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Should unemployment bene…ts decrease as the unemployment spell lengthens?

Bank of Finland Discussion Paper 23/2001

Tuomas Saarenheimo
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Abstract

It has become a conventional wisdom in economic policy debate that in order to minimise adverse e¤ects on employment, unemployment bene…ts should decrease with the unemployment spell. This paper, using a series of simple search models, shows that the theoretical result regarding the optimality of a declining unemployment bene…t pro…le is largely a result of speci…c modeling assumptions and fails to hold in a more general setting. While any pure reduction of unemployment bene…ts always improves employment, a redistribution of unemployment bene…ts from the long-term unemployed in favour of the short-term unemployed can either increase or decrease unemployment and unemployment bene…t expenditure. The direction of the e¤ect depends, inter alia, on the structure of unemployment and on the extent to which employed workers can reduce their lay-o¤ probability.

Key words: unemployment bene…t, unemployment, search models

JEL classi…cation number: J64

Tuleeko työttömyyskorvauksen pienentyä työttömyyden pitkittyessä?

Suomen Pankin keskustelualoitteita 23/2001

Tuomas Saarenheimo
Kansantalousosasto

Tiivistelmä

Talouspoliittisessa keskustelussa on yleistynyt näkemys, jonka mukaan työttömyysturvan haitalliset kannustinvaikutukset voidaan minimoida järjestelmällä, jossa työttömyyskorvauksen taso laskee työttömyysjakson pitkittyessä. Tässä tutkimuksessa osoitetaan yksinkertaisia etsintämalleja hyväksi käyttäen, että teoreettinen tulos ajan myötä vähenevän työttömyyskorvauksen optimaalisuudesta on pitkälti seurausta tietyistä rajoittavista oletuksista, eikä se yleisty monipuolisempaan mallikehikkoon. Siinä missä työttömyyskorvauksen aito pienentäminen parantaa työllisyyttä kaikissa tilanteissa, voi uudistus, joka suurentaa työttömyyskorvausta työttömyysjakson alussa ja pienentää sitä pitkäaikaistyöttömien osalta, lisätä tai vähentää työttömyyttä ja työttömyyskorvauksista syntyviä kustannuksia. Vaikutuksen suunta riippuu muun muassa työttömyyden rakenteesta sekä siitä, missä määrin työlliset työntekijät voivat vaikuttaa irtisanomistodennäköisyyteensä

Avainsanat: työttömyysturva, työttömyys, etsintämallit

JEL luokittelu: J64

Contents

1 Introduction

> "[T]he mission sees considerable merit in returning to a system of gradually declining unemployment bene…ts over the duration of the unemployment period to encourage swift job search before skills erode" (IMF Sta¤, Concluding Remarks to the Article IV Consultation on Finland, 2001)

In its Concluding Remarks the IMF mission restates what seems to have become a consensus view in economic policy debate: in order to minimise the negative e¤ects of unemployment bene…ts on employment, the time sequence of bene…ts over the unemployment spell should be front loaded, ie declining over time. Indeed, a reform of the unemployment bene…t system towards that direction has been on the Finnish economic policy agenda for some time. The proposed reform would stagger the unemployment bene…t pro…le (presently ‡at for the …rst two years) by increasing bene…ts during the …rst months of the unemployment spell and reducing the the bene…t level correspondingly for the latter part of the two-year period. The reform is intended to be cost-neutral: it seeks to redistribute bene…ts over the unemployment spell rather than reduce the general bene…t level. The aim is to encourage job search and thereby improve employment.

The proposal seems to …nd some support from economic theory. The result that the optimal unemployment bene…t pro…le decreases with the unemployment spell was …rst established in the seminal article by Shavell and Weiss (1979) and is based on the assumption that …nding a job requires costly search e¤ort from the worker — a search e¤ort which the government cannot directly monitor. The higher the expected present value of future unemployment bene…ts, the less the incentive for the representative unemployed to invest e¤ort in job search. To improve this incentive, the government can reduce the expected present value of his future bene…ts by switching to a declining bene…t pro…le. This can be done without reducing the overall utility of a representative unemployed if the bene…ts are correspondingly increased earlier in the unemployment spell. Alagoskou…s et al. (1995) goes so far as to suggest that unemployment bene…ts be paid as a "lump-sum payment on job loss" (Alagoskou…s et al. 1995, p. 106).

Despite the fact that the view quoted at the start of this paper has, to certain extent, reached the status of an accepted conventional wisdom, the implications of theory are, in reality, more nuanced and complex than this. Take, for illustration, the proposition to pay a lump-sum unemployment payment

on job loss (which, to be fair, Alagoskou…s et al. in fact meant as a thought experiment rather than as an actual policy recommendation). Stepping outside the simplistic model structure for a while, it is easy to see where such a scheme would fail. Obviously, it would make job loss a highly pro…table event. There would, consequently, be an incentive to exploit unemployment bene…t, in a mutual consensus between the employer and employee, for a variety of schemes that would involve short unemployment spells. Firms could periodically lay o¤ and re-hire their employees in response to seasonal demand variation or simply as a means to provide extra holidays for workers. Hence, in all likelihood, the scheme would give rise to a lot of very short unemployment spells. If the aggregate amount of funding for unemployment bene…ts was kept unchanged, the lump-sum amount would have to be reduced accordingly. The cost of would be carried by those who after a job loss face true di¢culties to …nd new employment and therefore go through a prolonged unemployment spell — i.e. exactly those that the UI system is intended to insure.

This example highlights well the two angles from which this study examines the e¤ects of changes in bene…ts pro…le. The …rst angle is the multiplicity of moral hazard problems associated with UI bene…ts. Job search e¤ort is just one — albeit the most widely analysed — of the incentive problems which the optimal design of UI bene…ts has to take into account. Its obvious counterpart is job retention e¤ort, the existence of which can lead to quite opposite implications regarding the optimality of bene…ts pro…le. The second angle is heterogeneity of labour force. The same policy action can have opposite incentive e¤ects on two unemployed which di¤er regarding their preferences or the degree of control which they have over their unemployment duration.

This paper does not attempt to derive general results. Rather, it presents a series of special, yet plausible, cases in which the consensus view — optimality of declining bene…t pro…le — may fail to hold. Its purpose is to show that the dominant view is, to a large extent, the result of the simplifying assumptions in the research tradition, and that in less speci…c settings, no general theoretical result can be derived. The e¤ects of a redistribution of bene…ts among unemployed always depends on the speci…c structure of the prevailing unemployment.

