Imagination, Time Discounting and Human Capital Investment Decisions*

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Abstract

While economic theory regards education as an important investment, the reality of students' behavior does not always seem to support this view. The aim of this paper is to analyze the behavior of students at college from an investment perspective. We provide robust paradoxical findings that college students with higher discount rates stay longer in education. The explanation we pursue is that a higher discount rate can partly be a consequence of a lack of imagination about the future work life. If so, the discount rate will be very high at moments when there are major changes in circumstances, in our case when students go from college to work. This provides incentives for students who lack a clear picture about their future working life to stay in education. To test this model we measure the crucial individual attributes, ask students about the way they made their choices and present them other choices that reveal the nature of their behavior. The empirical results support the model so the main conclusion is that a lack of imagination induces students to stay longer in education while it reduces the efficiency of this investment.

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1 Introduction

The observed behavior of the average college student does not reveal a picture of a hard working person investing in his future. On average a college student studies only 30 hours a week, while once working the same person puts in long hours. Some students stay in school longer than required, seemingly not keen to capitalize on their investments. Others regret the choice of study once they are in the labor market and often go back to school for retraining.

The aim of this paper is to analyze the behavior of students at college from an investment perspective. We start by analyzing the relationship between individual discount rates and study behavior. This reveals a robust paradoxical correlation suggesting that high discounters systematically choose longer tracks, stay longer within a track, put in less effort, and more often choose to continue studying after graduation. We put forward a theory to explain these observations and test its predictions empirically.

The key feature of the theory is that besides pure time preferences, the quality of images of the future affects the discount rate of students: Unknown, unloved. The main consequence is that the discount rate will be very high at moments when there are major changes in circumstances, in our case when students go from college to work. At college it is easy to imagine what will happen next year but even for those who almost graduate, working life still feels many years away. Students with a low ability to imagine the future therefore benefit from postponing this highly discounted working life and put less effort in their study. An important conclusion is therefore that a lack of imagination induces students to stay longer in education while it reduces the efficiency of this investment.

We use two surveys among Dutch high school and college graduates to test the empirical relevance of our model. These surveys include measures of the crucial individual attributes, questions about the way students made their choices and hypothetical questions in which we present them other choices to reveal the nature of their behavior.

The empirical analysis to test the model consists of four parts. First, we validate the measure of time discounting by showing that different measures of time discounting correlate and are related to a variety of indicators of risky behavior. Secondly, we obtain a high correlation between measures of time discounting and imaginative power. Thirdly, our model generates testable predictions about the way people make choices. Consistent with these predictions we find that graduates with high imaginative power report less

doubts and uncertainty with respect to their educational choices and the transition from school to work; and indicate more frequently that, looking back, they would again choose the same field of study.

This shows that people with less imaginative powers indeed face more problems when choosing. Additionally we test whether the same person invests more in future prospects for which he has a clearer view. We therefore measure the quality of the image related to four different domains of life and the willingness to invest in these domains. The findings support this prediction of the model.

The results also suggest that graduates who obtained more information about their future working life, as a result of family members working in a related field, report more satisfaction with their choice of study and stay in education shorter. Finally, we investigate alternative explanations of the finding that high discounters stay in school longer, and show that variables such as "enjoying college life," "cognitive abilities," "risk aversion" and "anxiety" are unable to explain this.

The paper is related to literature about time discounting. The trade-off between future and current utility is the topic of one of the oldest, yet most lively debates among economists. The traditional discounted utility model suggests that people trade-off current and future consumption by a discount rate (Samuelson 1937). Yet, especially in case of once-in-a-life-time choices (e.g. marriage, children, education) an agent does not only face the trade-off between now and then, but also faces uncertainty about his future preferences for the alternatives that can be chosen. Therefore, as Rae (1905) and Böhm-Bawerk (1971) first considered, part of the variations in intertemporal choice behavior may be due to differences in people's abilities to imagine the future and to differences in situations that promote or inhibit such mental pictures. Recently, these ideas have revived through among others Becker and Mulligan (1997) who postulate that the level of imagination influences the discount rate. If so, the level of imagination has important yet unexplored consequences on investment decisions. People will make erroneous choices and people who can imagine some options better than others, will be biased towards the option they imagine best. Empirical evidence has been the major lacuna to analyze such consequences.

In addition, our paper is closely related to the work on dynamically inconsistent preferences, which started by the work of Strotz (1956). The influential work by Ainslie

(1992), Thaler (1981), Loewenstein and Prelec (1992) and Laibson (1997) has given rise to the idea that discount rates are generalized hyperbolas, implying that people generally discount the distant future at lower levels than they discount the near future. The idea in this paper is that an alternative explanation for the seemingly inconsistent dynamic behavior can be that people are less able to imagine the distant future than the near future. We propose that the discount rate is a function of imagination. This is in line with the theoretical work by Azfar (1999), who shows that introducing the idea that individuals are uncertain about their discount rates can generate similar results as those generated by hyperbolic discounting functions.

The remainder of this paper is organized as follows. In Section 2 we present the empirical relationship between measures of time discounting and several dimensions of the human capital investment decisions of students. Section 3 writes down a model of human capital formation in which students have to choose a field of study. In Section 4 we give an overview of the data sources and investigate the validity of our measures and the relationship between discount rates and imaginative powers. In Section 5 we test the predictions of the model and in Section 6 we consider alternative explanations for our findings. Section 7 concludes.

2 Time discounting and investing in education

One of the main predictions of the human capital theory is that individual discount rates are negatively related to years of education. The starting point of this paper is to investigate whether we can confirm this relation empirically. We will use the terms time discounting, time preference and impatience interchangeably. We use the following survey question to measure time discounting:

> Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years?

Details about the data and the exact definitions of the variables will be given in the data section.

We have three measures that are related to how long people stay in education. First, high school graduates can choose between levels of continued education that differ in expected duration of stay. On average students spend 5 years at university, while the average duration of a professional college education equals 4 years. There are four levels of vocational education. On average students take less than 4 years in all these levels. In graph 1 we show that on average in the lower level track at high school (HAVO), graduates that are more impatient choose a continued education at a higher level. Graph 2 shows similarly that students from the higher level track at high school (VWO) who choose a university degree are on average less patient than those who choose a professional college education. Table 1 shows that the differences are significant and robust with respect to the inclusion of demographics and grades at high school. Note that table 2 also reveals that immigrants with a high level high school continue their education more often than natives at university.

– Graph 1, 2 and table 1, 2 –

A second piece of evidence concerning the duration of the stay in college is the number of years college and university graduates spend on their study. For professional college education, graph 3 shows that higher discounters stay on average longer in their education. In table 3, we show that this relation is significant and robust when including other controls. Men and students with low average grades also study longer.

– Graph 3, Table 3 –

As a third measure of the time spent in education, we look at continued education after college. Graph 4 shows again that a higher time preference induces college graduates to continue to study after graduation. Table 4 shows that the relation is significant and robust.

– Graph 4, Table 4 –

Interestingly, Chesson and Viscusi (2000) confirm the finding that a higher discount rate is related to further studying. Because of the inconsistency with the standard time discounting argument they explain their findings in terms of measurement problems in their tests, related to the lack of cognitive capabilities of many survey subjects. Fersterer

and Winter-Ebmer (2003) find for Austrian data that smoking at age 16 reduces educational attainment with 0.43 years. Their sample includes a substantial group students who left education at 16, and therefore the choice analyzed in their paper is essentially a participation decision while in our sample almost all respondents continue education. So our results reflect years of education conditional on participation in the further education.

Graph 5 shows that a high discount rate is related with less hours of studying per week. Note that inclusion of field dummy categories did not change the parameters for the time preference or the imagination significantly. This implies that students with a low time preference do not seem to choose disciplines that require less work.

– Graph 5, Table 5 –

Consistent with this finding that high discounters put less effort in their study, we found furthermore that lower time preference reduces the grade students got on their mathematics test ($t = -3.637$).

The size of relationship between the discount rate and various measures of educational investment are potentially biased because of measurement error in the measure of the discount rate we use. In table 6, we control for this error by using a similar question regarding time discounting as an instrument for the discount rate. The results then show that the effects of time discounting on the length of stay in education are large: a 10% higher discount rate is related to 1.4 months more education, 4.2% higher chance of continuing education and a reduction of 2.0 average weekly study hours.

