# Hyperbolic Discounting and Job Search

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**Abstract**

The theory of hyperbolic discounting can explain why people procrastinate. We test our hypothesis that people do have hyperbolic preferences by studying data describing the job search behavior among unemployed Swedish persons. A decision rather present in time regarding search intensity and a decision concerning reservation wage at a more distant future, will mutually determine the duration of the unemployment spell. A theoretical model introduces a general measure *impatience*, which captures the certain discount rate people use in order to evaluate present and future utilities. If impatience is significantly correlated with search intensity and insignificantly correlated with reservation wage, the model suggests that the agents have hyperbolic preferences. The results of our empirical test, align with these theoretical predictions. Thus our hypothesis is validated and the evidence of hyperbolic preferences among people is deepened.

# 1 Introduction

> "The two rules of procrastination: 1) Do it today. 2) Tomorrow will be today tomorrow." (*Author Unknown*)

'I resolve to ..., starting tomorrow', people say when talking about something burdensome that they are intending to do but that they perceive problematic to attain. An illustrating example is a person, who announces that he will start exercising next month. Although when the next month arrives, the future 'benefits' expected to be yielded from exercising does not appear large enough compared to the immediate 'sacrifices' that are required. Hence the ambition will be postponed into to the future. This behavior can be observed in many situations such as ambitions to stop smoking, drinking, saving money and dieting. In order to avoid procrastination people may take measures that will prevent them from postponing further. For instance a person might purchase a gym card since it will increase the incentives to actually exercise even though, at the moment, it might not feel to be worth it.

People that are irrational in their way to evaluate future utilities and inconsistent in their preferences over time can be said to be *hyperbolic*. Their behavior can be described with a hyperbolic discount function, in which the value of future events becomes increasingly more important as they get closer in time. Consequently, things that are to occur in the remote future are disproportionally unimportant to the person. The value in a hyperbolic utility function decreases rapidly in adjacent periods but will decrease more slowly in the remote future. This contrasts to a conventional exponential utility function, where the discounting is made by a constant factor each period. People with hyperbolic utility functions will disproportionally prefer immediate benefits and procrastinate task in a larger extent, compared with people that have exponential utility functions.

The aim of this essay is to further the evidence of hyperbolic preferences among people. In order to attain our purpose we will have to look at a specific example that implies the valuation of present costs and future benefits and where measures to avoid procrastinating are not available. Such an occasion is the jobseeker's search for employment: when searching for jobs, people normally lack an effective instrument for controlling their behavior. In addition, job search in it self is time-consuming and can be unpleasant. The benefits of a future employment may as well appear distant, so searching is given up in favor of more short-termed activities. This also corresponds to the conventional view: unemployed looking for

jobs generally search to little and to infrequent for being economically efficient (Pissarides 1984). Studies have concluded that jobseekers on average search as little as seven hours per week, in comparison to the usual forty-hour workweek (Barron and Mellow 1979).

Whether the person's underlying utility function is hyperbolic or exponential will have great consequences on the outcome of the job search. In order to determine people's preferences we will use a job search model, originally presented in DellaVigna and Paserman (2005).[1] Job search is endogenous, and determines the reservation wage and effects on the duration of an unemployment spell. An increase in search effort will increase the probability of receiving a job offer and hence improve the chances of leaving unemployment. A decrease in the wage acceptance level will make the person more willing to accept a given offer and will consequently leave unemployment sooner. The decisions regarding search effort and reservation wage are highly dependent on whether the job seeker are hyperbolic or exponential. Thereby, differences in people's preferences can rather deeply impact labor market policy outcomes. Studying hyperbolic preferences in the context of job search is also convenient since it does not encounter the usual problem when studying individuals time preferences.[2]

Search effort is determined upon evaluations of present perceived sacrifices associated with job search and the salary that is expected to be received the very next period. Although, the decision of the reservation wage implies an appraisal of benefits in a rather distant future. That is because a certain wage will not only be received the following period but for every period throughout the whole employment spell. Since the choices of search effort and reservation wage are based upon short and long time horizons respectively, they will be affected differently depending on the underlying discount function.

DellaVigna and Paserman (2005) approximate people's *impatience* as a measure of their discount factor. The discount factor can be decomposed in a hyperbolic and an exponential part, depending on the individual's preferences. Although, the relative composition of the factor cannot be directly observed, the influence of impatience will affect search effort and reservation wage in different ways, depending on whether the measure mainly constitutes

[1] The corresponding model where used in Paserman (2008), where the degree of hyperbolic discounting where estimated and possible policy options aimed at reducing unemployment where evaluated.

[2] Liabson *et al.* (1998) for example, find that life-cycle consumption and assets accumulation patterns are explainable by a hyperbolic discount model, but that the choices of hyperbolic and exponential consumers are hard to separate.

of a hyperbolic or an exponential part. Fortunately, this can also tell whether people have hyperbolic or exponential preferences: if variation in impatience have a significant correlation with search effort and a rather insignificant correlation with reservation wage, jobseekers can be said to have hyperbolic preferences. If the opposite is observed, i.e. variations in impatience are weakly correlated with search effort and strongly correlated with reservation wage, jobseekers are instead exponential in their preferences.

Based upon this theoretical mechanism we are able to perform an empirical test on whether the measure of impatience, in fact, will affect search intensity or reservation wage the most. Thereby, we can also conclude whether jobseekers have hyperbolic or exponential preferences. Our empirical test is based upon a longitudinal study of unemployed (Stenberg 2003) made by Swedish Institute for Social Research (SOFI) at Stockholm University. The study contains panel data on several hundreds of persons in search for work, which participated in an extensive survey in the 1990s. We have used measures of impatience as proxies of jobseeker's discount rates. We find that variation in impatience is strongly correlated with search intensity, while almost uncorrelated with variations in reservation wages. Thus, based upon the results we are able to conclude that jobseekers in our sample reasonably are hyperbolic. The results are in accordance with our hypothesis and thus strengthen the evidence for hyperbolic discounting among people.

# 2 Time Inconsistency and Hyperbolic Discounting

Time inconsitency and its economic consequences constitute a concept that has been extensively covered in the literature since Robert H. Strotz first addressed the problem in his paper Strotz (1956), and it has been widely debated by economists, psychologists and behaviorists. It has been shown that individuals have disproportionate preferences for the present, and are relatively impatient for rewards in the near future, compared with rewards that are more distant in time. This can be illustrated with a simple experiment by Thaler (1981), which goes as follows: Subjects are asked whether they would prefer 'one apple today' or 'two apples tomorrow', and respectively, 'one apple in one year' or 'two apples in one year plus one day'. Some prefer 'one apple today' but at the same time, 'two apples in one year plus one day', which indicate a dynamical irrationality: people seem to be impatient in a way that makes them favor the larger reward that entails waiting only when it's relatively distant

in time. When facing the choice today, they would prefer receiving an apple immediately in contrast to waiting for tomorrow to get an additional one. This 'present-bias' can explain both why people procrastinate, as well as their motives for constraining their future behavior for not doing so.

