On-the-Job Search, Work Effort and Hyperbolic Discounting

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- Preliminary draft -

ABSTRACT

This paper assesses theoretically and examines empirically the effects of time preferences on two types of career investments: work effort and on-the-job search activities. Whereas the former increases the probability of getting promoted, the latter affect the chance of receiving an outside job offer. The aim of this study is to test the exponential versus the hyperbolic discounting model within a framework of on-the-job behaviour. I develop a theoretical model which allows for endogenous work effort and on-the-job search intensity. The central assumption of the model is that the gains of promotion are larger but more delayed than the gains of (external) job mobility. Depending on whether exponential or hyperbolic discounting is assumed, this model leads to different predictions of the effect of patience on career investments. I make use of the CentER/DNB Household Survey (1996-2007), a large Dutch longitudinal survey containing detailed information about individual time preferences, on-the-job search behaviour and indicators of work effort. This study is the first to assess empirically the relation between time preferences and on-the-job search behaviour. The results provide support for the hyperbolic discounting model.

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1. Introduction

Employees invest a considerable amount of time and energy in their career in order to climb up the wage ladder. Like most intertemporal choices we make during our life, such as how much to save for retirement and how much education to obtain, the decision how much to investment in one's career involves a trade-off between short-run costs and long-run benefits. As individual time preferences or the degree of patience plays a crucial role for the outcome of such evaluations, I assess theoretically and examine empirically the effects of time preferences on career investments.

During their working life, individuals can increase their wage either through changing employer (external mobility) or through receiving a promotion (internal vertical mobility): empirical evidence points out that internal and external mobility are important sources of wage growth (e.g. Blau & DeVaro, 2007; Kosteas, 2009; Le Grand & Tahlin, 2002). Here, I assume that a worker's career investment portfolio consists of two main activities. Firstly, an employee can search on-the-job for another job to increase the probability of receiving an outside offer. Secondly, a worker can increase the chance of getting promoted by exerting high work effort on the job and by engaging in extra-role behaviour (such as accepting temporary impositions without protest, assisting co-workers and building good relationships with supervisors).

In standard economic models of promotion and on-the-job search, agents are assumed to discount future costs and benefits exponentially, which implies time-consistent preferences. However, a substantial amount of experimental and field evidence demonstrates that preferences are time-inconsistent and present-biased (see for a review: (DellaVigna, 2009; Frederick, Loewenstein, & O'Donoghue, 2002)). In order to allow for time-inconsistency, (quasi-)hyperbolic discounting models have been proposed as an alternative for the standard exponential model (e.g. Laibson, 1997). One of the most important predictions of hyperbolic discounting models is that individuals have a tendency to procrastinate investment activities (which involve immediate costs and delayed rewards) and do soon leisure activities (which entail immediate benefits and delayed costs). By assessing the relation between time preferences and search and work effort, this paper aims to test the exponential against the hyperbolic discounting model.

Despite the growing behavioural economic literature on hyperbolic discounting, the labour economic research has paid little attention to the role of time inconsistent preferences in job search and work effort models. The exceptions are the studies of DellaVigna and Paserman (2005) and Paserman (2008), which examine theoretically and empirically the relation between patience and job search and provide a test of the hyperbolic discounting model. However, both studies focus on search behaviour of unemployed individuals. Furthermore, Drago (2006) incorporates a hyperbolic discount function in a theoretical model of work effort and on-the-job search and tests the hypotheses using data on job duration and absenteeism. However, the theoretical model assumes that the total effort level is exogenous and implies that on-the-job search is a leisure activity. The model may therefore overlook some central dimensions of the job search process. Moreover, the empirical analysis focuses on mobility - the potential outcome of the search process - rather than the search activity.

The contribution of this paper is threefold. Firstly, I develop an alternative model of on-the-job search and work effort with endogenous career investments. To test whether workers are exponential or hyperbolic discounters, I exploit the theoretical finding that the expected relation between patience and the intensity of on-the-job search depends on the type of discounting. Secondly, this study is, to our knowledge, the first to analyse empirically the effect of time preferences on the intensity of on-the-job search. In general, studies on on-the-job search examine job-job transitions and ignore the search process (this may due a lack of data and to the fact that search is assumed to be costless in most on-the-job search models). The third contribution is methodological: whereas most studies rely on behavioural proxies for time preferences (such as smoking, drinking, drug use, having a life insurance), I am able use data which contain detailed information about self-assessed time preferences. This paper thereby contributes on the one hand to the labour economic literature on work effort and on-the-job search, and on the other hand to the behavioural economic literature on hyperbolic discounting.

This study has several policy implications. First of all, hyperbolic agents are mainly responsive to immediate costs and benefits, while the behaviour of exponential agents is more affected by long-run payoffs. Therefore, it can be expected that the effectiveness of social security and labour market policies depends on whether workers discount future payoffs exponentially or hyperbolically. Moreover, introducing commitment mechanisms may be an irrelevant policy strategy when workers are exponential discounters, but may improve the welfare of hyperbolic discounters substantially. Policy makers should take this into account when designing policies directed at encouraging employees to search on-the-job to avoid unemployment or at motivating workers to engage in employability enhancing activities. Whether policies should rely on immediate or long-run incentives depends crucially on the type of discounting. Furthermore, employers could use these insights to improve their recruitment and retention policies.

The paper is structured as follows: Section 2 reviews the previous literature on hyperbolic discounting and several applications in job search models. In Section 3 the theoretical model is developed. Section 4 discusses the data and indicators for time preferences, work effort and search intensity. The final section concludes.

2. Previous literature

2.1 Hyperbolic discounting: a review

In the standard economic literature, it is assumed that individuals have well-defined preferences and try to maximize life-time utility according the following intertemporal utility function:

$$U^t(u_t, u_{t+1}, ..., u_T) = \sum_{\tau=t}^{T} \delta^t u_t$$

where t denotes the time period, u_t represents the instantaneous utility in period t and δ is the discount factor ($0<\delta\leq 1$), indicating the individual's time preference. In this model, individuals discount utility exponentially. This specific feature implies that individuals have time-consistent preferences, which means that "[a] person feels the same about a given trade-off no matter when she is asked" (Rabin, 1998, p.38). Basically, the preference for A at some future time 't' over B at time 't + x', implies a preference for A over B for all values of t.

However, evidence from a wide range of laboratory experiments (Frederick et al., 2002) demonstrates that individual time preferences are dynamically inconsistent. Particularly, experiments point out that discounting is a decreasing function of time: discounting is steeper in the immediate future than in the more distant future (e.g. Thaler, 1981). Based on the work of Strotz (1956) and Phelps and Pollak (1968), Laibson (1997) proposes the following quasi-hyperbolic discounting model as an alternative for the exponential discounting model:

$$U^t(u_t, u_{t+1}, ..., u_T) = u_t + \beta \sum_{\tau=t+1}^{T} \delta^t u_t$$

The difference between the exponential discounting model and this model is the introduction of the β parameter ($0<\beta\leq1$), which indicates a preference for immediate gratification. When β is equal to one, the model is identical to the standard exponential model. However, when this parameter is below one, the discount rate is decreasing between the current period and the next period, but from then on it is constant. Such a (β, δ) model captures the idea of time-inconsistent preferences.

In hyperbolic discounting models, individuals have present-biased preferences or are 'myopic' since the individual attaches extra weight to current utility compared to future utility. "We procrastinate on tasks such as mowing the lawn that involve immediate costs and delayed rewards and do soon things such as seeing a movie that involve immediate rewards and delayed costs" (Rabin, 1998, p.38). As examined by O'Donoghue and Rabin (1999), the timing of activities depends on whether the activity involves immediate costs and delayed rewards (an investment activity) or entails immediate rewards and delayed costs (a leisure activity). In general, people have a tendency to postpone the first type of activities (labelled as the 'mañana effect' by Strotz (1956)) and to 'preproperate' (that is, do soon) the second type of activities.

An important implication of this type of models is that individuals have self-control problems. "We would 'like' to behave in one manner, but instead we 'choose' to behave in another. In particular, we tend to pursue immediate gratification in a way that we ourselves do not appreciate in the long run" (O'Donoghue & Rabin, 2000). Although individuals may be unwilling to engage in an investment activity in the present or near future, they may be willing and planning to do so in the more distant future. However, as time passes and the future becomes the present, the person prefers to abandon the original plan and tends to procrastinate. In the end, people end up continuing to postpone the activity until the next period.

In the literature on hyperbolic discounting models, the assumptions concerning an individual's beliefs about future behaviour and self-control problems play an important role. Strotz (1956) discusses two distinct cases: 'sophisticates' predict their future behaviour in the correct way and are fully aware of their self-control problems, whereas 'naives' believe they will behave as planned and are completely unaware of their self-control problems. O'Donoghue and Rabin (2001) argue that both cases may be too extreme and therefore develop a model of partial naiveté, in which individuals are aware of their self-control problems, but underestimate the degree. An important implication is that (partially) sophisticated people know they will have self-control problems in the future and are willing to constrain future choices, even if this involves costs. Mechanisms or instruments which restrict the possibilities of 'future selves' to pursue immediate gratification – labelled as commitment devices in the behavioural economics literature – are valued by sophisticated agents as such instruments can raise their long-run welfare (e.g. Laibson, 1997).

In addition to evidence from numerous experimental studies, findings from field data provide support for the hyperbolic discounting model. Many studies examined whether the model can help to explain saving behaviour (Angeletos, Laibson, Repetto, Tobacman, & Weinberg, 2001; Laibson, Repetto, & Tobacman, 2007). Other studies focus on the effectiveness of commitment savings schemes (Ashraf, Karlan, & Yin, 2006; Thaler & Benartzi, 2004) or the impact of default options on saving behaviour (Choi, Laibson, Madrian, & Metrick, 2003; Madrian &

Shea, 2001). The findings from these studies are hard to reconcile with standard economic theory but can be explained by hyperbolic discounting models. Moreover, empirical analyses outside the saving domain provide support for the hyperbolic discounting model: studies on gym attendance and contract choice (DellaVigna & Malmendier, 2006), quitting smoking (Gruber & Koszegi, 2001), contract design in consumer markets (DellaVigna & Malmendier, 2004), effects of (self-imposed) deadlines for homework assignments (Ariely & (Ariely & Wertenbroch, 2002) and evidence from neuroscience (McClure, Laibson, Loewenstein, & Cohen, 2004) are also are in line with the predictions of the hyperbolic discounting model.

2.2 Job search behaviour by the unemployed

DellaVigna and (2005) Paserman (DV&P hereafter) propose a test of the exponential versus the hyperbolic discounting model within a job search model – focusing on unemployed job seekers. DV&P exploit the fact that the timing of the costs and benefits of the two central job search decisions – the search effort and the reservation wage decision – is different. On the one hand, the choice on search effort is principally an investment decision involving immediate costs (looking for job openings, contacting employers, going to job interviews) and future rewards in terms of better job opportunities. On the other hand, the reservation wage decision involves comparing delayed payoff streams: accept a job and receive the offered wage in the future or reject the offer and wait and search for a better job.

