Staying on the Dole

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Abstract. We develop a simple model of labor market participation, human capital degradation, and re-training. We focus on how non-participation, as a distinct state from unemployment and employment, is determined by the welfare system in interaction with labor market conditions and personal characteristics. We provide a tractable framework to analyze how the decisions to exit the labor force and to mitigate human capital degradation by re-training depend on a broad range of factors such as education, skill degradation, age, labor market shocks, labor taxes, unemployment insurance benefits and social assistance. We extend our framework by allowing for time-inconsistent choices and demonstrate the possibility of an unemployment trap.

Keywords: Unemployment, Non-Participation, Skill Degradation, Re-training, Unemployment Benefits, Social Assistance, Present-Biased Preferences.

JEL: J64, J31, J38

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1. **Introduction**

Why do people drop out of the labor force and eventually become inactive? The economist's answer is disarmingly simple: Because the incentives are stacked against work. These incentives are importantly shaped by the generosity of the welfare system. But the extent to which a particular individual responds to these incentives depends on the characteristics of the person and on labor market prospects. For example, older workers with low productivity will respond differently to changes in the generosity of welfare benefits than younger and highly qualified people, and both groups may respond differently in a boom than if a recession is imminent.

This paper provides a tractable model of non-participation in the labor market. The main focus is to analyze how key parameters of the welfare system, i.e. labor income taxes, the duration and generosity of unemployment benefits and social assistance (or welfare in American diction), provide incentives to stay out of the labor force permanently. In particular, we investigate the role of human capital in determining the transition from unemployment into employment or non-participation.

The model assumes that human capital, i.e. a person's skills, experience and knowledge, determines the wages. Human capital degrades while not employed, thus reducing future labor market earnings. However, the unemployed can make costly investments to re-train, thus mitigating human capital degradation. Such investments in human capital can be optimal if an unemployed person plans to re-enter the labor market at a later stage but not if the person plans to remain out of work permanently. We elaborate on the determinants of why some never obtain benefits, some obtain benefits for a limited time, and some become dependent on dole money permanently. In this sense, we provide a human capital model of welfare careers or social benefit dependency. As in much of the literature, we assume perfect foresight about the benefit system and the future labor market prospects in the first part of the paper, but relax this rather unrealistic assumption later in two ways. First, we allow shocks on the labor market to be non-anticipated and, second, we demonstrate the possibility of an unemployment trap. Our account of the unemployment trap is based on the assumption of time-inconsistent preferences which may induce the unemployed to postpone re-training until it is too late (for an alternative account based on welfare cultures see Lindbeck et al. 1999). In both cases, people may end up on the dole permanently, against their best intentions.

Understanding the institutional determinants of non-participation in the labor market is im-

portant because benefit dependency rates are generally high but but vary substantially across countries. Benefit dependency rates, i.e. the proportion of people receiving an income-replacement benefit, are today about twice as large as the share of people on unemployment benefits in OECD countries, and benefit dependency rates have continued to increase in the 1990s in many OECD countries (Carcillo and Grubb, 2006). For example, the number of social assistance recipients in France (the RMI was introduced in 1989) grew by 45% between 1993 and 2000, even though this was a period of cyclical upswing (OECD 2003: 187). The available empirical evidence suggests that welfare benefits are an important determinant of non-participation. For example, Card and Robins (1998) found strong effects of welfare benefits on labor force participation in Canada in an experimental setting (see Krueger and Meyer 2002 for a survey of the effects of out-of-work benefits in selected OECD countries). Both welfare benefits and benefit dependency rates vary vary considerably across countries.

For example, benefit dependency among people of working age is about one third of employment in 6 EU countries, but higher in e.g. France and Germany and lower (one fifth) in other countries like Spain and the US (OECD 2003: 174). This variation suggests that a comprehensive analysis of non-participation needs to include country-specific parameters of the welfare system and labor market prospects. But it should also include important characteristics of decision makers because different people make different participation choices when facing the same situation. For example, when a country's welfare system is becoming more generous, younger workers with high human capital may choose to work while older workers with low human capital may opt for non-participation. But the younger workers preferred choice may be to opt for temporary unemployment, perhaps using the unemployment spell for further education, if the generosity of the welfare system is increased in a temporary recession. We therefore believe that understanding non-participation requires a unified analysis within a framework of employment, decisions to re-train, and unemployment. Using such a framework allows the researcher to scrutinize if measures intended to move people off unemployment benefits run the risk of increasing flows into welfare dependency, rather than into jobs.

Our explanation of non-participation is based on a model assuming that human capital erodes because skills degrade during unemployment. Skill degradation is frequently invoked as an intuitive explanation of long-term unemployment (e.g. Ljungqvist and Sargent, 1998) and complements other explanations based on insider-outsider effects of wage determination (Lindbeck

and Snower, 1988), habit formation (Vendrik, 1993), and stigmatization or scarring effects. See Cahuc and Zylberberg (2004) for overviews and Bean (1994) for a critical comparison of supply- and demand-side mechanisms in explaining European unemployment and its persistence. Demand-side effects of skill loss during unemployment are investigated by Pissarides (1992) and Coles and Masters (2000).

Our model is related to the literature that investigates the effects of welfare benefits on extensive and intensive labor supply (for example, Moffitt, 1983, Lindbeck et al., 1999, see Moffitt, 2002, for a survey). There seems to be an emerging consensus that extensive labor supply responses are much stronger than intensive responses (e.g. Heckman 1993. See Immervoll et al. 2007 for a discussion of European countries). In contrast to that literature we focus here on a unified three-status analysis of employment, unemployment, and non-participation resulting from the interplay of the welfare system, labor market prospects, and individual characteristics like age and skill depreciation.

Our model of non-participation is distinct from but related to the small literature extending the search and matching model towards a third state of non-participation (McKenna, 1987, Sattinger, 1995, Pissarides, 2000, ch. 7, Garibaldi and Wassmer, 2005). According to this approach individuals trade off the time spent on searching for a job against leisure, and allow for the possibility that some stop searching at all (perhaps discouraged by the belief that their search productivity is low, see Falk et al., 2006 or Frijters and van der Klaauw, 2006). The main difference of this approach to our model is that these authors assume that non-searching people would accept a job offer that comes without searching. In other words, while the non-participating individuals are not searching actively, they are nevertheless waiting for a job, i.e. they are "passively searching" (Jones and Riddell, 1999). In contrast, our model assumes that jobless individuals could get a new job immediately – possibly at a lower wage than in their last job – but prefer, all things considered, to stay on the dole permanently. In our model, non-participation is distinct from unemployment (Flinn and Heckman 1983) and to keep the analysis tractable, it is modeled as an absorbing state (as in Calmfors and Lang 1995). That is, those exiting from unemployment into non-participation do so permanently and this transition is modeled as a rational choice.[1]

[1] Pavoni and Violante (2007) use a similar modeling approach as we do. They integrate human capital degradation into the three-state search literature and investigate the optimal design of welfare to work policies. While not finding a job remains the cause of unemployment in their model, their model deviates from the search literature by assuming that the length of unemployment and eventual non-participation is determined – as in our work –

We believe that our approach is a useful complement to other theoretical approaches to non-participation because it has several advantages. Our model is rich in that it incorporates a large number of determinants of labor force participation; it is simple in that the formal reasoning is tractable and can be graphically displayed in a single diagram, it is flexible in that the model can easily be extended to account for present-biased preferences, and it is accurate in the sense that most of the predictions are in line with stylized empirical facts. These advantages come at the cost of some limitations. Our account is partial as it focuses on the supply-side and is not embedded in a general equilibrium framework, it abstracts from search frictions, and macroeconomic fluctuations are modeled in a highly stylized fashion. Our modeling approach can be interpreted as a modification and extension of the Roy model (Roy, 1951, Willis, 1986). While the standard Roy model investigates how people select themselves into different jobs according to their ability we investigate how they select themselves into one of the states employed, unemployed, and non-participating, depending on their human capital endowment and other personal characteristics.