The lack of generality of the theoretical optimality of front-loaded unemployment bene…ts is not an altogether novel result. The reality of economic research in the …eld has always been more diverse than the perception. While Shavell and Weiss (1979) are often credited for being the …rst to show the optimality of a declining bene…t scheme, it is seldom mentioned that this was the result in just one of their three model variations. Of the other two, one pro-

duced a constant, the other an increasing, optimal bene…t scheme. There are numerous other similar examples. For example, Wang and Williamson (1996) generate an optimal bene…t pro…le in which unemployment bene…ts initially increase for a short while and decrease thereafter.

Hence, the question of the e¤ect of bene…ts pro…le and bene…t reforms on employment is an empirical one. Identifying the kind of reform that would most bene…t employment in a particular country is no easy task and cannot, in general, be based on macro-level analysis. It requires a careful, micro-level empirical analysis of the structure of unemployment and the true incentives and opportunities faced by di¤erent groups of present and potential unemployed.

Next section presents the general dynamic model which is used in section 3 in slightly modi…ed forms to examine the e¤ects of loosening certain assumptions. Section 4 concludes the paper.

2 The model

The theoretical model used in this study is a continuous-time dynamic search model in the tradition of Pissarides and Mortensen (1999) (see also Baily, 1978, and Flemming, 1978). An unemployed worker receives an unemployment bene…t $wb(s)$ where w is the wage rate and s is the duration of unemployment. We denote the initial replacement ratio by b and assume that as the unemployment span lengthens, the replacement ratio decreases steadily according to

$$b(s) = be^{-\beta s}; \qquad b > 0; \beta \geq 0:$$

Job opportunities arrive at random and follow a Poisson process with a hazard rate that depends on the search e¤ort by the unemployed. To simplify the model, we assume that the decision on job search is binary: the unemployed can, at each instance, only choose whether or not to engage in job search, but cannot otherwise choose the intensity of the search e¤ort. For an unemployed engaged in search, the hazard rate of …nding a job is λ, for one not engaged in search, the hazard rate is zero.[1] Engaging in job search is associated with a cost l, which can either be interpreted as the value of lost leisure or as the cost of

[1] This assumption is a departure from the tradition. However, we believe little is lost in terms of intuition while a great deal is gained in terms of simplicity. Without some such simplifying assumption, a model without a steady state gets virtually intractable. Sinko (2001) chose to allow a continuum of e¤ort levels, but had to simplify the calculations by reducing the rationality of the agents: in his model, when making instantaneous decision of search e¤ort, an unemployed cannot foresee subsequent changes in his optimal e¤ort level but (incorrectly) assumes that the e¤ort level chosen at that instance is maintained inde…nitely.

search. Below, we will use the …rst interpretation. Job o¤ers are homogenous and always accepted by the unemployed. As always in this modeling tradition, we assume that the government cannot monitor the search e¤ort and therefore cannot condition UI bene…t on it.

It is easy to show that with the assumed monotonically (weakly) declining replacement ratio ($\theta \geq 0$), the optimal pro…le of the search e¤ort is one in which the unemployed …rst enjoys leisure for an initial period (of possibly zero length) and engages in job search thereafter. In other words, the optimisation problem is reduced to one of choosing the optimal starting moment $k^{\ast} \geq 0$ for job search. In this simple model, unemployment rate is directly linked to $k^{\ast}$ — higher $k^{\ast}$ means higher unemployment.

The problem of maximising and the value of unemployment $U(0)$ at the start of the unemployment spell can be written as

$$U(0;k^{\ast}) = \max_{k} \left\{ \int_{0}^{k} e^{-rs} b e^{-\theta s} + l \, ds + \int_{k}^{1} \cdot \int_{k}^{T} e^{-rs} b e^{-\theta s} ds + e^{-rT} W \right\} \gamma e^{-\gamma T} dT \tag{1}$$

where W denotes the value of an employment contract and r is the interest rate. Here, the …rst integral represents the known present value of bene…ts and leisure until the start of the e¤ective search, the second one the expected combined present value of bene…ts and the eventual employment contract. The last term $\gamma e^{-\gamma T}$ represents the density function of the distribution of the waiting time until the arrival of a job o¤er.

The present value of a job can be written as

$$W = \int_{0}^{1} \left\{ \int_{0}^{T} e^{-rs} w ds + e^{-rT} U(0) \right\} \alpha e^{-\alpha T} dT \tag{2}$$

where α is the exogenous constant instantaneous probability of being laid o¤. This simpli…es to

$$W = \frac{w}{r+\alpha} + \frac{\alpha U(0)}{r+\alpha}. \tag{3}$$

Solving the optimisation problem in equation (1) for the optimal k gives the …rst-order condition

$$l + \frac{\gamma b}{\theta + \gamma + r} e^{-\theta k^{\ast}} - \frac{r \gamma W}{r+\gamma} = 0. \tag{4}$$

The …rst-order condition shows some features that are obvious and some that

are less so. It is straightforward to show that if there exists a …nite optimal k¤, it is increasing in the initial replacement ratio b and decreasing in the rate-of-decline parameter ®; increasing the generosity of unemployment bene…t, either by increasing the initial replacement ratio or by reducing the rate at which the bene…t decreases as the unemployment spell lengthens, postpones the start of job search. Equally intuitively, a higher valuation of leisure l means a longer period without search e¤ort.

A less obvious relation — revisited later in section 3 — is the one between the hazard rate ¸, i.e. the likelihood of job search being successful, and the start of job search. It is easy to see that for very small values of ¸, that is, when the likelihood of …nding a job is very small, the …rst order condition in (4) cannot hold and hence there is no interior solution. Such an unemployed is "discouraged" and never engages in job search. Provided that the value of leisure is not too high (l < rW), there exists a threshold value of ¸ above which there exists a …nite optimal k¤. When ¸ increases further, k¤ …rst declines and then starts to increase, approaching a …nite value as ¸ goes to in…nity.

We shall use this model to analyse the e¤ects of the UI bene…t reform presently under discussion in Finland. This suggested reform would consist of staggering unemployment bene…ts in a cost-neutral manner so that, in comparison to the present situation, bene…t level would increase for the short-term unemployed and decrease for the longer-term unemployed. Within the parameters of the model of this paper, this reform could be approximated as a simultaneous increase both in the initial replacement ratio b and the front-loading parameter ®.