DV&P argue that, if job seekers are hyperbolic discounters, the degree of short-term impatience (β) affects only the search effort decision: higher impatience implies more procrastination of job search activities and thus a lower level of search effort. However, short-term impatience (β) can be expected to be orthogonal to the reservation wage decision, since this decision involves the evaluation of future payoff streams. Conversely, for the exponential discounter, time preferences (δ) affect not only the search effort decision but also the reservation wage decision. To be specific, the discount rate of exponential discounters is negatively related to the level of search and (strongly) negatively related to the reservation wage.

Furthermore, DV&P demonstrate that the theoretical effect of impatience on the duration of the unemployment spell depends on whether we assume exponential or hyperbolic discounting. For hyperbolic discounters, the search intensity effect dominates the reservation wage effect: it can be expected that more impatient hyperbolic agents spend more time in the state of unemployment because β affects job search effort negatively but has no effect on the reservation wage. On the other hand, for exponential discounters the reservation wage effect (more impatient job seekers accept lower wage offers) dominates the search effort effect and thus the unemployment duration decreases with exponential impatience (δ).

DV&P test these hypotheses using two US longitudinal data sets (NLSY and PSID) and construct a measure of impatience applying factor analysis: the items included in this aggregate measure include several (lagged) behavioural proxies of time preferences (e.g. smoking, number of hangovers in the past 30 days, contraceptive use, having a life insurance). The study examines the effects of this variable on search effort (measured by the number of search channels), (self-reported) reservation wages and the duration of unemployment. The empirical findings are in the direction predicted by the hyperbolic discounting model. Halima and Halima (2009), applying the same empirical strategy and using similar proxies for impatience, replicate these findings for France. Furthermore, Paserman (2008) performs a structural estimation (using the NLSY) which he uses to evaluate several policy options.

2.3 Search and collaboration on-the-job

Three period model

Drago (2006) analyses the career effects of hyperbolic discounting. Drago incorporates hyperbolic discounting in a model of on-the-job behaviour, where workers can experience wage increases through promotion or by moving to another employer. The main features and assumptions of the three period model are the following:

- Workers have to allocate effort/time between job search and collaboration: the sum of the two types of effort is assumed to be exogenous (and equal to 1).
- On-the-job search (s) positively affects the probability of receiving a job offer
- Collaboration on-the-job (1-s) positively affects the probability of receiving a promotion.
- A crucial assumption is that the expected size and timing of rewards of the two career paths are different: "the long-run benefit from collaboration [i.e. promotion] is greater than the one from search, and benefits that result from collaboration are not as immediate as the rewards from search conditional on the arrival of a better job offer" (p.3). The paper reviews previous empirical findings that support this assumption. In the model, the smaller payoff of external mobility is received in the current period, while the larger benefit of promotion arrives in the future.

Workers choose the level of search effort to maximize utility according to the following equation:

$$\begin{aligned}&\max_{s\in[0,1]} w - c(s) + \lambda s\int_{w}^{\overline{w}'}(w'-w)dF(w') \\ &+\beta\delta\left\{\lambda s\int_{w}^{\overline{w}'}[V_0(w')]dF(w') + \lambda(1-s)V_0(w^p) + [1-\lambda(1-sF(w))]V_0(w)\right\}\end{aligned} \qquad (1)$$

where the first line represents (immediate) payoffs in the current period, consisting of the wage (w) minus the costs ($c(s)$) and plus the potential gains of search ($\lambda s\int_{w}^{\overline{w}'}(w'-w)dF(w')$), where λ is a parameter representing the probability to receive an outside (and inside) job offer, w' is the new wage offer and $dF(w')$ the cumulative wage distribution of outside wage offers. The second line denotes future payoffs, which are discounted according to the quasi-hyperbolic discount function: β is the short-term discount rate and δ represents the long-term discount rate. In the future, workers either move to another employer ($\lambda s\int_{w}^{\overline{w}'}[V_0(w')]dF(w')$), receive a promotion ($\lambda(1-s)V_0(w^p)$) or remain in the same position ($[1-\lambda(1-sF(w))]V_0(w)$). $V_0(w)$, $V_0(w')$ and $V_0(w^p)$ represent the lifetime utility when the worker respectively keeps the same job, accepts an external job offer and gets promoted. Drago derives the f.o.c. of equation of (1):

$$c'(s) = \lambda\int_{w}^{\overline{w}'}(w'-w)dF(w') + \beta\delta\lambda\left(\int_{w}^{\overline{w}'}\left(V_0(w')-V_0(w)\right)dF(w') + \left(V_0(w)-V_0(w^p)\right)\right) \qquad (2)$$

Note that the part multiplied by $\beta\delta$ is negative. Applying comparative statics, Drago shows that more impatient workers exert less work effort (exhibit less collaborative behaviour), but search more on-the-job and are therefore more likely to move to another job. Moreover, a hyperbolic worker searches more – and thereby exerts less work effort – than an exponential worker with identical δ. This prediction contrasts with DV&P's predictions on search effort of the unemployed, which is (predicted and found to be) negatively related with impatience.

Because the direction of the effect of δ on search and work effort is the same as the direction of the effect of β, these predictions cannot be used to test the exponential model against the hyperbolic model[1]. Another hypothesis states that on-the-job search effort and therefore the job arrival rate increases with sophistication: by testing this hypothesis, Drago aims to distinguish exponential from hyperbolic discounting.

Empirical strategy and results

Like DV&P, Drago (2006) makes use of the NLSY for the empirical analysis and applies similar behavioural proxies for time preferences[2]. The study examines the effect of impatience on the hazard rate of voluntary job-job transitions – which are associated with wage increases and are not the result of external reasons (such as firing and plant closing) – by estimating a Cox proportional hazard model. The results indicate that impatient workers are more likely to make voluntary transitions and thus search more intensively. Moreover, the findings show that sophistication[3] has a positive and in most specifications a significant effect on the hazard rate. Next, the study assesses the effect of impatience on collaboration or work effort, using the absence rate as an indicator for effort, and finds that more impatient workers have higher absence rates. Drago therefore concludes that, in line with the predictions of the theoretical model, impatience is positively related with voluntary job-job transitions (and thus with on-the-job search intensity) and negatively related with work effort. Moreover, the results concerning the positive impact of sophistication on the hazard rate provide support for the hyperbolic discounting model.

Shortcomings

There are several theoretical and methodological problems associated with the study of Drago. The first theoretical issue concerns the assumption that total career effort is exogenous and, consequently, that there exists a perfect negative collinear relationship between on-the-job search on the one hand and work effort on the other hand. It can be argued that more impatient workers invest less in their career and that the entire career investments made by hyperbolic workers are smaller than that made by exponential workers. So, the level of total investments is likely to be endogenous and highly dependent on time preferences. The assumption of exogenous career effort, which is crucial for the theoretical predictions, may thus be invalid.

Secondly, the model assumes that job search involves immediate net gains (wage increase minus search costs), because both the costs and the benefits from on-the-job search are immediate. As a result, in Drago's model job search can be characterised as a leisure activity, with immediate benefits and delayed costs (in terms

[1] Drago in fact argues that the predictions can be used to test the models, as most estimates of δ lie in a more narrow range than the estimates of β, so the variation in mobility rates should be the result of variation in β. The validity of this argument is questionable because the estimates of the time preference parameters are averages – providing little information about the heterogeneity of the parameters – and the variation in mobility may be due to other factors (e.g. risk preferences).

[2] Drago however replaces 'contraceptive use' by cocaine use.

[3] Sophistication is measured by a dummy indicating whether the worker has accumulated savings in an Individual Retirement Account or a Keough account. The argument is that only sophisticated individuals will recognize and demand these retirement accounts as commitment mechanism.

of foregone promotions). So, in the theoretical model workers allocate time/energy between a leisure activity (search) and an investment activity (collaboration): of course, the more patient the worker, the more effort is allocated to the investment activity. However, it would be more realistic if the benefits of job search in terms of better job opportunities are delayed: in that case on-the-job search can be defined as an investment activity. One of the general predictions of hyperbolic discounting models is that individuals have a tendency to do soon leisure activities, while they are inclined to procrastinate investment activities. Since the theoretical predictions on search intensity are highly dependent on the timing of benefits, it is crucial to model this feature of job search accurately.

Furthermore, there are two methodological problems. First of all, the study examines the effect of impatience on job mobility but does not analyse the impact on search behaviour (the NLSY data does actually not provide information about on-the-job search behaviour). Though job mobility is generally the outcome of the search process, it is not clear whether impatience affects mobility through other factors: for instance, impatient workers (like unemployed job seekers) may be more likely to accept another job offer. Moreover, the impact of time preferences on job mobility may also be the result of the positive relation between patience and work effort. In addition, there may be another underlying factor, such as job satisfaction, which may be related to both the degree of impatience and the probability of job mobility. A second methodological problem involves the behavioural proxies that are used in the study of Drago (and by DV&P). These proxies may reflect other individual traits, such as risk aversion. As most of these proxies are clearly health related, it is rather dubious to use an indicator constructed from these proxies to examine the effect of impatience on absenteeism. Finding a positive relation between absenteeism and, for instance, the number of hangovers in the last month or cocaine use, may provide little evidence for the effect of time preferences on work effort. Furthermore, the proxy for sophistication may also measure patience (δ and/or β).

3. Theoretical framework

3.1 The four period model

In order to accommodate the aforementioned problems of the theoretical model of Drago, an alternative model of job search and work effort will be proposed. To allow the rewards of job mobility to materialize in the future, an additional period ('near future') is added to the model in which workers are able to move to another job, but are not be able to climb the hierarchy within the same organisation. In this four period model, workers (employed at wage w) can increase their wage through promotion or by switching jobs. In the first case, the worker receives the promotion wage w^p, according to the deterministic function $\Phi(w) = w^p$ (which is the same for all jobs). The worker enters the second upwards mobility route – external job mobility – if he receives a job offer from the cumulative density function $F(w')$ which is higher than his current wage w. So, conditional on receiving a wage offer which is higher than the current wage, the expected wage in the new job equals $E(w' \mid w' > w)$. These are the central assumptions of the theoretical model:

Assumption 1 *A worker allocates total career effort between search (s) and effort on-the-job (e), given the effort constraint* $e + s \leq 1$ *(hereafter, I will refer to the sum of e and s as total career effort or investment).*

Assumption 2 *Search intensity (s) has a positive impact on the probability of receiving an 'outside' job offer, whereas effort on-the-job (e) has a positive impact on the probability of receiving a promotion or an 'inside' job offer:*
$P_{job\ offer} = (\lambda s);\ P_{promotion} = (\lambda e)$
where the parameter λ is a constant which varies between 0 and 1 ($0 < \lambda < 1$*)*[4].