Typically economists think of agents that discount future events exponentially, by adding the discount rate for each period. In a functional form, total utility $U$, of today and further events, is the present value of all future utilities, denoted:

$$U = \sum_{t=0}^{T} \delta^t u_t. \tag{1}$$

However, the hyperbolic discount function allows agents to have irrational preferences, and weights the present with a much higher factor. If the agent is time inconsistent, utility in period $t = 0$ is discounted in the same way as in the exponential model—that is $u_t$—but the utility in the following periods $t = 1, 2, \ldots$ is discounted with a fraction $\beta$. Hence, it follows that the hyperbolic discounting function is

$$U = u_0 + \beta \sum_{t=1}^{T} \delta^t u_t, \tag{2}$$

so future events are discounted at a lower rate and though, less valued compared to events today—the discount rate declines as events becomes more distant in time. The factor $\beta$ can be interpreted as the short-run discount factor, while the factor $\delta$ is the long-run discount factor. When evaluating an event in the future in the perspective of today, the implied discount factor is $\beta\delta$. However, when evaluating and comparing two distant events, the discount factor between any two periods is $\delta$. The agent is time inconsistent if $\beta < 1$, or have the usual exponential preferences if $\beta = 1$. In other words, the present is more important to the agent, and as tomorrow becomes today—and though becomes the present—it becomes as important as yesterday was. On the whole, this implies that benefits that are expected in the future will be valuated higher when the agent foresees its future preferences, but those that arise tomorrow will appear to be of less value. An agent with hyperbolic preferences will though tend to procrastinate activities that entail costs immediate but rewards not until later (O'Donoghue and Rabin 1999).

The functional form was first used by Phelps and Pollack (1968), and gained much of its

reputation through the work of Laibson in his influential paper Laibson (1997) and has been largely accepted on the basis of psychologists' experiments on humans and animals (see Ainslie 1992, for a survey). However, there has been some critic of whether hyperbolic preferences describe the pattern of dynamic inconsistency correctly, and there are some alternative approaches. Rubinstein (2003) argues that the decision-making process of the agent better explains present-biased preferences and that hyperbolic preferences can be rejected on the same fundaments that it in turn rejects exponential preferences. Fudenberg and Levine (2005) have also developed an alternative approach, and propose a dual-self' model of impulse control, where a long-run self cares about the future and the short-run self cares for the present. In the following section, we will adopt these hyperbolic preferences on a job search model of endogenous search, and derive the implications of hyperbolic preferences on jobseekers.

## 2.1 A model of job search with hyperbolic preferences

To begin with, we will account for a simple model of the job search process, which determines how fast workers move from unemployment to employment. We will make use of a search model developed by Stefano DellaVigna and M. Daniele Paserman (2005).[3] Search effort is endogenous and determines the probability that an unemployed get a job offer. The worker decides the amount of effort to devote on search activity. Thereafter he decides on the wage level at which he will accept a job offer.[4] Using the same notation as DellaVigna and Paserman, the unemployed worker aims to maximize a continuation payoff, starting the next period, for unemployment $V_{t+1}^U$, and for employment $V_{t+1}^E(w)$ where $w$ is the wage received from being employed. Search effort and the reservation wage is then determined by:

$$\max_{s_t \epsilon [0,1]} b - c(s_t) + \beta\delta\Big[s_t E_F\big\{max\big(V_{t+1}^E(w), V_{t+1}^U\big)\big\} + (1-s_t)V_{t+1}^U\Big]. \tag{3}$$

The equation can be interpreted as follows: If unemployed, the worker gains a benefit $b$ from leisure, unemployment benefit or corresponding compensation. The costs of search is

[3]The model originate from the work of Lippman and McCall (1976), but with the additional feature of endogenous search and characteristics enabling hyperbolic preferences among jobseekers.

[4]Wage $w$ can be said to be a realization of a random variable $W$ that has a cumulative distribution $F_W(w) = P(W)$ with a positive density and bounded support $[\underline{x}, \bar{x}]$.

$c(s_t)$, where $s_t$ is the probability of receiving a job.[5] The continuation payoffs are discounted by both the usual discount factor $\delta$ and the hyperbolic discounting term $\beta$. By letting the hyperbolic discounting coefficient to be equal to one, $\beta = 1$, we allow the model to be valid also for strictly exponential agents. With the probability $s_t$, the worker receives a job offer for the next period, which he could either accept or reject. $E_F(W)$ denotes the wage offer that can be expected from a given distribution. With the probability $(1 - s_t)$, the worker does not find any job and hence, stays unemployed for the next period. The continuation payoff received from employment is

$$V^E_{t+1}(w) = w + \delta\big(V^E_{t+2}(w)\big). \tag{4}$$

The optimal search effort and the reservation wage are determined by the future strategies of the worker, through the continuation payoffs. Since people with a hyperbolic discount function are dynamically inconsistent, the future selves of the worker will have conflicting interest with the present self. This leads to an interpersonal game between the different selves, in which the outcome of each of all future periods is independent of the previous one.[6] The worker in period $t = 0$ will prefer to delay with search and so procrastinate, leaving the necessitate search effort for tomorrow's selves. However, the same worker in period $t = 1$ will not pay regard to the past, and consequently not devote more effort as to compensate for the previous selves. The wage acceptance level is determined on basis of the continuation payoff received when unemployed. Using the above equation, solving for the optimal reservation wage gives

$$w^* = (1 - \delta)V^U, \tag{5}$$

leaving out the time subscripts as we look for a stationary solution. The reservation wage is hence determined strictly by the exponential discount factor $\delta$ and the benefits received during unemployment. If benefits or subsidies received when unemployed are high, the reservation wage will be high as well. The short-run discount factor $\beta$ does not however affect

[5] We can view the job search process as drawing from a given distribution: By increasing the search intensity $z$, the distribution itself will not change but it would be like drawing a larger number of times and hence, the accumulated probability of getting a job offer will increase. So a job offer is obtained with the probability $s = p(z)$, where $s\epsilon[0, 1]$ and $p(z)$ is a strictly increasing function of $s$. The cost of search $c(s_t)$ is a convex function of $s$, and there exists no further fixed costs.