An important feature of the reform under consideration is that it is intended to be neutral in the sense that it should maintain the average bene…t level and have no e¤ect on aggregate bene…t expenditure. Such neutrality is, however, a di¢cult concept. The main question is, is neutrality supposed to apply before or after the behavioural changes are taken into account? The reform is, after all, intended to change incentives and thereby a¤ect the scale and structure of unemployment. To the extent such changes are realised, they will certainly a¤ect both the average bene…t as well as the aggregate expenditure. Is the change in bene…t parameters supposed to anticipate and neutralise any such ensuing e¤ects?

Here we take the view that neutrality must be understood in relation to the given initial structure of unemployment. In other words, when balancing the changes in the bene…t parameters against each other, the government acts as if those changes had no e¤ect on unemployment. We …nd that assumption justi…ed since, in reality, the e¤ects of reforms on the structure of unemploy-

ment are uncertain, come with a lag, and are intermingled with many other factors a¤ecting unemployment, so that factoring those into the reform is not a realistic task. Hence, an expenditure-neutral bene…t reform is actually neutral only in the ex ante sense — in general unemployment expenditure will be a¤ected ex post. Finally, where it makes a di¤erence, we will consider a reform in which the change in the bene…t parameters is larger than in…nitesimal. This means that e¤ects which are second order at the margin may have an e¤ect on the outcome.

In model terms, a neutral bene…t reform is a change in parameters b and θ which leaves the expected present value of unemployment bene…ts $UB(0)$ at the start of the unemployment spell unchanged:

$$\frac{@UB(0)}{@b}\,¢b + \frac{@UB(0)}{@\theta}\,¢\theta = 0 \tag{5}$$

where $¢b;\ ¡\,¢\theta > 0$ and

$$UB(0) = \int_0^{k¤} e^{¡rs} w b e^{¡\theta s} ds + \int_{k¤}^{1}\int_{k¤}^{T} e^{¡rs} w b e^{¡\theta s} ds\ ¸ e^{¡,T} dT: \tag{6}$$

In case of heterogeneous population, we require that, given the initial structure of unemployment, a neutral bene…t reform leaves the aggregate unemployment bene…t expenditure unchanged.

Hence, we apply the following de…nition:

De…nition 1 An ex-ante expenditure-neutral front-loading of unemployment bene…t pro…le is a combination of an increase in the initial bene…t level and an increase in the rate of decline of bene…ts over the duration of the unemployment spell, calibrated so as to keep the aggregate unemployment bene…t expenditure constant for the given scale and structure of unemployment.

3 E¤ects of bene…t reform on unemployment

In this section we will use a series of variations of the model presented above to analyse the e¤ects of a neutral bene…t reform on employment. In addition to the basic model, we study three simple extensions of it. For each of the extended models, we construct a situation in which a bene…t reform of the type de…ned above can actually increase unemployment.

3.1 Basic model

We …rst analyse the e¤ect of the bene…t reform in the basic model with homogenous labour force and no additional moral hazard problems beyond the one associated with job search. We assume that the parameters are such that the …rst-order condition (4) has an interior solution $k^{¤} > 0$. Hence, after being laid o¤, the representative unemployed enjoys leisure for a period $k^{¤}$ and engages in job search thereafter.

It is straightforward but somewhat tedious to show that a bene…t reform such as de…ned in De…nition 1 always improves employment (see Appendix) as long as there is initially any voluntary unemployment; that is, as long as $k^{¤} > 0$. It also improves the utility of the representative unemployed and reduces government expenditure. Hence, the model con…rms the traditional result obtained in similar settings (see e.g. Sinko 2001). In this setting, the optimal unemployment bene…t structure would be the one suggested by Alagoskou…s (1995): a lump-sum payment on job loss. With such a system, all workers would start job search immediately after being laid o¤. The amount of the lump-sum payment has no e¤ect on job search activity, so it could be determined purely on the basis social considerations.

We summarize the result of the basic model as follows:

Conclusion 1 In the basic model with homogenous workers and with moral hazard related only to job-search e¤ort, an ex-ante expenditure-neutral front-loading of unemployment bene…ts reduces unemployment and aggregate bene…t expenditure.

3.2 Heterogenous workers I: di¤ering search success probabilities

The …rst attempt towards more realism is to release the assumption of homogenous labour force. Speci…cally, we shall assume that workers di¤er with regard to the parameter ¸, ie their probability of …nding a job when engaging in job search. Figure 1 plots the relation between ¸ and the start of job search for representative parameter values. As Figure 1 illustrates, and as mentioned in the previous section, there is a non-monotonic relationship between job-…nding probability and search e¤ort. Unemployed with a very small probability of …nding work are discouraged and do not actively search for job. The reason is obvious: the likelihood of …nding a job is too small to outweigh the loss of leisure resulting from job search. Unemployed with a moderate ¸ are the …rst to start job search; job-…nding probability is su¢cient to warrant

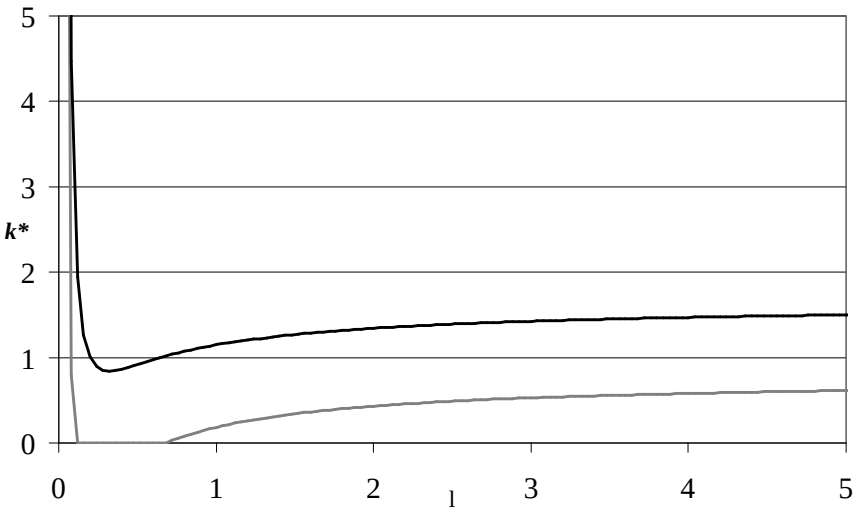

Figure 1: Job search e¤ectiveness and search e¤ort

job search while at the same time, the risk of involutary prolongation of unemployment is high enough so as not to allow postponing the start of the search. Finally, unemployed with a very high ¸ can rely on …nding a job very quickly so they can a¤ord waiting a bit longer before starting to look for a job.

