

THEORIZING ABOUT PATIENCE FORMATION – THE NECESSITY OF CONCEPTUAL DISTINCTIONS

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1. INTRODUCTION

The concept of patience describes a person's ability to make prolonged efforts towards future goals, and his or her ability to consider long-term future consequences.¹ Clearly, patience is a capacity that comes by degrees. On the following pages, a person will be said to be patient to the extent that his actions are *motivated* by future consequences. Hence, a person is not patient if he has the ability to see long-term consequences, while being unable to take these consequences into consideration when he decides how to act.

A person's level of patience determines his time preferences, and time preferences play an important role in rational choice theories in several scientific disciplines, including criminology, economics, preventive medicine, psychology, and sociology. In traditional rational choice theorizing, the rate of time preferences is taken as a given and fixed property of the individual – that is, it is not something the individual is able to choose or manipulate. Recently, however, Becker and Mulligan

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¹ In every-day language, patience is a richer concept. The Concise Oxford Dictionary's definition of patience goes as follows: '1. Calm endurance of hardship, provocation, pain, delay, etc. 2. Tolerant perseverance or forbearance. 3. The capacity for calm, self-possessed waiting'.

(1997) have proposed that a rational actor may in fact have the capacity to change his own time preferences, and they have developed a theory of 'patience formation'. The basic idea is that a rational person may be dissatisfied with his own patience, and that he may try to overcome this by reducing his consumption and spending some of his resources on developing more patience.

Besides being of considerable theoretical interest, the issue of patience formation is also of practical relevance – for instance for clinical intervention and treatment of different disorders. The ability to take long-term consequences into consideration is of central importance in relation to somatic health, behavioural disorders like addictions, and social deviance such as crime. Attempts at increasing the clients' valuation of the future often play an integral role in treatment efforts.

Becker and Mulligan (1997, p. 731) use the terms 'rate of time preferences', 'impatience', 'discount factor', and 'marginal rate of substitution of current and future consumption' interchangeably. This lack of conceptual distinction easily creates misunderstandings, since very different phenomena and distinct causal mechanisms are then lumped together under one single umbrella.

In particular, there is an important distinction between the marginal rate of substitution between current and future consumption, and the consumer's level of patience. A person's level of patience clearly will have causal effects on that person's marginal rate of substitution, but the same is true for many other factors. Therefore, the second cannot be used as a proxy for the first. For instance, if I have several bottles of wine, I may consume a certain quantity today, and the rest over the next few weeks. However, if I obtain information saying that the quality of the wine will improve upon storage, I may decide to change my allocation between the present and the future. The marginal rate of substitution will have changed as a result of this information, but I will not have become more patient. Therefore, no spillover effects can be expected to other consumption choices, where the outcome depends on my level of patience. For instance, I cannot be expected to attach greater weight to the long-term negative consequences of smoking due to this piece information about wine, and I cannot be expected to quit smoking for this reason.

Therefore, a theory of endogenous changes in patience is something different from a theory of marginal rates of substitution. Patience is a personality trait – an attribute or ability. A person's patience has implications for his choices in almost all life arenas. A theory of patience formation is a theory of character planning or self-command, as a person who attempts to become more patient is trying to change his own fundamental preferences. A theory of endogenous changes in marginal rates of substitution can simply be a theory of investing in the quality of

future consumption. Character planning is then not an issue, and the consumer does not try to change himself as a person.

Below, I shall argue that Becker and Mulligan's theory is not an adequate theory of patience formation. It is a theory of investments in future utility – for example, the quality of future consumption. In fact, a theory of patience formation must be constructed along different lines. Furthermore, the whole idea of patience formation faces certain conceptual difficulties, but these difficulties are of no consequence for a theory of investments in the quality of future consumption. I shall try to solve these difficulties along the way.