Assumption 3 *The costs of search and effort c(e,s) are a convex function of total career effort (e + s).*

Assumption 4: *The rewards from internal upwards mobility or promotion (*w^p*) are higher than the rewards from external mobility (*w'*), which are higher than the payoffs of no mobility (*w*):* $w^p > w' > w$

Assumption 5 *The rewards from a promotion are not as immediate as the rewards of moving to a new job: the rewards from job mobility materialize in the near future (t+1), whereas the rewards from promotion emerge during the period thereafter (t+2).*

Assumption 1 states that workers have to make an allocation between two types of investments: work and search effort. Work effort e may be interpreted as the amount of effort which is in addition to the minimal acceptable work effort. Effort on-the-job (e) thus represents 'extra-role behaviour' (e.g. working overtime hours, accepting temporary impositions without protest, assisting co-workers, building good relationships with supervisors). Search effort consist of all kinds of 'screening' (e.g. searching for vacancies in newspapers and on the internet) and application activities (writing applications letters, preparing for and attending job interviews). The residual (1-e-s) could be interpreted as leisure on-the-job: not all workers make the same level of career investments. Assumption 1 implies that there is a trade-off between work effort and search intensity: there may be time restrictions (e.g. working overtime reduces the amount of time to spent on job search activities) and in some cases searching for a job is simply incompatible with exerting high effort (e.g. attending a job interview during working hours implies absence from work). However, there exists no perfect linear relation between search and effort on-the-job.

Assumption 2 shows that workers can affect their promotion and mobility chances by investing in respectively work and search effort. The cost function is specified under Assumption 3. As in the model of Drago, the Assumptions 4 and 5 are crucial in the theoretical model: the long-term rewards from promotion are higher, but more postponed than the rewards from mobility: while the rewards from a promotion will emerge in the distant future, the rewards from a new job will already materialize in the near future. So, workers can pursue smaller more immediate rewards, or larger more postponed gains. Empirical findings confirm that the long-run gains of promotions outweigh the long-run gains of mobility. The results of Light and

[4] The same parameter λ is used in both the job offer and the promotion equation: this is of course a simplifying assumption, which is also made in the model of Drago (2006). One may argue that there are different λ's for the job offer and the promotion equation. We return to this issue in section 5.

McGarry (1998) indicates that workers who experience job changes frequently have a lower wage path than less mobile workers. Topel and Ward (1992) also find higher wage growth for stayers than for movers. In addition, the study of McCue (1996) shows that the long-run wage gains from promotion are substantially higher than the long-run wage gains from interfirm mobility. Finally, the findings of Le Grand and Tahlin (2002) indicate that both external and internal mobility increase earnings growth, but that the gains of the former decrease with the frequency whereas the benefits of the latter type raise with the frequency.

A worker with wage *w* will therefore choose search (*s*) and effort on-the-job (*e*) to maximize life-time utility:

$$\overbrace{w-c_0(e_0,s_0)}^{\text{t=0, present}}+\overbrace{\beta\delta\left(w-c_1(e_1,s_1)+\lambda s_0\int_{w}^{\overline{w}'}(w'-w)dF(w')\right)}^{\text{t=1, near future}}$$
$$\underbrace{+\beta\delta^2\begin{pmatrix}(\lambda s_0[1-F(w)])\begin{pmatrix} w'-c_2(e_2,s_2)+\lambda s_1\int_{w'}^{\overline{w}''}\left(w''-w'\right)dF(w'') \\ +\delta\left(V(w_A')+\lambda s_1[1-F(w')]\left(V(w'')-V(w_A')\right)\right)\end{pmatrix}+ \\ (1-\lambda s_0[1-F(w)])\begin{pmatrix} w-c_2(e_2,s_2)+\lambda s_1\int_{w}^{\overline{w}'}\left(w'-w\right)dF(w')+\lambda e_0\left(w^p-w\right) \\ +\delta\begin{pmatrix} V(w)+\lambda e_0\left(V(w^p)-V(w)\right) \\ +\lambda s_1[1-F(w')]\left(V(w_B')-V(w)\right)\end{pmatrix}\end{pmatrix}\end{pmatrix}}_{\text{t≥2, distant future}} \tag{3}$$

where *w* denotes the current wage, w^p the wage after promotion, w' the wage of the new job, *c(e, s)* the cost function of effort and search and λ a parameter representing the probability to receive a job offer. *F(w)* represents the cumulative distribution function from which the outside wage offer is drawn. The parameters β and δ are the hyperbolic (short-run) and the exponential (long-run) discount factor respectively.

Equation (3) consists of three parts: payoffs in the present, the near future and the distant future. The present period can be interpreted as the period from now until the term of notice: a worker is not able to change to another job within this period and therefore receives the wage *w* and makes costs $c_0(e_0,s_0)$. The second period, the near future (the part multiplied by $\beta\delta$), represents a period after the term of notice, during which a worker can move to another job but cannot experience a promotion. The payoffs during this period consist of the wage w, costs $c_1(e_1,s_1)$ and $\lambda s_0\int_{w}^{\overline{w}'}(w'-w)dF(w')$, which denoted the gains of mobility multiplied by the probability of receiving a better job offer.

In the distant future (the part multiplied by $\beta\delta^2$), there are three potential outcomes: staying in the same job; moving to another employer and receiving a promotion. With the probability $\left(\lambda s_0[1-F(w)]\right)$, the workers has moved to another job in period 1: in period 2, the workers receives the new wage (w') plus the potential gains of moving to another job again ($\lambda s_1\int_{w'}^{\overline{w}''}\left(w''-w'\right)dF(w'')$) and makes costs $c_2(e_2,s_2)$. Note that by moving to another employer, the worker forgoes to climb the wage ladder within the current organisation. On the other hand, when the worker has not moved to another employer in period 1 (probability $\left(1-\lambda s_0[1-F(w)]\right)$), the worker may stay in the same job, move to another job or receive a promotion in period 2.

The lifetime utility when the worker stays in the same job (4), moves to another job (5, 6), receives a promotion (7) or moves to another job for the second time (8) are defined as follows:

$$V(w)=w+\lambda s_2\int_{w}^{\overline{w}'}\left(w'-w\right)dF(w')+\lambda e_1\left(w^p-w\right) \quad (4)$$

$$V(w_A')=w'+\lambda s_2\int_{w'}^{\overline{w}''}\left(w''-w'\right)dF(w'')+\lambda e_1\left(w'^p-w'\right) \quad (5)$$

$$V(w_B')=w'+\lambda s_2\int_{w'}^{\overline{w}''}\left(w''-w'\right)dF(w'') \quad (6)$$

$$V(w^p)=w^p+\lambda s_2\int_{w'}^{\overline{w}'^p}\left(w'^p-w^p\right)dF(w'')+\lambda e_1\left(w^{pp}-w^p\right) \quad (7)$$

$$V(w'')=w''+\lambda s_2\int_{w''}^{\overline{w}'''}\left(w'''-w''\right)w'''\,dF(w''') \quad (8)$$

Note that this is a four period model, where $V(.)$ denotes the last period. However, the model may be extended to an N finite model.

The fundamental differences between this model and Drago's model are the result of two assumptions: Assumption 1, implying a non perfect linear trade-off between search and work effort (i.e. $e+s\leq 1$ rather than $e+s=1$) and Assumption 5, stating that the gains from mobility will materialize in the near future instead of the present. While the first entails a change in the structure of the model, the latter effectively extends the model of Drago with an additional period. By adapting the framework in this way, the model overcomes the theoretical problems discussed above

3.2 Hypotheses

Because the near future is a relatively short period of time and the long-term payoffs of a promotion are higher than the long-term payoffs of job mobility, moving involves opportunity costs. Time preferences can thus be expected to affect both the size and the allocation of the career investment portfolio. So how will time preferences be related with search and work effort under the assumption of hyperbolic or exponential discounting[5]?

First we consider the case where the worker is not effort constrained ($e_0+s_0<1$). In this case, there is no perfect negative linear relation between *e* and *s*. Setting the partial derivatives of expression (3) with respect to e equal to zero leads to the following first order condition:

$$c_0'(e_0)=\beta\delta^2\left(1-\lambda s_0[1-F(w)]\right)\lambda\left(\left(w^p-w\right)+\delta\left(V(w^p)-V(w)\right)\right) \quad (9)$$

Expression (9) shows that, in order to maximize lifetime utility, the marginal costs of work effort should be equal to the marginal benefits of work effort. As the part

[5] Note that the exponential discounting model is nested in the model, that is when β=1.

multiplied by $\beta\delta^2$ is positive, work effort is increasing in both β and δ. The f.o.c. with respect to search intensity s is:

$$c_0'(s_0) = \beta\delta\,\lambda\int_w^{\overline{w}'}(w'-w)dF(w') + \beta\delta^2\left(\lambda s_0[1-F(w)]\right)\left[\begin{pmatrix} w'+\lambda s_1\int_{w'}^{\overline{w}''}\left(w''-w'\right)dF(w'') \\ +\delta\left[\left(V(w_A')\right)+\lambda s_1[1-F(w')]\left(V(w'')-\left(V(w_A')\right)\right)\right]\end{pmatrix} - \begin{pmatrix} w+\lambda s_1\int_w^{\overline{w}'}\left(w'-w\right)dF(w')+\lambda e_0\left(w^p-w\right) \\ +\delta\begin{bmatrix}\left(V(w)\right)+\lambda e_0\left(V(w^p)-V(w)\right) \\ +\lambda s_1[1-F(w')]\left(V(w_B')-V(w)\right)\end{bmatrix}\end{pmatrix}\right] \quad (10)$$

Again, under utility maximization the marginal costs of search effort are equal to the marginal benefits of search effort. The part multiplied by $\beta\delta$ represents the short-term benefits of search, whereas the part multiplied by $\beta\delta^2$ denotes the marginal long-run payoffs: these involve long-run marginal gains of mobility minus long-run marginal opportunity costs of mobility in terms of forgone promotions. When the long-run payoffs are positive, search intensity is increasing in β and δ. However, if there are net long-run costs[6] of searching for external job offers, it can be shown that search intensity is decreasing in δ if:

$$\delta > \frac{(w'-w)}{2\begin{pmatrix} w+\lambda s_1\int_w^{\overline{w}'}\left(w'-w\right)dF(w')+\lambda e_0\left(w^p-w\right)-w'-\lambda s_1\int_{w'}^{\overline{w}''}\left(w''-w'\right)dF(w'') \\ +\delta\begin{bmatrix}\left(V(w)\right)+\lambda e_0\left(V(w^p)-V(w)\right) \\ +\lambda s_1[1-F(w')]\left(V(w_B')-V(w)\right) \\ -\left(V(w_A')\right)-\lambda s_1[1-F(w')]\left(V(w'')-\left(V(w_A')\right)\right)\end{bmatrix}\end{pmatrix}} \quad (11)$$

Since $\delta \le 1$, this possibility exists theoretically when the distant future costs are over half the near future benefits of search. This is the case when there are substantial differences between the gains of promotion and the gains of mobility.