[6] Under a assumption of stationarity, we look for a Markov perfect equilibria, which is defined as "a profile of Markov strategies that yields a Nash equilibrium in every proper subgame" (Fudenberg and Tirole 1991/1993, p. 501), in which only payoff-relevant events are accounted. In this setting then, previous actions do not affect present behavior of the worker.

the wage decision. At an intuitive level, the decision is about choosing between potential job offers in the remote future. Since this only involves costs and benefits in future periods, the worker does not regard the payoffs by the short-run discount factor (remember that $\beta$ only is part of the discount factor from today to the next following period). The first order condition, using above equations, of search intensity as a function of the reservation wage $w^*$, is

$$c'(s) = \frac{\beta\delta}{1-\delta}\left[\int_w^{\bar{x}} (w - w^*)dF(w)\right]. \tag{6}$$

The above function can be interpreted as follows: the marginal cost of higher probability obtaining a job offer equals the marginal benefit of finding a job where the worker gains a wage higher than the reservation wage. The value of this 'excess' wage is discounted with $\beta\delta/(1-\delta)$, so the short-term discount factor $\beta$ has implications on the search decision. In the next section, we will distinguish between two different types of hyperbolic agents, as this will be crucial for the theoretical derivation.

## 2.2 The naive and the sophisticated agent

The collected literature distinguishes between two different types of hyperbolic agents. The first one, the *naive* hyperbolic agent (Strotz 1956) is unaware of its future failings and believes that even though she is hyperbolic today, she will improve and be exponential tomorrow. Therefore she will procrastinate and delay her search activities until later. She does not, however, become exponential and though reason as before for all future periods, and therefore will cause severe procrastination of search effort. The other is the *sophisticated* hyperbolic agent, who is aware of her preferences and therefore she will try to commit and constrain her future selves. Unless she has a credible commitment device she acts in a hyperbolic manner. Otherwise she would behave like an exponential agent with $\beta = 1$. The sophisticated hyperbolic agent will realize that if she cannot commit to her initial plan she will engage in too little search effort. She will therefore increase her search effort and so exert more effort compared to the naive agent.

The central aspect of this model is the contrast between short-term and long-term decisions, and its impact on naive hyperbolic agents. Since the naive agent incorrectly believes that her hyperbolic preferences are just temporary, her continuation payoffs will coincide with

that of the exponential agent $V^{U,n}(\beta,\delta) = V^{U,e}(\delta)$. For a long-term valuation, this implies that there is no difference between the naive and the exponential agent, since they both use the long-term discount factor $\delta$. So when evaluating future job options, and deciding about the acceptance wage level, they will have the same reservation wage,

$$w^n(\beta,\delta) = w^e(\delta). \tag{7}$$

Hence, the reservation wage decision is unaffected by short-run discounting $\beta$—the naive agent thinks that she will improve and behave exponential tomorrow. On the other hand, short-run discounting does have a significant effect on search behavior. The first order conditions of search effort for the naive and the exponential agents can be written in the same manner as above:

$$c'\big(s^n(\beta,\delta)\big) = \beta c'\big(s^e(\delta)\big). \tag{8}$$

Because the cost of search is a convex function of $s$, search effort is strictly increasing in $\beta$. An increase in short-run impatience (a reduction of $\beta$) implies a lower present value of the benefit of a future job, so a naive agent will search less the higher the level of short-run impatience. Intuitively this is because the naive agent believes that she will value a future job higher tomorrow, and consequently spend more effort on searching then, so she searches less today since the cost of search is higher.

To sum up, the two types of hyperbolic agents will behave differently in the job search process and the outcomes on search activity and wage acceptance policy will diverge. The sophisticated hyperbolic agent will try to commit to her plan so that she searches according to what is optimal in the long run. She will, however, search less than she would like to. The naive hyperbolic agent is instead unaware of her pitfall and, consequently, search much less than what is optimal in the long run. From the above stated equations, it is easy to derive the implications of variations in short- and long-run discount factors. In the next section we will set forth the combined implications of both discount factors, and as we will point out, it is possible to deduce the aggregate outcome of changes in discounting on both exponential and hyperbolic agents.

## 2.3 Towards a hypothethical setting

The main feature of this model, which is crucial for our purpose, is the contrast between the naive hyperbolic agent with $\beta < 1$ and the exponential agent with $\beta = 1$. In order to further expound this, let us return to the *time* aspect of the model. There are distinct differences in the timing of the two decisions: the decision regarding how much effort to devote on search is rather immediate in time.The decision regarding the reservation wage is based upon evaluations of benefits occurring in a rather distant future. The additional benefit gained by receiving a higher salary will not only yield an excess benefit for a single period but for every period the salary is earned throughout the whole employment spell. Hence, changes in the level of the long-run discount factor $\delta$ will have rather significant effects on the valuation that precedes the decision of reservation wage.

Since both the naive and the exponential agent determine their reservation wage in the same manner, we will expect that changes in $\delta$ will lead to similar effect for both agents. Because $\beta$ is a measure of short-run impatience, changes in the factor will not be important for the wage decision. Although we recently realized that a decreased $\beta$ will lead to lower search intensity, this will in turn lower the probability of receiving a job offer. The continuation payoff of being unemployed consequently decreases and will, according to $w^* = (1-\delta)V^U$, diminish the level of reservation wage. This is an indirect effect of changes in $\delta$ that is only valid for sophisticated hyperbolic agents. Sophisticated hyperbolic agents realize that their decrease in job search will make them stay longer in unemployment.[7] In order to compensate they will decrease their reservation wage. Apparently, this only affects the wage decision marginally, as changes in $V^U$ are reasonably not so big, and as $\delta$ to a larger extent is more important. Furthermore, the naive hyperbolic agent still believes that she only are temporarily searching less and thus do not bother to compensate by decreasing wage.

Changes in long-run discounting will affect both search activity and reservation wages. As $\delta$ approaches one, the value of having a higher wage increases, and though raises reservation wages as the worker becomes more fastidious. At the same time, the worker will decide to exert more effort on search. However, as DellaVigna and Paserman conclude, the effect has disproportionate features, since searching more intensively reaches a point where the

[7] As search intensity decreases, the worker will draw fewer times from the distribution of job offers. The value of staying unemployed thereby decreases as the probability to receive a job with a higher wage is diminished.

marginal cost outweigh the marginal benefit. Then, when $\delta$ is sufficiently high, $\delta$ only affects reservation wages. When real values of the discount factor on individual level have been estimated it has refered to values between 0.7 and 1.0, and often closer to one (see, for example, Warner and Pleeter 2001, Hausman 1979, Coller and Williams 1999). This is also consistent with the prevalent conception in the financial literature.

