Procedural Rationality and Happiness

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Abstract

The economics of happiness already recognizes how procedures affect the evaluation of outcomes, although this has only been looked at within the standard framework of substantial rationality. This paper aims to go beyond that kind of approach by linking happiness and procedural rationality, focusing on 'happiness for choice' (the individual's perceived satisfaction after the decision making process). Simon's model shows the need for defining aspirations whose values are adapted to the past experience in a given environment. Some remarks proposed by Scitovsky's allow to extend this idea considering the role of creative representation of the world as a way for trying to go beyond the past. These ideas are tested using data on aspirations and satisfaction expressed by students attending an economic course.

1. Introduction

The economics of happiness already recognizes how procedures affect the evaluation of outcomes, although this has only been looked at within the standard framework of substantial rationality. This paper aims to go beyond this approach by linking happiness and procedural rationality, both theoretically and empirically. We will do this by focusing on a specific component of happiness, 'happiness for choice', that overlaps an individual's perceived satisfaction after decision making, basing our analysis on procedural rationality literature. So, this paper helps understand the determinants of satisfaction and their role in the whole process of decision making.

A theoretical reflection of the notion of procedural rationality (§ 2) shows the difficulties of trying to model rules conceived as simple 'preference over action'. Here, we face many problems, mainly when considering decisions beyond the moral or ethical sphere.

Routine behaviour (such as "if…then") requires stable contexts, but also the ability of applying a reactive style of choice based on implicit or explicit protocols. Our paper turns to Simon's bounded rationality approach (§. 2.1), which seems to understand the procedure side of decision making through the dynamic mechanism of aspiration levels. The usual approach has to be widened so that not only do past related experience play a crucial role for future choice, but also the individual's capability of building possible worlds. Thus, we have taken Tibor Scitovsky's (§ 2.2) as a starting point for determinants of individual satisfaction and to expand our hypothesis (§ 3).

Our empirical method of the role of different variables on satisfaction is a kind of natural experiment in which subjects (students) were asked to clarify some basic information before and after a university exam. The estimation of different specifications (§ 4) gave us some significant results that confirmed the influence of outcomes on one hand (the acquired mark) and of aspiration levels on the other hand in determining a subject's satisfaction.

An aspiration level "binary" formulation (whether the mark had been achieved or not) has a procedural nature; it can also be conceived as a proxy for a subject's personality (for example, fixing a low aspiration could be typical of a person who easily satisfies his/her goals). This consideration is fundamental as the attainment discrepancy (the difference between aspirations and performance) was not statistically significant in this model. All findings are discussed and summarised referring to current theoretical issues (§ 5).

2. Procedural rationality and satisfaction

Vanberg (2006) discusses moral choices, in relation to the opposition between rule based behaviour and the mainstream approach to decision making. So, standard rationality is defined

according to the results of choices and preferences and these are defined over outcome. Actions are simply the way in which specific results are obtained and are not relevant in themselves. Moral choices on the contrary, are usually defined over actions; i.e., what matters is the way in which something is done and not its outcome. The Kantian idea of moral choice is a good example: choosing the action you think is right, whatever outcome you get. Agents may be aware that their decision will not achieve the preferred outcome, but are still willing to pursue it.

Rule based behaviour is not just restricted to moral actions. Because of uncertainty, in most cases, agents cannot chose a preferred outcome. The relation between actions and outcome may, in fact, be unknown, or the same preferred results could even be unspecified. Agents have limited capacity to process information and cannot learn to deal with all relevant variables. Given these restrictions, it may be better to categorize situations, replying to just some of the cues available.

Limiting, either consciously or not, attention to a few variables allows their role to be understood better. Agents can decide to react to more significant clues, with a limited set of actions, whose effect are considered reliable (Heiner 1983). The same action is therefore, performed in contexts which would call for different optimal choices but the agent cannot distinguish and so, perceives them as identical. This kind of logic of action can allow better results than a case by case choice if the rules are the result of a (genetic or cultural) selection mechanism. In other words, an agent can learn to use a limited set of reliable actions whose outcomes are better than those they could get with other decisional mechanisms.

Now the point is if are preferences still preferred over action also in more general situations, e.g. as in moral choices, and how does this eventually influence satisfaction of results. If preferences are expressed over actions, agents should relate their satisfaction to choices and not to outcomes. If a rule is applied in different domains, even when not completely appropriate, it would sometimes cause bad results. So, when the rule fails, rule-following agents will not be too unhappy as this kind of result is inevitable. The awareness of having applied a good rule should make an agent happy even when faced with bad results.