Furthermore, search intensity is decreasing in β if the long-run payoffs of job search are negative and the following condition holds:

---

[6] This is the case if the following condition holds:

$$\begin{pmatrix} w+\lambda s_1\int_w^{\overline{w}'}\left(w'-w\right)dF(w')+\lambda e_0\left(w^p-w\right) \\ +\delta\begin{bmatrix}\left(V(w)\right)+\lambda e_0\left(V(w^p)-V(w)\right) \\ +\lambda s_1[1-F(w')]\left(V(w_B')-V(w)\right)\end{bmatrix}\end{pmatrix} - \begin{pmatrix} w'+\lambda s_1\int_{w'}^{\overline{w}''}\left(w''-w'\right)dF(w'') \\ +\delta\left[\left(V(w_A')\right)+\lambda s_1[1-F(w')]\left(V(w'')-\left(V(w_A')\right)\right)\right]\end{pmatrix} > 0$$

$$\delta > \frac{(w'-w)}{\left(\begin{array}{l} w+\lambda s_1\int_{w}^{\bar{w}'}\left(w'-w\right)dF(w')+\lambda e_0\left(w^p-w\right)-w'-\lambda s_1\int_{w'}^{\bar{w}''}\left(w''-w'\right)dF(w'') \\ +\delta\left[\begin{array}{l}\left(V(w)\right)+\lambda e_0\left(V(w^p)-V(w)\right) \\ +\lambda s_1[1-F(w')]\left(V(w_B')-V(w)\right) \\ -\left(V(w_A')\right)-\lambda s_1[1-F(w')]\left(V(w'')-\left(V(w_A')\right)\right)\end{array}\right]\end{array}\right)} \tag{12}$$

This condition holds when the distant future costs of search are larger than the near future benefits of search. This is implausible, as it implies that the net (non-discounted) payoffs are negative: workers can increase their long-run payoffs by investing less in their career.

Short-run patience and long-run patience have a different impact on search intensity as δ affects the relative size of the long-run costs compared to the short-run benefits, while the level of β does not determine whether the benefits outweigh the costs of on-the-job search.

Now consider the case when the worker is effort constrained ($e_0+s_0=1$). Imputing $s_0=1-e_0$ in equation (3) the first order condition can be derived:

$$c_0^{'}(e_0)=-\beta\delta\lambda\int_{w}^{\bar{w}'}(w'-w)dF(w')$$
$$+\beta\delta^2\lambda[1-F(w)]\left(\begin{array}{l}\left(\begin{array}{l} w+\lambda s_1\int_{w}^{\bar{w}'}\left(w'-w\right)dF(w')+2\lambda e_0\left(w^p-w\right) \\ +\delta\left[\begin{array}{l}\left(V(w)\right)+2\lambda e_0\left(V(w^p)-V(w)\right) \\ +\lambda s_1[1-F(w')]\left(V(w_B')-V(w)\right) \\ +\left(\frac{1}{[1-F(w)]}-\lambda\right)\left(V(w^p)-V(w)\right)\end{array}\right]\end{array}\right) \\ -\left(\begin{array}{l} w'+\lambda s_1\int_{w'}^{\bar{w}''}\left(w''-w_2'\right)dF(w'') \\ +\delta\left[\left(V(w_A')\right)+\lambda s_1[1-F(w')]\left(V(w'')-\left(V(w_A')\right)\right)\right]\end{array}\right)\end{array}\right) \tag{13}$$

There is a perfect trade-off between work and search effort when workers are effort constrained. An increase in work effort implies an equal decrease in job search intensity and vice versa. This means that allocating more time and energy to activities on-the-job gives rise to opportunity costs, which are reflected in the marginal benefits of work effort (the right-hand side of expression (13)): the marginal benefits of work effort, and therefore the level of work effort, decreases with the gains of job mobility ($w'-w$). Moreover, the marginal benefits of work effort increases with the level of exerted work effort since this implies a lower s_0 and thus a lower probability to move to another employer between period 0 and 1. Thus, ceteris paribus, the marginal benefits of work effort has the lowest value when $e_0=0$. It can be shown that the distant future marginal gains of work effort (the part multiplied by $\beta\delta^2\lambda[1-F(w)]$) are always positive (even if $e_0=0$) when:

$$w^p - w \geq \frac{w' - w}{\left(\frac{1}{[1-F(w)]} - \lambda\right)} \tag{14}$$

As β does not influence the relative size of costs and benefits of work and search effort, hyperbolic patience does not affect the allocation between work and job search effort. The exponential discount rate δ, however, determines whether the benefits of work effort dominate the costs. Assuming (14), δ is positively related with the level of work effort. When $e_0 + s_0 = 1$, this implies that on-the-job search intensity decreases with exponential patience δ. The intuition is that, when workers are effort constrained, increasing work effort - and thus decreasing on-the-job search effort - involves near future costs due to a lower job mobility probability and distant future benefits. Trading off higher search effort for lower work effort entails near future benefits but distant future costs (due to forgone promotions). The higher exponential patience δ, the more the relative weight shifts away from the near future payoffs towards the distant future payoffs. Thus, more patient (effort constrained) workers care relatively more about the distant future compared to the near future and will therefore allocate more effort to on-the-job activities and less to job search.

We have demonstrated that the impact of patience on the level and allocation of career investments is dependent on whether exponential or hyperbolic discounting is assumed. The effect of exponential discounting δ on work effort is positive, both in the unconstrained and the constrained scenario.

Hypothesis EXPO1 *Patience (δ) is positively related to work effort.*

However, search effort increases with δ in the unconstrained case but decrease with δ when the worker is effort constrained. In the latter case, the distant future reward from effort on-the-job dominates the near future reward of searching. Note that for unconstrained workers the higher δ, the higher both search and work effort and thus the more likely the worker will be effort constrained: so we can expect that search effort increases with δ when patience is low, and decreases with δ when patience is high.

Hypothesis EXPO2 *There is an inverse U-shaped relation between patience (δ) and on-the-job search intensity.*

Next, what is the expected relation between work effort and on-the-job search and hyperbolic time preferences? First of all, note that hyperbolic discounters ($\beta < 1$) exert less total effort than exponential discounters (given the same δ) and are therefore less likely to be effort constrained. This is consistent with the general literature on hyperbolic discounting: individuals procrastinate investment activities such as searching for a job or exerting high effort on-the-job, since they are present-biased and particularly sensitive to the immediate costs associated with these activities. The higher the degree of present-biasedness (the lower β), the lower is the value attached to the future gains of search and work effort and the higher the tendency to avoid the immediate investment costs. However, when the worker is effort constrained, β does not affect the specific allocation between work and search effort. The rationale is that β determines the degree of procrastination of career investments: of course, when the worker is effort constrained, this procrastination problem is absent.

Hypothesis HYPO1 *Patience (β) is positively related to work effort.*

Hypothesis HYPO2 *Patience (β) is positively related to on-the-job search intensity.*

Comparing EXPO1-2 with HYPO1-2, the expected relation between work effort and time preferences is positive both under exponential and under hyperbolic discounting. However, an inverse U-shaped relation between exponential time preferences and on-the-job search intensity is expected, whereas the model predicts a (diminishing) positive relation between hyperbolic time preferences and on-the-job search intensity.

Finally, consider the relation between time preferences and job-job transitions. For exponential discounters, work effort and hence promotion opportunities increase with patience δ (EXPO1). This means the expected current wage is high for patient workers (due to past promotions). Given the nature of the wage distribution, the probability of receiving a better outside option thereby diminishes[7]: patience has a negative job acceptance effect which decreases the probability of job mobility. Furthermore, for low levels of patience, job search intensity increases with δ (EXPO2), thereby having a positive job arrival effect. The latter implies a rise of the chance of moving to another employer. Consequently, the overall effect is ambiguous (positive or negative) for low δ. However, for high δ there is not only a negative job acceptance effect but also a negative job arrival effect (EXPO2), implying a positive relation between exponential patience and the probability of job mobility.

Hypothesis EXPO3 *There is a negative or inverse U-shaped relation between patience (δ) and the probability of job mobility.*

Under hyperbolic discounting, promotion opportunities also increase with patience β (HYPO1), resulting in a negative job acceptance effect. On the other hand, hyperbolic time preferences are positively related with on-the-job search intensity (HYPO2), which implies a positive job arrival effect. Hence, the overall impact of patience β on the probability of job mobility is ambiguous.

3.3 Potential extension: unemployment

The model assumes that staying in the same job is the outcome that results in the lowest potential payoffs. Of course, one can argue that workers may lose their job and become unemployed. Incorporating unemployment in the theoretical model is especially relevant from a policy perspective, because such a model may clarify the relation between patience and activities that decrease the probability to become unemployment (i.e. search and work effort). When the state of unemployment is introduced, the part of expression (3) multiplied by $\left(1-\lambda s_0[1-F(w)]\right)$ in the distant future will change[8]:

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[7] Basically, this means a decrease in $[1-F(w)]$.

[8] We assume here that workers cannot lose their jobs in the near future.

$$
\left(1-\lambda s_0[1-F(w)]\right)\begin{pmatrix} w-c_2(e_2,s_2)+\lambda e_0\left(w^p-w\right) \\ +a(1-e_0)(u-w)+\lambda s_1\int_w^{\overline{w}'}\left(w'-w\right)dF(w') \\ \\ +\delta\begin{pmatrix} V(w)+\lambda e_0\left(V(w^p)-V(w)\right) \\ +a(1-e_0)(V(u)-V(w)) \\ +\lambda s_1[1-F(w')]\left(V(w_B')-V(w)\right) \end{pmatrix} \end{pmatrix} \tag{15}
$$

Where u and $V(u)$ represents the period 2 and lifetime utility respectively when the worker loses his job and $a(1-e_0)$ denotes the probability that the worker is dismissed. Assuming $w>u$ and $V(w)>V(u)$, both $(u-w)$ and $(V(u)-V(w))$ are negative. By increasing the chance of moving to another employer or obtaining a promotion, the level of both on-the-job search and work effort affect the probability to enter unemployment indirectly. However, one can argue that the layoff probability is dependent on the level of exerted work effort and thereby decreases the chance to become unemployed directly. For that reason, introducing the state of unemployment amplifies the existing difference between the distant future gains of work effort and the distant future gains of search effort. Thus, the model leads to the same theoretical predictions on the relation between patience and work and search effort.

3.4 Sophistication versus naïveté

As discussed in section 2.1, sophistication refers to the individuals beliefs about β. Naïve individuals believe β=1 and expect that they will not face self-control problems in the future, whereas sophisticated individuals have accurate beliefs about their hyperbolic time preferences and future self-control problems. In the context of career investments, a sophisticated worker believes that his ‘future selves’ will exert too little work and search effort. For that reason, this worker is willing to commit his future selves to the behaviour that is optimal from the present self perspective. As other studies (O’Donoghue and Rabin, 1999; 2001) have shown, sophistication may mitigate the problems of procrastination of investment activities. So, theoretically both sophistication and hyperbolic patience have a positive effect on the level of work and on-the-job search effort[9]. However, as it is difficult to distinguish empirically between β and sophistication, we will not discuss sophistication effects in this paper.

[9] Note that sophistication has no theoretical meaning under exponential discounting.