All in all, reservation wage is apparently principally affected by changes in the long-run discount factor $\delta$ and only marginally, if at all, affected by the short-run discount factor $\beta$, through the sophistication effect. Search intensity, on the other hand, is primarily affected by $\beta$ and unaffected by $\delta$ when $\delta$ is sufficiently high. This is to expect on the basis of real value estimation of individual discount factors. The conclusion from the above reasoning is that the variation in $\delta$ is the main driving force of differences in reservation wages. On the other hand, variations in $\beta$ are more important explaining differences in search effort. Due to the contrasting characteristics of the hyperbolic and exponential agent, the outcome of changes in discount factors will deviate considerably when it comes to job search. A relatively impatient exponential agent, with a low long-run discount factor $\delta$, will devote more search effort compared to a relatively impatient hyperbolic agent, with a low short-run discount factor $\beta$ but with the same $\delta$. The reservation wage will though almost be equivalent for the two types.

This feature of the hyperbolic agents, who typically exerts less search than an exponential one, enables a test of people's preferences. If the effect of short-run discount factor $\beta$ only will be evident on search activity in the presence of hyperbolic preferences, one can easily check whether this may be true on a sample of jobseekers. If variations in $\beta$ account for variations in search activity, but not in reservations wages, one can assume that hyperbolic model indeed are valid and has some explanatory power. In the following chapter we will give a detailed account for how to empirically test this and, given our theoretical conclusion, how to prove whether people have hyperbolic preferences or not.

# 3 Empirical Approach

The job search model that we have presented makes it possible to estimate preferences quantitatively. As been described in the previous section, the effect of short-run and long-

run discounting on search intensity and reservation wage can be used to determine whether people have hyperbolic or exponential preferences. If people have hyperbolic preferences, variation in short-run discounting would account for a large proportion of the variation in search activity. Since we cannot be sure to expect finding the short-run discount factor $\beta$—as we have not yet proven its validity—we will consider the overall implications of both $\beta$ and $\delta$. If we change both $\beta$ and $\delta$, the variation in reservation wages would be much smaller than corresponding variation in search activity. This would implicate a significant effect of the *total* discounting on search behavior while it does not have any major influence on reservation wages. If people instead have exponential preferences, the opposite would be true, and total discounting does not affect search behavior, but very well reservation wages.

As people in everyday life rarely evaluate events by an exact and explicit discount factor, we will use people's *impatience* as a proxy for different levels of discounting. If a person has high $\beta$ or $\delta$, he or she is relatively patient as future events are relatively valuable to the person today. If a person instead discounts the future by a higher discount rate (lower $\beta$ or $\delta$), events would be less valued, and the person is relatively impatient. Impatience would then be one minus the discount factor. If it is possible to trace people's impatience level, we will also be able to determine whether a person is relatively impatient compared to others. From that, we can infer whether preferences are hyperbolic or not due to the effect of impatient. We will use explicit measures of search activity and reservation wages and estimate impatience from information of various activities that can indicate impatience. In the following we will present the data that we use for this study. Thereafter, we present the variables that measure search behavior and reservation wage, and finally, our measures of impatience.

## 3.1 Data

We will make use of a longitudinal study of unemployed (LSA), made by Swedish Institute for Social Research (SOFI) under the supervision of Sten-Åke Stenberg at Stockholm University. The study contains panel data on Swedish citizens in search of work, who participated in an extensive survey with repeated face-to-face interviews 1992, 1993 and 2001, respectively. The survey was made on a random sample of 752 individuals that had been registered as unemployed at the Swedish Public Employment Service in February 1992. The selection

criteria were that the individual was looking for full-time job to start immediately, was between 25–54 years old and of Nordic origin, and was not physically disabled to work. Of the total sample, 82 percent of the respondents participated in the survey in 1992 (651 respondents), which was followed and interviewed again in 1993 (594 respondents) and 2001 (500 respondents).[8] The data set contains more than 900 variables, which except the work-situation contained information about health, family and other social factors, occupation biography and economic status.

Since the data also contains information of individuals that were employed but doing on the job search, we will only use observations of respondents that at the moment did not have any employment.[9] The behavior of people that are employed would probably differ in substantial ways from those who are not. A person who already has a job is less incentivized to find another, and would therefore search less intensive. Further on, a person who has a job also has an explicit alternative cost, in form of the wage at the present employment, although the reservation wage will be higher compared to persons that do not have an employment. Finally, it is also likely that a person looking for another job will match better to the new one, otherwise he or she would reject the job offer. Hence, including these observations would most likely bias the result from a statistical regression in a way that would be misleading to the study. It would of course be interesting to study the effects of hyperbolic preferences on employed persons, but we consider it being outside the scope of this essay.

## 3.2 Measures of search intensity and reservation wage

The LSA contains detailed information of the respondents search behavior and job acceptance preferences. Hence, we have access to very precise and detailed measures of search activity and reservation wage. Search intensity is measured as the amount of hours spent on job search per week, and includes all time spent on search activity, including necessary non-search activities, like journeys.[10] This measure is reasonably more accurate than others usually used in similar studies, since time spent on search is directly related to the jobseekers

[8] However, as we presume people's behavior to be constant over time, we will not make use of the longitiudinal dimension of the survey, and only use the data from 1992.

[9] In LSA 1992 they amount to 488 persons, looking for job and did not have one at the moment for the interview.

[10] The respondents where asked: *Approx how many hours altogether did you spend looking for job last week? Include all time, including, for example, journeys and the time you spent reading job ads.*

discount function.[11] Thereby, we steer clear of the problem of validity in measuring search intensity, because our theoretical definition corresponds in detail to our operationalization.