– Table 6 –

3 The Model

To explain the paradoxical findings of the previous section we put forward a model about investments in human capital in which student might lack a clear view about their future work life.

Consider an agent who makes an investment decision. If he values current consumption over future consumption his discounted value of one unit of consumption will look like $\Delta_a(t)$ in figure 1, in which a constant discount factor δ_a determines the slope of the function. If the discount factor is larger, $\Delta_a(t)$ will decrease more sharply.

In the standard approach in the economic literature it is assumed that future utility is known to the agent. Consider however that some future consumption or return on investment may be uncertain. If future consumption is uncertain and present consumption is certain, the agent will value present consumption even higher. In the figure this is shown by $\Delta_b(t)$.

This higher discount rate in case of uncertainty about the future can be interpreted in terms of a risk premium, but can also reflect the consequences of suboptimal choices. If the agent can choose between alternatives $C_1, C_2, \ldots, C_n$, but observes the utility of each alternative with some error, the difference between the best choice $\mathrm{Max}_i U(C_i)$ and the expected utility when choosing with uncertainly $E\{U(\mathrm{ArgMax}_i U^{exp}(C_i))\}$ will increase when uncertainty increases.

If no large changes occur in the agent's world, he will know to a large extent what he can expect based on his current situation. When the time interval becomes longer, current experiences will be less valuable as indicator for future utility. However, suppose that he knows or expects that his world will change drastically at some point in time. If he is unsure about the outcome of that change, his uncertainty will increase instantaneously as a consequence. In the figure such a change occurs at point S, decreasing the expected value of further consumption with the factor e^{-D}. The discount pattern in this case is indicated by Δ_c. D indicates the size of this instantaneous decrease in expected utility, and depends on the unfamiliarity of the new situation (A) and the ability of a person to imagine these new circumstances (δ), so $D = \delta A$. Comparing this immediate fall in discounted value, with the normal gradual discount rate, reveals that A can be interpreted as a time equivalent of the extra uncertainty associated with this change in circumstances. The day after S feels A years further away.

– Figure 1 –

In the context of an investment in education, individuals choose to study for a certain time period before starting to work. During their study, their income will be lower than the wage they would get while working but of course this investment in human capital increases their future wages. Depending on the rate of time preference the individual will choose how much to invest in education. Obviously a lower time preference (meaning a lower preference for current utility over future utility) would lead by this reasoning to a

longer period of studying (Becker (1964) and Wilkinson (1966)).

However, students face uncertainty with respect to the returns on their investment. They do not know whether they can get a job in their specific field, they cannot accurately predict the wage they will receive in the labor market and most importantly many students are uncertain about how much they will like to work in a profession related to their education (Betts (1996), Siow (1984) and Zarkin (1985)). In sum, many students do not have an accurate view of what it means to work in a certain field. If they are uncertain about these future returns, they will value their current state more than the uncertain future state. Since especially the transition from college to work goes hand in hand with large uncertainty, students will devaluate working substantially as long as they are in college. As a consequence, this uncertainty will cause a delay in labor market entrance.[1]

3.1 Length of education

More formally, an agent maximizes an intertemporal utility function U, with a discount rate δ. This discount rate varies between people depending on their ability to imagine the future. During the time the agent studies (S) he receives intrinsic utility (plus perhaps some financial support) I. When working, he receives a wage $e^{\alpha S}$ that depends on the years spent in education S.

As long as a student remains at college he will face the usual uncertainty about the future. As long as he is in college he lacks experience with work. We therefore treat the transition between college and work at moment S as a moment of large uncertainty, with instantaneous discount factor $D = \delta A + D_0$. D_0 denotes specific deviations from the normal discount rate, reflecting that a student might accidently be worse or better informed about his future working life than others. Assuming for mathematical convenience that people stay in the work force forever, utility may be written as

$$U = \int_0^S I e^{-\delta t} \mathrm{d}t + \int_S^\infty e^{\alpha S} e^{-\delta t - D} \mathrm{d}t, \tag{1}$$

which reduces to

$$U = \frac{I(1 - e^{-\delta S}) + e^{(\alpha - \delta)S - D}}{\delta}. \tag{2}$$

[1] By the same reasoning, working people may be deterred from studying.

Maximizing the model and solving for S yields

$$\hat{S} = \frac{\ln(I\frac{\delta}{\delta-\alpha}) + D}{\alpha}, \tag{3}$$

in which $(\delta > \alpha)$.

The effect of the discount factor δ on the length of study can be investigated by taking the derivative of $\hat{S}$:

$$\frac{\partial \hat{S}}{\partial \delta} = -\frac{1}{\delta I(\delta - \alpha)} + \frac{A}{\alpha}. \tag{4}$$

When $D = 0$ this derivative equals

$$\frac{\partial \hat{S}}{\partial \delta} = -\frac{1}{\delta I(\delta - \alpha)} < 0, \tag{5}$$

and therefore larger discount rates lead to lower investments, measured in years of education.

When A is sufficiently large $(A > \frac{\alpha}{I\delta(\delta-\alpha)})$ higher discount rates now will lead to longer periods in college. Lack of knowledge about working life increases the relative value of being in college and therefore leads to a delay of the transition from college to work.

Since $\frac{\partial \hat{S}}{\partial D_0} = \frac{1}{\alpha} > 0$ additional uncertainty concerning the college to work transition further increases the time students stay in college, so those who are better informed will leave earlier.

3.2 Intensity of studying

To investigate whether the relationship between higher discount rates and years in college really means that high discounters want to invest more in human capital we extent the model with the intensity of studying.

Let h denote the number of hours a student spends each week on learning. While in college, the student's utility is positively affected by his leisure time $-h^{\gamma}$.[2] Human capital

[2] Blinder and Weiss (1976) also take leisure time into account in their model of human capital accumulation. They conclude that when schooling involves foregone leisure, the existence of pure time preference might lead a utility-maximizing individual to postpone his education.

accumulation now depends on S and h. After entering the labor market the wage equals $w = \alpha S h^{\beta}$. Utility equals

$$U = \int_0^S -h^{\gamma} e^{-\delta t} \mathrm{d}t + \int_S^{\infty} \alpha S h^{\beta} e^{-\delta t - D} \mathrm{d}t, \tag{6}$$

which reduces to

$$U = \frac{h\gamma(e^{-\delta S} - 1) + \alpha S h^{\beta} e^{-\delta S - D}}{\delta}. \tag{7}$$

Maximizing and solving for h yields

$$\hat{h} = \left(\frac{\beta \alpha S e^{-\delta S - D}}{\gamma(1 - e^{-\delta S})} \right)^{\frac{1}{\gamma - \beta}}, \tag{8}$$

in which $(\gamma > \beta)$

$$\frac{\partial \hat{h}}{\partial \delta} < 0 \tag{9}$$

and

$$\frac{\partial \hat{h}}{\partial D_0} < 0. \tag{10}$$

Therefore, higher discount rates, associated with a lower ability to imagine the future, reduces the intensity of studying.

4 Data and definitions

In the Dutch educational system pupils attend primary school up to the age of 12. At the age of 13 pupils are selected (based on a test and the judgment of the teacher) to go to

different levels of high school. These levels are called VMBO, HAVO and VWO. A VMBO diploma gives access to vocational schools (MBO). With a diploma from HAVO or VWO, one can continue education at a professional college (leading to a bachelor title). Only with a VWO diploma one is entitled to enrol at university, leading to a master degree. In practice graduates from VWO go either to university or to a professional college, graduates from HAVO continue at a professional college or a vocational school and most graduates from VMBO continue in vocational education. The nominal duration of VMBO is 4 years, HAVO 5 years and VWO 6 years. Each year in high school there are exams and students can pass or fail. Those who fail have to repeat class, but often decide to continue at a lower level. It is very difficult to go to a higher level before graduating. There is however a substantial group that takes a VWO after graduation from HAVO, or HAVO after graduating from VMBO at the cost of one additional year. Although graduates from HAVO and VWO are at least 17 and therefore beyond compulsory education, almost all students will continue education.