I will proceed as follows: in Section 2, I outline the basic logic of Becker and Mulligan's theory of investment in future utility with the aid of a simple example concerning the quality of future consumption. In Section 3, I discuss the conceptual problem that faces a theory of patience formation, and I will try to identify the basic assumption inherent in such a theory. In Section 4, I shall demonstrate that a theory of patience formation cannot be constructed along the lines of Becker and Mulligan's model. I will demonstrate that the rational consumer is faced with a choice that is quite different from the choice facing a person investing in the quality of future consumption. Rather than maximizing one single function, a rational consumer involved in patience formation needs to solve two maximization problems. The outcome of this analysis is a new model, that I believe correctly describes the problem of patience formation, and that works on the proviso that the basic assumption mentioned above is valid.

2. INVESTING IN THE QUALITY OF FUTURE CONSUMPTION

Following Becker and Mulligan (1997), I will consider a two-period consumption problem. The consumer can invest an amount S of his or her total budget A on something X that will affect his or her valuing of future pleasure. The rest of his budget is spent on a certain good. Let c_0 and c_1 denote the consumption of this good in the two periods. With unit price, the budget constraint is $c_0 + c_1 + S = A$. The consumer's problem is to decide how much should be invested in X , and how the remaining resources should be allocated between the two periods.

Becker and Mulligan claim that this consumption problem can be represented as follows: in the first period, before consumption starts, the objective of the consumer is to maximize

$$V = u_0(c_0) + \beta(S) \cdot u_1(c_1)$$

with respect to c_0 , c_1 , and S under the budget constraint. The functions u_0 and u_1 map present and future consumption to present and future pleasure. These functions are assumed to be non-negative, strictly

increasing, and strictly concave. (In the numerical examples that follow, I will, for convenience, assume that these mappings are logarithmic.) Future pleasures are discounted according to the discount function $\beta(S)$, which depends on the investment in X . It is assumed that

$$\beta(S) > 0, \quad \beta'(S) \geq 0, \quad \beta''(S) \leq 0, \quad \text{for } S \geq 0.$$

This implies a complementarity between future utility and the weighting of the future. 'Consequently, anything that raises future utilities without raising the marginal utility of current consumption will tend to lower the equilibrium discount on the future'. (Becker and Mulligan, 1997, p. 739).

This model can obviously serve as an adequate representation of certain types of investments in the utility of future consumption. Consider the following example.

Example I. Let us, for vividness of imagination, assume that the good is a cake consisting of $A=9$ pieces, to be consumed today and tomorrow. The consumer is extremely patient and values tomorrow's pleasures as much as current pleasures. However, the quality of the cake drops significantly the second day, so as to give the consumer only one half of the utility he would obtain from the cake today. Hence, if he consumes x pieces today and the remaining $(9 - x)$ tomorrow, he should choose x so as to maximize

$$V_0 = \ln(x) + 0.5 \cdot \ln(9 - x)$$

which gives $x = 6$. Hence, $V_0 = 2.34$.

Now, suppose he can buy room in a fridge overnight for the price of one piece of cake. The effect is to make the quality of tomorrow's pieces – and hence the utility from tomorrow's consumption – the same as today's. Since he is not discounting the future, and since he has only 8 pieces left, his problem is to maximize

$$V_1 = \ln(y) + \ln(8 - y)$$

which gives $y = 4$. Hence, $V_1 = 2.77$, which is higher. His conclusion obviously would be that it is best to invest in the fridge.

This example fits Becker and Mulligan's model, with the sole exception that $\beta(S)$ measures the quality of tomorrow's cake, rather than patience. And the model is a precise description of the rational consumer's allocation problem.

Becker and Mulligan's theory, if meant only as a theory of how people make investments in devices and techniques for improving the utility of future consumption, serves this purpose. However, the fact that they call it a theory of patience formation (1997, p. 733) creates problems. In fact, if one tries to interpret their formalism from the perspective of patience formation, two basic problems are encountered. The first is a

conceptual problem related to the idea of changing one's own level of patience. The second problem concerns how one should construct a formal model of a rational actor's evaluation of the situation. Becker and Mulligan's investment model does not describe the latter choice correctly. In the following two sections, I shall address these two problems.