4. Data

4.1 General

For the empirical analysis, I make use of the DNB Household Survey (former name: CentER Savings Survey), a Dutch panel survey which has been collected by CentERdata from 1993 to 2008. The panel consists of around 2500-3000 households (the size of the panel varies over time): once a year, each household member aged 16 or older fills in a questionnaire via internet[10]. The survey contains six different modules which focus on specific domains: demographical characteristics of the respondent and the household, housing, health and income, assets and liabilities, and economic and psychological concepts.

As the questions about time preferences (see next subsection) are asked in the years 1996-2007, I restrict the sample to these years. Moreover, I select male employees who have not just (re)entered the labour market by excluding workers who were non-employed in the previous year. The rationale is that workers who just (re)entered the labour market may have rather distinctive job search behaviour: they may for instance accept a job which they regard as transitory/temporary. Moreover, many questions refer to the period two months prior to the interview (e.g. how many job applications in the past two months). In this period the entrants could be unemployed and thereby indicating search effort while they were unemployed. Due to panel attrition and refreshment, I make use of an unbalanced panel, consisting of about 5000 observations and over 1900 individuals.

4.2 Time preferences

I make use of 11 general statements about time preferences and orientation towards the future (see Table 1 for details). Respondents indicate to which extent they agree with the statement using a 7-point scale (1=completely disagree; 7=completely agree). These measures of patience are fundamentally different from those used by DV&P and Drago, as these are self-assessed statements and refer to individual time preferences in general: most other time preference measures refer to 'financial patience' (e.g. lottery questions), or are health related (e.g. smoking, drug use).

We would expect that the variables FUTURE01, FUTURE02, FUTURE06, FUTURE07 and FUTURE08 are positively related to patience, whereas the items FUTURE03, FUTURE04, FUTURE05, FUTURE09, FUTURE010 and FUTURE011 can be expected to be negatively correlated with patience. We therefore recode the latter group of variables (1 is recoded to 7, 2 is recoded to 6, etcetera). Thus, we would expect that all 11 time preference variables are positively correlated with one another. Appendix A1 provides details about the correlations between these items and the KMO measures of sampling adequacy. The correlation matrix shows that in general correlations between these variables are positive and significant: the exceptions seem to be FUTURE04 and FUTURE05. Moreover, the KMO measures vary between 0.69 and 0.83 (overall KMO of 0.78), which suggest the variables reflect the same underlying trait.

Initially, I performed factor analysis using all 11 future variables (see Appendix A1 for details of factor analyses): the items FUTURE04 and FUTURE05 appeared to have the lowest factor loadings. Therefore (and because they are negatively correlated with the other future variables) I decided to exclude these two

[10] It is not necessary that households have a PC or internet: when a PC is absent, access is provided through a special box which enables household members to fill in the survey via the television.

Table 1 Time preferences: statements and descriptive statistics						
		Complete sample (N=21587)		Selected workers (N=5008)		Patience
Name	Description	Mean	Std. Dev.	4.104433	1.489353	
FUTURE01	I think about how things may be in the future and I try to influence these in everyday life	4.081716	1.517553	3.644569	1.549099	+
FUTURE02	I often deal with things that will have consequences in several years	3.558531	1.576176	4.38738	1.511588	+
FUTURE03	I am only concerned about the present, assuming it will turn out all right in the future	4.310882	1.541854	4.439151	1.529588	-
FUTURE04	I only think about the immediate consequences of my actions (several days/weeks)	4.368092	1.563048	3.598875	1.337165	-
FUTURE05	Whether something is convenient determines my decisions to a large extent	3.529532	1.362764	3.692891	1.404838	-
FUTURE06	I am prepared to sacrifice my current well-being in order to achieve objectives in the future	3.508778	1.477511	4.971046	1.260134	+
FUTURE07	I think that it is important to take warnings about negative future results of my actions seriously, even if these results will materialize in the distant future	4.932228	1.353348	4.285942	1.284444	+
FUTURE08	I believe it is more important to deal with matters that will have major consequences in the future, than to deal with matters with immediate but minor consequences	4.203039	1.354908	4.684704	1.329569	+
FUTURE09	I generally ignore warnings about future problems because I assume that these problems will be solved by then	4.64071	1.373589	4.249601	1.367546	-
FUTURE10	I believe that there is no need to make sacrifices now for future issues, because these could be solved later	4.128828	1.431255	4.336861	1.410021	-
FUTURE11	I only respond to urgent problems, supposing that I can deal with future problems when they emerge	4.196646	1.46844	4.104433	1.489353	-

items. Appendix A1 shows the results for the factor analysis using the 9 remaining variables: as expected, all variables have positive loadings. As the first factor is the only one with an eigenvalue above 1 and other factors may be difficult to interpret (for instance, for the second factor, some loadings are positive while others are negative), I keep the first factor and interpret this as a measure of patience. As I include a squared patience variable in the estimation equations (next section), I rescaled the variable in such a way that it varies between 1 and 7 (rather than between -3 and 3). Table 2 shows some descriptives of this factor.

Table 2 Patience measure: summary statistics							
	Mean	Std. Dev.	10%	25%	50%	75%	90%
Patience(complete)	0	.8989751	-1.130355	-.5637271	-.0292132	.5759295	1.175117
Patience (selected)	.0873046	8621186	-.9928441	-.4496084	.0548437	.6545448	1.211628

Table 3 illustrates to what extent this measure of patience is correlated with behavioural outcomes, statements about spending behaviour and statements about the financial position. It can be expected that, when our indicator measures patience, the patience measure is correlated with several outcomes. First of all, the patience measure should be negatively correlated with the annual discount rate (unfortunately, the item which is used to construct the annual discount rate is only available for the years 1997-2002; see Appendix A2). Moreover, we would expect a positive correlation between the patience measure and the likelihood that the individual has a life insurance, a bank account or a savings account. Furthermore, a negative correlation between the patience measure and the probability that individual smokes, consumes several units of alcohol every day, has credit card debt and has any outstanding hire-purchase debt. All correlations between the patience variable and the behavioural proxies are significant and have the expected sign, except for drinking behaviour (insignificant). In addition, correlations between the patience measure and various variables indicating individual statements about spending behaviour and the financial situation of the household are in line with the expectations. These findings suggest that our measure is a reliable indicator of patience.

Table 3
Correlation: patience and behavioural outcomes[11]

Variable	Coefficient	Significance
Discount rate	-0.0405	0.0007
Behavioural outcomes		
Having a life insurance	0.0821	0.0000
Having a bank account	0.0432	0.0000
Having a savings account	0.0511	0.0000
Smoker	-0.0504	0.0000
Drinker	-0.0045	0.5361
Having credit card debt	-0.0269	0.0002
Outstanding debt hire-purchase	-0.0181	0.0136
Statements about spending behaviour		
spend	0.2162	0.0000
planning	-0.0412	0.0000
Period: Next months	-0.2481	0.0000
Next year	-0.0163	0.0175
Next few years	0.1284	0.0000
Next 5-10 years	0.1587	0.0000
Beyond next ten year	0.0972	0.0000
Statements about household financial situation		
Current financial situation of household: Making debt	-0.0124	0.0742
Current financial situation of household: Can just manage	-0.0774	0.0000
Current financial situation of household: Saving a lot of money	0.0835	0.0000
Manage with total household income (1=very hard; 5=very easy)	0.0369	0.0000

[11] The complete sample is used here. See Appendix A2 for details on the questions/items.

4.3 Work effort

The effort exerted by workers can be measured in several ways. As work effort is an input factor, we should consider indicators that measure individual input rather than individual performance measures (output). Drago (2006) for instance uses information on employee absenteeism and reviews several studies pointing out that absenteeism is negatively related to promotion opportunities. We rely on two different indicators for work effort: statement about individual shirking behaviour and overtime.

In the years 2004-2008 workers are asked to what extent they agree (on a 5-point scale) with the following statement: 'I shirk my duties'. Although this question refers to the individual's behaviour in general and not specifically in the work environment, it can be argued that individuals who agree with this statement have a tendency to shirk at work. Table 4 shows that almost three quarters of the workers disagree with this statement: about 12 per cent however state that they are 'shirkers'.

Next to the shirking measure, I make use of average overtime work as an indicator for work effort. Landers et al. (1996) demonstrated that long working hours may be used as indicators of work effort in promotion decisions, leasing to a 'rat-race'. Numerous empirical studies examined the investment character of working hours. Francesconi (2001) and Booth et al. (2003), using UK data, find a positive relationship between overtime hours and the incidence of promotion. Several studies focused on unpaid overtime: Anger (2008) and Pannenberg (2005) used German data to examine the career effects of unpaid working hours. Whereas Anger found limited evidence for unpaid overtime as career investment in the short-term, the results of Pannenberg indicate that unpaid overtime is indeed a long-term career investment. This seems to be consistent with the theoretical model: the future gains of high work effort are long-term. Moreover, it could be argued that there is a trade-off between working overtime hours and job search intensity.

The overtime variable (e^3) is defined as the actual (average) weekly working hours minus the contractual weekly working hours (see Table 4 for descriptives). In addition, I also used a variable (e^2) which indicates whether the individual works less than, equal to, or more than the contractual hours:

$e^2 = 0$ if actual hours < contractual hours

$e^2 = 1$ if actual hours = contractual hours

$e^2 = 2$ if actual hours > contractual hours

The majority of the employees report that they work overtime hours: male workers work on average over three hours more than their contract specifies. Less than 5 per cent of the workers state that on average they work less than their contractual working hours. So, I make use of three indicators for work effort:

Table 4
Work effort

	Freq.	Percent	Cum.
Statement: 'I shirk my duties' (1-5)			
Very Inaccurate	628	37.07	37.07
	635	37.49	74.56
	231	13.64	88.19
	152	8.97	97.17
Very Accurate	48	2.83	100.00
Total	1,694	100.00	

Overtime hours (categ.)			
	Freq.	Percent	Cum.
$Hours_{contract} > Hours_{actual}$	209	4.37	4.37
$Hours_{contract} = Hours_{actual}$	1,759	36.81	41.19
$Hours_{contract} < Hours_{actual}$	2,810	58.81	100.00
Total	4,778	100.00	

Overtime (actual hours – contract hours)				
Obs	Mean	Std. Dev.	Min	Max
4887	3.298547	4.495721	-22	30

Table 5 show the relation between the different work effort variables: the correlation between the shirking variable and overtime hours is insignificant but the sign is as expected (negative).

Table 5
Correlation between different work effort variables

	Overtime	Overtime (categ.)	Shirk
Overtime	1.0000		
Overtime (categ.)	0.7282 (0.0000)	1.0000	
Shirk	-0.0259 (0.2861)	-0.0206 (0.3960)	1.0000

4.4 Job search effort

In the previous literature, the intensity of job search effort has been measured by various proxies: some rely on the amount of time spent on search activities (Barron & Mellow, 1979; Krueger & Mueller, 2008), others use the number applications during a specific period (Gorter & Kalb, 1996; van der Klaauw & van Vuuren, 2010) or the number of different search methods (DellaVigna & Paserman, 2005; Manning, 2009). Empirical evidence points out that the last indicator is highly related to time spent on searching activities (by unemployed individuals): Krueger and Mueller (2008) show that the number of search methods is a strong instrument for the number of minutes of job search in the last seven days.