We proceed as follows. Section 2 presents the model. Section 3 investigates the comparative statics of changes in unemployment insurance and welfare benefits, socio-economic characteristics, and labor market conditions. Section 4 discusses the determinants of the optimal unemployment spell. Section 5 relaxes the standard assumptions by allowing for time-inconsistent preferences. This modification can explain why agents get stuck in an unemployment trap and remain on the dole permanently, against their best intentions.

2. **The Model**

Consider a person who loses his (or her) job but could get a new job immediately or anytime in the future. The person can either accept the job, earn a wage that depends on his productivity and current labor market conditions, and pay taxes on his wage income. Alternatively, he can remain unemployed. If he stays unemployed he is entitled to receive unemployment benefits depending on the last net wage for a limited time of τ periods. After that he receives social assistance which is independent of the last wage until the end of his working life. We call a person remaining without job for up to τ periods unemployed and a person who remains without job for more than τ periods non-participating. The main difference to the three-stage search literature

through the interaction of human capital and its erosion with labor market institutions.

of unemployment is that somebody who stays jobless beyond the short term in our model is neither actively nor passively looking for a job. In fact, he could get a job without search, but as long as the current labor market conditions and institutions do not change he prefers to stay on the dole.[2]

The cost of being out of work is that human capital erodes, i.e. the jobless face skill degradation. We assume that jobless people can re-train at some cost to mitigate skill degradation. A jobless person thus faces two decisions: when to accept a job (i.e. whether to be employed, unemployed, or non-participating) and whether to mitigate human capital degradation by re-training. As shown in detail below, our model predicts that some (those with high productivity) find it profitable to accept a job and to be employed immediately, and some find it attractive to obtain unemployment insurance for some periods. Of those, some use this time for re-training while others (often those with low skills), find it profitable to let human capital erode and remain on the dole permanently. These decisions depend in subtle ways on labor market institutions, personal characteristics and macroeconomic labor market shocks.

Consider a currently jobless person with human capital (productivity) h who could get a job at a gross wage $w_t = h - \lambda_t$. The parameter λ_t measures exogenous productivity shocks devaluating human capital at time t. We assume that labor income is taxed at a constant rate θ. It pays for a person with human capital h to accept a job immediately (i.e. at time $t = 0$) if the present value of life-time labor market income

$$V(h,0) = \sum_{t=0}^{T-1} \delta^t (1-\theta)(h - \lambda_t) \tag{1}$$

dominates all other possible income streams. We assume that future income is discounted at factor $\delta < 1$, and that the person retires from working life after T periods. Equation (1) shows that life-time labor market income $V(0)$ increases with human capital endowment and the length of remaining working life. This implies that $V(0)$ decreases with the worker's age.

The cost of being jobless is that human capital degrades during this period. This may, for example, be the case because the jobless do not benefit from on-the-job training, because human capital erodes when not familiarized with the current state-of-the-art technology, or simply

[2] Note that all workers are eligible to benefits from unemployment insurance for τ periods. The non-participants are in this respect indistinguishable from the unemployed. However, the non-participants continue to be jobless after unemployment insurance benefits expire, i.e. by staying on social assistance.

because they are not used to work anymore.[3] People can mitigate human capital degradation or actually improve skills by incurring costly educational efforts (e.g. by taking a computer course) while being without job. These efforts are valuable because they increase human capital, and thus future wages. To keep the analysis of skill degradation and re-training tractable, we assume that a fraction d of human capital depreciates during short-term unemployment and that jobless persons can spend $c \cdot \bar{e}$ units of income on re-training which increases their human capital by $e > 0$ units. Alternatively, they may let their human capital erode and do not re-train ($e = 0$).

Jobless people receive benefits $b \cdot (1-\theta)h$ from unemployment insurance for τ periods. Unemployed persons leave unemployment at time τ and receive a wage of $w_t = (1-\theta)[(1-d)h+e-\lambda_t]$ per period t for the rest of their working life. Thus the present value of life-time income for an unemployed is given by

$$V(h,\tau) = \sum_{t=0}^{\tau-1} \delta^t b(1-\theta)h - c \cdot e + \sum_{t=\tau}^{T-1} \delta^t (1-\theta)\left[h(1-d) + e - \lambda_t\right], \tag{2}$$

where c denotes unit costs of re-training (in present value terms).[4]

If people are still without a job after τ periods, they receive tax-exempt social assistance s per period until time T. The present value of life-time income of a non-participant who has just lost his job includes unemployment insurance benefits received over the first τ periods and is given by

$$V(h,T) = \sum_{t=0}^{\tau-1} \delta^t b(1-\theta)h + \sum_{t=\tau}^{T-1} \delta^t s. \tag{3}$$

A person's life-time income $V(h,t)$ can be understood as a function of his human capital and the time t at which he ceases to be jobless (by either entering employment or retirement). To keep the analysis simple, we assume that λ_t can take two values: λ_0, representing contemporaneous labor market shocks and λ_τ denoting expected labor market shocks between time τ and T. To

[3] Topel (1990) estimates that in the US in the 1970s and 1980s workers losing a job suffered on average a wage reduction of between 15 and 40 percent by the time they found a new job. Jacobsen et al. (1993) find similar results. Keane and Wolpin (1997) estimate that blue-collar skills depreciate by about 10 percent in a year absent from work, while white-collar workers lose about 30 percent of their skills during one year of unemployment. Thus, a more realistic model would tie the depreciation rate itself to the level of human capital. In any case, however, human capital degradation is of non-negligible magnitude.

[4] There is no uncertainty in the model. We thus abstain from modelling the possibility to lose the accepted job again. This possibility could, however, be integrated into the model without changing any qualitative results, i.e. it only increases analytical complexity. Note that our model does not imply that the person will never lose his job again. It only implies that this event, if it occurs, comes unexpected in form of an exogenous shock. Likewise, our model does not imply that non-participants stay out of the labor market forever. If they re-enter, however, this comes as a reaction to an exogenous event of, for example, a favorable macroeconomic shock or an unexpected reduction in the generosity of social assistance.

simplify the notation, we introduce the following aggregated discount factors.

$$\delta_\tau \equiv \sum_{t=0}^{\tau-1} \delta^t = \frac{1-\delta^\tau}{1-\delta}, \qquad \delta_T \equiv \sum_{t=\tau}^{T-1} \delta^t = \delta^\tau \cdot \frac{1-\delta^{T-\tau}}{1-\delta}. \tag{4}$$

Note from inspection of equations (4) that a longer working-life increases δ_T and leaves δ_τ unaffected, while longer duration of eligibility for unemployment benefits increases δ_τ and reduces δ_T in equal proportions, $\partial\delta_\tau/\partial\tau = -\partial\delta_T/\partial\tau > 0$. With these notational simplifications we can analyze career decisions conveniently in a $h - V$-diagram, taking the exit time from unemployment $t \in \{0, \tau, T\}$ parametrically. For this purpose we rewrite (1') – (3') as

$$V(h,0) = \delta_\tau(1-\theta)(h-\lambda_0) + \delta_T(1-\theta)(h-\lambda_\tau) \tag{1'}$$

$$V(h,\tau) = \delta_\tau b(1-\theta)h - c\cdot e + \delta_T(1-\theta)\left[(1-d)h + e - \lambda_\tau\right] \tag{2'}$$

$$V(h,T) = \delta_\tau b(1-\theta)h + \delta_T s. \tag{3'}$$

The decision to re-train is straightforward. Equation (2') reveals that life-time income of the unemployed is higher with re-training ($e > 0$) than without ($e = 0$) if the present value of the labor income gain exceeds the present value of re-training costs. In particular, $e > 0$ is chosen if

$$c < (1-\theta)\delta_T. \tag{5}$$

Otherwise, no re-training takes place, i.e. $e = 0$. Thus, equation (5) captures the empirically plausible effects that high labor taxes discourage re-training and that younger workers (i.e. those with higher δ_T) tend to do more re-training than older workers. Mitigating human capital degradation is never optimal for non-participants because they expect not to return into employment and not to reap the returns of re-training.