3. THE CONCEPTUAL PROBLEM

For my present purpose, the distinction between patience and marginal rates of substitution is the most decisive one. Below I will use the term patience in the sense already outlined, and I will conceive the discount factor as a measure of patience. As I will mainly discuss two-period choice problems, the issue of exponential versus non-exponential discounting (Ainslie, 1992) is of no concern. Time preferences will be used synonymously with discount factor.

The very idea that a rational person can change his own level of patience seems to harbour a conceptual problem. For instance, Elster (1997) has claimed that 'We cannot expect people to take steps to reduce their rate of time discounting, because to want to be motivated by long-term concerns *ipso facto* is to be motivated by long-term concerns, just as to expect that one will expect something to happen is to expect that it will happen. If people do not have that motivation in the first place, they cannot be motivated to acquire it'.

Elster's point is probably not to deny that the person may have a second order wish for more patience, but to deny that he is able to act on the basis of this second order wish. If he were able to act on the basis of this wish for a high level of patience, it would be a first order, rather than a second order wish. Hence, he would already have a high level of patience.

I have previously (Skog, 1997) tried to pin down the conceptual problem with the following example: 'For instance, consider a person with exponential discounting, valuing tomorrow's rewards at 40 per cent of their instantaneous value. He would always prefer one chocolate bar at $T = t + s$ to two chocolate bars at $T = t + s + 1$, whatever the delay s . Suppose that he was offered a pill that would increase his discount factor to 60 per cent. This obviously would induce him to wait for the two bars. But why should the impatient self want to do that? For him one bar with a small delay is better than two bars with a bigger delay'. In this example, the myopic actor has no real *motive* for reducing his discount rate (increasing his discount factor). According to his utility function, one chocolate now is the best option.

In this example, 'the pill' is shorthand for some technology that would have the effect of changing people's patience. In the future,

pharmaceutical products with such an effect may come into existence, but at present we probably would have to think in terms of psychotherapy of one sort or another, purposive exercise or training, cognitive strategies (see Ainslie, 1992), and systematic collection of certain types of experiences. I will not pursue this particular issue any further.

Would the answer to the preceding question be different if the consumer should happen to be trapped in a state that he himself regards as unsatisfactory? For instance, let us consider a person who is trapped in a sub-optimal consumption state, as Becker and Murphy's rational addict (Becker and Murphy, 1988). The addict understands that life would be better as an abstainer. However, he excessively discounts the prospects of future improvements, and is therefore unable to tolerate the temporary setback necessary to overcome his addiction (see Skog, 1999). According to his own utility function, it is better for him to continue his heavy consumption life style.

If this rational addict consumed a pill (or used some other technology or aid) that had the effect of increasing his discount factor, he would be able to overcome his addiction. This would be so because more patience would imply that he valued the prospects of future improvements higher than the temporary setback he will have to suffer. If offered such a pill for a minimal cost, should he not rationally take it?

According to his own utility function, he should not. Not if he is fully rational, that is. Given his consumption history, he strictly prefers continued heavy consumption compared to abstention. That is the defining characteristic of his addiction. If one argues that he could in fact take the pill, one is in effect saying that he is not addicted in Becker and Murphy's sense.

When he realizes that he would have been better off as an abstainer, he is comparing his present utility with the utility he would have experienced if he had never started his heavy consumption career. He might rationally wish that his past history were different, but he cannot rationally act on the basis of second order preferences. This would require allowing a rational person to have inconsistent preferences: primary preferences for continued heavy consumption; secondary preferences implying the opposite consumption choice.

In the two preceding examples, changing the discount factor is supposed to serve as an *instrument* for obtaining something else (obtaining two chocolates instead of just one, or getting out of an unpleasant state of addiction). The causal structure of the problem is this:

1. Given his preferences (including time preferences) it is subjectively best for him to do A.

2. He has a second-order wish for doing B instead – say, because B is better from a certain (non-myopic) point of view (two chocolates are more than one, abstention is better than addiction).
3. It is presumed that this tension will cause him to try to change his time preferences.