This idea needs to be discussed and understood. While it may be obvious that if I think I did my best, I will not blame myself, I still need to know when I did my best. In evolutionary term, the reliability of a rule can be defined in relation to its capacity to survive. Yet, agents use different evaluation criteria. For example, doctors who lose patients should and would not be too unsatisfied with their performance, if applying an appropriate procedure. This kind of evaluation is, possible, only in certain specific cases. Agents need to be aware of the procedural nature of their rationality and of the partly random nature of results they usually get. This is possible when there is a protocol, based on a clear, well-documented experience. Yet, an even more general type of knowledge is involved in how people evaluate outcomes and procedures. The evolution of medical protocols is based on the evolution of general understanding which makes old results no longer satisficing.

We therefore need to define when a result can be considered satisficing and an error is part of the game, or when it is an unexpected result. This requires understanding how agents perceive a situation and its possible outcomes. Vanberg stated in a different article (2002, p. 13): "As K.J. Arrow (1996: xiii) has noted: 'Choice is over sets of actions, but preference orderings are over consequences'. A choice therefore reflects the actor's belief about, or his 'knowledge of the relation between action and consequences (ibid)'". So the evaluation of an outcome is based on an agent's knowledge of possible results. Rule following does not imply a simple and mechanical behaviour and does not leave out eventual explicit decisions (Vromen 2006), even if they are based on a specific perception. Rules, therefore, can be mainly seen as elements defining how individuals perceive their environment. As Hayek (1969) pointed out, complex action usually requires us to use and mix different rules, any of which can be seen as a stimulus in a specific direction.

This would suggest that rules can also be seen as parameters to evaluate possible outcomes. Agents may be incapable of giving an absolute evaluation of an outcome. As stated explicitly by Simon (1976), an individual uses procedures which fix his/her aspiration levels. So, probably, aspirations are a necessary part of rule based behaviour. Only knowing what is satisfactory, can an

agent fix a set of reliable actions, limiting their choices and stopping their research processes. Our analysis will be concentrated on this point.

2.1 Aspirations in bounded rationality

Simon's bounded rationality approach is mainly focused on the so called "search and satisficing" process through which individuals, unlike the maximizing, due to cognitive limitations process, tend to look for "good enough solutions" that achieve an aspiration level they have fixed (Simon 1955, 1983, 1985, 2000). This frugal mechanism, based on wide empirical results, works as follows: when it is hard to find "good enough" solutions to fix an aspiration level, agents tend to decrease it and/or to increase research activity, *vice versa* the opposite occurs (Simon 1972). This rationality of research process for different alternatives, is more procedural than substantial (Simon 1987) and represents psychological rationality as opposed to economic rationality. So, according to Simon (1976), while the mainstream view of substantial rationality requires given aims within external limits and focuses on final expected results, bounded rationality is more linked with the procedural level of decision making. We can argue that bounded rationality needs to account for many aspects of the human mental process[1] related both to research activity and/or ongoing adjustment of the aspiration level and post-decision evaluation (Levitt & March 1988). Both of these stages of decision making are intimately linked to personal experience and to the ability to 'frame' a situation by connecting it to similar earlier situations using a sort of analogical reasoning (Vosniadou & Ortony 1989).

Bounded rationality however, does not imply simple rule-following behaviour, since the process is driven by serial evaluation of alternatives regarding an aspiration level and experience (Lant 1992). In the early seventies, organizational cognitive renewal, also indicated *aspiration adaptation* as the crucial mechanism through which individuals behave. It looks at the fact that agents, while framing and resolving even simple decision-making, compare past results. Thus, under *similar* settings their aspiration level is also fixed. Hence, people tend to fix certain aspiration levels for decisions that were framed similar to those that will be faced.

In particular, James March (1994) and Zur Shapira (1996), state that an individual's aspiration levels has to be comparable with outcomes (performance) in order to allow a post-decision evaluation (i.e. failure or success) which is mainly based on the difference between performance and aspiration levels (the so called "attainment discrepancy"). It is worth noting that this process can be affected both by *ex ante* and *post hoc* rationalization. The former concerns the propensity of underestimating aspiration levels in order to protect oneself from large discrepancies, while the latter can arises when subjects tend to reduce phenomena such as cognitive dissonance (Gilbert & Ebert 2002; Mullainathan 2002).

Because of information processing limitations, agents tend to consider only a few alternatives and/or variables to fix aspiration levels, and this means that when the aspiration level is satisfied, a sub-optimal solution may be reached rather than an optimal one, as the search and satisficing process is serial and not all-embracing (Schmidtz 2004).