A natural assumption (which holds for every OECD country, see OECD, 1999) is that the net market wage is higher than unemployment insurance benefits, i.e. that the replacement rate b is smaller than 100 percent. Under this condition, life-time income is always more steeply increasing in human capital for employed persons than for unemployed persons. For the unemployed,

in turn, life-time income increases more steeply in h than for the non-participating.

$$V(h,0)' = \delta_\tau(1-\theta)+\delta_T(1-\theta) > V(h,\tau)' = \delta_\tau(1-\theta)b+\delta_T(1-\theta)(1-d) > V(h,T)' = \delta_\tau(1-\theta)b. \tag{6}$$

Thus, in a $V-h$ diagram, life-time income intersects in three points yielding critical levels of human capital.[5] These intersections are calculated from (1') – (3'):

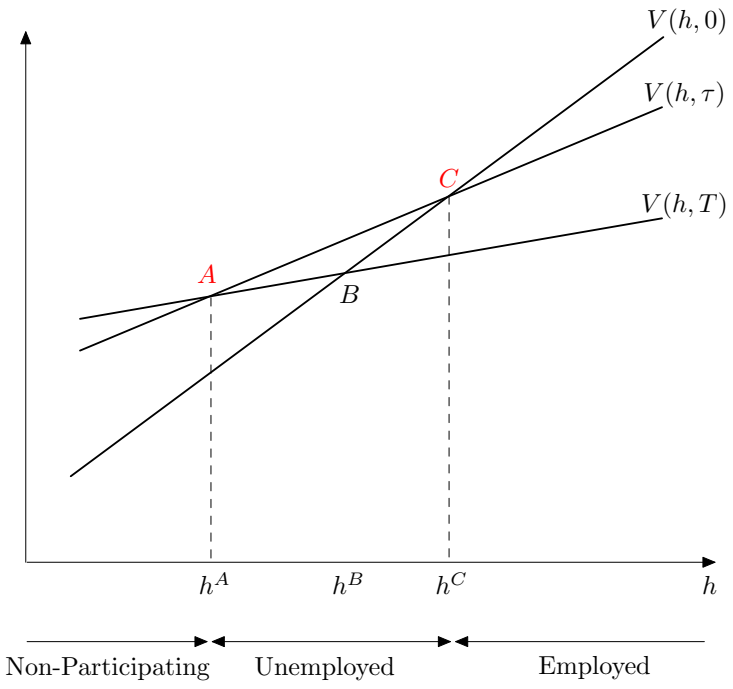
$$h^A = \frac{\delta_T\left[s+(1-\theta)\lambda_\tau\right] - e\left[(1-\theta)\delta_T - c\right]}{\delta_T(1-\theta)(1-d)} \tag{7}$$

$$h^B = \frac{(1-\theta)\left[\delta_\tau\lambda_0 + \delta_T\lambda_\tau\right] + s\delta_T}{(1-\theta)\left[\delta_\tau(1-b)+\delta_T\right]} \tag{8}$$

$$h^C = \frac{\delta_\tau(1-\theta)\lambda_0 + e\left[(1-\theta)\delta_T - c\right]}{(1-\theta)\left[\delta_\tau(1-b)+\delta_T d\right]} \quad . \tag{9}$$

We call the intersection between $V(h,\tau)$ and $V(h,T)$ point A, the intersection between $V(h,0)$ and $V(h,T)$ point B, and the intersection between $V(h,0)$ and $V(h,\tau)$ point C (see Figure 1).

Figure 1: Career Decision Diagram



[5] It is also possible according to (6) that it is never optimal to be unemployed, i.e. people are either employed or non-participating. This empirically less plausible, degenerate case is discussed in the Appendix.

Figure 1 reflects several well-known empirical regularities. First, unemployment decreases with education (see e.g. OECD, 2004). Second, non-participation is more prevalent among low-skilled workers. For the latter, human capital, i.e. productivity, is so low that the best available choice is to live on the dole permanently. In our model, this is in particular the case when labor market prospects are currently bleak and will remain so in the future (high λ_0 and λ_τ), and when social benefits (s) are generous.[6]

Education and employment go hand in hand, according to the empirical literature. For example, Nickell (1979) and Machin and Manning (1999) show that unemployment duration falls with education. Yet, in our setup becoming non-particpating means a complete exit from the labor force. In other words, the decision to participate in the labor market again (triggered, for example, by a change of social assistance, taxation, or a favorable labor market shock) affects labor supply at the extensive margin. Our result that non-participation is – ceteris paribus – observed for people with low skills and low productivity is in line with the empirical regularity that extensive labor supply elasticities are particularly large at the low end of the income distribution (Eissa and Liebman, 1996 and Meyer and Rosenbaum, 2001). A positive relationship between education and participation rates is also documented in OECD (2004).

On the upper end of the education spectrum we find those workers who never prefer to be unemployed because the opportunity costs of unemployment (in terms of human capital degradation and future wage loss) are too high. For intermediate skill-levels a period in unemployment is optimal if h^A is located to the left of h^C. For the unemployed it pays to let human capital erode if unemployment benefits are relatively generous, if human capital does not erode much, or if the unemployment spell is actually used to re-train and to upgrade human capital.

Unemployment is optimal if re-training pays off, i.e. when (5) holds. In that case there are always some persons who find it optimal to retreat from the labor market to acquire additional human capital. In order to obtain the condition that there is unemployment without re-training, insert (7) and (9) and $e = 0$ into $h^A < h^C$ to get:

$$\lambda_\tau + \frac{s}{1-\theta} < \frac{\delta_\tau \lambda_0 (1-d)}{\delta_\tau (1-b) + \delta_T d} \tag{10}$$

[6] Note that we compare income streams and do not consider how utility is affected by stigma effects or by time availability – be it positively via leisure or negatively via reduced self-esteem. See Moffit (2002) for the standard model on the effect of leisure preferences for welfare recipients and Darity and Goldsmith (1996) for an overview on the effects of joblessness on emotional well-being. See Moffitt (1983) on stigma. Note that stigma and leisure effects could be easily introduced parametrically into our model, i.e. as shift parameters of $V(h, T)$ and $V(h, \tau)$.

Thus, unemployment is more likely to be observed when the opportunity costs of being unemployed are low, i.e. when adverse productivity shocks are currently large (large λ_0) but are expected to be low in the future (small λ_τ), when the direct cost in terms of human capital degradation are low (low d), when the benefits for unemployment (b) are generous and granted for a long period (i.e. δ_τ is large), and when exiting unemployment after some time is relatively attractive (i.e. social assistance (s) is low, and taxes on labor income (θ) are not too high). Equation (10) also shows that, ceteris paribus, unemployment without re-education is more prevalent among older workers (i.e. for low δ_T).