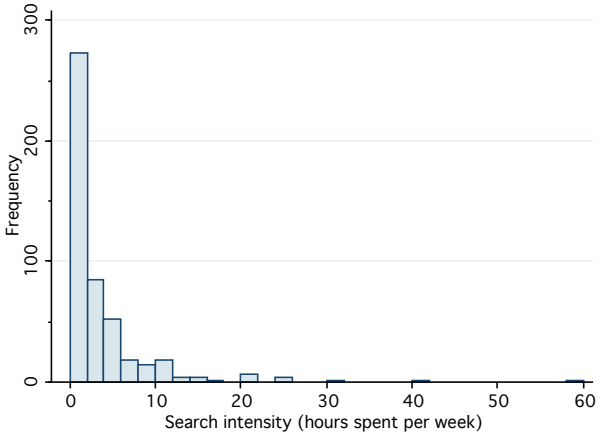


Figure 1: Search intensity

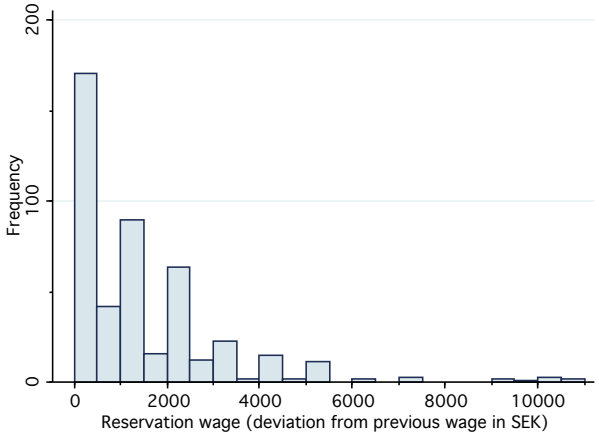


Figure 2: Reservation wage

Reservation wage is measured as the amount of SEK that a jobseeker is willing to sacrifice compared to previous wage received.[12] The reservation wage is hence equal to $\tilde{w} = \bar{w} - w^*$, where $\bar{w}$ is the previous wage received by the jobseekers, $w^*$ is acceptance wage that the worker is willing to accept, and $\tilde{w}$ is the difference between them. $\tilde{w}$ is therefore unaffected of which wage level the jobseeker belongs to because it is just the deviation from former wage. In that respect it does constitute a very suitably measure of reservation wage, since it do not require control for different salary groups. Figures 1 and 2 shows the distribution of search activity and reservation wage respectively in our sample and Table 1 displays some summary statistics.

## 3.3 Measures of impatience

To determine whether an individual is impatient or not, we will use a set of variables that individually indicates impatience and differences in discounting. Most attempts to study time inconsistency have been done in an experimental mode where the measures of impatience can be rather precise. However, there are several activities that involve a trade-off between

[11] Especially, the numbers of different search methods has been used as a proxy for search intensity in other studies (e.g. DellaVigna and Paserman 2005), but we believe that merely approximating search effort in that way is vague and imprecise.

[12] The respondents where asked: *How much of a reduction in your monthly pay would you accept?*

Table 1: Summary statistics—Measures of impatience, search intensity and reservation wage

| Variable | Mean | Std. Dev. | Min | Max | Obs. |
|---|---|---|---|---|---|
| Planned expenses<br>(plan expenses carefully) | 0.718 | 0.450 | 0 | 1 | 485 |
| Planning day<br>(plan what to do the following day) | 0.592 | 0.492 | 0 | 1 | 486 |
| Hard to get going<br>(difficult to get going in the morning) | 0.264 | 0.441 | 0 | 1 | 488 |
| Smoking<br>(smoked a half of a lifetime or more) | 0.274 | 0.447 | 0 | 1 | 485 |
| Exercise activity*<br>(pursue sports, outdoor or exercise activity) | 2.778 | 1.519 | 0 | 4 | 487 |
| Avoiding fats**<br>(uses low-fat provisions) | 0.957 | 0.904 | 0 | 2 | 488 |
| Search intensity<br>(hours spent on search per week) | 3.092 | 5.758 | 0 | 60 | 486 |
| Reservation wage<br>(deviation from previous wage in SEK) | 1327.978 | 1789.541 | 0 | 11000 | 461 |

* Exercise activity on a increasing five-point scale, from 'never' to 'several times a week'

** Avoiding fats on a three-point scale, from 'seldom' to 'often'

short- and long-term payoffs, and though can indicate impatience. The LSA contains a wide array of behavioral aspect and our measures are set up by those that we find most probable and suitable for our purpose. If several measures show the same result, a reasonable assumption is that a person is impatient in all circumstances, including the job search process. Crucial is however that these variables do not affect search behavior and reservation wage in any other way than just through people's tendencies preferring early gratification. In our setting, impatience contains both the property of long-term discounting ($\delta$) and short-term discounting ($\beta$). Since these measures are relatively imprecise and only noisy proxies of whether a person is impatience, we do not try to distinguish between short-run and long-run discounting—this would likely make the analysis vague and arbitrary. Instead, we will interpret our variables as measures of aggregate impatience, which may contain aspects of both short- $(1-\beta)$ and long-run $(1-\delta)$ impatience. Given the hypothesized effects, we can though make a conclusion of people's preferences, as well as whether the measures indeed catch up $\beta$ or $\delta$. We will now present the different measures included in our data that we will use as indicators of impatience.

*Planning for future expenditures.* There are various dimensions of an individual's economic behavior that can reveal her underlying discount function. We will make use of whether a person has considered and made a plan for future expenditures.[13] People that are planning on advance are more foreseeable of expenditures and future consumption needs, which would suggest that they prefer the value of future benefits and are ready to lower their present consumption due to that. A person that do not put away money for coming needs are more eager to fulfill present well-being and are consequently more impatient. In addition, planning one's consumption could be perceived as tedious and boring, so the mere planning might seem unattractive to an impatient person. Hence, there is a clear tension between short- and long-term payoffs.

*Planning for a weekly agenda.*[14] People that in the weekdays are planning what to do the next coming day are more structured and foreseeable than people that take the days as they come. This does not necessarily mean that everyone that do not are not concerned about the future, but people that plan beforehand are at least aware of irrationality, and are therefore making up their agenda in advance to reduce the risk of quiescence and their

[13]The respondents where asked: *Do you plan your expenses carefully or do you take them as they come?*

[14]The respondents where asked: *On the weekdays, do you plan what you're going to do the following day or do you take the day as it comes?*

future preferences. People that do not plan are not taking any concern of this dynamical irrationality, and may be hyperbolic just in the mere fact that they do not bother themselves taking the time planning what to do next day.

*Hard to get going in the morning.*[15] People that perceive it hard to get started in the morning can typically be expected to be impatient. Going up from bed can sometimes be perceived as unpleasant, and typically makes people to defer daily activities, such as searching for jobs. Though, lingering in the bed instead of going up is a short-term trade off as it results in postponing of daily tasks that are important on a longer sight.

*Smoking.* There are various health habits and activities that have very long-term consequences on persons. Smoking cigarettes are such one. People that smoke are often aware of the negative consequences of smoking, which can on a long sight lead to lung cancer, cardiac infarction, stroke and fetal damage to pregnant women. This is continually communicated by public authorities, organizations and by relatives. Still, millions of people decide to continue smoking despite the severe health impacts. It is hard to determine when cigarette smoking is turning dangerous to the individual, and when the trade-off between short and long sight becomes significant. We will, however, consider people that have smoked for half of their life or more being in the risk zone, and most likely are aware of that they are.[16] This is probably a better measure than, for example, how many cigarettes smoked daily, since that is both ambiguous and reasonably biased.[17]

*Physical exercise.*[18] Daily exercise and fitness training are common by many who are concerned of their health and well-being and may so catch up aspects of impatience. It is commonly known that some physical activity can prevent long-term health problems, such as type-2-diabetes, heart diseases and stroke. Also, people who are troubled of overweight are especially prescribed daily exercise (and a healthy diet) as to combat obesity.