To illustrate the speci…c issues that heterogeneity may create we will consider a highly stylised situation. We assume that in the economy, there are two types of workers which di¤er with regard the value of their probability of …nding a job. Type 1 workers are characterised by a ¸ equal to zero. These workers are discouraged and once laid o¤, will remain unemployed. Hence, their k¤ is in…nite. Conversely, type 2 workers are characterised by an in…nite ¸; these workers, when unemployed, will …nd a job immediately after engaging in job search. We denote their optimal starting point of job search by $k_2^¤$. To create a sensible equilibrium structure of unemployment in this model a set of additional assumptions regarding population dynamics would be needed. We choose to take a shortcut by assuming that the interest rate term r also includes a measure of the probability of death, and that the share of type 1 workers of the in‡ow to unemployment is constant at n 2]0; 1[.

A newly unemployed type 1 worker is expected to stay unemployed inde…nitely and hence carries an expected unemployment bene…t cost of wb=(® + r). Correspondingly, a newly unemployed type 2 worker will …nd work at moment $k_2^¤$ and will thus cost the unemployment insurance system wb=(® + r)(1 ¡ $e^{¡(r+®)k_2^¤}$). The aggregate expenditure on unemployment ben-

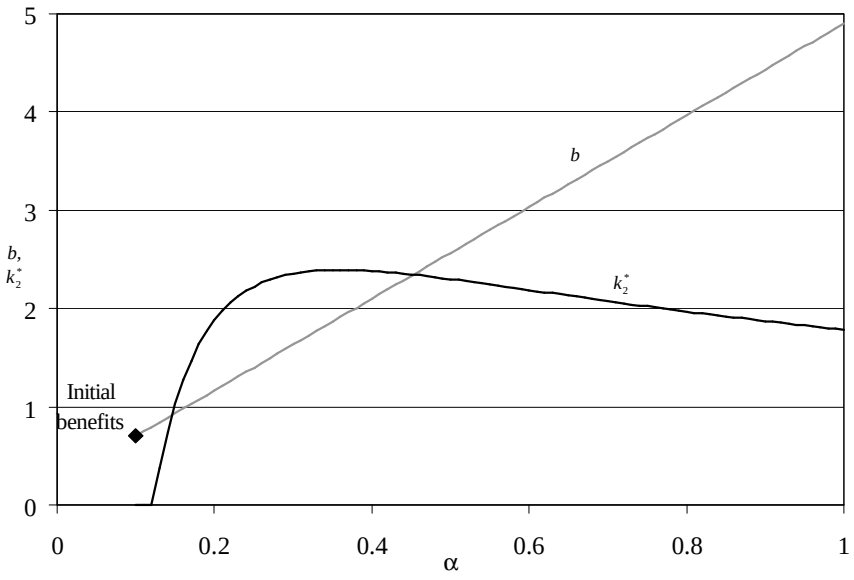

Figure 2: Job search e¤ort by type 2 workers.

e…ts is thus proportional to

$$nwb=(® + r) + (1 ¡ n)wb=(® + r)(1 ¡ e^{¡(r+®)k_2^¤}) \quad (7)$$

In order to be expenditure-neutral at the aggregate level, any bene…t reform that increases the initial bene…t but reduces bene…ts to long-term unemployed must reduce the expected bene…ts for type 1 unemployed and increase them for type 2 unemployed. Such a reform will not have any e¤ect on the behaviour of type 1 workers; their job-…nding probability is zero, so they never engage in job search regardless of unemployment bene…ts. Hence, to discover the e¤ect on aggregate unemployemt we only need to consider type 2 workers and the e¤ects of the reform on $k_2^¤$.

For type 2 workers, the net e¤ect of the reform depends on the exact parameter values. It is shown in the appendix that for low enough initial $k_2^¤$ (essentially for low enough pre-reform b) an expenditure-neutral reform will increase $k_2^¤$ and hence unemployment.

Figure 2 illustrates the relation between the bene…t parameters and the search e¤ort by type 2 workers for particular parameter values. Before the reform, the initial replacement ratio b is 0.7 and its rate of decline ® 0.1.[2] The

[2] The rest of the parameters in the example are l = 0:2 (value of leisure relative to the wage rate), r = 0:05; and ± = 0:01:

parameters are chosen so that prior to the bene…t reform, there is no unemployment among type 2 workers, ie $k_2^¤ = 0$. The horizontal axis of Figure 2 represents the the post-reform value of ®. The locus b depicts the combinations of ® and b that would constitute a revenue-neutral reform: it connects each value of ® to the value of b that is required to keep aggregate bene…t expenditure unchanged ex ante. The second curve shows how $k_2^¤$, and hence unemployment, changes as the two bene…t parameters are adjusted in a revenue-neutral manner. The …gure shows that as b and ® increase beyond a threshold value, $k_2^¤$ starts to rise; ie unemployment among type 2 workers emerges and starts to increase. Unemployment reaches its maximum at around ® = 0:35 and declines thereafter. As ® approaches in…nity — that is, as unemployment bene…t becomes closer and closer to a lump-sum payment — $k_2^¤$ approaches zero again.

The intuition behind this result is fairly simple. The bene…t reform reduces the attractiveness of long-term unemployment. However, the only long-term unemployed in the model are by assumption irreversibly discouraged, so this change in incentives has no e¤ect on their labour supply. On the other hand, the reform increases the attractiveness of short-term unemployment for those that do have a choice. As a consequence, type 2 workers, who can control the duration of their unemployment, see their bene…t opportunities increase. Unlike the …rst group, this second group is responsive to changes in incentives, and reacts to higher bene…ts by postponing the start of job search. The result is an increase in aggregate unemployment and, ex post, after behavioural changes, also in aggregate unemployment expenditure.