3. **Comparative Statics**

We now discuss how labor market institutions (in particular, the generosity of unemployment benefits b, duration of eligibility for unemployment benefits τ, labor market taxes θ, generosity of social assistance s), the characteristics of the jobless (in particular, human capital h, skill loss d, age $T-\tau$, re-training costs c) interact with adverse contemporaneous (λ_0) or expected (λ_τ) productivity shocks to explain re-training and the decision to stay temporarily or permanently on the dole. By differentiating the functions (7) and (9) with respect to the model's institutional and individual parameters we obtain how h^A and h^C change their position in the career diagram, providing comparative statics of individual career decisions. If we imagine a country's (or region's) workforce ordered along the h-line according to their human capital endowment, we can infer the comparative statics of aggregate unemployment and labor force participation.

3.1. **Unemployment Benefits.**

In line with empirical evidence, we find that a higher replacement rate b increases overall unemployment (e.g. Nickell et al., 2005). In Figure 1, an increase in b leaves h^A unaffected and shifts h^C to the right.

$$\frac{\partial h^A}{\partial b} = 0, \qquad \frac{\partial h^C}{\partial b} = \frac{\delta_\tau h^C}{\delta_\tau(1-b)+\delta_T d} > 0.$$

Higher unemployment benefits increase unemployment because they increase the incentive to let human capital erode for a while or to use an unemployment spell for the accumulation of new skills. The model predicts that workers with low human capital degradation (d) and old workers (small δ_T) are particularly responsive to changes in unemployment benefits.

3.2. **Duration of Eligibility for Unemployment Benefits.** The effects of an increase in the duration of eligibility for unemployment benefits are less straightforward. A longer period of unemployment benefits increases non-participation if it discourages the unemployed to re-train. Without re-training ($e = 0$) a change in duration has no effect on labor force participation. An increased duration of benefits increases unemployment under some conditions (in particular when taxes and current productivity shocks are high). To simplify the notation, we define $\delta' \equiv \partial\delta_\tau/\partial\tau > 0$ and recall that $\partial\delta_T/\partial\tau = -\delta'$. We obtain the following effects of increasing the duration of eligibility for unemployment benefits (τ).

$$\frac{\partial h^A}{\partial \tau} = \frac{ce\delta'}{\delta_T^2(1-\theta)(1-d)} \geq 0, \qquad \frac{\partial h^C}{\partial \tau} = \frac{(\delta_\tau + \delta_T)\lambda_0(1-\theta)d - \phi \cdot e}{(1-\theta)[\delta_\tau(1-b) + \delta_T d]^2} \cdot \delta'$$

$$\phi \equiv [(1-\theta)\delta_T - c](1-b) + (1-\theta)(1-b)\delta_\tau + cd > 0,$$

where $\phi > 0$ follows from the re-training condition (5).

Suppose unemployment is not used for re-training ($e = 0$). In this case, longer eligibility for unemployment benefits does not affect the decision to be non-participating (because for a non-participant it is optimal to stay on the dole permanently anyway). It increases unemployment because some workers in the upper range of the education spectrum find a short spell in unemployment attractive ($\partial h^C/\partial\tau > 0$ for $e = 0$). This will in particular be the case when current productivity shocks are large. In the absence of productivity shocks ($\lambda_0 = 0$) and without re-training, there is no effect of benefit eligibility on unemployment because the replacement rate is smaller than one (i.e. $1 - \theta - b > 0$).

If workers re-train, their option to upgrade skills is the dominant motive for being unemployed (rather than to collect unemployment benefits). In this case, our simplified model which treats re-training as a one-time event that happens instantly (by paying the re-training cost) may imply a degenerate reaction to longer eligibility of unemployment benefits. Having used the unemployment spell for re-training, workers actually strive for a new job because the payoff of the newly acquired skills in terms of higher wages can be reaped only after re-employment.

An (exogenous) extension of the unemployment period τ has thus the negative effect of delaying re-employment. The delay devaluates re-training such that some workers with intermediate skills who would have re-trained with a shorter duration now decide against re-training. Without re-training, they find a permanent stay on the dole attractive and as a consequence the range

of Non-participating increases at the expense of unemployment ($\partial h^A/\partial\tau > 0$ for $e > 0$).

An exogenous extension of the eligibility period τ also affects workers with relatively high skill levels. These workers would also have chosen to use an unemployment spell to invest in human capital, but with a higher τ, they find this option less attractive than entering employment. The derivative of h^C shows that devaluation of re-training is the dominant effect on unemployment if taxes are low and labor market are not much distorted by adverse shocks (since both further increase the value of being quickly employed again). While this interpretation of exogenous changes of τ on human capital is fairly intuitive, the reverse interpretation is perhaps more plausible. In this case, τ is interpreted as decision variable depending on h. Interpreted in this way, the derivative shows that a worker's preferred duration of unemployment for re-training purposes decreases with his initial endowment of human capital, $\partial\tau/\partial h^C < 0$. In Section 4 we investigate the decision on unemployment duration in detail.

The "normal" reaction of increasing unemployment for increasing duration of unemployment benefits payments $\partial h^C/\partial\tau > 0$, is obtained when current productivity shocks and taxes are sufficiently high. In this case, longer eligibility makes unemployment more attractive and employment decreases. In other words, interaction terms matter (see Belot and van Ours, 2004, and Nickell et al., 2005). In a U.S.–style welfare system where λ_0 is small and ϕ is large (because taxes θ and benefits b are low), the effect of longer eligibility on unemployment will be small and possibly ambiguous. In a European–style welfare system where λ_0 is large and ϕ is small the effect of benefit eligibility on unemployment is positive and possibly large.

3.3. **Social Assistance.** Higher social assistance changes labor force participation and through this channel the overall level of unemployment. It reduces participation because some low-skill unemployed individuals find it now attractive to remain on the dole permanently. In Figure 1, an increase in social assistance moves h^A to the right and leaves h^C unaffected.

$$\frac{\partial h^A}{\partial s} = \frac{1}{(1-\theta)(1-d)} > 0, \qquad \frac{\partial h^C}{\partial s} = 0$$

Workers at the upper end of the education spectrum may consider using an unemployment spell for some further re-training but staying permanently on the dole is never an option for them. Thus, the decision between employment and unemployment is unaffected by a change in social assistance ($\partial h^C/\partial s = 0$). But some workers who previously planned only a short

spell of unemployment will find the status of non-participation attractive when social assistance increases. The derivative $\partial h^A/\partial s$ indicates that this effect will be large for those with high rates of human capital degradation.

Some researchers hold generous social assistance responsible for continental Europe's employment problem. A single non-participant without children, for example, who would live on food stamps in the U.S. receives in Germany *Sozialhilfe* of 648 Euros per month (including support for housing and heating). Sozialhilfe for other types of households is higher. A couple with two children, for example, receives on average 1601 Euros per month. Several other European countries operate social assistance of comparable generosity (European Commission, 2004). For Germany, Boss (2001) and Sinn et al. (2002) calculate marginal tax rates on (potential) low-wage income of the recipients of social assistance between 80 and 100 percent. Sinn et al. conclude that it does not pay to work for a head of a West German household with two children if his or her productivity is below 50 percent of average productivity.