Our empirical analyses are based on two surveys. First, we ask survey questions to a large group of high school and college graduates in 2003 and secondly, six months after a similar survey in 2004, we approach a sub sample with a survey with additional questions to further validate our findings.

4.1 Main Survey

The main data used to show the paradox in section 2 are taken from the Research Center for Education and the Labour Market's 2003 school leaver survey. In this survey Dutch graduates from high school and professional college are approached 1.5 years after graduation. From the approached graduates, 3,879 high school graduates (54%) and 15,601 college graduates (36%) responded.

Table 7 provides some descriptives of the data. It can be seen from the table that 1.5 years after graduation most college graduates are working, while only a small proportion of the high school graduates is working. In general – when working – the high school graduates work in part-time jobs of about 1.5 days per week.

13% of the high school graduates and 11% of the college graduates is immigrant. Following the definition of Statistics Netherlands, people are immigrant if they are born abroad (first generation), or if at least one of their parents is born abroad (second gen-

eration). Most immigrants in our sample are second generation immigrants from Turkey, Morocco, Surinam, and the Dutch Antilles.

– Table 7 –

The basic survey contains many questions related among others to the education and the job the graduate is occupied with. We added a question to the survey to measure our key variable: time preference.

? give an overview of empirical estimates of discount rates in various studies. Time preference in the studies in this survey has been measured in two ways. Some authors attempt to measure time preference by observations of real-world behaviors, while others derive their estimates from experimental elicitation procedures or hypothetical questions. Our measure of time preference falls in the latter category. We ask:

> Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years?

The results vary from zero (meaning a very high preference for delayed utility) to more than 300 days (or a very high preference for immediate utility) both for high school and college graduates. The mean value is 16.1 days and 19.1 days for high school graduates and college graduates respectively. This corresponds to discount rates of 37.7 and 42.8 %. 97.6% of the high school observations and 96.5% of the college observations are in the 0-50 days interval. We truncate our measure at 50 days and calculate the annual discount rate as $\left(\frac{days+10}{10}\right)^{1/3} - 1$ as a measure for time preference.

4.2 Supplement

In 2004, a similar survey was held among people who graduated in 2003. We approached a subsample of the respondents of the 2004 survey again in the spring of 2005 with a comprehensive set of questions.

Respondents were approached by e-mail to fill out a questionnaire called "Dealing with difficult choices" on the internet. In the mail, we explained that the aim of the research

is to increase understanding of how young people deal with difficult decisions, especially those related to educational choices. We explained that knowledge about these processes is of great societal and scientific importance since e.g. 20% of all graduates indicate that they regret their educational choice. To stimulate participation and deliberate answers, we promised the respondents upon completion of the questionnaire a personal profile regarding several psychological factors. In the mail we did not state which personal factors are included in the profile. The respondents got a profile and an explanation of the terms in the profile regarding their individual discount rate, the quality of the image of the future, cognitive ability, locus of control, anxiety, self-confidence, self-image and risk-aversion.

The discount rate is measured by the question:

> Suppose you win a 10-day holiday trip worth 2000 euros to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years?

We find that 95% of the respondents filled out between 0 and 30 days. On average people answered 12.0 days (st.dev. 9.3). This corresponds to a discount rate of 27.9%. Compared with a discount rate at a bank this average discount rate is therefore very high. In the literature (Frederick, Loewenstein, and O'Donogue 2002) it is known that the discount rate is strongly influenced by anchoring effects but that some people consistently score higher or lower on these measures.

We validated the discount rate with a measure which is used often in psychology (Rachlin, Raineri, and Cross 1991). We asked the people to answer the following question: What would you prefer 800 Euros now or 1200 euros in one year. To deduce information most efficiently, we made a tree of follow-up questions depending on the answer they gave. If they e.g. chose 800 euros, they got a similar question with the amounts 800 and 1400 euros. If they chose 1200 euros, they had to choose between 800 and 1000 euros. Depending on these choices they got one more question in which we again varied the answer possibilities. Three sets of such monetary discount questions were included in the survey. Table 8 shows that the measures correlate very significantly with the discount

rate measure. A β of about .15 reveals however that there is a substantial measurement error in these measures of the discount rate.

– Table 8 –

Another part of the survey focuses on typical outcomes related to time preference. We use these measures to validate our measure of the discount rate. High time discounters value present consumption more than future consumption. Psychological studies, e.g. Sykes, Evans, and McCrum (1990), have shown that as a result, compared with low time discounters, they would be more willing to trade pleasant but detrimental consumption now for a better health in the future. Bad health, and especially smoking is therefore associated with a high discount rate. Also in economic literature (e.g. Fuchs (1982), Evans and Montgomery (1994), Chevalier and Walker (1999) and Munasinghe and Sicherman (2001)) smoking is used as a proxy for time preference or time discounting. Table 9 shows some correlation between the discount rate and forms of risky behavior. The discount rate correlates in the expected direction with most of these measures.

– Table 9 –

To our knowledge, the power to imagine the future has not been measured before, although in psychological literature some related concepts have been measured. Caplin and Leahy (2001) give some examples of psychological research concerning the measurement of feelings of anticipation and e.g. Eisenberg, Baron, and Seligman (1998) estimate anxiety.

We included a battery of subjective questions to measure this power of imagination as precisely as possible. Some of these questions have an ex ante and others an ex post nature. An examples of the former is a statement like "I can imagine well what my next job will look like," while the latter is of the type "My life now is totally different from what I expected it to be 3 years age."

5 Testing predictions of the model

5.1 Time preference and imagination

The first empirical question we want to answer is whether time preference is related to power of imagination. To that aim in graph 6 and table 10 we relate power of imagination to the discount rate. We find that the power to imagine is negatively related with the discount rate, as expected.

– Graph 6, Table 10 –

A weak power to imagine the future should be related to more difficulties making choices. Table 11 shows that people who were better at imagining the future indeed choose early what they will study, and doubted less the choice of the educational discipline. An important further consequence is that the probability increases that after a choice has been made unforeseen factors appear. Table 11 shows that the image graduates with a low power to imagine have of their education has become worse after they left college. This implies that they overestimated the benefits of the discipline they chose. We show moreover that the image of the education remained more similar for people with more imaginary faculties and that they experienced a smaller transition from the education to what they do now.

– Table 11 –

5.2 Regret

The ultimate consequence of unforseen aspects of a choice is that people face a higher probability to discover afterwards that they would have preferred an alternative, had they known these consequences in advance. Of course there can always be unforeseen circumstances but people who have an incomplete picture of the future utility of a specific investment will regret their choice more often than those who have a better picture. To measure regret with respect to the choice of the educational discipline, we ask:

> Would you choose the same education if you had the opportunity to choose again?

Answers range from 1 "yes, same education at same college," 2 "yes, same education but at different school," 3 "no, a different education," 4, "no, I would not go and study." The measure of regret is very strongly related with imaginary faculties (t-value: -7.306). The model predicts that when time discounting reflects power of imagination, this would imply that high discounters are more likely to make inadequate educational choices. Graph 7 and table 12 show that graduates who have a low level of time preference are more likely to regret their choice of education.

– Graph 7, Table 12 –

5.3 Willingness to invest and clarity of image

The evidence we provided above supports the prediction of the model that people with high discount rates and a low ability to imagine the future make different, less adequate choices. In addition to this variation in investment behavior between people, the theory also predicts that the same person will invest more when he has a clearer view about the future. To test this we included a small experiment in our survey.

To obtain a measure for the clarity of the image, we asked 4 sets of questions related to things that may happen in life. First we asked "Often people get children at a certain moment in their lives. Do you have a clear image why it would be nice to have children? (1 No image at all...7 A very clear image)" and "Do you have a clear image of the disadvantages related to having children? (1 No image at all...7 A very clear image)." Similar questions were asked with respect to three other domains of life: having a house, being ill, and being retired.

To measure the willingness to invest we asked later in the survey "Suppose the government wants to stimulate that people save money for events later in their life. For instance, there could be a fund in which money is put which you may spend on expenses when you have got children, e.g. for child care. The money is invested as long as you do not need it, hence the amount grows over time. If you do not have children when you are 40 years of age, you receive the amount of money including interest. If you may choose between receiving 1000 euros in cash now or having a larger amount of money invested in the fund, how much money would at least have to be invested in the fund before you would agree with this destination?" Similar questions were asked with respect to having

a house, being ill, and being retired. We pooled the data for these 4 sets of questions. We excluded those who already had children, a house, were retired or had a serious disease. In a regression we explain the minimum amount that has to be invested in the fund, with the variable reflecting the clarity of the image of this future situation, the discount rate and domain specific dummies.

