and, therefore, the downward shift of the shirking constraint in the wage-employ-
ment space is unambiguously more pronounced than the upward movement of the
aggregate employment schedule.

An increase in benefits \( b^s \) which a former employee receives due to being fired
because s/he shirked, raises wages and lowers employment since \( \Psi_{b^s} > 0 \) and
\( \Phi_{b^s} > 0 \). Furthermore, a lump-sum, across-the-board rise in unemployment compensa-
tion \( b = b^e = b^s \), also raises wages and reduces employment \( (\Psi_{b^e} > 0, \Phi_{b^e} > 0) \). \(^5\) This result reflects the predominant finding for efficiency wage models
that a higher uniform benefit level has adverse employment consequences since
shirking becomes more attractive. \(^6\) Moreover, a simultaneous increase in \( b^e \) and
\( b^s \) is likely to have the same qualitative though not quantitative consequences as
higher benefits solely for shirkers will have. This is the case because \( b^e \) enters the
effort function only with a probability \( q \), while \( b^s \) has an impact on effort
with the higher probability \( 1 - q \). Unless the increase in \( b^e \) and \( b^s \) is

\(^5\) The assumption of \( b - b^e - b^s > 0 \) is the most convenient way of analysing an across the board
rise in benefits. The effort function is then given by \( e(w,b,u,q) = 0.5[w - e(b) - (1 - u)/(u(1 - q))] \).

\(^6\) See, for example, Shapiro and Stiglitz (1984), Pisapro (1991), Carter (1992), or Drago and
benefits for shirkers and non-shirkers in the context of the Shapiro and Stiglitz (1984) model in which,
however, shirking never occurs in equilibrium. In contrast to the usual results, in adverse selection
models, lower unemployment benefits might increase search by low-quality workers relative to that of
high-quality ones such that the incentives to pay efficiency wages rise. Hence, unemployment can
increase if benefits are lowered (Stiglitz, 1986, 188). In multi-sector fair-wage efficiency models,
higher unemployment compensation can also raise employment since the movement of labour across
sectors might invalidate the adverse incentive effects of higher benefits (Agell and Lundborg, 1992;
Albert and Meckl, 1997).
extremely disproportionate or the marginal utilities from obtaining $b^s$ and $b^e$ strongly diverge, the rise in $b^s$ will dominate the increase in $b^e$.

4. The role of the benefit office

Thus far, it has been assumed that a shirker always obtains benefits $b^s$, while an unemployed non-shirker receives $b^e$. However, it might not be possible to distinguish perfectly between different causes of unemployment. This issue is approached in a twofold manner: first, it is assumed that the benefit office is lenient and pays out unemployment compensation $b^e$ in doubtful cases, that is, to people who have been fired because of exogenous reasons and because they have been found shirking at the same time. Second, it is presumed that the benefit office can only differentiate imperfectly between dismissals for shirking or exogenous reasons.

Legal restrictions, factual difficulties, well-intentioned politicians, or simply the leniency of the benefit office might be responsible for eligibility rules which grant the benefit level $b^e$ also to employees who have shirked and have been fired for exogenous reasons. The question then arises whether such a leniency on behalf of the benefit office alters the employment consequences of a change in the benefit level $b^e$. If ‘ambiguous’ applicants are paid $b^e$, the probabilities in Eq. (1) for obtaining $b^s$ and $b^e$ will be given by $(1 - q)p$ and $q$, instead of $p$ and $q(1 - p)$, respectively. The expected utility of a workers collapses to:

$$EU = [v(w) - e](1 - u( p + q - pq)) + u[(1 - q) pv(b^s) + qv(b^e)]$$

(10)

It is immediately obvious that the effort function which results from the maximisation of Eq. (10) is independent of $b^e$ since $q$ is not a function of effort $e$. Moreover, the effort function is the same as for the case of a uniform benefit level, where unemployment compensation is defined by the amount $b^e$ which shirkers obtain (cf. footnote 5). Therefore, a rise in $b^e$ reduces employment, while an increase in $b^e$ no longer has any employment consequences. This is because workers cannot influence the probability that they receive $b^e$ instead of $b^s$ by varying effort. Thus, the positive employment impact of a rise in $b^e$ crucially depends on the feature of the benefit system that not only ‘pure’ shirkers obtain benefits $b^s$, but that this also (sometimes) occurs to shirkers who have been fired for exogenous reasons.