The aforementioned literature deals with job search behaviour by the unemployed: studies that empirically examine on-the-job search are scarce. An exception is the study of Bloemen (2005), who assesses search behaviour of both the unemployed and the employed. Bloemen makes use of the three following measures for search effort: job search attitude (seriously searching or not); ‘screening’ (looked for a job in the past two months); and the number of applications the job seeker made in the past two months.

In our empirical analysis, I use the following indicators of search effort[12]:

[12] Respondents are asked the question: “Are you currently looking for a(nother) job?” Potential answers are: “Yes, I am seriously searching for a(nother) job”; ““Yes, I am considering searching for a(nother) job”; “No, I just found another job”; “No, I am not looking”. We make use of the answer to this question to construct the variable s^1. When the respondent answered this question positively, several additional questions will be asked. For the variables s^2, s^3 and s^4 information is obtained from

- Search attitude (s^1):
  - $s^1 = 0$ if not searching for a job;
  - $s^1 = 1$ if considering looking for another job;
  - $s^1 = 2$ if seriously searching for another job.
- Whether the worker has applied for a job in the last two months (s^2):
  - $s^2 = 0$ if no applications
  - $s^2 = 1$ if one or more applications
- The number of job applications made by the worker during the last two months (s^3):
  - s^3 = # applications (0-14)
- The number of job search channels/methods used by the worker during the last two months (s^4):
  - s^4 = # search channels (0-8).

Table 6 and Table 7 provide information about these search effort variables. About 18 per cent of the workers is either thinking about looking for or seriously searching for another job. About a quarter of these 879 employed 'job searchers' report that they are seriously searching for another job. One out of 13 workers applied for a job in the last two months; over 40 per cent of the job seekers applied for a job during the previous months. About 2 per cent of the employees applied more than 2 times for a job.

Considering the number of different search methods, it appears that reading advertisements is the most commonly used channel – used by almost half of the job searchers. Next, answering advertisements, directly contacting employers and asking friends and relatives are also frequently used job search methods. Just a small minority of the on-the-job searchers uses more than one search channels: on average, workers use one search channel.

Table 8 provides the correlation coefficients between the different indicators of search intensity. When the various indicators measure search intensity, we would expect that the correlations between the indicators to be positive. The table shows that all correlations are positive and highly significant. For instance, those workers who report to search seriously apply more frequently for another job and use more search channels. This indicates that all four measures represent the same underlying variable: search effort.

4.5 Job-job transitions

Although respondents are not asked directly whether or not they moved to another job, we can construct a transition dummy by making use of information on tenure at year t+1 (respondents are asked to report the year and month in which they started working with their current employer). Moreover, workers are regarded as having made a job-job transition, when they report at year t or t+1 that they are not searching for another job because they already found another job but have not started this new job yet. Accordingly, between the years 1996 and 2008 248 (7 per cent) transitions and 3391 (93 per cent) 'stayers' can be identified.

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the questions "How many times have you applied for a job during the last two months" and "How have you searched for a job during the last two months?" (up to eight different methods).

Table 6 **Job search effort: search attitude, job applications and search channels**			
	Frequency (N=5008)	Percentage all workers (N=5008)	Percentage job seekers (N=879)
Search attitude			
Not looking for another job	4,129	82.45	-
Considering looking for another job	644	12.86	73.27
Seriously searching for another job	235	4.69	26.73
Applied for a job in the past two months			
No	4,623	92.31	56.20
Yes	385	7.69	43.80
Number of applications in the past two months			
0	4,623	92.31	56.20
1	200	3.99	22.75
2	87	1.74	9.90
3	30	0.60	3.41
4	28	0.56	3.19
5	13	0.26	1.48
6	7	0.14	0.80
7	1	0.02	0.11
8	5	0.10	0.57
9	1	0.02	0.11
10	6	0.12	0.68
12	2	0.04	0.23
>=14	5	0.10	0.57
Different search channels			
Answered advertisements	299	5.97	34.02
Placed advertisements	7	0.14	0.80
Asked employers	89	1.78	10.13
Asked friends/relatives	174	3.47	19.80
Through job center	36	0.72	4.10
Temporary employment agency	31	0.62	3.53
Reading advertisements	420	8.39	47.78
Other way	161	3.21	18.32
Number of search channels			
0	4,291	85.68	18.43
1	391	7.81	44.48
2	200	3.99	22.75
3	90	1.80	10.24
4	26	0.52	2.96
5	8	0.16	0.91
6	2	0.04	0.23

Table 7 **Descriptives: Number of channels and applications**					
Variable	Obs	Mean	Std. Dev.	Min	Max
# channels (all workers)	5008	.2430112	.6913624	0	6
# channels (job seekers)	879	1.384528	1.069365	0	6
# applications (all workers)	5008	.1783147	.8939989	0	14
# applications (job seekers)	879	1.015927	1.92507	0	14

Table 8 **Correlation between search effort variables**				
All workers (N=5008)				
	Search attitude	Applied	# applications	# channels
Search attitude	1.0000			
Applied	0.6884	1.0000		
	(0.0000)			
# applications	0.5303	0.6912	1.0000	
	(0.0000)	(0.0000)		
# channels	0.7970	0.7031	0.5997	1.0000
	(0.0000)	(0.0000)	(0.0000)	
Job seekers (N=879)				
	Search attitude	Applied	# applications	# channels
Search attitude	1.0000			
Applied	0.3734	1.0000		
	(0.0000)			
# applications	0.3918	0.5981	1.0000	
	(0.0000)	(0.0000)		
# channels	0.3695	0.4483	0.4629	1.0000
	(0.0000)	(0.0000)	(0.0000)	

5. Results

5.1 Work effort

In order to assess empirically the relation between patience and work effort, I specify the following equation:

$$e_{it}^{k*} = \alpha p_{it} + X_{it}^{'}\beta + \varepsilon_{it} \qquad k = 1,2,3 \qquad (5.1)$$

where e_{it}^{k*} denotes work effort, p_{it} represents the patience measure and $X_{it}^{'}$ include controls, which include demographical variables (age, age squared, marital status, number of children, educational level), employment related factors (type of contract, civil servant dummy, tenure), the unemployment rate (province level), three regional dummies and 11 year dummies.

Since work effort is a latent variable, I use three different proxies: shirking (e^1), overtime categories (e^2) and actual minus contractual hours (e^3):

$$e_i^k = 0 \;\; if \;\; -\infty < e_i^{k*} \le v_1$$
$$e_i^k = n \;\; if \;\; -v_j < e_i^{k*} \le v_{j+1} \;\; j = 1,..,N-1$$
$$e_i^k = N \;\; if \;\; -v_1 < e_i^{k*} \le v_{j+1}$$
$$N = 5 \; for \; k = 1; N = 2 \; for \; k = 2$$

The first column of Table 9 shows the results where I used e^1 (shirking) as the dependent variable, estimated with an ordered probit model. The coefficient of patience is negative and highly significant. This result indicates that more patient workers have a lower tendency to shirk their duties. The coefficients of all the other coefficients are insignificant. It may be a problem that the question about shirking may reflect the personality trait ‘conscientiousness’. This personality trait is related to time preferences (Borghans, Duckworth, Heckman, & Ter Weel, 2008). It could therefore be the case that the dependent and the patience measure indicate the same personality characteristic.

The estimation results where e^2 (overtime categories) and e^3 (difference between actual and contractual hours) are used as dependent variables are shown in the last two columns of Table 9, estimated with ordered probit model and pooled OLS respectively. The results are very similar. First of all, the main result is that patience is positively related with both the probability of overtime work and the number of overtime hours. This finding provides support for both the EXPO and the HYPO hypotheses. Note that this result is in line with the theoretical predictions and empirical findings of Drago (2006). Moreover, if patience and conscientiousness are indeed related, this result is consistent with the (in the psychological literature) well documented positive relation between work effort and this psychological trait (for instance, see Ilies et al. (2009)).

Furthermore, the empirical results point out a positive and significant effect of the level of education and being married on overtime work, whereas being a civil servant and tenure are negatively related with working overtime hours. The coefficients of age (and age squared), the number of children, the province unemployment rate and the dummy indicating whether the worker has a permanent contract are however insignificant.

Table 9
Effort on the job: shirking and working overtime

VARIABLES	(1) Shirking (Ordered probit)	(2) Overtime (Ordered probit)	(3) Overtime (OLS)
Patience measure	-0.112328***	0.145204***	0.458339***
	(0.038182)	(0.023967)	(0.088464)
Age	-0.016356	0.012414	0.036763
	(0.027976)	(0.019311)	(0.072972)
Age squared	0.000152	-0.000219	-0.000506
	(0.000319)	(0.000226)	(0.000868)
Marital status	-0.027991	0.130307**	0.837915***
	(0.086054)	(0.064958)	(0.223171)
Nr of children	-0.019662	-0.019553	-0.058927
	(0.032405)	(0.024392)	(0.085750)
Education level 2	-0.046500	0.285665***	0.488039
	(0.111181)	(0.091488)	(0.314367)
Education level 3	0.111909	0.240970***	0.573641**
	(0.091087)	(0.064467)	(0.232327)
Education level 4	0.003711	0.556821***	1.621572***
	(0.094608)	(0.069490)	(0.246349)
Education level 5	-0.071100	0.682040***	2.337375***
	(0.106498)	(0.089323)	(0.315474)
Unemployment rate (prov)	0.049038	0.023469	0.017916
	(0.043824)	(0.034000)	(0.126137)
Permanent contract	0.039850	0.066346	0.083987
	(0.133394)	(0.086480)	(0.344307)
Civil servant	-0.041696	-0.102510*	-0.584667***
	(0.085937)	(0.059925)	(0.208589)
Tenure	-0.002721	-0.005836**	-0.031820***
	(0.003285)	(0.002802)	(0.010023)
Region: north	-0.204503	-0.175113*	-0.551829
	(0.126322)	(0.102152)	(0.376485)
Region: east	-0.080246	-0.074376	-0.427445*
	(0.086526)	(0.065613)	(0.244514)
Region: south	-0.149980*	0.029726	-0.185387
	(0.082340)	(0.064772)	(0.226416)
Const	-0.527849	-1.309350***	2.703907
	(0.636881)	(0.458523)	(1.703173)
Const	0.463987	0.269240	
	(0.638471)	(0.453482)	
Const	0.997959		
	(0.638685)		
Const	1.718312***		
	(0.641736)		
Observations	1897	5817	5817

The coefficients on year dummies are suppressed in the table
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.2 Search effort

We formulate the following equations to examine empirically the relation between time preferences and search effort:

$$s_{it}^{k*} = \alpha p_{it} + X_{it}^{'}\beta + \varepsilon_{it} \qquad k = 1,2,3,4 \qquad (5.2)$$

$$s_{it}^{k*} = \alpha_1 p_{it} + \alpha_2 p_{it}^2 + X_{it}^{'}\beta + \varepsilon_{it} \qquad k = 1,2,3,4 \qquad (5.3)$$

where s_{it}^{k*} represents search effort, p_{it} and p_{it}^2 denote patience and patience squared, and $X_{it}^{'}$ includes the same set of controls as in (5.1). Like work effort, search intensity or effort is a latent variable. As proxies I use search attitude (s^1), whether the worker has applied for a job (s^2), the number of job applications (s^3) and the number of job search channels (s^4):

$$s_i^k = 0 \;\; if \;\; -\infty < s_i^{k*} \le v_1$$
$$s_i^k = n \;\; if \;\; v_j < s_i^{k*} \le v_{j+1} \quad j = 1,..,N-1$$
$$s_i^k = N \;\; if \;\; v_N < s_i^{k*} \le \infty$$
$$N = 2 \; for \; k = 1; N = 14 \; for \; k = 2; N = 8 \; for \; k = 4$$

$$s_i^k = 0 \;\; if \;\; s_i^{k*} \le 0$$
$$s_i^k = 1 \;\; if \;\; s_i^{k*} > 0$$
$$if \; k = 2$$

Table 10 and 11 present the estimation results for the dependent variable s^1 (estimated with an ordered probit model), s^2 (estimated with a probit model), s^3 and s^4. In the latter two specifications count data is used (number of applications and number of search methods) and therefore these are estimated with a negative binomial regression model.