Table 13 shows that people who have a clearer image, asked for less money in return. This implies that they were more willing to invest in the life-domain.

– Table 13 –

Interestingly, the table also shows that higher discounters also wanted a significantly higher amount of money, showing yet again that they are less willing to invest.

5.4 Specific information

Finally, the model predicts that specific information about future consequences of choices could support students to choose, also when they have less abilities to imagine the future in general. To test this implication we use the idea that students who had parents or family working in the field they are interested in, have the advantage that they have a person in their direct surroundings from whom they can deduct specific information. Observing your parents working in a certain field, and talking to them about their experiences will improve the understanding of the work life in that job. In table 14 we show that students with relatives working in the field of their educational choice, indicate to regret their choice less and to study less months in their education. For the continuation of education after graduation and the amount of hours studied we find no significant differences however.

– Table 14 –

6 Alternative explanations

There may be several alternative explanations for our findings. The discount rate may be determined by other factors besides imagination and these factors may drive the results we find. To analyze this we included many other psychological variables which we will describe in turn.

Locus of control indicates to what extent people think success or failure depends on their own actions. It is measured by statements such as 'Most people do not realize to what extent their lives are determined by coincidences.

Self-confidence is measured by statements such as 'I think I have sufficient reason to be proud of myself'.

Anxiety indicates to what extent people are afraid of things they do not know. It is measured by statements such as 'I often think back about unpleasant experiences'.

Risk aversion is measured by offering the respondents one amount of money they can get for sure or a higher amount of money with a chance of getting it and a chance of not getting it. We asked 6 questions in which we varied the amounts of money and the chance of getting the money. To deduce information most efficiently, we used follow-up questions. For instance, we started with the question: What would you choose: 800 Euros, or 50% chance on nothing, 50% chance on 2000 Euros. If the respondent chose 800 Euros, he would get the question: What would you choose: 800 Euros, or 50% chance on nothing, 50% chance on 2400 Euros. A respondent who chose 2000 Euros in the first question would get the question: What would you choose: 800 Euros, or 50% chance on nothing, 50% chance on 1600 Euros.

Cognitive skills are measured by 8 questions taken from Frederick, Loewenstein, and O'Donogue (2002). An example of these questions is

> Together, a ball and a cap cost 1.10 Euros. The ball costs 1.00 Euros more than the cap. How much does the cap cost?

The comprehensive list of the questions measuring these personal characteristics is shown in table 15.

– Table 15 –

Besides these psychological characteristics we asked people whether they had fun during their education time. Having fun may be an important variable determining the length of stay.

Table 16 shows that self-image, self-confidence and cognitive skills are related significantly with imagination. Self-image, cognitive skills and risk aversion are related to

the discount rate. However, adding imagination itself to the regression, shows that the discount rate shows the largest correlation with imagination.

– Table 16 –

The table shows also that men are more patient than women. We find no relationship between the discount rate and age, in contrast with findings of e.g. Chaloupka (1991) and Lawrance (1991). As expected, we find that immigrants also discount the future more heavily.

Table 17 shows that including these variables does not affect the relation of the discount rate with the length of stay. When we include imagination again, we see that the effect of the discount rate diminishes while the effect of imagination on the length of stay is very significant. This gives additional evidence for our theory that the paradoxical relation of the discount rate with the length of stay can to a large extent be explained by its relation with imagination.

– Table 17 –

7 Conclusions

In this paper we analyze the paradoxical finding that people with higher discount rates tend to stay longer in education. Our main argument is that differences in the discount rate between individuals might reflect the ability of imagination rather than only a pure taste for consumption now relative to future consumption. This interpretation has important direct implications for the investment decision. First we argue that in this case high discounters will make less adequate choices, and will therefore regret their choice more frequently afterwards. Secondly, we argue that limitations in the ability to imagine the future will lead to a bias in investment in favor of a choice that can be imagined more easily.

This effects will be especially be relevant for once in a lifetime decisions. We therefore investigate the investment decision in education. It is obvious that many students have an incomplete picture of how it will be to work. Our model predicts that students with a weaker power to imagine their future working life will (1) make less adequate choices, (2)

put less effort in their study, and (3) stay longer in education. The difficulty of imagining future job life makes staying in school relatively attractive compared to starting to work.

The empirical analysis to test the model consists of four parts. First, we validate the measure of time discounting. Different measures are significantly correlated and are related to a variety of indicators of risky behavior. Secondly, we show that there is a high correlation between time discounting and imaginative powers. Thirdly, our model generates specific predictions about the way people make choices that can be tested. Consistent with the predictions, we find that graduates with high imaginative powers (i) report less doubts and uncertainty related to their educational choices and the transition from school to work; (ii) indicate more frequently that, looking back, they would choose the same field of study again. (iii) Comparing their willingness to invest in their future for different domains in life, these graduates invest more in prospects for which they have a better view of the future consequences. (iv) We find that graduates who got more specific information about their future working life, due to family members who work in a related field, report more satisfaction with their choice and stay shorter in education. Finally, we investigate alternative explanations of the paradoxically findings, and show that variables like "enjoying college life," "cognitive abilities," "risk aversion" and "anxiety" are not able to explain these relationships.

These findings raise several questions that could be addressed in future research. A first question is whether also in other investment settings, an effect of the power of imagination can be found. Power of imagination could be an important determinant of successful entrepreneurship. Secondly, what are the determinants of power of imagination, explaining why some students are more successful in their choices than others? Related to that one could wonder what measures could improve the power of imagination. Especially the hypothesis raised by Becker and Mulligan (1997) that education itself plays a crucial role in lowering the discount rate by improving the power of imagination, could be investigated to find a clue about the measures to improve the quality of investments.

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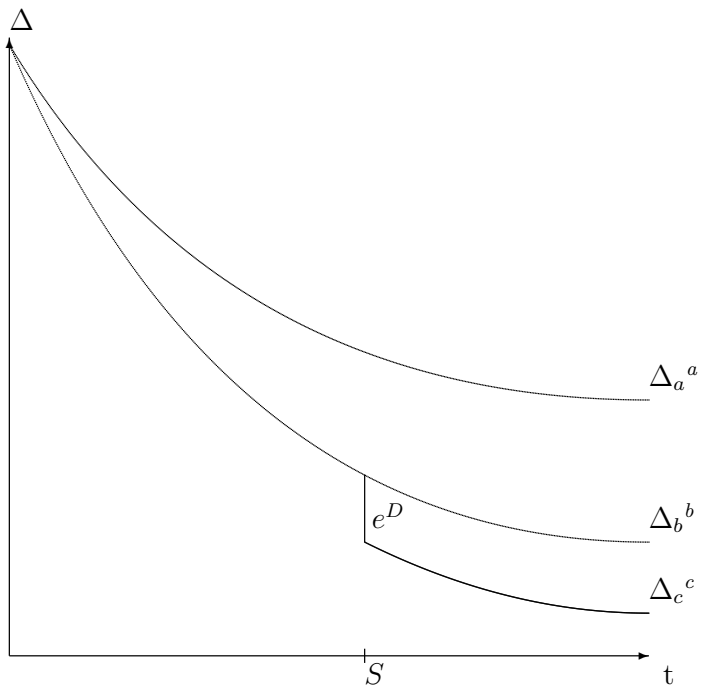
Figure 1