A benefit office which also pays unemployment compensation $b^e$ to ‘ambiguous’ applicants might do so because it cannot properly differentiate between workers who have lost their jobs owing to shirking or due to exogenous reasons. This inability to ascertain, without error, the cause of unemployment can also be introduced explicitly. Therefore, assume that ‘ambiguous’ applicants are entitled to
and denote by \( \alpha \) the probability that someone who has shirked and been caught is not recognised as a shirker by the benefit office and consequently obtains benefits \( b^s \). With probability \((1 - \alpha)\) the correct evaluation is made and \( b^s \) is paid out. Conversely, someone who has lost his or her job for exogenous reasons might be misjudged as a shirker and obtain \( b^e \). This happens with probability \( \beta \). With probability \((1 - \beta)\) the correct evaluation is made and \( b^e \) is paid out. Consequently, a non-shirker receives benefits \( b^e \). Denote by \( \tilde{e} \) the optimal level of effort for a given wage under these assumptions. The expression for \( \tilde{e} \) can be obtained from Eq. 2 by substituting \( 1 - q \beta \) for \( \beta \) and \( (1 - \beta) v(b^e) + \beta v(b^s) \) for \( v(b^s) \). While the wage and employment consequences of a uniform rise in benefits \( b = b^e = b^s \) obviously are not affected by the introduction of assignment errors, the impact of a rise in either \( b^e \) or in \( b^s \) is potentially ambiguous since the change in effort cannot be determined:

\[
\tilde{e}_{b^e} = -v'(b^e) \frac{1 - \alpha - q \beta}{2(1 - q)} \tag{11}
\]

\[
\tilde{e}_{b^s} = -v'(b^s) \frac{\alpha - q(1 - \beta)}{2(1 - q)} \tag{12}
\]

Accordingly, \( \Psi_{b^e} \) \( \Phi_{b^e} \) and \( \Psi_{b^s} \) \( \Phi_{b^s} \) can no longer be signed with certainty. The higher \( \alpha \) — or the type I error which the benefit office makes — is, the more likely it becomes that effort rises (decreases) with \( b^e \) \( b^s \), potentially reversing the employment effects derived above. A high type I error implies that a shirker obtains benefits \( b^e \) with a fairly high probability, but \( b^s \) with a comparatively lower likelihood. Hence, by increasing \( b^e \) shirking is punished less severely than for a low value of \( \alpha \), reducing effort and, therefore, employment. The reverse argument holds for a rise in \( b^s \). A high type II errors signifies that many people might only obtain \( b^e \), although they have lost their job for exogenous reasons. If the financial support they receive in this case rises, that is, if \( b^e \) is increased, the incentive to shirk can be reduced.

Eqs. (11) and (12) can be used to compute restrictions for \( \alpha \) and \( \beta \) such that the results which have been derived in Section 3 retain their validity. To obtain some idea of the empirical magnitude of \( q \), the exogenous probability of losing the job could be proxied, for example, by the inflow rates into unemployment. Most likely, inflow rates are an overestimate of \( q \), since they also include shirkers and workers who quit their job. Thus, the subsequent calculations presumably represent excessive restrictions on \( \alpha \) and \( \beta \). Monthly inflow rates vary between 0.2% for Belgium and Ireland and 3.4% for the US (Layard et al., 1991, 222 f). If the time period under consideration is viewed as a year, the relevant value of \( q \) might reach 15%–20% in high inflow countries such as Australia, Canada or the US. Unless type I and II errors are both close to unity, the employment reducing effect of an increase in \( b^s \) would not be affected. But for \( q = 0.2 \), for example, \( \tilde{e}_{b^e} > 0 \) will only hold, if \( 5 \alpha + \beta < 1 \), that is, the type I error must be less than 20%. Thus, substantial type I errors, i.e., paying shirkers benefits that should only be paid to
those who have lost their jobs for exogenous reasons, can reverse the beneficial employment effects of an increase in $b^e$.

The above findings demonstrate that reducing the impact of unemployment insurance to a single variable — the level of compensation — omits important determinants of unemployment. In an efficiency wage setting, a differential treatment for shirkers and non-shirkers is one of these components which has, thus far, been given little attention. If it is important whether an unemployed is classified as having been a shirker or not, the administrative effectiveness of the benefit office will influence the level of unemployment. Accordingly, for $b^e > b^e$, a reduction in assignment errors raises effort for a given wage and reduces unemployment. Hence, institutions such as the benefit office matter. For example, if the efficiency of two branches of the labour offices differs, this institutional diversity can contribute to an explanation of regional disparities of unemployment in an efficiency wage economy.

5. Long-run perspective

In the analysis of shirking models, it has been claimed by Albrecht and Vroman (1996, 189) in this journal that “the qualitative comparative static properties… change in an important way” in the long-run. Therefore, the question arises if the differential employment effects of altering benefits for shirkers and non-shirkers will be affected by a long-run perspective. Following Albrecht and Vroman (1996), Goerke (1997), and Rasmussen (1998), the alternative time horizon is modelled by endogenising the number of firms and imposing a zero profit constraint (cf. Eq. (3)). Any positive (negative) level of profits induces firms to enter (leave) the market until a zero profit equilibrium is restored. If assuming, in addition, that fixed costs $h_s$ can vary across firms, the profit constraint will determine which companies remain in the market and which have to leave — or can enter.