[15] The respondents where asked: *Do you find it difficult to get going in the mornings?*

[16] Namely, the respondents who answered the question: *How many years have you been smoking altogether?* by a half of their age or more.

[17] Imagine a person that recently has entered unemployment. Due to the increased amount of spare time, waiting on job applications and so on, it is reasonable to believe that such a situation is causing people starts smoking.

[18] The respondents where asked: *Do you pursue any sports, outdoor or exercise activities, e.g. long walks? How often?*

*Avoid eating fats*.[19] In the same way as physical exercise, avoid eating unhealthy food with a high content of fats, is done by people that favor a good health on a longer sight, substituting short-term temptation. In addition, fast food and convenience food containing high levels of fats are mostly consumed by people who do not have the time, or do not strive to cook food. Combined, avoiding eating fats could though indicate whether people are impatient or not.

Some descriptive statistics of the impatience measures are shown in Table 1. We control for serial and partial correlation and see that the variables indeed are correlated. Table 2 shows a correlation matrix containing simple correlation between the different variables. Even though the correlation coefficients may seem suspiciously small, this is not surprising since our measures are rather diffuse and noisy proxies that only in part could be expected to catch up the full aspect of impatience. Therefore, they are reasonably marginally correlated. However, they all show the expected sign and all except smoking have pairwise correlation coefficient different from zero.[20] We also control for a number of socio-economic factors, such as education level, parental education, family economy and foreign origin, since the correlation may arise due to low socio-economic status. The partial correlation matrix is displayed in Table 3. The correlation is more or less unaffected, and the coefficients still have the same magnitude and sign. We conclude that the measures are unaffected by individuals economic and social status.

We make use of confirmatory factor analysis to examine if the impatience measures indeed catch up a common factor.[21] The results of the factor analysis are presented in Table 4. We choose to obtain one single factor in the analysis, since it is hard to ideate other factors that the variables have in common. The factor loadings (the coefficients of the common factor) are all of the right sign and the eigenvalue (share of total variance that the factor account for) is 0.797, meaning the factor can explain almost 80 percent of the common variance in the measures. The variables that best fit the factor are *planned expenses* and *planning day*, while *smoke* and *get up* are slightly less influenced by the common factor. All in all, this points to that the common factor could indeed be impatience and that impatience can explain a substantial proportion of the common variation in each measure.

[19] The respondents where asked: *Do you tend to avoid fatty foods, for example by choosing skim milk and light margarine or other lean products when this is possible?*

[20] *Smoking* is neither correlated with *planned expenses*, *avoiding fats* or *hard to get going in the morning* on a 5 percent significance level.

[21] See Appendix for an exposition of factor analysis.

Table 2: Measures of impatience—Simple correlations

| Variables | Expenses | Exercise | Smoking | Avoid fats | Plan day | Get going |
|---|---|---|---|---|---|---|
| Planned expenses | 1.0000 | | | | | |
| Exercise activity | 0.0905 | 1.0000 | | | | |
| | (0.0463) | | | | | |
| Smoking | -0.0469 | -0.1277 | 1.0000 | | | |
| | (0.3037) | (0.0049) | | | | |
| Avoiding fats | 0.1422 | 0.1591 | -0.0334 | 1.0000 | | |
| | (0.0017) | (0.0004) | (0.4636) | | | |
| Planning day | 0.2161 | 0.1864 | -0.1391 | 0.1505 | 1.0000 | |
| | (0.0000) | (0.0000) | (0.0022) | (0.0009) | | |
| Hard to get going | -0.1445 | -0.0901 | 0.0018 | -0.1412 | -0.1498 | 1.0000 |
| | (0.0014) | (0.0469) | (0.9681) | (0.0018) | (0.0009) | |

*p*-values in parentheses
NOTE. Table shows simple pairvise correlation between the variables.

Table 3: Measures of impatience—Partial correlations

| Variables | Expenses | Exercise | Smoking | Avoid fats | Plan day | Get going |
|---|---|---|---|---|---|---|
| Planned expenses | 1.000 | | | | | |
| Exercise activity | 0.073 | 1.000 | | | | |
| | (0.119) | | | | | |
| Smoking | -0.044 | -0.121 | 1.000 | | | |
| | (0.348) | (0.010) | | | | |
| Avoiding fats | 0.157 | 0.130 | -0.022 | 1.000 | | |
| | (0.001) | (0.005) | (0.640) | | | |
| Planning day | 0.227 | 0.149 | -0.118 | 0.133 | 1.000 | |
| | (0.000) | (0.002) | (0.012) | (0.005) | | |
| Hard to get going | -0.133 | -0.094 | 0.002 | -0.155 | -0.175 | 1.000 |
| | (0.004) | (0.046) | (0.674) | (0.001) | (0.000) | |

*p*-values in parentheses
NOTE. Table shows partial pairvise correlation between the variables when controlling for education level, parental education, family economy and foreign origin.

Table 4: Measures of impatience—Factor analysis

| Variable | Factor loadings | Uniqueness |
|---|---|---|
| Planned expenses | 0.4049 | 0.8360 |
| Planning day | 0.5139 | 0.7358 |
| Hard to get going | −0.3057 | 0.9066 |
| Smoking | −0.1981 | 0.9607 |
| Exercise activity | 0.3455 | 0.8807 |
| Avoiding fats | 0.3420 | 0.8831 |
| Eigenvalue: | | 0.7971 |

NOTE. Table shows factor loadings and unique variance of one common factor. 480 observations where used in the analysis.

If we exclude *smoke*, that we found to be uncorrelated with three of our six measures, we obtain nearly the same coefficients and explained variance. When comparing the $\chi^2$-statistics of the full and reduced model, one can certify that the model containing *smoke* is more appropriate in describing the data then the one that exclude it.[22] Hence, from this we conclude that even if *smoke* is pairwise uncorrelated with some of the other measures, it is feasible to include it as a measure of impatience.