Time preference and uncertainty

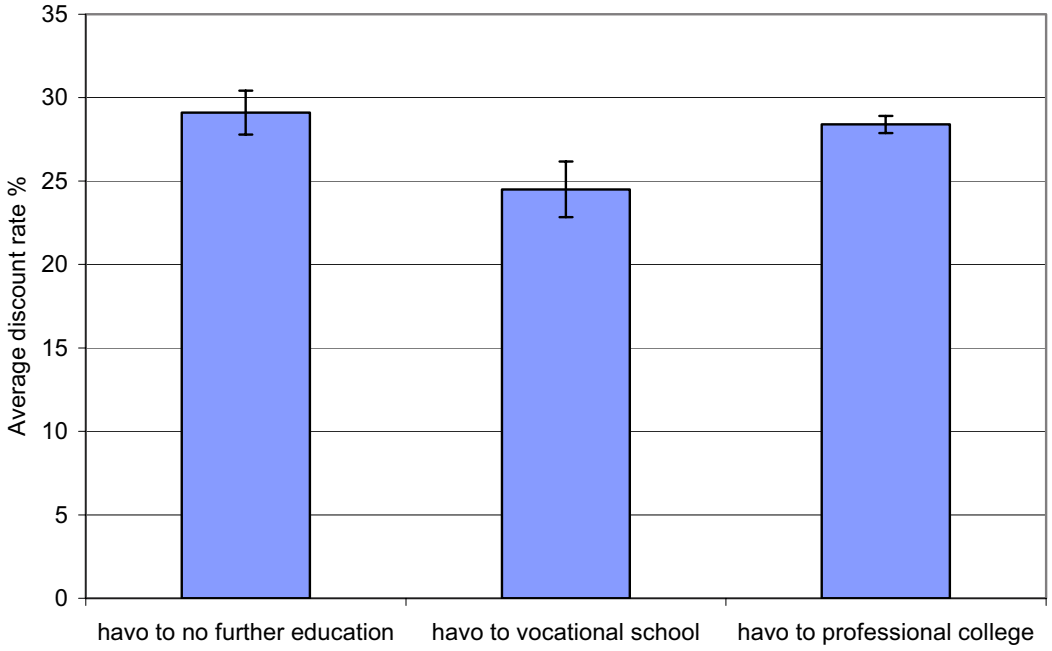


[a] Δ_a is the discounted value of consumption over time.

[b] Δ_b describes discounted value of consumption over time if an individual is uncertain of his future consumption.

[c] Δ_c is the discounted value of consumption over time of an individual who faces not only uncertainty about the future in general but is especially uncertain about the state of the world after $t = S$. D is the associate decrease in utility.

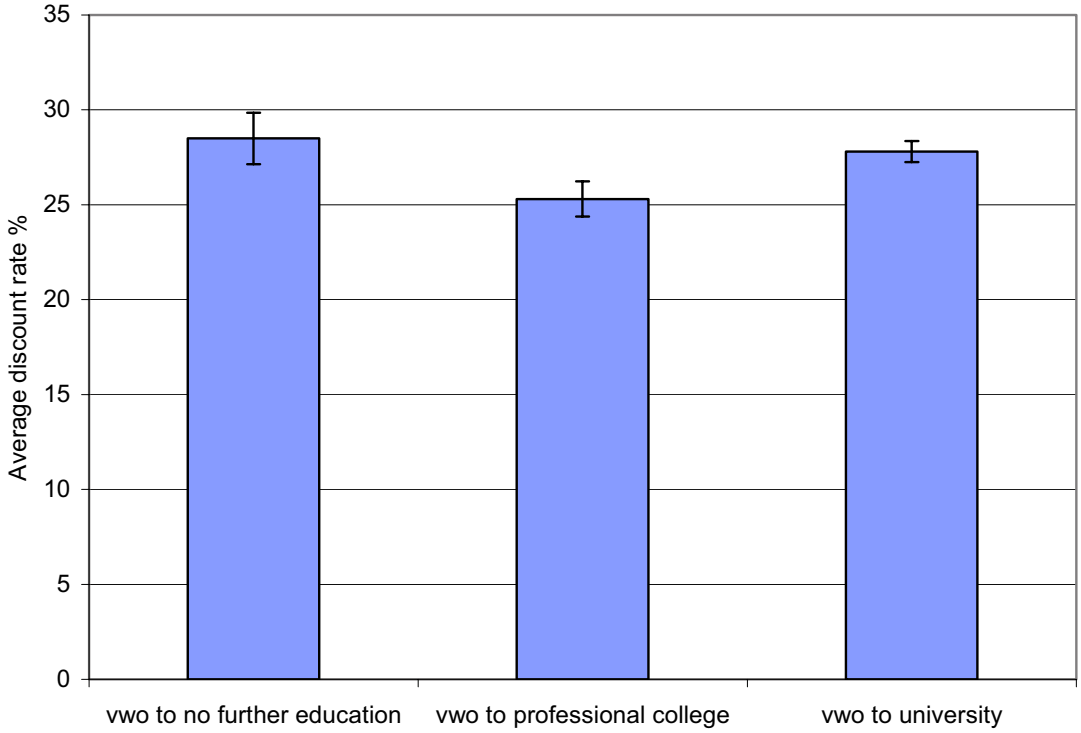
Graph 1
Average discount rate of graduates from Low level high school (havo) by destination[1]



Source: Research Centre for Education and the Labour Market Graduate Survey 2003.

1. Low level high school is the Dutch HAVO, vocational school is MBO and professional college is HBO.
2. Discount rate is measured by the following question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated the answer at 50 days and calculate the annual discount rate as ((10+days)/10)^(1/3)-1. In this graph we multiply this by 100 and hence indicate the discount rates as percentages.

Graph 2
Average discount rate of graduates from High level high school (vwo) by destination[1]



Source: Research Centre for Education and the Labour Market Graduate Survey 2003.

1. High level high school is the Dutch VWO, professional college is HBO and University is WO.
2. Discount rate is measured by the following question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated the answer at 50 days and calculate the annual discount rate as ((10+days)/10)^(1/3)-1. In this graph we multiply this by 100 and hence indicate the discount rates as percentages.

Table 1
The probability of graduates from Low level high school (havo) to continue at professional college[1]

	Coef	*t-value*		*Coef*	*t-value*		*Coef*	*t-value*	
Constant	0.905	78.069	***	0.992	6.347	***	0.792	4.113	***
Discount rate[2]	0.071	2.099	**	0.069	2.030	**	0.093	2.447	**
Male				0.017	1.243		0.023	1.454	
Age				-0.005	-0.612		-0.003	-0.311	
Income level parents below 15,000 euros per year[3]				0.010	0.341		0.009	0.266	
Immigrant[4]				0.010	0.540		0.006	0.263	
Math grade[5]							0.019	2.633	***
Reading grade[6]							0.003	0.338	

* = Significant at 10% level, ** = Significant at 5% level, *** = Significant at 1% level.
Source: Research Centre for Education and the Labour Market Graduate Survey 2003.

1. Low level high school is the Dutch HAVO, vocational school is MBO and professional college is HBO. The dependent variable is a dummy with the value 1 for the HAVO students who go to professional college and 0 for those who go to vocational school. All regressions are OLS.
2. Discount rate is measured by the following question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated the answer at 50 days and calculate the annual discount rate as ((10+days)/10)^(1/3)-1.
3. This is a dummy which has the value 1 if parents were in the lowest income category.
4. A person is defined to be an immigrant if he is not born in the Netherlands or one or both of his parents are not born in the Netherlands.
5. In the Dutch school system there is a separation between Math A (statistics) and Math B (geometry, arithmetic). Math B is considered to be a higher level of mathematics. When available we use the grade for math B, subtracting the average difference between math B and math A grades from people with grades in both to correct for differences in these scales.
6. This is the grade in Dutch language, which is compulsory for all students.