First of all, when patience squared is excluded (equation 5.2), the coefficient of the patience variable is positive in all four specifications and significant in the first (5 per cent level), second (10 per cent level) and fourth (5 per cent level) specification: the estimated coefficient of the model where the number of applications is used as a dependent variable is insignificant. Under hyperbolic discounting, (short-term) patience is positively related to the level of on-the-job search effort. Thus, the empirical finding of a positive and (in most cases significant) relation between patience and search effort supports the hypothesis derived from the hyperbolic discounting model.

Next, consider the results when patience squared is included in the analyses (equation 5.3). The exponential discounting model predicts an inverse U-shaped relation between the worker's degree of patience and the level of on-the-job search intensity. In line with hypothesis EXPO2, a positive coefficient of the patience variable and a negative coefficient of patience squared can be expected. This appears to be the case in none of the specifications: in fact, a reverse relation is found when search attitude or a job application dummy is used as the dependent variable (2 and 4). When the number of job applications or search channels is used as the dependent variable (6 and 8), the coefficient of patient as well as the coefficient of patience squared are positive. Moreover, in all four specifications the two patience coefficients are individually insignificant. The coefficients are also jointly insignificant in (4) and (6), but are jointly significant in (2) and (8) (respectively the 5 per cent and 10 per cent level)[13]. Rather than an inverse U-shaped relation, this would imply either a U-shaped or an increasing positive relation between patience and job search intensity. Hence, we have good grounds to accept hypothesis HYPO2 and reject the hypothesis EXPO2: hyperbolic instead of exponential patience can explain the empirical relation between time preferences and on-the-job search effort.

Concerning the other empirical results, the directions of the coefficients are generally consistent across the different specifications. This indicates that the different proxies measure the same behavioural outcome. The results indicate an inverse U-shaped relation between age and search effort. The coefficients of the marital status dummy, the number of children, unemployment rate, the civil servant dummy are negative but insignificant in most cases. As expected, tenure and having a permanent contract decreases workers' on-the-job search intensity significantly. The effect of educational level seems to be positive in some specifications, but is not clear in others. Search effort seems to be dependent on human capital, but I found no evidence of a (positive) linear relationship.

5.3 Job-job transitions

The final test of the hyperbolic versus the exponential model concerns the relation between patience and job mobility. The following equations are estimated using a bivariate probit model:

$$P(mob)_{it}^{k*} = \alpha p_{it} + X_{it}^{'}\beta + \varepsilon_{it} \qquad k = 1,2,3,4 \qquad (5.4)$$

$$P(mob)_{it}^{k*} = \alpha p_{it} + \alpha_2 p_{it}^2 + X_{it}^{'}\beta + \varepsilon_{it} \qquad k = 1,2,3,4 \qquad (5.5)$$

As a dependent variable a dummy is used indicating whether the worker has made a job-job transition between t and t+1. As in the previous analyses, p_{it} and p_{it}^2 represent patience and patience squared and $X_{it}^{'}$ includes a set of controls. Table 12 presents the results of the probit estimation. In the specification excluding patience squared (column 1), the coefficient of the patience variable is positive and insignificant. The results of the estimated equation including patience squared are reported in the second column: both coefficients are individually significant at the 10 per cent level but are jointly insignificant (chi-squared value=4.13, p-value=0.13). The coefficient of the patience variable is negative whereas the coefficient of patience squared is positive. This result implies a U-shaped rather than an inverse U-shaped relation predicted by the exponential model (EXPO3). Both the (insignificant) positive (column 1) and the U-shaped relation (column 2) between patience and job mobility cannot be explained by the exponential model.

The hyperbolic model does not lead to unambiguous predictions about the effect of patience on job mobility chances: patience has a negative job acceptance effect and a positive job arrival effect. An explanation for a U-shaped relation between patience and job mobility may be that the job acceptance effect dominates the job arrival effect for low values of patience, while the inverse holds for higher patience levels.

Other results are in line with general predications: age, tenure and having a permanent contract negatively affects the probability to move to another job, while living in the most economically dynamic region of the Netherlands (West) has a positive impact on the job mobility probability.

[13] (2): chi-squared value=7.66, p-value=0.22; (4): chi-squared value=3.72, p-value=0.16; (6): chi-squared value=2.01, p-value=0.37; (8): chi-squared value=5.07, p-value=0.079.

Table 10
On-the-job search intensity: attitude, job applications and search channels

	Search attitude (ordered probit)		Applied for job (probit)	
VARIABLES	(1)	(2)	(3)	(4)
Patience	0.066562**	-0.202246	0.063891*	-0.084059
	(0.029332)	(0.165636)	(0.035747)	(0.227082)
Patience squared		0.031828		0.017402
		(0.019595)		(0.026587)
Age	0.133725***	0.134557***	0.143027***	0.143839***
	(0.031197)	(0.031267)	(0.037999)	(0.037942)
Age squared	-0.001836***	-0.001846***	-0.001836***	-0.001845***
	(0.000375)	(0.000376)	(0.000448)	(0.000447)
Marital status	-0.180055**	-0.183135**	-0.121306	-0.123314
	(0.072338)	(0.071977)	(0.086224)	(0.086084)
Nr of children	-0.015618	-0.014137	-0.015459	-0.014867
	(0.027593)	(0.027512)	(0.032583)	(0.032481)
Education level 2	0.207569*	0.209703*	0.181754	0.181987
	(0.107246)	(0.107370)	(0.125958)	(0.126050)
Education level 3	0.158144**	0.160349**	0.227385**	0.228073**
	(0.079485)	(0.079670)	(0.092747)	(0.092939)
Education level 4	0.183081**	0.186332**	0.195410**	0.196383**
	(0.080346)	(0.080639)	(0.092412)	(0.092670)
Education level 5	0.188356*	0.185382*	0.227995**	0.225580**
	(0.096471)	(0.096184)	(0.110031)	(0.109670)
Unemployment rate (prov)	-0.009866	-0.010958	-0.091770**	-0.092468**
	(0.039406)	(0.039418)	(0.046400)	(0.046489)
Permanent contract	-0.362295***	-0.362146***	-0.325349**	-0.325009**
	(0.104746)	(0.104966)	(0.137517)	(0.137599)
Civil servant	-0.011279	-0.013648	-0.012893	-0.014049
	(0.068178)	(0.068255)	(0.076865)	(0.076954)
Tenure	-0.015998***	-0.016057***	-0.017458***	-0.017518***
	(0.003764)	(0.003756)	(0.004420)	(0.004406)
Region: north	0.134816	0.133525	0.301907**	0.302007**
	(0.117173)	(0.117395)	(0.136852)	(0.136907)
Region: east	0.032955	0.034164	0.076500	0.077008
	(0.075891)	(0.075797)	(0.086499)	(0.086461)
Region: south	0.005292	0.003219	0.070826	0.069261
	(0.070351)	(0.070286)	(0.079495)	(0.079277)
Const	2.510555***	2.252482***	-3.018319***	-2.991533***
	(0.687657)	(0.756967)	(0.859585)	(0.987027)
Const	3.312452***	3.054774***		
	(0.692509)	(0.760873)		
Observations	5010	5010	5008	

Clustered and robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The coefficients on year dummies are suppressed in the table

Table 11
On-the-job search intensity: number of job applications and search channels

	Number of job applications (neg. bin. regression)		Number of search channels (neg. bin. regression)	
VARIABLES	(5)	(6)	(7)	(8)
Patience	0.117960	0.053742	0.113142**	0.077569
	(0.083510)	(0.469259)	(0.050600)	(0.333052)
Patience squared		0.007511		0.004242
		(0.055509)		(0.039085)
Age	0.219166**	0.219518**	0.220730***	0.220704***
	(0.087171)	(0.087150)	(0.061694)	(0.061681)
Age squared	-0.002795***	-0.002799***	-0.002924***	-0.002924***
	(0.001014)	(0.001013)	(0.000742)	(0.000742)
Marital status	-0.178589	-0.179407	-0.230929*	-0.231387*
	(0.213690)	(0.214138)	(0.125879)	(0.125521)
Nr of children	-0.090302	-0.089974	-0.051903	-0.051571
	(0.075386)	(0.075505)	(0.050710)	(0.050528)
Education level 2	-0.021400	-0.022587	0.029060	0.029171
	(0.312799)	(0.312090)	(0.189165)	(0.189250)
Education level 3	0.129095	0.127134	0.205755	0.205949
	(0.266019)	(0.263628)	(0.151454)	(0.151690)
Education level 4	0.090049	0.088414	0.318681**	0.318948**
	(0.247714)	(0.246933)	(0.143777)	(0.144019)
Education level 5	0.020397	0.017125	0.289464*	0.288480*
	(0.282598)	(0.280775)	(0.173073)	(0.172217)
Unemployment rate (prov)	-0.202015*	-0.202191*	-0.056721	-0.056882
	(0.111933)	(0.111825)	(0.066781)	(0.066771)
Permanent contract	-0.922666***	-0.923528***	-0.506798***	-0.506971***
	(0.296200)	(0.295913)	(0.180538)	(0.180560)
Civil servant	-0.341526*	-0.341444*	-0.085354	-0.085740
	(0.180996)	(0.181045)	(0.118251)	(0.118577)
Tenure	-0.044122***	-0.044190***	-0.039874***	-0.039885***
	(0.013055)	(0.013128)	(0.007516)	(0.007521)
Region: north	0.353194	0.353989	0.320803	0.320765
	(0.308516)	(0.308286)	(0.195251)	(0.195263)
Region: east	-0.031069	-0.029867	0.146064	0.146367
	(0.225382)	(0.225447)	(0.136422)	(0.136151)
Region: south	-0.058433	-0.059494	-0.005646	-0.005739
	(0.187547)	(0.187254)	(0.124467)	(0.124452)
Const	-2.878093	-3.233880	-3.980309***	-4.371111***
	(1.873133)	(2.061054)	(1.318750)	(1.450700)
Const	2.603034***	2.603028***	1.305151***	1.305093***
	(0.105849)	(0.105879)	(0.089206)	(0.089258)
Observations	5008		5008	