So, agents are satisfied when they reach a specific aspiration level fixed by considering a subset of information/attributes through which they build up their perceived context and evaluate each alternative. An agent's reaction usually turns out to be a sort of surprising effect that arises from the difference between outcome and aspiration level (Harrison & March 1984), called 'attainment discrepancy' (Murphy *et al*. 2001). Many psychological and cognitive-organizational studies on aspiration levels point out that agents are willing to modify action that has been considered appropriate for a certain recurrent problem when the attainment discrepancy is positive (inferential function of feedback). On the other hand, when attainment discrepancy is slightly negative, aspiration levels can be reduced or the course of action can be changed for another.

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[1] Nevertheless, mainstream economic literature has not concentrated on crucial cognitive processes (Slote 1989), rather looking at simplifying mechanisms of human information processing (for example, bias and heuristics in Kahneman and Tversky conception. This view is frequently contained in many economic models (Conlisk 1996) grounded on maximization under constraint solutions (Foss 2003).

It is worth noting that the crucial stage of this concept of decision making is how an agent categorizes his/her representation of the world. They need to have a coherent frame to link it to fix feasible aspirations. Therefore, people are allowed to make both inferences and evaluations based upon their process-action-results "repository", as happens in everyday behaviour (Lundberg 2000). So, according to bounded rationality, past performance and experience play a key role in determining aspiration level adjustments, which is important not only for outcome but also for the regulating process itself.

This dynamic mechanism, called by Simon a sort of 'thermometer of human happiness' (Simon 1981), considers satisfaction as a changing state of continuous feedback generated by choice. It emerges as a response to the divergence of outcome from aspiration levels and not simply the value of the final outcome. Hence, according to Simon, rationality is more a feature/quality of the process of research than simply an attribute of the link between behaviour and attainment (Simon 1978). Aspirations adapt downwardly when it is difficult to find 'good enough' solutions *vice versa* in opposite cases. This mechanism, which had a "residual" and negative conception in early studies, has now a procedural and positive nature (Foss 2003) as it characterizes an individual's capability of linking personal cognitive limitations (such as attention and memory) with the external environment.

Following Simon, owing to the *ex ante* nature of the evaluation (the adjustment of aspiration levels occurs before the choice is made and during the evaluation of alternatives), the aspiration adaptation mechanism is "always" rational in procedural terms. This does not happen in attainment post-decision discrepancy models, in which personal judgment is based on an assessment (in psychological terms a construction) of the result, high or low discrepancy between aspiration and performance).

Furthermore, in Selten's approach, aspiration adaptation has an *ex post* nature. On the basis of a qualitative scheme of influence among variables (simply with positive and negative input and output, for example), an individual fixes a 'feasible' (i.e. a concrete and achievable) aspiration level for a target variable (Selten 2001). Aspiration levels are adjusted as consequences of choice' but also of updating the influence scheme. So, with positive results, the relation between variables is confirmed and aspirations can be pushed up (upward adaptation) or down (downward adaptation).

This process has no stable pattern if we consider past results. In fact "[...] it takes a considerable amount of experience for subjects to come to the conclusion that a hitherto neglected influence should be reintroduced into their mental model and other influence should be neglected in order to achieve balance". (Selten 1998, p. 213). Selten points out that individuals rarely reason through the "calculus of formal logic", since they use their mental models to figure out and consider possible alternatives. The core point is that individuals "create" the task environment, or the problem space they have to cope with and this affects the route of human decision making.

If people frame the task environment as "ergodic" (or, "well-structured", i.e. stable and regular), the continuous feedback from results in similar situations should drive aspiration adaptation towards the highest possible outcome. Obviously in the subjective perspective of a decision maker, In extremely steady task environments, people simply tend to act reactively, adopting routines that have been successfully applied in the past without adjusting aspiration levels. The application of these routines leads to a sort of binary solution, i.e. "right or wrong", *ex post* evaluation does not play a particular role in terms of attainment discrepancy. Therefore, well-structured problems that can be solved by routine, have "a definite criterion for recognizing solutions and a mechanized process for applying that criterion" (Fernandes & Simon 1999, p. 226).

Gradually as we shift towards ill-structured problems, with non-transparent, situational complexity and time-delayed effect (Funke 1991), aspiration level adjustment plays a major role. This is because people need different degrees of satisfaction in response to the environment and not merely a right/wrong solution (March 1994). The adaptation mechanism (or counter-adaptive one, depending on the attainment discrepancy level), when people have no past experience or when the task environment is too complex (see Fernandes & Simon 1999) is no longer appropriate and other decision styles take place. In these cases, sense-making creative routines revert to being important, even if "defensive", i.e. people apply them when they do not recognize contexts

or cannot correctly categorize them. In cases of extreme uncertainty, people become creative, unencumbered by any past experience relying on intuition or inner desires (Watzlawick 1984).