In the career decision diagram more generous social assistance shifts h^A to the right. This moves social assistance above net wage income for a larger fraction of the h-ordered population and increases the range of non-participation in the low-productivity segment of the labor market. The magnitude of this effect is predicted to be large when taxes on (potential) labor income are high.[7]

3.4. **Taxation.** Higher taxes on labor income increase non-participation because they discourage some low-skill unemployed to accept a job when unemployment benefits expire. Higher taxes also make re-training for high-skill persons less profitable. In Figure 1, a higher tax rate on labor income θ moves h^A to the right and shifts h^C left, if anything.

$$\frac{\partial h^A}{\partial \theta} = \frac{\delta_\tau s + ce}{\delta_T (1-\theta)^2 (1-d)} > 0$$

$$\frac{\partial h^C}{\partial \theta} = -\frac{ce}{(1-\theta)^2 \left[\delta_\tau (1-b) + \delta_T d\right]} \leq 0.$$

Higher taxes reduce the net payoff from working and increase the range of non-participation. Note that the effect is particularly strong if re-training is, in principle, worthwhile ($e > 0$). Some low-productivity workers who would have used an unemployment spell to upgrade their skills

[7] Of course, the policy conclusion to be drawn is not that s should be lower but that it should not be paid conditionally on the status of non-participation.

when taxes are low are now facing a lower net return of re-education after the tax increase and prefer to stay on the dole permanently. Furthermore, the effect is strong if taxes are already high, if social assistance is generous, and if skills degrade rapidly during unemployment.

Because we count non-participants as unemployed during the first phase of their joblessness, the model suggests that higher taxes *reduce* the incidence of *short-term* unemployment at the expense of non-participation. Moreover, lower net returns of re-training also apply to workers of intermediate productivity who previously considered an unemployment spell and now prefer to exit unemployment immediately. Thus short-term unemployment is reduced for two reasons: an outflow into employment of workers from the higher productivity segment and an outflow into non-participation of workers from the lower productivity segment who are permanently discouraged by higher taxes.

We now discuss how personal characteristics of the unemployed determine re-training and non-participation. As explained below, some variables which are interpreted as reflecting personal characteristics might also be interpreted policy variables. For example, the effect of the variable "remaining work-life" might be interpreted as a worker's age or as (mandatory) retirement age.

3.5. **Human Capital Degradation.** The rate at which a worker's human capital erodes can depend on his personal characteristics, i.e. on his skill level, or be a consequence of exogenous factors like the rate at which technological innovations are made. Rapid degradation of human capital increases the range of non-participation because re-training is less attractive for the unemployed, and it reduces the share of unployment because the costs of skill degradation while unemployed are too high for high-skill workers. In Figure 1, higher human capital degradation during unemployment moves h^A to the right and h^C to the left.

$$\frac{\partial h^A}{\partial d} = \frac{[s + \lambda_\tau(1-\theta)] - e\,[(1-\theta)\delta_T - c]}{\delta_T(1-\theta)(1-d)^2} = \frac{h^A}{(1-d)} > 0, \qquad \frac{\partial h^C}{\partial d} = -\frac{h^C}{\frac{\delta_\tau}{\delta_T}(1-b)+d} < 0.$$

Hence, rapid human capital degradation reduces short-term unemployment at both ends. Some workers from the upper end of the education spectrum who previously thought about using a spell of unemployment to upgrade their human capital, now decide against it because the opportunity costs of skill loss while not working are too high. At the lower end of the educational spectrum some workers who previously found a short spell of unemployment attractive, now see their human capital (and potential future wages) erode so fast that staying permanently out of

work becomes attractive.

Interestingly, we find that it are not high unemployment insurance benefits that are identified as the main amplifier of skill-degradation effects but high social assistance (s), a bleak labor market outlook (high λ_τ), and high labor income taxes or, more generally, a large welfare state. In the high-skill segment, short-term unemployment even *decreases* because the opportunity costs of skill-loss are too high in turbulent times. Thus, according to our model, the "European disease" is manifested in decreasing participation rates and an increasing share of workers from the lower end of the skill distribution who find a permanent life on the dole attractive when times are turbulent.

Finally, we can derive a result with respect to working-age. The derivative of h^C is increasing in δ_T in absolute terms. Thus, the positive effect on employment operates among the youth (with a long remaining work life $T-t$) who exit unemployment earlier under the threat of rapid skill degradation. On the other end of the education spectrum we find that h^A is decreasing in δ_T implying that older workers close to retirement age face strong incentives for non-participation. Our result is supported by the observation that labor force participation in Europe decreased in particular within the group of older and less educated workers (Bloendal and Scarpetta, 1999).

3.6. **Re-training Costs.** An increase in re-training costs discourages re-training among the unemployed and therefore increases non-participation. In Figure 1, higher re-training costs c shift h^A to the right and h^C to the left.

$$\frac{\partial h^A}{\partial c} = \frac{e}{\delta_T(1-\theta)(1-d)} \geq 0, \qquad \frac{\partial h^C}{\partial c} = -\frac{e}{(1-\theta)\left[\delta_\tau(1-b)+\delta_T d\right]} \leq 0.$$

Obviously, an increase in re-training cost has no effects if re-training does not take place ($e=0$). With re-training, unemployment is reduced at both ends when c rises. At the upper end of the education spectrum, some workers who previously considered an unemployment spell to upgrade their skills now find that they cannot afford it and stay employed. re-training becomes also too expensive for some at the lower end of the education spectrum. For those persons, however, it is then the best choice to stay out of work permanently.

While re-training costs can be determined by personal characteristics, they may also importantly depend on labor market policy. For example, re-training costs can be reduced by subsidies for (re-) education. Our model suggests a short-run increase of unemployment due

to subsidies for re-training. The policy only reduces unemployment in the long run, i.e. when workers re-enter employment who were motivated by the re-training subsidy to leave the status of non-participants (reflected by the move of h^A to the left). Note that re-training subsidies are particularly effective for persons with rapid human capital degradation since $\partial h^A/\partial c$ increases and $\partial h^C/\partial c$ decreases in absolute terms when d rises.

3.7. **Age.** Comparative statics of increasing working-life T and, thus, a larger discount factor δ_T depend on a number of factors in subtle ways. The derivatives are

$$\frac{\partial h^A}{\partial \delta_T} = -\frac{ce}{\delta_T^2(1-\theta)(1-d)} \leq 0, \qquad \frac{\partial h^C}{\partial \delta_T} = \frac{e - dh^C}{\delta_\tau(1-b) + \delta_T d}.$$

The duration of working life can be analyzed in a cross-sectional perspective distinguishing between younger and older workers or in a time-series perspective when investigating exogenous events like an increase in retirement age. In analyzing the effects of a longer work life on employment, we distinguish two cases.

When re-training does not pay off ($e = 0$), the effects of an increased duration of working life are clear. In this case, our model predicts no effect on non-participation because low-productivity workers prefer to stay on the dole permanently anyway. Yet, an increase in the length of working life induces an increase of employment, i.e. a reduction of unemployment($\partial h^C/\partial \delta_T < 0$ for $e = 0$). The reason is that a longer working life increases the present value of a permanent loss of human capital during an unemployment spell. Therefore, the status of unemployment becomes more threatening and some additional workers with intermediate skills accept a job immediately.

When re-training is worthwhile ($e > 0$), an increase in work-life affects unemployment because it extends the time during which the fruits of re-training are reaped and thus makes an unemployment spell for the purpose of re-training attractive. If the re-training effect dominates (reflected by relatively high e), unemployment increases as a response to a longer working life; if the human capital degradation effect dominates (reflected by relatively high d) it decreases.