In this example, type 1 unemployed are a lost cause and the only challenge for the government is to keep type 2 workers at work. This can be done with any bene…t scheme that does not involve a too high initial bene…t level. More speci…cally, for non-increasing unemploment bene…ts (® ¸ 0) it su¢ces that

$$wb + l < w; \tag{8}$$

ie the initial benei…t plus the value of leisure should not exceed the wage level.

The results of this model extension can be summarised as follows:

Conclusion 2 If workers di¤er in terms of their ability to …nd a job, an ex-ante expenditure-neutral front-loading of unemployment bene…ts may increase or reduce aggregate unemployment and bene…t expenditure.

3.3 Heterogenous workers II: di¤ering valuations of leisure

The extension considered next can be given two alternative interpretations. The one used below is that the unemployed di¤er in terms of their value of leisure parameter l. However, as l de…nes the value of leisure only in relation to the market wage, an equivalent story could easily be constructed for a case in which unemployed have identical valuation of leisure but di¤er with respect to their market wage w. This present example is analysed to a large extent along the same lines as the previous one. Again, to avoid unnecessary complexity and to highlight the intuitive point, we concentrate on a highly stylised situation in which there are only two types of workers. Type 1 workers have a higher value of leisure than type 2 workers, ie $l_1 > l_2 > 0$. We further simplify the analysis by assuming that both types of workers have $\gamma = 1$, ie all unemployment is voluntary. This assumption is not necessary for the results but it reduces complexity drastically.

From (4) it follows that

$$l_i + wbe^{i\theta k_i^{\alpha}} - rW = 0 \qquad (9)$$

for the two types of workers $i = 1;2$. It is immediately obvious that $k_1^{\alpha} > k_2^{\alpha}$; type 1 workers start their search e¤ort later than type 2 workers. We assume that the initial bene…t level b is equal to $1 - l_2/w$; ie the initial unemployment bene…t is equal to the wage rate minus the value of leisure of a type 2 worker. This means that initially, a type 2 worker has an interior optimum at $k_2^{\alpha} = 0$, ie he is indi¤erent between taking up a new job immediately after being laid o¤ and postponing the search in…nitesimally (see Appendix). Therefore, the whole unemployed population consists of type 1 workers.

Now consider the e¤ects of an ex ante expenditure-neutral front-loading as in De…nition 1. Since initially all unemployed belong to type 1, an ex ante expenditure-neutral bene…t reform would be one that maintains unchanged the present value of unemployment bene…ts over an unemployment spell of length k_1^{α}. It follows directly from Conclusion 1 that such a reform would reduce unemployment among type 1 workers. On the other hand, it is easy to see that any reform that raises the b from its initial level $1 - l_2/w$ will give rise to unemployment among type 2 workers. Whether the developments in aggregate unemployment are dominated by the decrease in unemployment among type 1 workers or the increase in unemployment among type 2 workers depends on the shares of the two types of workers in the total population. Clearly, for any

values of model parameters there exists a threshold value for the share of type 2 above which the reform will increase aggregate unemployment.

As in the previous case, the reform improves job-search incentives for the actual unemployed but reduces them for potential unemployed. To predict the effect of a particular reform on total unemployment, one needs to be be able to quantify relative importance of these two effects.

Hence we have:

Conclusion 3 If workers differ in terms of their valuation of leisure relative to the market wage, an ex-ante expenditure-neutral front-loading of unemployment benefits may increase or reduce aggregate unemployment and benefit expenditure.

3.4 Dual moral hazard; endogenous job-loss probability

Here we will return to a homogenous worker population and will instead release the assumption of an exogenous lay-off probability. We assume that an employed worker's probability of being laid off depends on his job retention effort c. The instantaneous probability of being laid off is a decreasing function of job retention effort $\pm(c)$. The worker's in-job optimisation problem can be written as choosing c to maximise

$$W(c) = \int_0^{\infty} e^{-rt}(w - c)dt + e^{-rT}U(0;k^{\alpha}) \int_0^{\infty} \pm(c)e^{-\pm(c)T}dT \quad (10a)$$

$$= \frac{w - c}{r + \pm(c)} + \frac{\pm(c)U(0;k^{\alpha})}{r + \pm(c)} \quad (10b)$$

where, the present value of unemployment at job loss, $U(0;k^{\alpha})$ is as in equation (1).

Let us consider first an incremental benefit reform in which the change in b and Φ is infinitesimal and expenditure neutral ex ante. By Conclusion 1, such a reform reduces k^{α}. The effect on the optimal job-retention effort c depends on the behaviour of $U(0;k^{\alpha})$. By the virtue of the expenditure neutrality, the direct effect of the reform on $U(0;k^{\alpha})$ is zero. However, by the envelope theorem, also the indirect effect via the change in k^{α} is zero. Hence, the reform does not affect $U(0;k^{\alpha})$ and therefore also leaves the optimal work retention effort unchanged. As the reform reduces k^{α} but leaves c unchanged, it is established that the net result of an infinitesimal reform must be a reduction of unemployment.

However, this is not the end of the story. In the real world, reforms are not infinitesimally small. When we leave the realm of the infinitesimal, the

envelope theorem ceases to apply and the second order e¤ects start to play a role. In this case the reasoning goes as follows. Consider a discrete change in the unemployment bene…t system, designed so as to leave the aggregate bene…t expenditure unchanged for the given structure of unemployment. Of course, in reality behaviour is a¤ected and so is the structure of unemployment. By adjusting their behaviour to the new optimum, workers will obtain a higher utility level than prior to the reform. A discrete change in bene…t system prompts a discrete change in behaviour which, in turn, results in a discrete increase in the present value of unemployment. Higher present value of unemployment reduces investment in job-retention e¤ort and thereby creates higher in‡ow to unemployment. Whether or not this higher in‡ow to unemployment outweighs the higher out‡ow from unemployment due to earlier job-search effort (established above), depends on the model parameters in a complicated way.