So, aspiration levels are related not only to past experience and analogy reasoning to fix aspiration levels. Other crucial psychological and cognitive mechanisms are supposed to take place when people build possible worlds related to future developments of action.

2.2 Scitovsky: satisfaction as aspiration to personal growth and development

If, as Simon maintains, to achieve prefixed goals and reformulate new ones is a part of the decision-making process, it follows that the capability to fix new goals becomes itself a goal of primary importance. We previously looked at how past experience determines aspiration level adjustment. Simon states how boundedly rational agents fix outcome under uncertainty by resorting to the feedback mechanism. Individuals are inclined to follow rules because they are uncomfortable with taking decisions under risk as this costs mental efforts. Hence, even if the rule is not completely efficient, it is an advantage, as it implies effort saving in terms of time and energy to select and process information needed to make a choice. So, an individual frames reality with cognitive maps, which facilitate problem processing.

Still, rules are routines and for Simon (and March) applying routines implies that "search has been eliminated" (1993 [1958], p. 142). Therefore, rules and past experiences are necessary components, but not sufficient alone to engage the aspiration/adaptation mechanism which perpetuates the virtuous "search and satisficing" circle. Tibor Scitovsky (1976) better explains the psychological mechanism which induces an individual to break the routine of rules and *search for* new goals by *increasing* their aspiration level.

Scitovsky considers adaptation in terms of comfort.[2] By studying the neuro-psychologists' findings on the arousal system (Hebb 1955; Berlyne 1963, 1971) he implies that satisfaction which derives from comfort (i.e. adaptation to aspiration), is only part of the story. Rather, perfect comfort is only comforting at first, but soon becomes boring, then disturbing. In fact, according to the motivational theory of arousal, "too much comfort may preclude pleasure" (Scitovsky 1976, p. 26). The biology of the human organism also requires new and stimulating activities which are sources of satisfaction as fundamental as comfort. Still, since comfort and stimulation are mutually exclusive sources of satisfaction, there is no way of having a full measure of both comfort and stimulating activities at any one time. Indeed, what makes comfort pleasurable is the certainty which comes from 'sticking' to our habits" (ivi, p. 124) while, what makes stimulating activities pleasurable is the novelty they bring. Novelty creates a problem and its enjoyment comes from the resolution of this problem. The more difficult it is, the more enjoyable it becomes» (ivi, p. 54).

Scitovsky conceives satisfaction with choice as that pleasant feeling which results from *proper balancing* (i.e. the satisficing approach) between routine redundancy of *comfort* (arousal-reduction mechanism), and *stimulation* (arousal-boost mechanism) which spontaneously arises by pursuing new challenges. Scitovsky terms 'culture' (ivi , p. 226) as the strategy which emerges from the interplay of past knowledge and skills acquired from previous experience and allows the individuals to fix the aspiration level which is most appropriate (neither to easy, too dull or too demanding). In short, according to Scitovsky's motivational theory of arousal, satisfaction with choice is *not* connected to a stable comfort level, but with *change* in comfort levels (i.e. change of the aspiration level) which originates from *contrast* and discrepancies with the fixed ones.

According to Scitovsky, the mental act of fixing new aspiration is an act of creativity and creativity according to the motivational theory of arousal, is a source of happiness. So, it is the very mechanism of fixing new aspiration levels that is a means of satisfaction, regardless of the actual outcome. The perpetuation of the virtuous cycle that allows individuals to continuously reformulate personal aspiration levels for personal growth and development is granted by the very pleasant sensation which spontaneously arises with satisfying the basic need of pursuing ever more challenging activities.

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[2] See, Di Giovinazzo (2008).

3. Research Hypothesis

On account of these issues, a general scheme of possible relations of satisfaction and other variables can be shown. We are going to look at the determinants of individual satisfaction, which can be exemplified by means of a general function in which arguments (i.e. the determinants to be estimated), are supposed to be: results/performance achieved by individuals (PER); attainment discrepancy based on the difference between performance and aspirations (AD_{asp}) and between performance and expectations (AD_{exp}); aspiration levels fixed in relation to past experience (AL_{past}) and with future possible worlds (AL_{pw}):

$$SAT = f(PER; AD_{asp}; AD_{exp}; AL_{past}; AL_{pw})$$

Moreover, the experiment tests whether perceived satisfaction is significant for future similar choices or not, since both theoretical and empirical studies do not look at its role in similar task environment settings and when choices are iterated in similar (or same) fields. The following section shows data on the satisfaction experienced by students for their exam results. The aim was to test the effect of aspirations and past performance compared with expectations on individual satisfaction.