To analyse the consequences of such a long-run constraint in the present model, a linear system is set up which consists of the shirking constraint (Eq. (4)), in conjunction with the effort function (Eq. (2)), the aggregate employment schedule (Eq. (5)) with a variable number of firms $t$, and the zero profit constraint for given output prices (Eq. (3)). The endogenous variables are the wage $w$, aggregate employment $N$, and the number of firms $t$, while variations in the parameters of

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7 See Atkinson (1995, 175 ff) for an analysis of whether electoral preferences induce changes in eligibility conditions, that is, variations in the probability of assignment errors, rather than alter benefit levels.

8 Obviously, the analysis also pertains to the case of a production function with constant returns for $h = 0$. 
the benefit system, $x = b^e$, $b^s$, $b^s$, are the exogenous variables. Totally differentiating Eqs. (4) and (5), and $\Pi = 0$ yields:

$$\begin{bmatrix}
  e_{ww} w & -e_N & 0 \\
  -n_w \tau & 1 - n_x e_N \tau & -n \\
  0 & f' n e_N & 0
\end{bmatrix} \begin{bmatrix}
  dw \\
  dN \\
  dx
\end{bmatrix} = \begin{bmatrix}
  e_x \\
  n_x e_N \tau \\
  -f' n e_x
\end{bmatrix} \begin{bmatrix}
  dx
\end{bmatrix}$$

(13)

In the short-run, i.e., without the zero profit constraint, the $2 \times 2$ matrix in the left hand corner of Eq. (13) defines the wage and employment consequences of variations in benefits for a given number of firms $\tau$. Below, the subscript $s$ denotes these short-run effects, while the subscript $l$ indicates the long-run impact which can be derived when taking into account $\Pi = 0$. The respective employment consequences are given by (see also Eq. (8)):

$$\frac{dN}{dx|_l} = \frac{n}{dN|_l} = -\frac{e_x}{e_N}$$

(14)

$$\frac{dN}{dx|_l} = -\frac{e_x \tau (e_{ww} w e_x + n_w)}{e_N \tau (e_{ww} w e_x + n_w) - e_{ww} w}$$

(15)

Eq. (14) reveals that employment per firm $n$, $n = N/\tau$, remains constant. Hence, the variation in aggregate employment in the long-run is solely driven by the change in the number of firms. Moreover, a rise in either $b^e$ or $b = b^s = b^s$ reduces aggregate employment more strongly in the long-run than in the short-run. The increase in benefits reduces effort and causes profits to fall below the minimum level $\Pi = 0$. Hence, same firms leave the market. The result that the aggregate employment change is more pronounced in the long-run than in the short-run, which Albrecht and Vroman (1996) also obtain for a model with dichotomous effort is, thus, independent of the type of shirking model as long as unemployment compensation does not depend on the wage.

An increase in benefits $b^e$ paid to non-shirkers raises effort, ceteris paribus, such that efficiency wages are lowered. This raises employment. Firms make profits and new companies enter the market. In the long-run, the rise in employment is magnified beyond the short-run impact, again only via an increase in the number of firms. Moreover, the employment effect is independent of the restriction on technology ($f'' e + f' > 0$). Turning to wages, there are two conflicting effects: the increase in $b^e$ reduces the wage, while the rise in $N$ has the opposite impact. In the long-run, these two effects just cancel out such that $dW/db^e = 0$. If wages and employment per firm are constant, so must be effort in order to guarantee $d\Pi = 0$. Therefore, the rise in effort owing to the increase in benefits $b^e$ which are paid to non-shirkers is exactly reversed by the fall in unemployment.

Summing up, a higher level of benefits for non-shirkers (shirkers) does not alter employment per firm, wages, and effort, and raises (reduces) the number of firms and aggregate employment in the long-run. This striking result arises because if
benefits change, the level of profits varies owing to the alteration in effort. However, changes in wages and employment per firm have no first-order profit effect because $\Pi_w = \Pi_n = 0$. Therefore, profits are positive and new firms enter the market. This will continue until the increase in aggregate employment has driven effort $e = e(b^*, N, \ldots)$ back to its original level. Therefore, the assumption that profits per firm cannot change at all is of vital importance for the long-run constancy of employment per firm, wages, and effort, that is of all firm-related variables, in this model.

6. Summary

It has been shown that a higher level of unemployment compensation for non-shirkers reduces the level of unemployment. This effect is amplified in the long-run when the number of firms is allowed to vary. It is mitigated by the possibility that non-shirkers receive the unemployment compensation which is supposed to be paid to shirkers and can be reversed if too many shirkers obtain benefits which are only intended for non-shirkers. The model illustrates the importance of administrative decisions of the benefit office once differential causes for unemployment and, therefore, the relevance of eligibility requirements are allowed for. If efficiency wages are an important source of unemployment, the theoretical analysis of this paper predicts that reductions in unemployment might not only be achieved by a reduction in the level of unemployment compensation but also by an appropriate change in its structure.

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References