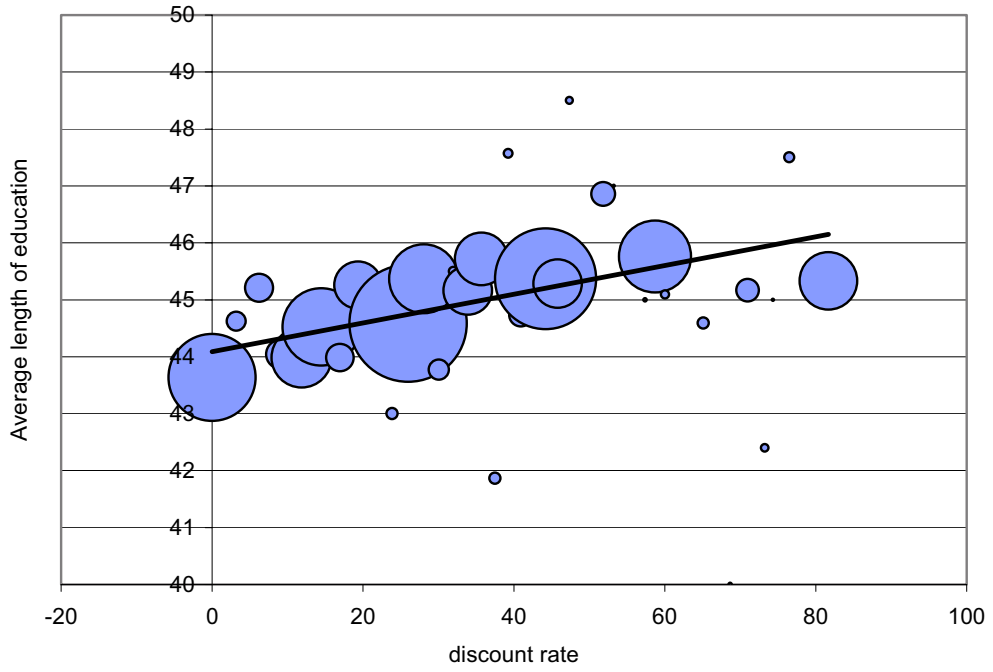
Table 2
The probability for graduates of High level high school (vwo) to continue at university[1]

	Coef	*t-value*		*Coef*	*t-value*		*Coef*	*t-value*	
Constant	0.736	39.669	***	1.620	5.425	***	0.474	1.377	
Discount rate[2]	0.124	2.223	**	0.123	2.197	**	0.151	2.655	***
Male				0.066	3.062	***	0.068	3.064	***
Age				-0.048	-3.082	***	-0.022	-1.386	
Income level parents below 15,000 euros per year[3]				-0.066	-1.161		-0.100	-1.703	*
Immigrant[4]				0.124	3.834	***	0.130	3.941	***
Math grade[5]							0.060	6.189	***
Reading grade[6]							0.035	2.377	**

* = Significant at 10% level, ** = Significant at 5% level, *** = Significant at 1% level.
Source: Research Centre for Education and the Labour Market Graduate Survey 2003.

1. High level high school is the Dutch VWO, professional college is HBO and University is WO. The dependent variable is a dummy with the value 1 for the VWO students who go to university and 0 for those who go to professional college. All regressions are OLS.
2. Discount rate is measured by the following question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated the answer at 50 days and calculate the annual discount rate as ((10+days)/10)^(1/3)-1.
3. This is a dummy which has the value 1 if parents were in the lowest income category.
4. A person is defined to be an immigrant if he is not born in the Netherlands or one or both of his parents are not born in the Netherlands.
5 In the Dutch school system there is a separation between Math A (statistics) and Math B (geometry, arithmetic). Math B is considered to be a higher level of mathematics. When available we use the grade for math B, subtracting the average difference between math B and math A grades from people with grades in both to correct for differences in these scales.
6. This is the grade in Dutch language, which is compulsory for all students.

Graph 3
Duration of the stay in education and the discount rate



Source: Research Centre for Education and the Labour Market Graduate Survey 2003.

1. The duration of the stay in education is the number of months the respondent indicates to have needed to complete the professional college education.
2. Discount rate is measured by the following question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated the answer at 50 days and calculate the annual discount rate as ((10+days)/10)^(1/3)-1. In this graph we multiply this by 100 and hence indicate the discount rates as percentages.

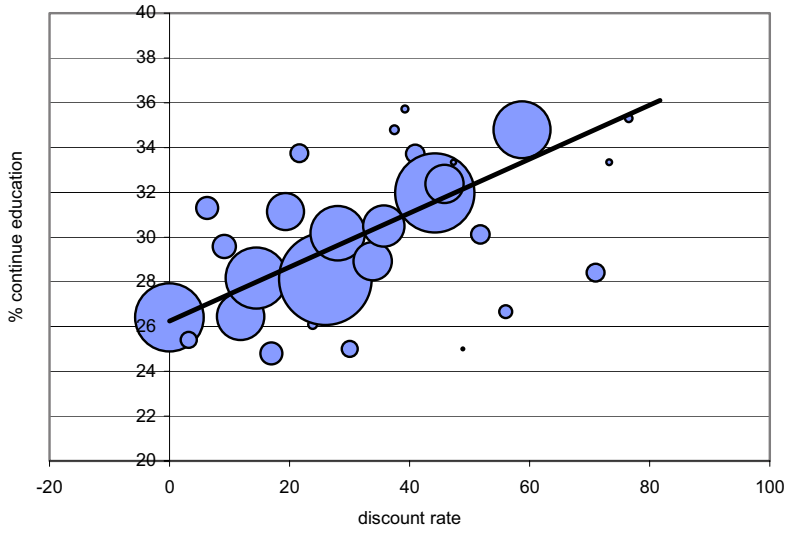
Table 3
Duration of the stay in education and discount rate[1]

	Coef	*t-value*		*Coef*	*t-value*	
Constant	44.088	213.469	***	59.288	81.241	***
Discount rate[2]	2.524	4.523	**	1.548	2.768	***
Male				2.679	11.449	***
Age				-0.467	-23.395	***
Educational level father[3]				0.152	2.579	***
Educational level mother[3]				0.096	1.414	
Immigrant[4]				0.994	2.743	***
Level high school[5]				1.388	5.184	***
Average grade[6]				-1.440	-14.670	***
Field dummies[7]				Included		

* = Significant at 10% level, ** = Significant at 5% level, *** = Significant at 1% level.
Source: Research Centre for Education and the Labour Market Graduate Survey 2003.

1. The dependent variable is the number of months the respondent indicates to have needed to complete the professional college education. We selected the respondents who needed less than 8 years to complete the education. Both regressions are OLS.
2. Discount rate is measured by the following question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated the answer at 50 days and calculate the annual discount rate as ((10+days)/10)^(1/3)-1.
3. The educational level of the father or the mother is reported by the respondent. There were 8 categories varying from primary school to university.
4. A person is defined to be an immigrant if he is not born in the Netherlands or one or both of his parents are not born in the Netherlands.
5. Level high school is a dummy variable with the value 1 if the person had followed a high level high school (vwo) and 0 if he followed a low level high school (havo).
6. This is the average grade the person scored during the professional college education.
7. Field dummies are 9 groups of educational disciplines at the professional college level: Agriculture, Education, Technics, Economics, Health, Behavior and society, Language and culture, Law and public order, and Science.

Graph 4
Continued education after college and the discount rate



Source: Research Centre for Education and the Labour Market Graduate Survey 2003.

1. Continuing education is a dummy variable with the value 1 for graduates with a professional college education who continue studying and 0 for those who do not continue. In this graph we multiply this by 100 and hence define the continuing rate in percentages.
2. Discount rate is measured by the following question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated the answer at 50 days and calculate the annual discount rate as ((10+days)/10)^(1/3)-1. In this graph we multiply this by 100 and hence indicate the discount rates as percentages.