In any case, however, a prolonged working life reduces non-participation when re-training is worthwhile. Some of the workers from the lower end of the productivity spectrum who previously opted for a life on the dole find re-training attractive when the fruits of the educational effort are reaped through a longer working life. This result suggests a strong policy conclusion: Early retirement cannot be a solution of the employment problem (as some western European

authorities seem to have believed in the 80's and 90's). Quite the opposite is true according to the model. Another way of putting this result is that non-participation is particularly attractive for older workers (with small δ_T). Furthermore, the derivative of h^A shows that the incentive to stay on the dole permanently will be strong for older workers when skills erode rapidly and labor income taxes are high.

3.8. **Labor Market Shocks.** Fluctuations in labor markets are captured by changes in λ_t which drive wage income away from wages paid under "normal" circumstances, $w_t = h$. We model macroeconomic labor market shocks as resulting from exogenous events. These can be temporary, perhaps due to a downturn in the business cycle, or persistent, perhaps due to technological change. A contemporaneous and temporary recession is captured by an increase in λ_0, and an expected recession by an increase in λ_τ. Technological progress is modelled by imposing $\lambda_0 = \lambda_\tau > 0$. Since the λ's are assumed to effect human capital additively (rather than multiplicatively), such a permanent technological progress is implicitly assumed to be skill-biased. The corresponding derivatives are

$$\frac{\partial h^A}{\partial \lambda_0} = 0, \qquad \frac{\partial h^C}{\partial \lambda_0} = \frac{\delta_\tau}{\delta_\tau(1-b) + \delta_T d} > 0$$

$$\frac{\partial h^A}{\partial \lambda_\tau} = \frac{1}{(1-d)} > 0, \qquad \frac{\partial h^C}{\partial \lambda_\tau} = 0.$$

In line with standard intuition, a contemporaneous temporary recession increases unemployment and leaves non-participation unaffected. The effect on unemployment is particularly large if unemployment benefits are high and granted for a long period (δ_τ is large). The effect is particularly pronounced among older workers (with low δ_T). A possibly more surprising prediction of our model is that an expected *future* downturn of the economy (i.e. higher λ_τ) increases non-participation. A pessimistic outlook reduces the incentive to re-train during unemployment, and some workers of the current unemployment pool decide against re-training. Without re-training, their productivity falls to a level that makes a permanent life on the dole attractive. This effect is particularly strong if human capital erodes rapidly.

An adverse structural change, perhaps due to a fall in international competitiveness, is modelled by higher $\lambda_0 = \lambda_\tau$ and is obtained as the sum of both effects discussed above. The structural change will thus unambiguously increase non-participation and reduce employment. The effect

on (short-term) unemployment depends again on whether the inflow into unemployment dominates the outflow into non-participation. A comparison of derivatives shows that this is the case if

$$\left(1+\frac{\delta_T}{\delta_\tau}\right)\cdot d < b,$$

i.e. if human capital erosion is relatively small compared to unemployment benefits. In this case, incentives are high enough for skill-upgrading to be the predominant motive for unemployment.

4. **Endogenous Unemployment Duration**

The focus of investigation of this paper has been the decision to be employed, unemployed, or out of the labor force. It has thus addressed a different question than the standard search-and-matching literature which focusses on the duration of unemployment (given the status of being unemployed). In order to relate our model to this literature we now show how the optima length of unemployment depends on individual characteristics and labor market institutions. While search models explain unemployment with reference to opportunity costs of leisure or foregone home production while searching for a new job, our model explains unemployment with current labor market shocks and the gains from re-training which are traded off against the opportunity cost of skill degradation. Surprisingly, we arrive at very similar comparative static results with respect to unemployment duration as the searching literature despite our radically different modeling approach.

As a starting point we take that unemployment has been the optimal choice according to the model from the previous section and assume that the unemployed actually prefers to stay unemployed for a shorter time t than his eligibility for benefits b is, i.e. $t < \tau$. Otherwise, we would be back to the original model. For a meaningful analysis we have to subdivide the degradation of human capital among the periods of the actual length of the unemployment spell. Let Δ denote the depreciation rate per unit length of period (day or week of unemployment). Thus human capital is $(1-\Delta)^t \cdot h$ at time t when the unemployed accepts a job, with $(1-d) = (1-\Delta)^\tau$ if he stays unemployed until he loses eligibility, i.e. $d \equiv 1-(1-\Delta)^\tau$.

Any interior solution t maximizes

$$\max_t \frac{1-\delta^t}{1-\delta}\left[b(1-\theta)h\right] - ce - \delta^t \frac{1-\delta^{T-t}}{1-\delta}(1-\theta)\left[(1-\Delta)^t h + e - \lambda_\tau\right].$$

It fulfills the first order condition

$$-\delta^t \log(\delta) bh + \delta^t \left[(1-\Delta)^t h + e - \lambda_\tau\right] \log(\delta) - (\delta^T - \delta^t)(1-\Delta)^t h \log(1-\Delta)^t = 0$$

implying that it solves the implicit function

$$G = \psi \left[(1-\Delta)^t h + e - \lambda_\tau - bh\right] - (\delta^{T-t} - 1)(1-\Delta)^t h = 0$$

with $\psi \equiv \log(\delta)/\log(1-\Delta) > 0$. After some algebra the derivative w.r.t. t is obtained as

$$\frac{\partial G}{\partial t} = (1-\Delta)^t h \left[\psi(1+\delta^{T-t}) + 1 - \delta^{T-t}\right] > 0.$$

The derivative with respect to b is straightforward: $\partial G/\partial b = -\psi h < 0$. And, applying the implicit function theorem, $\partial t/\partial b = -[\partial G/\partial b]/[\partial G/\partial t] > 0$. Thus, a higher replacement rate b increases unemployment duration.

Likewise we obtain $\partial t/\partial \lambda_\tau > 0$ and $\partial t/\partial e < 0$ indicating that labor market shocks lead to longer unemployment while higher marginal returns from education reduce the length of the desired unemployment spell. Particularly interesting is the derivative with respect to human capital.

$$\frac{\partial G}{\partial h} = (1-\Delta)^t \left[\psi + 1 - \delta^{T-t}\right] - b,$$

which is generally ambiguous. Note that $\partial G/\partial h < 0$ and thus $\partial t/\partial h > 0$ is more likely for large b, low ψ (i.e. low δ and low Δ) and for small T. Generous benefits are more likely to induce high-skilled rather than low-skilled workers to remain unemployed according to our model. Unemployment duration decreases with the rate of skill degradation and the rate of time preference, and it decreases with age. In other words, high skilled workers prefer shorter stays in unemployment if they are young and when the threat of skill degradation with respect to potential future work income is large.

5. **Present-Biased Preferences and the Unemployment Trap**

In this section we return to the original model of Section 2 but relax the assumption on optimizing behavior by allowing for present-biased preferences. Such preferences seem to be common and imply time-inconsistent behavior, such as procrastination (Laibson 1997 and O'Donoghue and Rabin 1999). Allowing for such preferences enables us to extend the model to account for the possibility of an unemployment trap in which people end up on the dole permanently, against

their best intentions. The unemployment trap we demonstrate is a consequence of mistaken intertemporal optimization.

Reconsider the case where re-training costs are sufficiently low and people are sufficiently young such that re-training, in principle, pays off, i.e. condition (5) holds. Diagrammatically, those with human capital below h^A are non-participating and those with human capital exceeding h^C take up employment immediately in Figure 2. The interesting group consists of those with intermediate human capital endowment, $h^A < h < h^C$, who enter unemployment with the *intention* to upgrade their skills and re-enter employment later.