To illustrate the situation, we consider a numerical example. We assume that the job-retention e¤ort c reduces the lay-o¤ probability according to $\pm(c) = \pm=c$, the initial replacement ratio is 0.8 and the unemploment bene…t decreases at a rate equal to 0.1.[3] Figure 3 plots the optimal job-retention e¤ort c (which can be thought of as re‡ecting the in‡ow to unemployment) and the start of search k^{α} (a proxy for the duration of unemployment) for di¤erent post-reform values of the parameter ®. For each value of ®, the initial bene…t level b is adjusted so as to maintain ex-ante expenditure neutrality. The …gure shows that k^{α} always decreases as ® increases: the more front-loaded the bene…t structure, the shorter the expected duration of an unemployment spell. Job-retention e¤ort is (by the envelope theorem) at its maximum at the initial bene…t structure. However, the larger the bene…t reform, the larger the ensuing increase in the attractiveness of unemployment, and the smaller the resulting job-retention e¤ort, resulting in higher in‡ow to unemployment.

Figure 4 plots the behaviour of the equilibrium unemployment rate — ie the rate of unemployment at which the in‡ow to unemployment $\pm(c)(1 ¡ U)$ equals the out‡ow from unemployment $¸[U ¡ k^{\alpha}\pm(c)(1 ¡ U)]$ — as a result of the bene…t reform. Initial equilibrium unemployment rate is a little above 31%. Since any reform that reduces ® increases both the in‡ow to and the duration of unemployment, it obviously increases unemployment. For small increases of ®, the shortening duration of unemployment more than o¤sets the increasing in‡ow, so that unemployment …rst decreases to reach its minimum at around

[3] The other parameter values used in this simulation were $¸ = 2:7$, $r = 0:04$, $l = 0:3$, and $\pm = 0:002$.

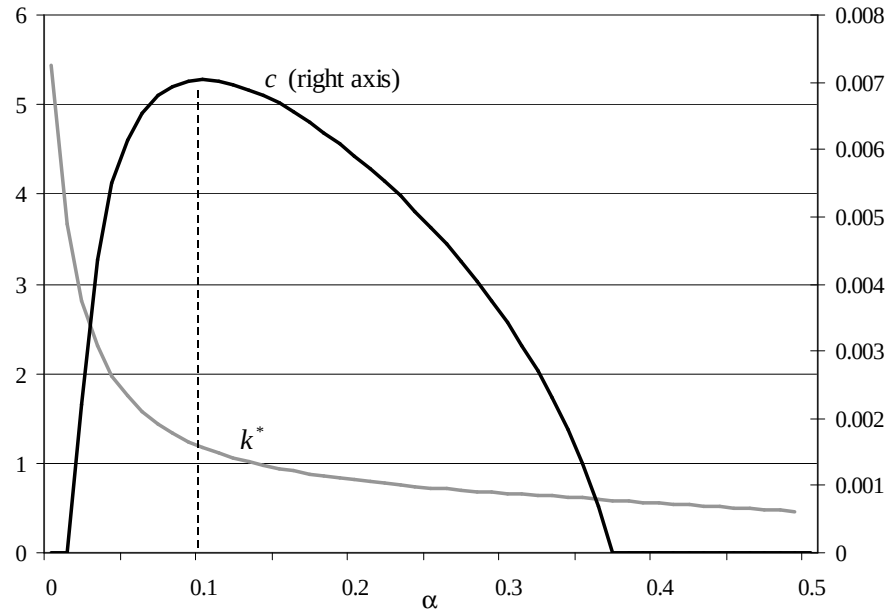

Figure 3: Job-search e¤ort k¤ and job-retention e¤ort c after a bene…t reform.

® = 0:17. For higher values of ®, the in‡ow e¤ects start to dominate and the equilibrium unemployment rate increases to exceed the initial unemployment rate for values of ® greater than about 0.25. Unemployment reaches 100% at both at ® = 0, as well as for high values of ®. In the former case this is because with an unemployment bene…t that stays constant in…nitely, an unemployed worker has never an incentive to start searching for job. In the latter case, each unemployed worker starts job-search relatively early, in order to bring the bene…t level back to the initial level, but employment spells have zero length: once the unemployment bene…t counter is reset, the worker invests so little job-retention e¤ort as to be immediately laid o¤.[4]

Finally, …gure 5 presents the ex-post level of bene…t expenditure associated with the bene…t reform. Bene…t expenditure behaves in a similar way as the unemployment rate. Minimum bene…t expenditure is reached at about ® = 0:16 while the pre-bene…t expenditure level is exceeded for ® greater than about 0.22.

The results of this section can be encapsulated as follows:

[4] This, of course, is only possible because in this model, even an in…nitesimally short employment spell su¢ces to reset the unemployment clock and bring the bene…t back to its initial level. In reality, a minimum employment spell is needed between unemployment spells. Including this in the model would reduce the equilibrium unemployment in all situations in which the optimal k¤ is …nite.

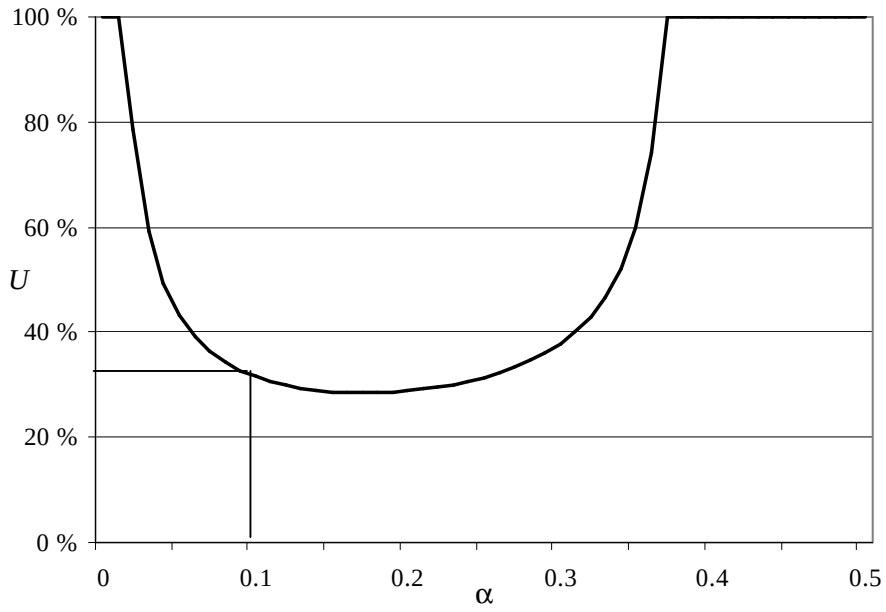

Figure 4: Equilibrium unemployment rate after a bene…t reform.