# 4 Empirical Results

The results of the regressions of different measures of impatience on search intensity (1) and reservation wage (2) are displayed in Table 5. The first column shows the OLS estimates of six simple regressions of different measures of impatience as the explanatory variable on search activity. To start with, three of the estimates are significant on at least a 0.10 significance level. The estimates are all of considerable proportions and have the expected sign. *Hard to get going* has a seemingly substantial effect on search intensity. If a person finds it difficult to get going in the morning, he consequently search almost an hour less per week. In comparison to the mean amount of time spent on searching, i.e. 3.09 hours per week, this constitutes a large proportion. The coefficient of *smoke* is of the same magnitude;

[22]The $\chi^2$ *goodness-of-fit* test states the null hypothesis of that the model adequately accounts for the data, against the alternative that it do not.

Table 5: Estimation results

| | (1)<br>Search intensity | (2)<br>Reservation wage |
|---|---|---|
| Planned expenses | 0.770 | −277.8 |
| | (0.540) | (202.8) |
| Planning day | 0.775 | 156.6 |
| | (0.511) | (168.8) |
| Hard to get going | −0.900* | −78.35 |
| | (0.482) | (185.1) |
| Smoking | −1.032** | 78.24 |
| | (0.468) | (203.9) |
| Exercise activity | 0.477*** | 129.0** |
| | (0.119) | (53.50) |
| Avoiding fats | 0.318 | 54.54 |
| | (0.303) | (92.72) |
| Observations | 484 | 460 |

Heteroskedasticity robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
NOTE. The table are showing the OLS estimates of 12 different simple linear regressions, each one with search intensity respective reservation wage as the dependent variable, and the impatience measures as explained variables.

a person that has smoked for a half of a lifetime or more, is searching more than an hour less than a person that has not been smoking in the same extent, nearly one third of the average search time in the sample. *Exercise activity* has the strongest correlation and cannot be rejected to be different from zero even on a 0.01 significance level. The magnitude of the measure is as well the most striking. As *exercise activity* is measured on an increasing five-point scale from 'never' to 'several times a week', a person that exercises regularly during the weeks exerts 2.39 hours more on search than a person that does not engage in training. This is a huge difference compared with the average time spent on search in the sample.

*Planned expenses* and *planning day* are both of the same dimension. People that in advance are planning expenses and their daily agenda, devote three quarters of an hour more on searching than a person that takes things as they come. However, none of these are statistically significant on a 10 percent level; $p$-values are 0.150 and 0.129, respectively. *Avoiding fats* is insignificant as well and has marginal magnitude compared with the other measures.

These estimates are however favorable, since the coefficient is of such a magnitude and they all show the expected sign. In addition, all estimations are simple regressions of the explanatory variables on search intensity, and though probably have marginal strength explaining all variation in search effort. Altogether, the results seem to correspond to the beforehand stated hypothesis; that an increase in impatience is expected to lower search effort.

The second column in Table 5 shows the regressions of the same measures on reservation wage. This, on the other hand, is only marginally affected of impatience. All explanatory variables but *exercise activity* are statistically insignificant. Although, all coefficients but two show the right sign, all of them are of trifling magnitude. In comparison to mean, all but one of the coefficients are only about one tenth of the average accepted wage reduction in the sample (1 328 SEK). This is hardly of considerable significance so the effect of impatience on reservation wage is more or less negligible, both statistically and economically. *Exercise activity* though, is significant on a 0.05 significance level and has, as it appears, some meaningful influence on reservation wage. A person that does not exercise is accepting a lower wage of 645 SEK a month compared to previous salary, in comparison to a person that exercises several times a week. This is a relatively large effect and constitutes for 48,6 percent of the average change in acceptance wages.

On the whole, even though that *exercise activity* is statistically significant, the effect of impatience on the reservation wage is of such a marginal matter. The implications of higher impatience on search intensity is of a much greater degree than the effect on wages. The absolute magnitude of impatience cannot be compared directly, but in relation to the average values, search intensity is generally much more affected than reservation wages, even if we only see to the measure of *exercise activity*. The $F$-statistic of the explanatory variables to be jointly different from zero when regressed on reservation wage is 1.96 compared to 3.29 when regressed on search intensity. Although, the effect of impatience on reservation wage can be neglected on a 0.05 significance level.

## 4.1 Controlling for human capital

We run the same regressions while controlling for a large set of additional control variables.[23] The results from the OLS estimation are shown in Table 6. These include demographic

[23]See Appendix for an extensive list of the control variables.

aspects, state of health, family background, whether a person has received an unemployment benefit and information about the latest job the respondent had as well as occupation and previous wage. The aim for controlling for these aspects is to account for productivity differences among people, that affect employment but also the job search situation. Human capital can reasonably affect both search intensity as well as reservation wage. Therefore, by controlling for these variables, the results may be further strengthened.

Table 6: Estimation results (Controlling for human capital)

| | (1)<br>Search intensity | (2)<br>Reservation wage |
|---|---|---|
| Planned expenses | 0.263 | −461.80** |
| | (0.598) | (215.8) |
| Planning day | 0.150 | −3790.00 |
| | (0.550) | (182.1) |
| Hard to get going | −0.551 | −130.90 |
| | (0.549) | (168.9) |
| Smoking | −0.879* | 95.70 |
| | (0.508) | (214.0) |
| Exercise activity | 0.369*** | 109.90* |
| | (0.118) | (58.03) |
| Avoiding fats | 0.298 | 19.75 |
| | (0.300) | (91.79) |
| Observations | 455 | 460 |

Heteroskedasticity robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
NOTE. The table are showing the OLS estimates of 12 different multiple regressions, each one with search intensity respective reservation wage as the dependent variable, and the impatience measures as explained variables while controlling for a set of additional variables (see Appendix), including demography, health, family background and information about unemployment and previous job.

To start with, the estimates of the regression of search intensity (1) has diminished when controlling for human capital. The magnitude of all coefficients has been reduced but still has the right sign and is of relatively relevant dimensions. Only *smoke* and *exercise activity* are though statistically significant. Still, *smoking* has the greatest magnitude, and even controlled, a person that has smoked for a relatively long time searches as much as 0.879 hours less in a week compared to a person that has not smoked for so long or a non-smoker.

*Exercise activity* shows on corresponding strength as before, and the total difference in search intensity between a person that exercises several times a week compared to a person that do not exercise, is 1.845 hours per week. This entails almost 60 percent of the average time spent on search per week in the sample. The other measures do not however show on such a great effect as in the first regressions.

The regressions of impatience on reservation wage (2) show corresponding results as before, when controlling for human capital. The coefficients still shows on conflicting signs in accordance to our theory. The magnitude of some of the estimates has increased, but not in the right direction, so they still evince an ambiguous effect. *Planned expenses* is however now significant on a 5 percent level, but indicate a *lower* reservation wage, which is not in line with what the exponential model predict. *Exercise activity* is still significant, but has diminished in magnitude, so that the corresponding effect described above only amount to 550 SEK: a person that exercise has a higher value than a person that does not. All in all, the remaining measures still show contradictory sign or are of a negligible magnitude. The conclusion though appears to coincide with the earlier one; impatience does not seem to affect reservation wage in any substantial degree and can thus be neglected.