However, for the reasons already given, I strongly suspect that there is no solution to this problem within the frame of standard theory.² The rational person must act on the basis of his first order preferences at the time of action – that is, when he is impatient – and his impatient self thinks that A is better than B. Hence, step 3 will not work.

There is, however, another way of looking at patience formation. For instance, patience can be conceived as an ability or attribute with intrinsic value. If the consumer can buy a pill (or invest in other technologies) that makes him more patient, and if he wishes to become more patient, then he should do so, provided the price does not exceed his valuation of increased patience.

From this point of view, one could argue that just as the person may wish to be more intelligent, to have a better memory, and to have a nicer face, he may also wish to be more patient. At present, he may be unable to act on the basis of a discount factor exceeding 0.6. Nevertheless, he may admire people who are able to act on the basis of a discount factor of 0.9, and he may wish he had the same ability for delayed gratification, just as he admires their intelligence and good looks and wishes he had the same.

Note that the causal structure is quite different in this case. The starting point is not tension between first and second order preferences in relation to a specific consumption choice, but rather an attribute the person wants for its own sake.

If the consumer conceives patience as an attribute or ability that he desires for its own sake, he might rationally take steps to acquire it. He may even be willing to pay a price for this attribute. Of course, if he is rational, he will realize that buying the pill that makes him more patient would also have a causal effect on the pleasures (and pains) he experiences; further, it would change his consumption choices, so that they would become different from his current choices. Note that, from his current (impatient) point of view, the new (patient) consumption choices would be less valued than his current (impatient) choices. The current self would have to balance this reduction in utility against his valuation of the new ability.

² There is, however, a solution outside the frame of standard theory: if the person's patience fluctuates over time, he may – while in the patient mode – take steps to increase his level of patience in the impatient mode (see Skog, 1997).

Hence, the causal structure of this conception of the problem is this:

1. For some reason, the consumer wishes to become more patient. He is willing to pay a price for more patience.
2. He realizes that this will change his present preference for A to a preference for B, which is less valued by his present self. (He may or may not have a second order preference for B).
3. From the point of view of his present (impatient) self, this change from A to B represents reduced (not increased!) utility. However, he is willing to pay this price, since increased patience has intrinsic value.

According to this argument, patience formation can occur only if patience is conceived as an attractive attribute for its own sake. A rational actor cannot change his own level of patience simply because it is an instrument *vis-à-vis* a specific allocation problem: the consumer cannot rationally take the pill in order to be able to wait until tomorrow for the two chocolate bars. But he can rationally take the pill if he wants patience for its own sake. Then, as a byproduct, he will also be able to wait for the two chocolate bars, but this byproduct is not the motive or the cause of his action.

This argument presupposes that patience is a basic trait of a person's character. It follows that changes in a person's level of patience (as measured by his or her discounting of the future) will have effects over a wide range of different choices. However, one may ask if real people may not turn out to have different rates of discounting in different arenas of life. You may discount possible future health hazards for your children less than you discount your own future health, or your own pleasures from future consumption. If taken to the limit, this line of argument could generate different rates of discounting for different consumption contexts. If this were the case, changes in the rate of discounting in one consumption context could not be expected to have consequences for other consumption contexts, and one might no longer speak of patience as a distinct, unique character trait.

However, although a monolithic and uni-dimensional concept of patience may not be entirely realistic, there are good reasons for believing that a completely fragmented concept is even less realistic. Different rates of discounting for alternative options would create massive dynamic inconsistencies, so that the agent could plan to choose A over B prior to the moment of choice, but at the moment of choice he would actually choose B. This would occur even if the agent discounted each reward exponentially, and he would experience a weakness of the will similar to that of a hyperbolic discounter. As Ainslie (1992) argues, such an agent would constantly experience frustration and regrets, and

he would have a strong motivation for becoming a consistent planner. The agent's efforts towards this goal would have the effect of harmonizing his discounting of different alternatives. Moreover, the techniques the agent might use in order to overcome dynamic inconsistencies, such as personal rules and so on (see Ainslie 1992), can be transferred from one consumption context to another. Hence, when the agent has learned to use personal rules to avoid inconsistencies in one context, he or she is likely to use the same technique in other contexts as well. This in itself could bring about harmonization.