Conclusion 4 If lay-o¤ probability depends on costly job-retention e¤ort by the worker, an ex-ante expenditure-neutral front-loading of unemployment bene…ts by a non-in…nitesimal amount may increase or decrease unemployment rate and the expenditure on unemployment bene…ts.

It is important to notice that this conclusion is of a nature di¤erent from those reached in the two previous model variations dealing with heterogenous workers. Here, unemployment bene…ts should decrease over time. In fact, the optimal unemployment bene…t structure — optimal in the sense of minimising unemployment rate or unemployment expenditure for a given level of utility of an unemployed at job loss — is a lump-sum payment at job loss. The problem for the government is that in order to achieve that goal, the bene…t reform would have to be designed so as to correctly anticipate the ensuing behavioural changes. In practical terms, the lump-sum payment would need to be substantially smaller than the present value of expected bene…ts prior to the reform. Besides being more challenging to design, such a reform would create a perception of a weakening of unemployment bene…ts and could therefore be politically a harder sell.

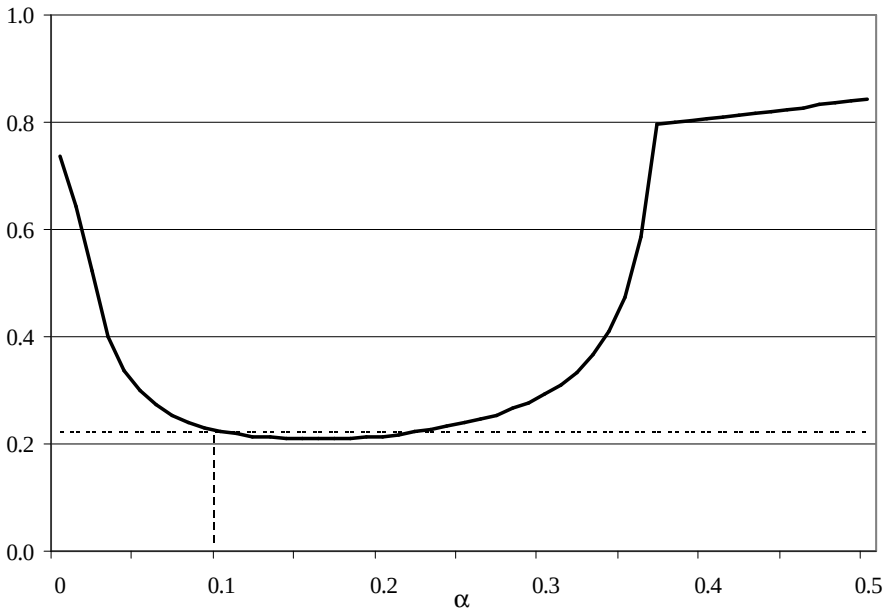

Figure 5: Unemployment expenditure after a bene…t reform.

4 Conclusions

The Finnish debate on the needs to reform the unemployment bene…t system has, to a large extent, been based on the presumption that shifting unemployment bene…t expenditure from the long-term unemployed to the short-term unemployed improves incentives and thereby increases employment. The purpose of this paper has been to show that this result lacks generality and does not survive a variety of extensions to the basic model.

The extensions considered in this paper are twofold. First, it is shown that heterogeneity of the labour force may create a situation in which front-loading can increase unemployment and the cost of the bene…t system. Broadly speaking, a reform fails if it targets the wrong segment of labour force: ie if it improves job-search incentives for those whose job-search e¤ort is least likely to produce results while weakening job-search incentives for those for whom incentives play a more consequential role. The second extension is to consider an additional source of moral hazard in the form of a costly job-retention e¤ort. Such an extension may cause a bene…t reform to result in higher unemployment if it fails to correctly anticipate the behavioural changes induced by the reform and factor them into the reform design .

There are a large number of further considerations that may a¤ect the optimal design of the unemployment insurance system. For example, in this paper, as in most of the literature, the handling of the insurance aspect of bene…t design has been rudimentary. The utility of a worker was measured by the discounted value of expected income. A more realistic modeling framework would involve risk aversion and possibly imperfect access to …nancial markets. In such a framework, the insurance dimension of unemployment bene…ts would involve not only insurance against the occurrence of unemployment but also against involuntary prolongation of unemployment. Obviously, the more front-loaded the bene…t structure, the less insurance it provides against the latter type of risk.

There are other extension that would tend to tip the scale in favour of front-loaded bene…ts. One extension that has been mentioned is the deterioration of the market value of the worker over a prolonged unemployment spell. This argument would seem to speak for more front loading, although again, the generality of such a result is not entirely obvious. Further, a similar phenomenon could be modelled as a time-declining e¤ectiveness of job-search, which could actually lead to quite opposite conclusions regarding the virtues of bene…t front-loading. Still, there are undoubtedly numerous arguments in both directions.

The general lesson is that balancing the incentive e¤ects of unemployment bene…ts against social and insurance considerations is all but a simple task. It is easy to predict that reducing unemployment bene…ts reduces unemployment; it is much more di¢cult to predict how a redistribution of bene…t among di¤erent groups of unemployed a¤ects unemployment. One should seek to identify and target those segments of unemployed (actual and potential) that are most receptive to incentives and have the greatest control over their employment situation. The resulting optimal bene…t structure is likely to di¤er from one situation to the other. In all cases, …nding the optimal structure requires a careful micro-level analysis of the structure of unemployment and the actual situation in the labour market.

A Appendix

A.1 Basic model

The following is the proof that in the basic model, a small ex-ante expenditure neutral front-loading of unemployment bene…ts reduces unemployment:

Taking the total di¤erential of the …rst order condition (4) yields the following condition for a change in the bene…t parameters ® and b to leave k¤ (and hence unemployment) unchanged:

$$\left[-\beta b \frac{1 + k^{\natural}(® + r + \beta)}{(® + r + \beta)^2} e^{-(® + r)k^{\natural}} \right] d® + \left[\frac{\beta}{® + r + \beta} e^{-(® + r)k^{\natural}} \right] db = 0;$$

which simpli…es to

$$\left. \frac{db}{d®} \right|_{dk^{\natural}=0} = b \left[k^{\natural} + \frac{1}{® + r + \beta} \right]: \tag{11}$$