3.1 Expectations or aspirations? What is important for a student's satisfaction

How much time should a student spend studying if he/she wants to pass an exam? The traditional utility model equates any choices as optimal and the expected outcome as the best achievable given available alternatives and prefixed outcomes. So, in order to find the optimal solution for a rational student, we need to calculate the marginal benefit of time spent studying. However, as Simon maintains, the complexity of reality, limited human cognitive capacity and future uncertainty all impede precise evaluation of the best goal. Thus, a rational student will prepare his/her exam not according to his/her expectations (the best grade he/she expects to get) but according to his/her aspirations (the minimum grade considered acceptable).

So, decision-making for a student preparing an exam is similar to a chess player (Chase & Simon 1973): given the final outcome (ie to checkmate/to pass the exam) rational bounded students are inclined to frame the task into sub-tasks each with its own specific goal. This is not only to render the problem easier to process, but also and primarily to check the propriety of their decision-making process. So, the *outcome itself becomes part of the procedure*, as it represents the starting point for developing the next strategy.[3] The level of aspirations becomes part of the procedure used to define an action.

Checking Simon's theory through the analysis of a student's performance in exams is particularly profitable as students can repeat an exam if not satisfied with his/her score. This is a valuable proxy for checking whether they have decided to take it or leave it. Furthermore, the chance to do the exam again means we can control changes in the aspiration level. So, we can make some specific hypotheses on features that influence declared satisfaction:

- students who get a score at least equal to the lowest considered acceptable (ASP) have a higher satisfaction than others. There could be a difference between students who get exactly the minimum score and those who get a higher one but we can not test this as there were too few people who got exactly the minimum. These are students who reach their goal, so we calculated the dummy variable GOAL equal to one when at least the lowest acceptable score was obtained, and zero otherwise;

- expectations (EXP) should be correlated with satisfaction with a negative sign; the higher the expectation, the lower the satisfaction, given all other variables.[4] Still, expectations should be less

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[3] Also Selten (1998) maintains that the final outcome depends on the path taken.

[4] The distinction between aspirations and expectations has been widely analysed in the economic literature, but several results can be also found in management field studies, e.g. Lant (1992) and Wiseman & Bromiley (1996).

relevant than aspirations as they do not represent a goal, but only a forecast. Moreover, forecasting the exact grade can be difficult since expectations are a specific score, getting the expected grade is quite difficult (in the experiment nobody made a correct forecast and all students were overconfident in respect to EXP). On the contrary, aspirations are a range of marks;

- students should evaluate their performance mainly compared to aspirations levels (ASP) and irrespective of the GOAL. This should happen not only because, according to Simon, agents focus on satisfaction choices, but also because, according to Scitovsky, past scores can be understood as comfortable levels of aspiration which are less demanding, even if less satisfying; thus, it should mean that aspirations can also be a creative act intended to escape from the comfort of the past;

- the score at the end of high school (SCORE_HIGH) should have a negative effect on satisficing choice. Students with high values of SCORE_HIGH are probably used to getting good results and this can influence their expectations and aspirations ('even if I know that I am not well prepared and I am just aiming at passing the exam, as I am used to high grades I may be more disappointed than a friend of mine, who, *cœteris paribus*, is used to bad results'). This is why it was decided to separate the two effects (model 9, below);

- the literature on organizational procedural rationality (Lant 1992; Lant & Mezias 1992; Mezias *et al*. 2002) focuses on the attainment discrepancy (DISC-ASP, calculated as the real grade minus aspiration), between actual performance and the aspiration levels. If one's actual performance is far from the past aspiration level, he/she should considerably revise his/her current aspirations. Such values should play a central role in determining the evolution of these aspirations (with a positive relation). This should be relevant also in determining individual satisfaction.[5] Yet we believe that what really matters in defining the aspirations is reaching goals

Nine models have been estimated as the bases of these hypotheses:

1) SAT = CONSTANT + A*SCORE + B1*ASP + C*SCOREHIGH + D1*GOAL

2) SAT = CONSTANT + A*SCORE + B1*ASP + C*SCOREHIGH

3) SAT = CONSTANT + A*SCORE + C*SCOREHIGH + D3*DISCR-EXP + E*REPETITION

4) SAT = CONSTANT + A*SCORE + B2*EXP + C*SCOREHIGH

5) SAT = CONSTANT + A*SCORE + B1*ASP + C*SCOREHIGH + D1*GOAL + E*REPETITION

6) SAT = CONSTANT + A*SCORE + B1*ASP + B2*EXP + C*SCOREHIGH + D1*GOAL + E*REPETITION

7) SAT = CONSTANT + A*SCORE + B2*EXP + C*SCOREHIGH + D2*DISC-ASP

8) SAT = CONSTANT + A*SCORE + B1*ASP + C*SCOREHIGH + D3*DISCR-EXP + E*REPETITION

9) SAT = CONSTANT + A*SCORE + B12*EXP

REPETITION is a dummy, equal to 1 for the students who repeated the mid-term exam. Both EXP and ASP were able to evolve, when or after students actually took their exam. REPETITION, in some way, measured this point. A student who was really unhappy with a result would repeat his/her exam, so this is a measure of dissatisfaction. This variable could be relevant also because it could also establish a link between satisfaction and decision.

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[5] The attainment discrepancy in relation to expectation (DISC-EXP, calculated as the actual grade minus the declared expectations) has been shown to be insufficient. In any case, the procedure principle is focused on aspiration and not on expectation.

The expected signs of the parameters were:

a (score):   positive
b1 (aspiration):   negative
b2 (expectations):   negative
c (score at the end of the high school):   negative
d1 (getting the minimum acceptable grade):   positive
d2 (attainment discrepancy measured on aspiration):   positive
d3(attainment discrepancy measured on expectations):   positive
e (repeating the exam):   negative

Estimating different models including or excluding certain variables allowed a robustness test and also allowed us to compare their relative effects and strength. Whereas it was possible to include the attainment discrepancy in the model (calculated SCORE-ASP) or, alternatively, the aspirations and the GOAL variable, of course it was not possible to use all these three variables together, with the score, as there would be perfect linear dependency. The two specifications are quite similar, yet that with two variables could give some additional information, as it allowed us to account for the absolute level of aspirations, which are otherwise missing.

4. Empirical analysis

4.1 Data

The empirical analysis is based on data collected in the Academic Year 2005-2006 on students attending the Economics course at the faculty of Law at the *Università del Piemonte Orientale - Amedeo Avogadro*, in Alessandria (Italy). The courses were planned during the first semester of the student's first year. The sample used included all 53 students who regularly attended all lessons in Economics and took the mid-term exam after three weeks from the beginning of the course.

Before the exam, we collected information on expected grades ("what grade do you think you'll get at the exam?") and on the minimum grade ("what is the lowest grade in this exam you think is acceptable to you") they considered acceptable and later on their satisfaction, on a scale 0-10, for the score (we asked a specific value and not their life happiness: "state with a grade from 0 to 10 your satisfaction for the mark you got"). Twenty days after the mid-term exam, students were allowed to repeat the same exam, if they did not pass it or if they wanted to improve the grade. Table 1 describes the timetable of exam and data gathering and introduces the variables we will examine later.

Table 1. Timetable

September 18: lessons started; we collected information on the score obtained at the end of high school (SCORE_HIGH)
October 26: students declared their expectations for the score in the first exam (EXP) and the lowest score they considered acceptable (ASP)
November 2: first mid-term test in Economics
November 7: students were shown the score of the first test in Economics (SCORE) and were required to state their satisfaction for the score (SAT)
November 22: new test for the students who did not pass the first one or were unsatisfied with the score

All information were collected by an assistant student enrolled in another course and were analyzed only after the exams. In this way we wanted to avoid possible attempts by students to over-estimate their own expectations in order to try to influence the teacher's evaluation. A student may have feared that a low expectation would have been seen as a kind of declaration of bad study. So students may have tried to over-estimate their expectations. In order to avoid or limit this, we also introduced a reward for students whose expectations were correct or wrong by

plus or minus half a grade. This incentive was also used as a way to stimulate a proper self evaluation and to reduce overconfidence, quite a negative fact in student learning (Grimes 2002).

There were no incentives for the lower acceptable score. We think that this variable could be seen as the aspiration level, i.e. the minimal goal a student wants to reach (this is, in fact, the definition of aspiration level). We measured both aspirations and expectations a week before the exams. Both of these variables may have changed in the following period, even during the exam. Yet the values we measured were a proxy of real values and they could have even influenced the time and energy devoted to preparing the exam.