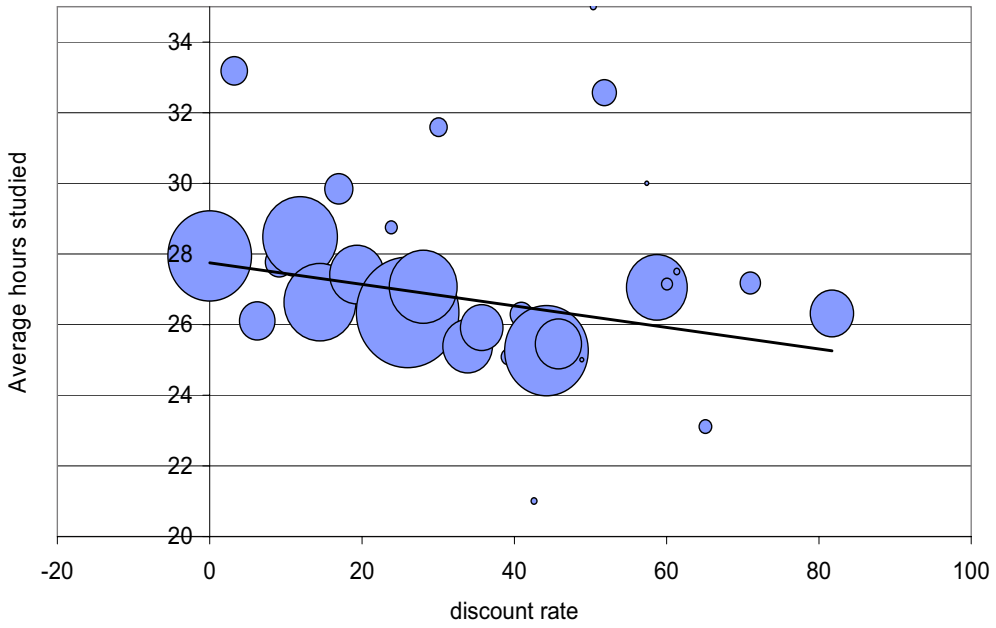
Table 4
The probability to continue education after college and the discount rate[1]

	Coef	*t-value*		*Coef*	*t-value*	
Constant	0.262	33.749	***	0.340	12.749	***
Discount rate[2]	0.122	5.800	***	0.128	6.294	***
Male				0.084	9.873	***
Age				-0.010	-13.598	***
Educational level father[3]				0.007	3.365	***
Educational level mother[3]				0.008	3.321	***
Immigrant[4]				0.028	2.104	**
Level high school[5]				0.041	4.209	***
Average grade[6]				0.007	1.978	**
Field dummies[7]				Included		

* = Significant at 10% level, ** = Significant at 5% level, *** = Significant at 1% level.
Source: Research Centre for Education and the Labour Market Graduate Survey 2003.

1. The dependent variable is a dummy variable with the value 1 for graduates with a professional college education who continue studying and 0 for those who do not continue. Both regressions are OLS.
2. Discount rate is measured by the following question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated the answer at 50 days and calculate the annual discount rate as ((10+days)/10)^(1/3)-1.
3. The educational level of the father or the mother is reported by the respondent. There were 8 categories varying from primary school to university.
4. A person is defined to be an immigrant if he is not born in the Netherlands or one or both of his parents are not born in the Netherlands.
5. Level high school is a dummy variable with the value 1 if the person had followed a high level high school and 0 if he followed a low level high school.
6. This is the average grade the person scored during the professional college education.
7. Field dummies are 9 groups of educational disciplines at the professional college level: Agriculture, Education, Technics, Economics, Health, Behavior and society, Language and culture, Law and public order, and Science.

Graph 5
Hours studying and the discount rate



Source: Research Centre for Education and the Labour Market Graduate Survey 2003.

1. Continuing education is a dummy variable with the value 1 for graduates with a professional college education who continue studying and 0 for those who do not continue. In this graph we multiply this by 100 and hence define the continuing rate in percentages.
2. Discount rate is measured by the following question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated the answer at 50 days and calculate the annual discount rate as ((10+days)/10)^(1/3)-1. In this graph we multiply this by 100 and hence indicate the discount rates as percentages.

Table 5
Hours studying and the discount rate[1]

	Coef	*t-value*		*Coef*	*t-value*		*Coef*	*t-value*		*Coef*	*t-value*	
Constant	27.784	72.983	***	8.268	1.235		7.732	1.159		3.596	0.525	
Discount rate[2]	-3.197	-2.839	***	-2.676	-2.253	**	-3.036	-2.572	**	-2.848	-2.369	**
Male				-0.441	-0.934		-0.506	-1.076		-0.688	-1.212	
Age				0.488	1.499		0.518	1.606		0.764	2.386	**
Income level parents below 15,000 euros per year[3]				0.943	0.810		0.822	0.711		-0.655	-0.546	
Immigrant[4]				-2.011	-2.952	***	-1.948	-2.873	***	-2.182	-3.115	***
Math grade[5]				0.911	4.262	***	0.873	4.091	***	0.430	1.926	*
Reading grade[6]				0.524	1.704	*	0.540	1.766	*	0.749	2.363	**
Level high school[7]				2.035	4.118	***	2.139	3.125	***	3.596	0.525	
Level dummies further education[8]							Included			Not included		
Field dummies[9]							Not included			Included		

* = Significant at 10% level, ** = Significant at 5% level, *** = Significant at 1% level.
Source: Research Centre for Education and the Labour Market Graduate Survey 2003.

1. The dependent variable is the answer to the question: 'How much time do you spend studying in an average week in your education. All regressions are OLS.
2. Discount rate is measured by the following question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated the answer at 50 days and calculate the annual discount rate as ((10+days)/10)^(1/3)-1.
3. This is a dummy which has the value 1 if parents were in the lowest income category.
4. A person is defined to be an immigrant if he is not born in the Netherlands or one or both of his parents are not born in the Netherlands.
5. In the Dutch school system there is a separation between Math A (statistics) and Math B (geometry, arithmetic). Math B is considered to be a higher level of mathematics. When available we use the grade for math B, subtracting the average difference between math B and math A grades from people with grades in both to correct for differences in these scales.
6. This is the average grade in Dutch language, which is compulsory for all students.
7. The level of the high school the person followed is a dummy being 0 if the person had followed the low level high school and 1 if he followed the high level high school.
8. These consist of three dummies: one for vocational education, one for professional college and one for university.
9. These include 94 aggregates of educational disciplines in the three educational levels.

Table 6
Correcting the size of the effects of the discount rate for measurement error

	OLS[1]				*2SLS*[2]			
	Coef	Beta	t-value		Coef	Beta	t-value	
Length education[3]	2.980	0.035	2.365	**	14.129	0.205	2.378	**
Continue education[4]	0.099	0.037	2.238	**	0.417	0.192	1.976	**
Hours studying[5]	-4.632	-0.069	-3.814	***	-20.011	-0.372	-3.544	***

* = Significant at 10% level, ** = Significant at 5% level, *** = Significant at 1% level.
Source: Supplement Research Centre for Education and the Labour Market Graduate Survey 2005.

1. The three variables on the rows of this table are the dependent variables in our regressions. The (beta)coefficients and t-values are reported for the discount rate which is measured by the following subjective question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated our measure at 50 days and calculate the annual discount rate as ((10+days)/10)^(1/3)-1. We controlled in all regressions for gender, level of high school and we included a dummy with the value 1 if the respondent had followed an education at university and 0 if he followed a professional college education.
2. In the 2SLS, the dependent variable is the average discount rate measured by monetary questions. This is the average value of the answers to three monetary sets of questions. The first set of questions starts with 'What would you prefer 800 Euros now or 1200 euros in one year', after which a set of follow-up questions are asked. If they e.g. chose 800 euros, they got a similar question with the amounts 800 and 1400 euros. If they chose 1200 euros, they had to choose between 800 and 1000 euros. Depending on these choices they got one more question in which we again varied the answer possibilities. The second set starts with What would you prefer 1000 Euros now or 4000 euros in four years? And the third set starts with: What would you prefer 800 Euros in one year or 1200 euros in two years? The instrument is the discount rate.
3. Length of education is the amount of time it took the respondent to complete the education in months.
4. Continuing education is a dummy variable with the value 1 for graduates who continue studying and 0 for those who do not continue.
5. We measured hours studying in retrospect. So we asked the graduated how many hours they studied in each year of their education and took the average of the first four years.

Table 7
Descriptive statistics[1]

	HAVO	*VWO*	*COLLEGE*
Male (%)	38.3	38.9	37.5
Immigrant[2] (%)	14.2	12.2	10.8
Age (mean)	18.6	19.1	26.6
Years needed to obtain diploma (mean)	5.1	6.1	3.8
Studying[3] (%)	90.7	94.8	19.0
Hours studying per week[4] (mean)	25.7	28.1	-
Working (%)	5.7	2.8	68.4
Hours working per week (mean)	13.5	10	33
Gross monthly wage (mean, Euros)	341.7	304.5	1,898
Number of respondents	1,976	1,903	15,601

Source: Research Center for Education and the Labor Market's School Leaver Survey, 2003.
1. The data are collected 1.5 years after graduation. HAVO is a lower high school education with a nominative duration of 5 years, VWO a higher high school education with a nominative duration of 6 years, College is a 4 years professional college education . Both HAVO and VWO graduates can go to college but only VWO graduates can go to university.
2. Not native born or one or both parents not native born.
3. Studying full time or in combination with work
4. High school respondents: hours currently studying in college or university. College respondents: question not asked

Table 8
The relationship between the discount rate based on the vacation question and monetary measures of the discount rate[1]

	Beta	*t-value*	
Average monetary questions 1,2,3 [2]	0.177	10.568	***
Monetary question 1[3]	0.150	8.967	***
Monetary question 2[4]	0.138	8.235	***
Monetary question 3[5]	0.171	10.191	***

* = Significant at 10% level, ** = Significant at 5% level, *** = Significant at 1% level.
Source: Supplement Research Centre for Education and the Labour Market Graduate Survey 2005.