Clustered and robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The coefficients on year dummies are suppressed in the table

Table 12
Job-job transition

	Job mobility probability (probit model)	
VARIABLES	(1)	(2)
Patience	0.033755	-0.376395*
	(0.040123)	(0.227073)
Patience squared		0.048402*
		(0.026464)
Age	-0.068905*	-0.069611*
	(0.036816)	(0.036669)
Age squared	0.000616	0.000622
	(0.000437)	(0.000435)
Marital status	-0.016438	-0.023621
	(0.100981)	(0.101524)
Nr of children	0.075751**	0.077983**
	(0.035244)	(0.035482)
Education level 2	0.021455	0.022373
	(0.129636)	(0.129155)
Education level 3	0.067954	0.075296
	(0.110545)	(0.110513)
Education level 4	0.010981	0.014836
	(0.106766)	(0.106577)
Education level 5	0.182887	0.179567
	(0.121916)	(0.122241)
Unemployment rate (prov)	0.026500	0.024794
	(0.054524)	(0.054653)
Permanent contract	-0.320445**	-0.321990**
	(0.143887)	(0.143939)
Civil servant	-0.020147	-0.019608
	(0.084549)	(0.084514)
Tenure	-0.025069***	-0.024935***
	(0.005037)	(0.005025)
Region: north	-0.362628**	-0.361560**
	(0.154697)	(0.155771)
Region: east	-0.189650*	-0.185682*
	(0.099085)	(0.098932)
Region: south	-0.212737**	-0.210566**
	(0.085687)	(0.085807)
Constant	1.008890	1.864790*
	(0.878150)	(0.978175)
Observations	3756	3756

Clustered and robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The coefficients on year dummies are suppressed in the table

6. Conclusion and discussion

By investing in their career, workers can pursue different career paths: some career paths may lead to smaller more immediate rewards, while others may result in larger more delayed benefits. In this paper, I developed a theoretical model in which workers can allocate time and energy between two types of career investments. Firstly, workers can exert high work effort in order to climb the wage ladder within the same organisation. Besides affecting their promotion opportunities, workers can increase the probability of receiving an outside job offer by engaging in job search activities. The central assumption is that internal promotion leads to larger more delayed rewards, while the gains of external mobility are smaller but more immediate. In the model, the total level of career effort is endogenous: some workers exert less work and on-the-job search effort than others.

Because making investments in one's career involves trade-offs between short-run costs and long-run benefits, time preferences can be expected to be crucial for work effort and job search intensity. Under exponential discounting, patience is positively related to work effort but has an inverse U-shaped relation with on-the-job search effort. However, assuming workers are hyperbolic discounters, patience has a positive effect on both work and job search effort. Since both activities are investment activities involving immediate costs, hyperbolic agents have a tendency to procrastinate these activities in a way that is suboptimal for their long-run selves.

Furthermore, a negative or inverse U-shaped relation between exponential patience and the probability of a job transition can be expected, whereas the theoretical relation between the hyperbolic discount rate and external job mobility is ambiguous. I exploit these theoretical predictions to test the exponential versus the hyperbolic discounting model.

Using detailed information on individual time preferences, various indicators of work effort and several proxies for on-the-job search intensity, I tested the predictions empirically. The results provide support for the hyperbolic discounting model: patience is positively related to both types of career investment. These findings appear to be consistent across different model specifications. Furthermore, we found no evidence of a relation between patience and job mobility as predicted by the exponential discounting model.

The results contrast with the central hypothesis and main empirical results of Drago: he predicts a negative relation between patience and search intensity and finds a negative effect of patience on the hazard rate of moving to another job. There are several potential explanations for this inconsistency. First of all, more impatient workers exert less work effort and therefore are more likely to lose their job: they may move to other jobs anticipating dismissal. Another explanation could be that the behavioural proxies do not measure impatience but other individual characteristics which are positively related with job search effort. This seems to be a likely explanation as the sophistication proxy may capture patience and is positively related with the hazard rate. Finally, jobs may be considered as experience goods: impatient workers may be unwilling to invest time and energy in the job and therefore move from one job to another more frequently (without searching intensively).

The results have important policy implications: (on-the-)job search models that were used in previous work as a frame of reference for policy analyses assume exponential discounting. In such a framework, long-term incentives can be expected to be effective. However, under hyperbolic discounting, policy should focus on short-term costs of career investments and commitment devices. Next to the implications for public policy, employers could take this into account in the development of recruitment and retention policies.

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Appendix A1: patience factor analysis

Correlation matrix

	future01	future02	future03	future04	future05	future06	future07	future08	future09	future10	future11
future01	1										
future02	0.6302	1									
	0.0000										
future03	0.3210	0.4466	1								
	0.0000	0.0000									
future04	0.0072	0.0501	0.3048	1							
	0.2707	0.0000	0.0000								
future05	-0.0922	-0.0428	0.1500	0.3039	1						
	0.0000	0.0000	0.0000	0.0000							
future06	0.2894	0.3301	0.1332	-0.0509	-0.0673	1					
	0.0000	0.0000	0.0000	0.0000	0.0000						
future07	0.2775	0.2367	0.1547	-0.0175	-0.1945	0.2160	1				
	0.0000	0.0000	0.0000	0.0077	0.0000	0.0000					
future08	0.3423	0.3745	0.2064	0.0262	-0.0856	0.3395	0.4159	1			
	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000				
future09	0.1424	0.1576	0.3670	0.1803	0.0931	0.0405	0.1878	0.1091	1		
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
future10	0.1609	0.2260	0.3858	0.1782	0.1370	0.2272	0.1062	0.1491	0.4548	1	
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
future11	0.1897	0.2613	0.4642	0.2718	0.1684	0.1619	0.1364	0.1656	0.4530	0.5628	1
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	

Kaiser-Meyer-Olkin measure of sampling adequacy

future01	0.7518
future02	0.7306
future03	0.8315
future04	0.7328
future05	0.6910
future06	0.7954
future07	0.7447
future08	0.7956
future09	0.8090
future10	0.7790
future11	0.8093
Overall	0.7766

Factor analysis A

Items: FUTURE01 – FUTURE11
Estimation method: principal factor

Eigenvalues

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	2.65079	1.43426	0.7489	0.7489
Factor2	1.21653	0.82830	0.3437	1.0926
Factor3	0.38823	0.21816	0.1097	1.2023
Factor4	0.17007	0.04342	0.0481	1.2504
Factor5	0.12665	0.21270	0.0358	1.2862
Factor6	-0.08605	0.04419	-0.0243	1.2618
Factor7	-0.13024	0.03600	-0.0368	1.2251
Factor8	-0.16624	0.03198	-0.0470	1.1781
Factor9	-0.19822	0.00845	-0.0560	1.1221
Factor10	-0.20667	0.01875	-0.0584	1.0637
Factor11	-0.22542	.	-0.0637	1.0000

Factor loadings (pattern matrix) and unique variances

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Uniqueness
future01	0.5614	-0.3799	0.2040	-0.0869	-0.0562	0.4881
future02	0.6457	-0.3256	0.2680	-0.0903	-0.0045	0.3971
future03	0.6417	0.1949	0.1721	0.0273	-0.0821	0.5132
future04	0.2424	0.3760	0.1816	0.2141	0.0035	0.7210
future05	0.0691	0.4105	0.2073	0.1125	0.1184	0.7571
future06	0.3714	-0.2753	-0.0953	-0.0145	0.2367	0.7209
future07	0.3806	-0.3107	-0.2432	0.1749	-0.1040	0.6580
future08	0.4584	-0.3444	-0.1127	0.2067	0.0616	0.6120
future09	0.4906	0.3031	-0.1938	-0.0433	-0.1456	0.6068
future10	0.5725	0.3232	-0.1942	-0.1323	0.1013	0.5024
future11	0.6181	0.3619	-0.1141	-0.0470	0.0241	0.4712

Scoring coefficients

future01	0.16909
future02	0.23819
future03	0.19312
future04	0.05555
future05	0.01583
future06	0.08352
future07	0.10256
future08	0.12753
future09	0.13070
future10	0.18225
future11	0.20917

Factor analysis B

Items: FUTURE01-FUTURE03; FUTURE06- FUTURE11 (9)
Estimation method: principal factor

Eigenvalues

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	2.58747	1.64661	0.8321	0.8321
Factor2	0.94086	0.64096	0.3026	1.1346
Factor3	0.29990	0.20060	0.0964	1.2311
Factor4	0.09930	0.15539	0.0319	1.2630
Factor5	-0.05608	0.09043	-0.0180	1.2450
Factor6	-0.14651	0.04287	-0.0471	1.1979
Factor7	-0.18938	0.01595	-0.0609	1.1370
Factor8	-0.20533	0.01524	-0.0660	1.0709
Factor9	-0.22057	.	-0.0709	1.0000

Factor loadings (pattern matrix) and unique variances

Variable	Factor1	Uniqueness
future01	0.5856	0.6571
future02	0.6656	0.5570
future03	0.6118	0.6258
future06	0.3943	0.8445
future07	0.3990	0.8408
future08	0.4792	0.7704
future09	0.4729	0.7764
future10	0.5564	0.6904
future11	0.5914	0.6502

Scoring coefficients

future01	0.18224
future02	0.25579
future03	0.17141
future06	0.09173
future07	0.10767
future08	0.13755
future09	0.13062
future10	0.18263
future11	0.19935

Appendix A2: behavioural proxies, statements and discount rates

Discount rate
Discount rate = (extra amount of money / 1000)

Smoker
Question: *"Do you smoke cigarettes?"*
Smoker = 0 if "No"
Smoker = 1 if "Yes, daily" or "Yes, occasionally"

Drinker
Question: *"Do you consume over four alcoholic beverages each day?"*
Drinker = 0 if "No"
Drinker = 1 if "Yes"

Statements about spending behaviour
Period
Question: *"Which of the following time periods is the most relevant to you when planning household expenditures and savings?*
Period = 1 if "next few months"
Period = 2 if "next year"
Period = 3 if "next few years"
Period = 4 if next 5 to 10 years"
Period = 5 if "beyond the next 10 years"
Spend (7-point scale)
Ques*tion:* *"Would you indicate on a scale from 1 – 7 how you use the money that is left after having paid for food, housing and other necessaries? (1 means you want to spend the money immediately - 7 means you want to save as much money as possible)"*
Planning (7-point scale)
Question: *"Do you find it difficult to control your expenditures" (1 very easy – 7 very difficult)*