Table 2 shows the basic statistics for the main variables used in the following estimations. The mean value of the expectations was higher than the real grade mean value. Almost all students were in fact, over-confident. The lower grade to pass the exam was 17, a student should get at least 18, but for this preliminary test even 17 was considered a pass. So, our sample included only students who had passed their test. Students who didn't pass it were not asked to state their satisfaction.

Table 2. Basic statistics for the main variables

	Minimum	Maximum	Mean	Standard deviation
SAT1 (ON 10)	.0	10.0	6.1	2.1
EXP1 (ON 30)	19	29	26.4	1.8
SCORE1 (ON 30)	17.0	27.0	22.2	2.7
ASP (ON 30)	18	27	22.7	2.8
SCOREHIGH (ON 1)	.60	1.00	.89	.1
GOAL	.00	1.00	.56	.5

Table 3. Correlation coefficient between some variables

	SCOREHIGH	ASP1	EXP1	SCORE1
SCOREHIGH	-	.		
ASP1	.226 (0.107)	-		
EXP1	532 (0.000)	.661 (0.000)	-	
SCORE1	.375 (0.006)	.231 (0.099)	.501 (0.000)	-

Note: the value in parenthesis is the p-value of the t-test

Table 3 shows the value of the correlation coefficient for some interesting variables. While expectations were significantly and strongly related to the score awarded in high school, the aspiration levels were only weakly linked with this value. This is an important result, as it shows a clear conceptual difference between these two variables. The aspiration levels seemed to be less related to past experience, as probably they were defined also in relation to a student's future aims and present perception. In some way, they includes the willingness to change in respect to past experience.

4.2 Estimates

We estimated the model, using the ordinary least square techniques. Table 4 shows the results. We had all the expected signs with the exception of b2; expectations did not seem to influence satisfaction[6]. It was almost significant only in model 6, but with a positive sign. It was almost significant, with a negative sign, in the estimate 9, where it was included only with the

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[6] We got this same result using a small sample for another course where all students reached their aspiration level, b1 could not be estimated. Yet ASP proved to be more significant than EXP. Data are available on request.

score in the exam and without the mark received at high school. This variable was not significant only in specifications including expectations or the attainment discrepancy on expectations. It always had the expected negative sign. All other variables were highly significant. Their values and signs were stable for all different specifications.

Including GOAL increased the model fit (estimate 1 *vs* estimate 2). Including both ASP and GOAL improved the fit in in the model with only the discrepancy attainment variable on aspirations (model 1 *vs* model 3; model 6 *vs* model 7). When we inserted both the score and the aspiration, we accounted for the discrepancy attainment, but did not consider whether the aspiration was reached or not. If we inserted just the discrepancy attainment, we did not account for the absolute value of aspiration. Both these points seemed to be relevant, the absolute value of the aspiration matters for the fact of just reaching the fixed goal.

4.3 Comments

The role of aspiration levels in determining satisfaction proved to be fundamental, both directly and indirectly. Students achieving their goals had a premium in satisfaction, equal to more than one point (on a total of ten). Students with lower ASP, *cœteris paribus*, had a higher chance of achieving their goal, and lower direct reduction in satisfaction. So, even if possible results (grade) were clearly defined, students evaluated their performance also relying on their *a priori* aims. Not all students can get a high score. Most of them preferred to study less and have more free time. So aspiration levels were obvious reference points.

At the same time, expectations proved to have little effect on satisfaction. Even if we stimulated students to forecast their grade, expectations still proved to be less relevant. The incentive to state good expectations may have made expectations become real goals. However, they seemed to have a very small effect on satisfaction. This makes sense as aspiration levels can be perceived as goals, while expectations are mainly forecasting the future. In this case, forecasting did not create a kind of "endowment effect". At least in *ex post* rationalization, students were not affected by them.

There was also another explanation for these results. Aspirations were almost unrelated with past performance. The score from high school, more strongly correlated with expectations, could be the best measure of what happened in the past. Students who used to get good results, *cœteris paribus*, were more negatively affected by bad results, as the idea of comfort seems to suggest.

Students who did not achieve their goal and who decided to take the exam again had lower satisfaction. This obvious fact is relevant to prove the reliability of the data and the possibility to have useful information with simple questions, but it also shows the link between satisfaction and decision.

All of these findings have a clear procedural flavour. Aspiration level, and the *ex post* evaluations of satisfaction can be seen as fundamental points in the decision process and not just determinants of happiness. Satisfaction is therefore not just a final point of arrive, but it is a passage in a wider process of evolution and adaptation, connecting past, present and future. Deciding to be happy or not played a central role in our students' decisional process.