## 4.2 Further discussion

The statistically power of these tests are considerably diminished when controlling for additional variables, but the results do point in the same direction as when doing simple regressions. There are of course several explanations to the diminished significance, but the fall in magnitude can be due to that several of the control variables in fact are containing aspects of impatience. Notably, education and health status are most likely correlated with impatience. In the case of education, a more patient person will reasonably be more motivated to studies, as well as he may be more productive and diligent, and consequently achieves higher results, reaching necessary criteria for higher studies. As we have argued above, health aspects are potential indicators of whether a person is impatient. This feature may we unfortunately disturb when we control for health status as to account for productivity heterogeneity in our sample. The aspects of impatience that we hence try to catch, may as well be included in our control variable, and would rub out the effect of impatience in the estimation, so we just observe the noise included in the proxies. The fact that we even see

significant effects is though in a way notably, as the effect of impatience as well could have been gone in the noise of the measures. However, as the potential effect of human capital are the most reasonably source of bias in our estimation, we accept this possible risk.

As we concluded earlier however, the main problem in this model is that the impatience measures are imprecise and vague and only approximately can account for all of the potential aspects of the trait. A way to further improve the estimates would be to control for the level of correlation between impatience and the control variables, but it would be hard to effectively correct for this since impatience has a rather broad influence on people's behavior in several aspects. Another aspect would be to control for behavioral pattern over time, and through that strengthen the robustness of the impatience measure.

All in all, the results of the regressions are in line with our hypothesis, which predicted a significant effect of impatience on search activity, but not on reservation wage, if people have hyperbolic preferences. The robustness of this tests can though be challenged, since the statistically power and eventually also the economically importance are partially diminished when controlling for human capital. But, given that our empirical setting is appropriate, we can confirm our hypothesis on the basis of our results. Since we have not seen any conflicting indications of impatience on reservation wage, except for the exercise measure, we do find it reasonably to turn down the exponential model. Foremost, the effect of impatience on search activity is of such magnitude and significance, so the hyperbolic model seems to be the most likely case. Hence, we conclude that we have observed a great evidence of hyperbolic preferences in our sample of jobseekers.

# 5 Concluding Remarks

Our purpose for this essay has been to determine whether people are hyperbolic or not when they are evaluating future utilities. We have elucidated the outcome in a job search model and empirically tested this in a sample of jobseekers. This context have been favorably appropriate as the job search process contain distinctly demarcate decisions, in which people's preferences can be observed. This is characterized by decisions regarding the valuation of present perceived sacrifices and associated future utilities. The two crucial decisions the jobseeker faces is the one concerning how much effort to devote on searching and the one

concerning the wage to accept a job offer. Intensive job search means a higher probability to receive a job offer, and a lower reservation wage means a higher chance of accepting an offer. Both results in a reduction of the unemployment spell.

We have identified the characteristics of these two decisions: The decision concerning search activity is preformed with a relatively short time-horizon: sacrifices associated with searching give benefits in form of a salary already in the next coming period. The decision concerning reservation wage, on the other hand, are regarding utilities and costs in the more remote future: the reservation wage to be decided apply for a rather long time period. This has been crucial for our case.

We have used the framework and concepts developed by DellaVigna and Paserman (2005) to get a theoretical foundation for our further investigation. These authors study how search effort and reservation wage affect the unemployment spell, and how these factors are functioning under the presence of hyperbolic preferences. People with hyperbolic preferences have a short run discount factor $\beta$, while people with exponential preferences have a long-run discount factor $\delta$. These factors are indeed very hard to identify individually and therefore DellaVigna and Paserman introduces a general term, *impatience* which captures the total discount function a person is using. Accordingly, this can contain both $\beta$ and $\delta$, but the actual composition is indistinct. However, we do know differences in how changes in impatience are affecting search intensity and reservation wage respectively. From that, we are able to conclude whether people are hyperbolic or not: If impatience is correlated with variation in search intensity but uncorrelated with changes in reservation wage, we know that hyperbolic preferences exist.

We find a very strong correlation between impatience and search intensity. In several of our measures, we observe differences in search effort, representing almost a third of the average time spent per week. This is a huge difference, which we conclude, favor our intuition. On the other hand, variations in reservation wage is almost uncorrelated with variations in impatience, and though, supports our hypothesis. The same results are established when controlling for human capital, even though they are slightly weakened. Altogether, the results lay in line with our theoretical predictions. We can conclude that there is a strong evidence of hyperbolic preferences in our sample of job seekers. Thus our hypothesis is validated and the evidence of hyperbolic preferences among people is deepened.

# 6 Appendix

*Factor analysis.* Here we will explain the basics principles of factor analysis. Factor analysis is a method used to examine the influence of underlying factors that are common to a set of correlated variables (DeCoster 1998). It does so by describing a set of measures $(X_1, X_2, ..., X_p)$ as a linear combination of a set of common factors and a unique factor for each variable. This can be denoted

$$W_p = a_{p1}F_1 + a_{p2}F_2 + ... + a_{pQ}F_Q + u_pY_p \qquad (p = 1, 2, ..., P) \tag{9}$$

where $(F_1, F_2, ..., F_Q)$ are the common factors and $Y_P$ are the unique factors for each one of the measures. Factor analysis is done by examine the correlation between the observed measures, that, if they are correlated, reasonably also will be influenced by some common factors. The common factors account for the proportion of the variance in the measures that they have in common, while the unique factor account for the proportion of variance that are unique to each measure. We use confirmatory factor analysis—that is, to examine common factors of beforehand-determined variables. In this sense, we are then able to further investigate the common feature of our measures of impatience. We use the method of maximum likelihood, since this seems to have the most proper characteristics for our purpose and data.

*Human capital: List of control variables.* The following variables where used as to control for respondents' human capital: Respondents age, foreign origin (binary variable for not born in Sweden), education (binary variable for education above primary school), married (or have partner), number of children, health status, father's education (binary variable for education above primary school), mother's education (binary variable for education above primary school), parents' origin (binary variable for not born in Sweden), family economy (binary variable for economic hardships during childhood), books (has books at home), encyclopedia (has encyclopedia at home), family illness (family member has been ill during childhood), unemployment benefit (has received unemployment benefit or unemployment assistance), previous job occupation, previous salary received.

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