Although these and similar mechanisms should produce some degree of harmonization of discount rates across consumption contexts, it does not necessarily follow that the agent will have one and only one level of discounting. There may be life arenas that seldom interact, in the sense that alternatives from these different arenas seldom compete with each other. The agent would then seldom experience the frustration resulting from different rates of discounting, and the motivation for harmonization across these arenas could be weak.

However, these possible exceptions do not represent a problem for the basic argument. All we need do is assume that patience is a distinct and fairly unique character trait within a life arena defined by a set of consumption contexts that is not too narrow, and that a certain level of patience in this arena is conceived by the agent as having intrinsic value. In the remainder of this paper I will assume that this premise is coherent.

4. OUTLINE OF A THEORY OF PATIENCE FORMATION

In this section, I will outline how a rational actor wishing to acquire more patience (i.e., a higher discount factor) for its own sake will have to evaluate the options. I will assume that technologies by which he can obtain more patience are available, and I will not discuss this particular issue further. In order to demonstrate the difference between patience formation and investment in future utility, I will use an example very similar to the previous one.

Example II. Let us change the previous example a bit. The utility function is the same, but the quality of the cake is now supposed to be identical in the two periods. However, we now assume that the person is impatient. Initially, he discounts the second period heavily – his discount factor is 0.5. For the price of one piece of cake he can buy a pill that will have the effect of increasing his discount factor to unity – that is, after the pill he will no longer discount consumption one period ahead.

If he does not take the pill, his optimal consumption string is six pieces now and three pieces in the next period. The discounted utility of this no-pill option is

$$V_0 = \ln(6) + 0.5 \cdot \ln(3) = 2.34$$

as in the previous example.

When considering the option of buying the pill, the rational consumer will start by asking himself what would happen if he consumed the pill. He will recognize that, after the fact, he will distribute the remaining eight pieces according to his new discount factor, and therefore he will maximize

$$V = \ln(x) + 1 \cdot \ln(8 - x).$$

He realizes that his consumption string after having consumed the pill will be four and four pieces. So far, we are in line with Becker and Mulligan.

However, his valuation of this consumption string at the time when the option of making the investment is considered, but before the pill has been bought and consumed, has to be made in terms of his present discount factor, that is, 0.5. Hence, at this stage the discounted utility of this consumption string is

$$V = \ln(4) + 0.5 \cdot \ln(4) = 2.08.$$

It is the impatient person who makes the evaluation. Before having consumed the pill, he cannot rationally evaluate the prospects according a discount factor differing from the one he actually has at that time. If he could, there would be no need for the pill, as this would imply that he would only have to *contemplate* taking the pill in order to be able to act according to its effects.

There are in effect two different utility functions involved, just as there are two different questions the rational consumer must ask himself at the planning stage:

1. How will the pill affect me – i.e., how will my consumption string be affected by the pill?
2. How do I value this effect, from my current point of view?

The first question is about the causal effects of taking the pill; the second is the consumer's evaluation of this effect.

This being so, it follows that the consumer's valuation of his optimal consumption string under the no-pill alternative must necessarily exceed his valuation of the consumption string induced by the pill. Therefore, if patience has no intrinsic value, he must decide not to take the pill.

However, he may still prefer to take the pill, provided that patience is valued for its own sake. The value of patience has to be added to the discounted value of the consumption string. If the value the consumer attaches to increased patience is 0.1, his complete valuation of the pill alternative becomes

$$V_1 = \ln(4) + 0.5 \cdot \ln(4) + 0.1 = 2.18$$

which is less than the no-pill alternative ($V_0 = 2.34$). However, if the value of patience is 0.3, his complete valuation becomes $V_1 = 2.38$, which is more than the no-pill alternative. Hence, in order to make his decision, the consumer has to be explicit about his own valuation of patience for its own sake.