A higher grade could be related to lower satisfaction if aspirations were higher (for example a student getting 19 with an aspiration equal to 18 is happier than one getting 24 with an aspiration of 26). This determines an effect similar to the well know paradox of happiness (it is sufficient to substitute grade with income) and suggest an explanation for it: if people with higher income have higher aspirations, they may be less happy.

High aspirations can compensate for low past scores, giving a possible stimulus to improve. People more prone to be less happy have, in fact, a greater need to try to do better. Less satisfaction is the price for having the chance to improve. Given other variables, higher expectation could just be a sign of optimism, and optimism may increase satisfaction. This could explain the positive, and almost significant sign of b2 in the model 5 and 6.

5. Conclusions

This paper has analyzed how a different approach to rationality can help in explaining individual satisfaction and happiness for a given outcome (§ 2). The literature on procedural utility (Frey & Stutzer 2002) already recognizes the need to consider possible preferences for specific actions over or beyond outcome. We have extended this idea to more general domains from simply moral ones. Apart from specific cases, procedural rationality does not imply a preference over action as in moral choices, but needs to be characterized differently. Applying a rule requires fixing certain reference points or aspiration levels. We focused our analysis on this issue by analyzing the relevant literature and by proposing a new empirical study.

We developed and tested a simple model on satisfaction determinants (§ 3). Data on aspirations, expectations and satisfaction of a class of students attending a course in economics was used to check the declared hypothesis on satisfaction determinants (§ 4). The experiment data showed that 1) even if students could clearly rank their grade in respect to an absolute reference point (the maximum grade), they evaluated their performance using a procedural approach in which a goal was preliminarily set; 2) the aspiration level they fixed and the capacity to reach it proved to be more significant than matching *ex ante* declared expectations on the grade. It did mean that satisfaction with choice was connected with aspirations and was *not* connected with expectations; 3) students used to good results suffered more when they received bad grades.

Given uncertainty and a series of bounds in human rationality, agents are unlikely to evaluate their decisions in terms of outcomes. Reality needs to be perceived and represented simply. Aspiration levels have to be set in order to be a reference point. Aspirations are not necessarily based only on the past, at least when an agent deals with a new environment. Our students were at their first experience at University. Past performance, however, plays a fundamental role in determining the level of satisfaction of a given outcome, but together with different aims. This could stimulate innovation and break a given situation.

Our results were multiple; they not only proved the propriety and effectiveness of Simon's theory on the individuals decision-making process focused on aspirations, but also singled out a strong coherence and complimentarity between Simon and Scitovsky's theory on satisfaction. The former understands a satisfaction choice as matching one's aspiration level, while the latter understands satisfaction as aspirations to personal growth and development. So, the link between procedurally formed aspiration levels and satisfaction with choice is a valuable connection which is useful in the economics of happiness.

parameter	variable	est1	est2	est3	est4	est5	est6	est7	est8	est9
COSTANT	COSTANT	-3.579 (.067)	-2.368 (.223)	-2.451 (.255)	-4.096 (.161)	-3.412 (.072)	-5.120 (.065)	-5.998 (.024)	-4.302 (.129)	-4.156 (0.164)
A	SCORE	.823 (.000)	.655 (.000)	0.524 (.000)	.636 (.000)	.769 (.000)	.356 (.008)	.719 (.000)	.575 (.000)	0.614 (0.000)
B1	ASP	-.259 (.004)	-.130 (.063)			-.239 (.007)		-.309 (.002)		
B2	EXP				-.021 (.882)		0.253 (0.145)	218 (.159)		-0.128 (0.325)
C	SCORE_HIGH	-3.882 (.003)	-3.524 (.007)	-3.395 (.075)	-3.803 (.079)	-3.058 (.018)	-3.453 (.107)	-3.496 (.009)	-2.507 (.247)	
D1	GOAL	1.312 (.025)				1.362 (.017)		1.302 (.022)		
D2	DISCR-ASP			-0.130 (.066)			-.193 (.035)			
D3	DISCR-EXP								-0.013 (.922)	
E	REPETITION					-1.028 (.049)	-1.015 (.065)	-1.074 (.039)	-1.162 (0.042)	
	R^2	.65	.61	0.61	.59	.68	0.63	.69	0.62	0.56
	Adjusted R^2	.62	.59	0.59	.56	.65	0.62	.65	0.65	0.54
	P-value F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: the value in parenthesis, under the parameter estimation, is the p-value of the t-test; N=53 for all estimations

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