Correspondingly, the condition for a bene…t reform to leave unemployment bene…t expenditure unchanged can be solved by di¤erentiating the bene…t expenditure function (6):

$$\begin{aligned} &\left[-\frac{b}{(® + r)^2} + be^{-(® + r)k^{\natural}} \left(\frac{1 + k^{\natural}(® + r)}{(® + r)^2} - \frac{1 + k^{\natural}(® + r + \beta)}{(® + r + \beta)^2} \right) \right] d® \\ &+ \left[\frac{1 - e^{-(® + r)k^{\natural}}}{® + r} + \frac{e^{-(® + r)k^{\natural}}}{® + r + \beta} \right] db \\ &= 0; \end{aligned}$$

which can be written as

$$\left. \frac{db}{d®} \right|_{dUB=0} = b \frac{\frac{1}{(® + r)^2} - e^{-(® + r)k^{\natural}} \left[\frac{1 + k^{\natural}(® + r)}{(® + r)^2} - \frac{1 + k^{\natural}(® + r + \beta)}{(® + r + \beta)^2} \right]}{\frac{1 - e^{-(® + r)k^{\natural}}}{® + r} + \frac{e^{-(® + r)k^{\natural}}}{® + r + \beta}}:$$

In order for a expenditure-neutral reform to reduce unemployment (ie re-

duce k^{α}) it is necessary and sufficient to show that

$$\left.\frac{db}{d\beta}\right|_{dU|B=0} < \left.\frac{db}{d\beta}\right|_{dk^{\alpha}=0}$$

$$\Leftrightarrow \frac{\frac{1}{(\beta+r)^2} - e^{-(\beta+r)k^{\alpha}}\left[\frac{1+k^{\alpha}(\beta+r)}{(\beta+r)^2} - \frac{1+k^{\alpha}(\beta+r+\gamma)}{(\beta+r+\gamma)^2}\right]}{\frac{1-e^{-(\beta+r)k^{\alpha}}}{\beta+r} + \frac{e^{-(\beta+r)k^{\alpha}}}{\beta+r+\gamma}} < k^{\alpha} + \frac{1}{\beta+r+\gamma}$$

$$\Leftrightarrow \frac{1}{(\beta+r)^2} - e^{-(\beta+r)k^{\alpha}}\left[\frac{1+k^{\alpha}(\beta+r)}{(\beta+r)^2} - \frac{1+k^{\alpha}(\beta+r+\gamma)}{(\beta+r+\gamma)^2}\right] < \left(k^{\alpha} + \frac{1}{\beta+r+\gamma}\right)\left(\frac{1-e^{-(\beta+r)k^{\alpha}}}{\beta+r} + \frac{e^{-(\beta+r)k^{\alpha}}}{\beta+r+\gamma}\right)$$

$$\Leftrightarrow \frac{1}{\beta+r}\left[1-e^{-(\beta+r)k^{\alpha}}\right] < k^{\alpha} + \frac{1}{\beta+r+\gamma}\left[1-e^{-(\beta+r)k^{\alpha}}\right]$$

$$\Leftrightarrow \left(\frac{1}{\beta+r} - \frac{1}{\beta+r+\gamma}\right)\left(1-e^{-(\beta+r)k^{\alpha}}\right) < k^{\alpha}.$$

Noting that $1 - e^{-(\beta+r)k^{\alpha}} < (\beta+r)k^{\alpha}$ for all $\beta, r, k^{\alpha} > 0$, for the above to hold it is sufficient that

$$\left(\frac{1}{\beta+r} - \frac{1}{\beta+r+\gamma}\right)(\beta+r)k^{\alpha} < k^{\alpha}$$

$$\Leftrightarrow \frac{\gamma}{\beta+r+\gamma} < 1,$$

which holds for all $\beta, r, \gamma > 0$ and hence completes the proof.

A.2 Heterogenous workers I

An expenditure-neutral front-loading needs to leave the expenditure function (7) unchanged. Differentiating and arranging yields

$$\left[nw/(\beta+r) + (1-n)w/(\beta+r)(1-e^{-(r+\beta)k_2^{\alpha}})\right]db +$$
$$\left[-nbw/(\beta+r)^2 - (1-n)bw/(\beta+r)^2(1-e^{-(r+\beta)k_2^{\alpha}}) + (1-n)bw/(\beta+r)e^{-(r+\beta)k_2^{\alpha}}k_2^{\alpha}\right]d\beta = 0$$

$$\Leftrightarrow \left.\frac{db}{d\beta}\right|_{dU|B=0} = \frac{b}{(\beta+r)} - \frac{(1-n)be^{-(r+\beta)k_2^{\alpha}}k_2^{\alpha}}{n+(1-n)(1-e^{-(r+\beta)k_2^{\alpha}})}$$

From (11), noticing that $\psi_2 = 1$, a reform that leaves k_2^* unchanged is characterised by

$$\left.\frac{db}{d\theta}\right|_{dk_2^*=0} = bk_2^*.$$

We intend to establish that for low enough b, an expenditure-neutral reform increases k_2^*. For that to be the case, it is sufficient to show that

$$\left.\frac{db}{d\theta}\right|_{dUB=0} > \left.\frac{db}{d\theta}\right|_{dk_2^*=0};$$

ie an expenditure-neutral reform raises the initial benefit level more than a reform that maintains k_2^*. Hence, from the above, it is required that

$$\frac{1}{(\theta + r)} - \frac{(1-n)e^{-(r+\theta)k_2^*}k_2^*}{n + (1-n)(1-e^{-(r+\theta)k_2^*})} > k_2^*.$$

Noticing that as b decreases, k_2^* goes to zero, it is sufficient to show that the above inequality holds as $k_2^* \to 0$. This is obvious since the inequality approaches

$$\frac{1}{(\theta + r)} > 0$$

as $k_2^* \to 0$. This completes the proof.

A.3 Heterogenous workers II

To establish that $b \geq 1 - l_2/w$ makes type 2 individual indifferent between taking up a job immediately at job loss or postponing the search infinitesimally it suffices to show that the first-order condition holds at $k_2^* = 0$.

From (1) and (3) it is easy to solve that if $k_2^* = 0$ and $\psi = 1$, then $U(0) = W = w/r$. Substituting these into the first-order condition

$$l_2 + \frac{\psi wb}{\theta + \psi + r}e^{-\theta k_2^*} - \frac{r\psi W}{r + \psi} = 0$$

yields $l_2 + wb - 1 = 0$. The result follows.

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