To summarize, in the two-period case, the model of patience formation should be constructed as follows: (the procedure can be generalized to cases with multiple periods).

1. The consumer knows how different investments will affect his discount factor. For any given investment S , and the resulting discount factor $\beta(S)$, the consumer will first determine the effect of this investment on his consumption string. Hence, for each possible value of S he will maximize

$$V = u_0(c_0) + \beta(S) \cdot u_1(c_1)$$

with respect to c_0 and c_1 , subject to the budget constraint $c_0 + c_1 + S = A$. Let $c_0(S)$ and $c_1(S)$ denote the results.

2. Then he will evaluate these possibilities according to his present discount factor $\beta(0)$, and according to how he values different degrees of patience for its own sake. Hence, he will maximize

$$V = u_0(c_0(S)) + \beta(0) \cdot u_1(c_1(S)) + p(\beta(S))$$

with respect to S . Here, $p(\bullet)$ denotes his valuation of patience.

Specific theories about patience formation will now have to specify the functions $\beta(\bullet)$ and $p(\bullet)$. Following Becker and Mulligan, one could assume that $\beta(S) > 0$, $\beta'(S) \geq 0$, and $\beta''(S) \leq 0$ for $S \geq 0$, and make similar assumptions about the consumer's valuation $p(\bullet)$. Or, one could assume that the consumer values patience up to a certain level, but not beyond that (see below). I will not pursue this issue.

As we have already seen, the result of this decision-making procedure can be quite different from the result of Becker and Mulligan's procedure. In the example at hand, if the valuation of patience is fairly small, the rational consumer will decide not to buy the pill. On the other hand, a person who invests in improving the quality of future consumption will follow Becker and Mulligan's scheme, and will decide to make the investment, even if the instrument (the fridge) has no intrinsic value at all.

4. SUMMARY AND CONCLUSIONS

Enhancing one's future utilities and increasing one's own patience are very different phenomena. As the previous examples demonstrate, they obviously cannot be covered by the same theory.

Enhancing future utilities by investing in the quality of future consumption are normal activities in the lives of most people. People can also enhance future utility in other ways, as exemplified by Mulligan (1997): investment in skiing equipment increases the utility of future ski trips. Due to this complementarity, it is rational to make such investments. Becker and Mulligan's theory offers an adequate description of these consumption choices. However, patience formation is an entirely different affair. This concerns character planning, rather than consumption choices, and Becker and Milligan's theory does not cover this phenomenon. The same problem of distinction carries over to Mulligan's main theme – namely, intergenerational altruism (Mulligan, 1997).

Regarding the theory of patience formation, I have made the following claim. If the consumer's sole motive for changing his level of patience is to escape an allocation that is dictated by his first order preferences (including time preferences), but that contradicts his second order preferences, he will not be able to achieve this by rational means. This is to put the cart before the horse. However, if his motive is to increase his own patience for its intrinsic value, he clearly can do so.

But this implies that he will also be able to solve a combined problem, where he both desires patience for its own sake, and also wishes to escape the frustration of a collision between first and second order preferences. However, the causal mechanism has to be tied to the value of patience for its own sake, and not to the tension between first and second order preferences. Within standard theory, this tension cannot have motivational force.

In all the preceding examples and arguments it has been assumed that the person desires more, rather than less patience. However, one can imagine cases where the preferences are reversed. First, being strongly motivated by the future entails both future pleasures and pains. In particular, if pleasures dominate the near future, while pains are dominant in the remote future, and some of these are unavoidable, the person may have good reasons for wishing to be less, or at least not more, farsighted. Second, more patience typically will mean less spontaneity, and spontaneity, like patience, can have intrinsic value. Hence, there is a trade off and one cannot take for granted that more is always better in regard to patience. The model outlined in the preceding paragraph should be sound in cases where the consumer wishes to become less patient, as well as in cases where the opposite applies.

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