The duration of unemployment can be subdivided in τ subperiods of eligibility for unemployment benefits, which can conveniently be thought of as weeks or months. Suppose that it takes one subperiod to upgrade the skills, for example, by taking a computer course and suppose that some individuals have present-biased preferences (Laibson, 1997, O'Donoghue and Rabin, 1999).[8] Thus, the present value of life-time income (2') for an unemployed can be rewritten as

$$V_t(h,\tau) = b(1-\theta)h - k_t \cdot c \cdot e \tag{11}$$
$$+ \beta \left\{ \sum_{s=1}^{\tau-1-t} \delta^s \left[b(1-\theta)h - k_s \cdot c \cdot e \right] + \sum_{s=\tau-t}^{T-1-t} \delta^s (1-\theta) \left[(1-d)h + \left(\sum_{i=0}^{\tau-1} k_i \cdot e \right) \right] \right\}$$

with $\beta \leq 1$ and where k_t is an indicator function that takes a value of $k_t = 0$ in any subperiod without re-training and $k_t = 1$ in the re-training subperiod.[9] If re-training happens, then $\sum k_t = 1$ and $\sum k_t = 0$ otherwise. The only but crucial difference between (11) and (2') is that now the discount factor from today to the next subperiod is $\beta\delta$ whereas δ remains the discount factor between any two subperiods in the future.

The unemployed move from subperiod $t = 0$ to subperiod $\tau - 1$. We first consider the case in which individuals have perfectly time-consistent preferences ($\beta = 1$) as a benchmark. In this case, people rationally postpone re-training until the ultimate period of unemployment and then re-train ($k_{\tau-1} = 1$) if re-training is worthwhile, i.e. if

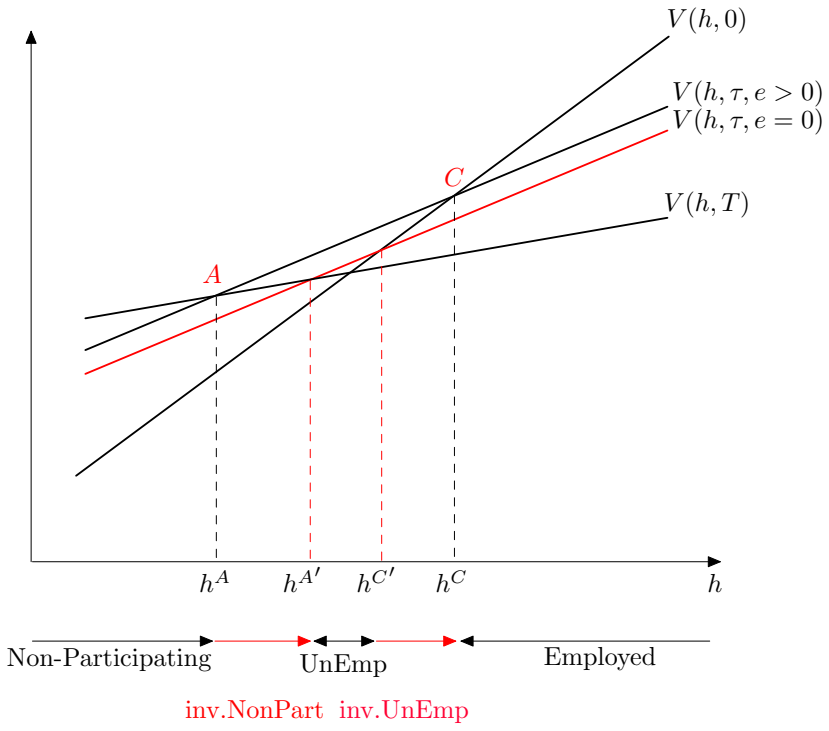
$$c < (1-\theta)\tilde{\delta}_T \equiv (1-\theta)\frac{\delta(1-\delta^{T-1-\tau})}{1-\delta}. \tag{12}$$

[8] The assumption that it takes one subperiod to re-educate is made for simplicity and could be generalized. The crucial underlying assumption is that re-training has to be taken up once (or never) during unemployment. DellaVigna and Pasermann (2005) integrate present-biased preferences into a search and matching model. They find (theoretically and empirically) a negative effect of impatience on search intensity and exit from unemployment.

[9] Since the argument is independent from labor market shocks we drop the λ's in (11) for convenience.

Except for the determination of the timing of re-training, this is exactly the result from section 2, and with $\beta = 1$ we are back in the standard model.

Figure 2: The Unemployment Trap



Now consider agents with present-biased preferences, i.e. the case of $\beta < 1$. All future selves of these persons prefer to re-train if condition (12) holds. The analysis below focuses on the case where people are not aware of their time-inconsistency problem, i.e. they do not realize that their tastes change when they get closer to the moment when they originally intended to execute their re-training decision.[10] Like the rational agents they postpone re-training. However, in the last period of eligibility for unemployment benefits (at $t = \tau - 1$, when the rational agents re-train), the present-biased value of life-time income is

$$V_{\tau-1}(h,\tau) = b(1-\theta)h - k_{\tau-1} \cdot c \cdot e + \beta \sum_{s=1}^{T-\tau} \delta^s (1-\theta) \left[(1-d)h + \left(\sum_{i=0}^{\tau-1} k_i \cdot e \right) \right] \qquad (13)$$

[10] These persons are called naive agents in O'Donoghue and Rabin (1999). Sophisticated agents would realize their present-bias and thus execute re-training inefficiently early during the unemployment spell. Thus, sophisticated agents will not run into the unemployment trap as discussed here.

implying that they will re-train if

$$c < \beta(1-\tau)\tilde{\delta}_T. \tag{14}$$

They will not re-train if the costs of re-training fulfill

$$\beta\tilde{\delta}_T < \frac{c}{1-\theta} < \tilde{\delta}_T. \tag{15}$$

If condition (15) holds, present-biased agents do not not re-train when they lose eligibility for unemployment benefits although they originally planned to use the unemployment spell to upgrade their skills.

Figure 2 illustrates the consequences of a failed re-training episode depending on the worker's initial skill level. Because re-training was, in principle, worthwhile, failed re-training shifts life-time income $V(h,\tau)$ downwards. At the upper end of the education spectrum, between h'_C and h_C, we find those workers who would have preferred to be employed had they known that they run into a time-inconsistency problem and do not take up the originally planned re-training. At intermediate education levels, between h'_A and h'_C, present-biased preferences have no consequence on the unemployment decision (but, of course, on life-time income). At the lower end of the education spectrum, between h_A and h'_A, we obtain the sad result that workers who originally planned to re-enter employment after a spell of unemployment used for re-training find themselves lacking the willpower to do so. Yet, with failed re-training and human capital erosion, their productivity is so low that living on the dole permanently is now the best available option. Thus, they end up unintentionally as non-participants. Some of the well-educated are lured into unemployment, but will not remain on the dole permanently. It is the low-educated that fall prey to the unemployment trap and get stuck on the dole permanently.

The preceding discussion indicates the importance of active labor-market policies. If re-training capabilities are equally distributed across initial education levels, a sufficiently high subsidy of re-training costs (or a tax allowance) that drives $c/(1-\theta)$ below $\beta\tilde{\delta}_T$ would eliminate the time-inconsistency problem according to the model. More generally, any commitment device that enforces re-training would be beneficial for the unemployed (in the sense of increasing their long-run utility) and would reduce short-run and long-run unemployment.

The expression "unemployment trap" usually refers to a situation where a jobless person is unable to increase his income through employment. This applies to all non-participants in our model. What we are concerned with here is the possibility that an agent ends up as non-

participating against his best intentions. Note that the discussion above provides a rationale for an unemployment trap resulting from agents having present-biased preferences but are otherwise rational. Our account of an unemployment trap is not based on strategic interaction. In contrast, an unemployment trap may loom, for example, when multiple equilibria arise due to externalities from hiring restrictions (Saint-Paul 1995), due to discrimination of long-term unemployed (Acemoglu 1995), or from an interplay of social norms and voting on welfare policies (Lindbeck et al. 1999).

A further explanation for why people end up as non-participants, a status they would have chosen to avoid ex ante, is based on "forced unemployment", which can easily be integrated into the model of section 2. Forced (short-term) unemployment occurs if a worker's optimal choice, given the prevailing labor market conditions, is to work but the person is for some external reason inhibited from doing so and is therefore in fact unemployed. Forced unemployment increases the incidence of non-participation. The intuition for this result is as follows: Some workers with relatively low human capital endowment are only slightly better off by working than by not working. If these workers are forced to enter unemployment, their human capital degrades. If this degradation is pronounced enough and if human capital investments during unemployment are costly enough, their human capital erodes to the point where it does not pay to work again at the time when re-employment is possible.

6. **Conclusion**

This paper develops a microeconomic tool for the analysis of non-participation. Our framework highlights how key aspects of the welfare system interact with personal characteristics and stylized labor market prospects in determining non-participation. While our model encompasses a large number of determinants, it is still simple enough to be solved analytically and to be presented in a single diagram. Our tool generates a large number of intuitively plausible predictions and many of these predictions are in line with observed empirical regularities.

The high degree of consistency of our simple model with empirical results is remarkable, and in some sense quite surprising. The reason is that we use a strictly supply-side and partial equilibrium approach which is not embedded in a broader macroeconomic model. We agree that such embedding is in principle desirable. However, we feel that doing so may substantially increase analytical complexity but add little value added. The reason is that our micro-economic

model already suggests that "it depends". Our results in Section 3 show that the individual characteristics of the unemployed (education, skill loss, and age) determine the impact of institutional change. This holds in all cases with respect to the magnitude of effects and sometimes even with respect to their sign. As a consequence, the heterogeneity of the workforce must be taken into account when analyzing the implications of policy interventions.

With this caveat in mind, we believe the following general conclusions can be drawn from our model. Our analysis suggests that generous social assistance, high tax rates, and skill-biased productivity shocks as the main amplifiers of the impact of skill degradation effects. In addition, we identify – in line with the empirical evidence – low-skilled workers and older workers as particularly prone to human capital degradation and non-participation. Finally, our analysis has emphasized the role of re-training costs and active labor market policies. These policies are particularly important when the unemployed have present-biased preferences and lack the willpower to re-train. In this case, voluntary short-term unemployment is like a slippery slope and can result in a permanent life on the dole, against one's best intentions.

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Appendix: Comparative Statics without (short-term) Unemployment

If life-time incomes intersect in a way that unemployment is never the best choice as in Figure 3, human capital endowment h^B separates employment and non-participation. The relevant derivatives are

$$\frac{\partial h^B}{\partial b} = \frac{\delta_\tau h^B}{\delta_\tau(1-b)+\delta_T} > 0$$

$$\frac{\partial h^B}{\partial \tau} = \delta' \left(\lambda_0 - \lambda_\tau - \frac{s}{1-\theta} + h^B b \right) \frac{1}{\delta_\tau(1-b)+\delta_T}$$

$$\frac{\partial h^B}{\partial s} = \frac{\delta_T}{(1-\theta)\left[\delta_\tau(1-b)+\delta_T\right]} > 0$$

$$\frac{\partial h^B}{\partial \theta} = \frac{\delta_T s}{(1-\theta)^2\left[\delta_\tau(1-b)+\delta_T\right]} > 0$$

$$\frac{\partial h^B}{\partial d} = \frac{\partial h^B}{\partial c} = 0$$

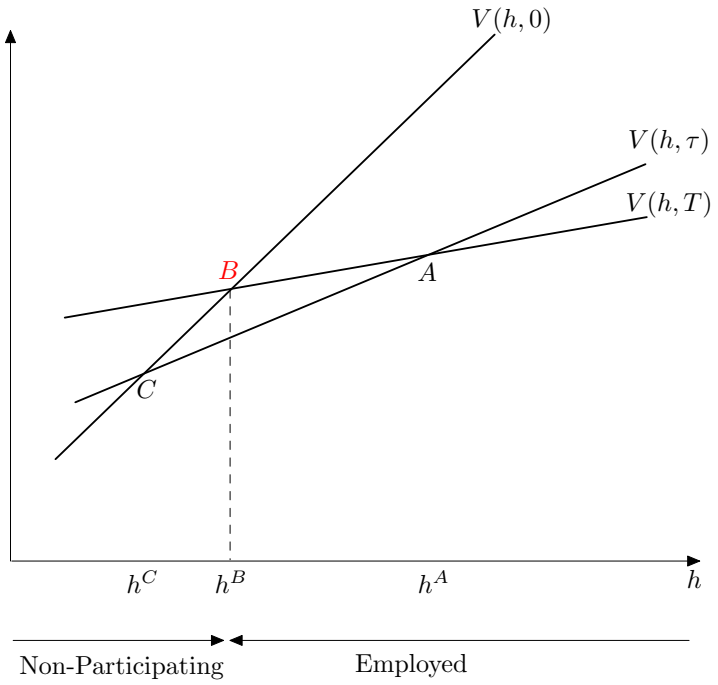
$$\frac{\partial h^B}{\partial \delta_T} = \left(\frac{s}{1-\theta} - h^B \right) \frac{1}{(1-\theta)[\delta_\tau(1-b)+\delta_T]^2}$$

$$\frac{\partial h^B}{\partial \lambda_0} = \frac{\delta_\tau}{\delta_\tau(1-b)+\delta_T} > 0, \quad \frac{\partial h^B}{\partial \lambda_\tau} = \frac{\delta_T}{\delta_\tau(1-b)+\delta_T} > 0$$

In principle, the effects on employment and non-participation are the same as for the non-generate case discussed in the text. Sometimes, of course, there are no *partial* effects observable. Because the non-participants will never be at work again they are not affected by re-training costs and do not suffer from (further) increasing skill degradation. This is not the same as saying that there are no effects at all. The parameter variation can be so large that non-participation is affected because unemployment out to be worthwhile and the degenerate case ceases to exist.

The sign of $\partial h^B/\partial \delta_T$ is undetermined and only unambiguously positive without current labor market frictions ($\lambda_0 = 0$). In this case non-participation is decreasing with δ_T, i.e. younger workers are less afflicted with unemployment. The sign of $\partial h^B/\partial \tau$ is also ambiguous. It includes a degenerate case where longer eligibility for unemployment benefits leads to *lower* unemployment. In order to provide an intuition, we assume that labor market frictions are structural

Figure 3: Career Diagram without Unemployment



($\lambda_0 = \lambda_\tau = \lambda$), implying that the sign of the derivative equals the sign of

$$b(1-\theta)\lambda(\delta_\tau + \delta_T) - s(1-b).$$

A degenerate case may occur if s is very high and b is low. Then, social assistance is so generously granted compared to unemployment benefits that increasing eligibility for unemployment benefits entails the dominating negative effect of delaying waiting time until eligibility for social assistance. Of course, without social assistance ($s = 0$) this channel is always closed.

Non-participation is independent from re-training costs and human capital degradation because the choice is between being never and always unemployed ($\partial h^B/\partial d = \partial h^B/\partial c = 0$). The other derivatives are in line with the normal, non-degenerate case discussed in the main text: Non-participation increases for higher unemployment benefits, higher social assistance, higher taxes rates, and higher labor market frictions.

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