1. The dependent variable is the discount rate which is measured by the following subjective question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated our measure at 50 days and calculate the annual discount rate as ((10+days)/10)^1/3-1. The regressions have been run separately per monetary question. All regressions are OLS.
2. This is the average value of the answers to the three monetary questions below.
3. We asked the people to answer the following question: What would you prefer 800 Euros now or 1200 euros in one year. We made a tree of follow-up questions depending on the answer they gave. If they e.g. chose 800 euros, they got a similar question with the amounts 800 and 1400 euros. If they chose 1200 euros, they had to choose between 800 and 1000 euros. Depending on these choices they got one more question in which we again varied the answer possibilities.
5. The second tree of questions has the same mechanism but started with the question: What would you prefer 1000 Euros now or 4000 euros in four years?
6. The third tree of questions has the same mechanism but started with the question: What would you prefer 800 Euros in one year or 1200 euros in two years?

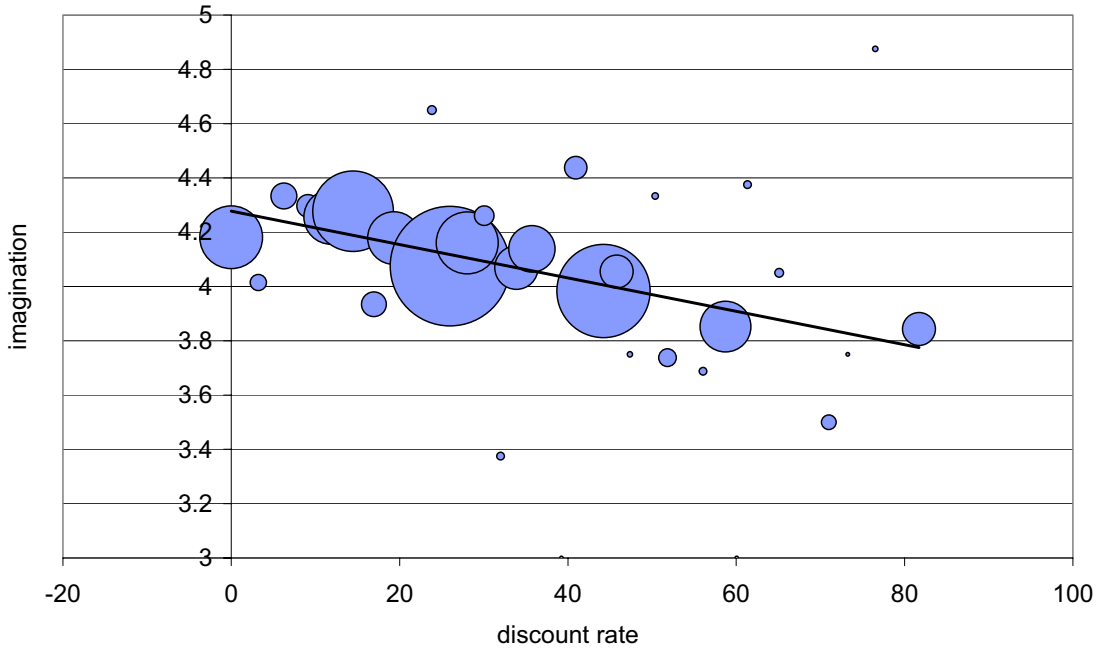
Table 9
Relationship between measures of the discount rate and indicators of risky behavior[1]

		Discount rate[2]			*Discount rate based on monetary questions*[3]		
Question	Answer categories	beta	t-value		beta	t-value	
If you have to study hard because you have an exam in one week and you were therefore planning to stay home, but a friend calls you to go out that evening, what are the odds you would join him/her anyway?	1 never…5 always	0.044	3.199	***	0.053	3.806	***
In general, how is your health?	1 bad…5 excellent	-0.010	-0.711		-0.047	3.442	***
If you go out, how many glasses of alcohol do you use on average?	# glasses	0.022	1.703	*	0.031	2.426	**
Do you smoke?	1 no never, 2 yes sometimes, 3 yes regularly	0.044	3.159	***	0.078	5.619	***

* = Significant at 10% level, ** = Significant at 5% level, *** = Significant at 1% level.
Source: Supplement Research Centre for Education and the Labour Market Graduate Survey 2005.

1. The regressions have been run separately per indicator for risky behavior. All regressions are OLS. We control for gender, age, and include a university dummy.
2. The discount rate is measured by the following subjective question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated our measure at 50 days and calculate the annual discount rate as ((10+days)/10)^(1/3)-1.
3. The discount rate based on monetary questions is the average value of the answers to three monetary sets of questions. The first set of questions starts with 'What would you prefer 800 Euros now or 1200 euros in one year', after which a set of follow-up questions are asked. If they e.g. chose 800 euros, they got a similar question with the amounts 800 and 1400 euros. If they chose 1200 euros, they had to choose between 800 and 1000 euros. Depending on these choices they got one more question in which we again varied the answer possibilities. The second set starts with What would you prefer 1000 Euros now or 4000 euros in four years? And the third set starts with: What would you prefer 800 Euros in one year or 1200 euros in two years?

Graph 6
Discount rate and imagination



Source: Supplement Research Centre for Education and the Labour Market Graduate Survey 2005.

1. Discount rate is measured by the following question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated the answer at 50 days and calculate the annual discount rate as ((10+days)/10)^(1/3)-1. In this graph we multiply this by 100 and hence indicate the discount rates as percentages.
2. The average answer to the statements related to imagination which had an ex post character: 1. My life now is totally different from what I expected it to be 3 years age (-). 2. The last year has been quite different from what I expected (-), 3. If I have made an important decision, the outcome usually resembles the image I had on beforehand to a large extent. 4. My life now is totally different from what I expected 5 years ago (-).

Table 10
Correlation between different measures of the discount rate and measures of imagination[1]

	Imagination 1[7]	Imagination 2[8]	Ex ante imagination[9]	Ex post imagination[10]	All questions related to imagination[11]
Discount rate[2]	-0.097***	-0.050***	-0.061***	-0.085***	-0.079***
Average monetary question[3]	-0.071***	-0.079***	-0.058***	-0.077***	-0.086***
Monetary question 1[4]	-0.057***	-0.055***	-0.046***	-0.058***	-0.063***
Monetary question 2[5]	-0.059***	-0.083***	-0.061***	-0.064***	-0.083***
Monetary question 3[6]	-0.066***	-0.071***	-0.047***	-0.075***	-0.078***

* = Significant at 10% level, ** = Significant at 5% level, *** = Significant at 1% level.
Source: Supplement Research Centre for Education and the Labour Market Graduate Survey 2005.

1. The regressions have been run separately per monetary question. All regressions are OLS, controlling for male, a university dummy and age. We report the beta coefficients.
1. The discount rate is measured by the following subjective question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated our measure at 50 days and calculate the annual discount rate as ((10+days)/10)^1/3-1.
2. This is the average value of the answers to the three monetary questions below.
3. We asked the people to answer the following question: What would you prefer 800 Euros now or 1200 euros in one year. We made a tree of follow-up questions depending on the answer they gave. If they e.g. chose 800 euros, they got a similar question with the amounts 800 and 1400 euros. If they chose 1200 euros, they had to choose between 800 and 1000 euros. Depending on these choices they got one more question in which we again varied the answer possibilities.
5. The second tree of questions has the same mechanism but started with the question: What would you prefer 1000 Euros now or 4000 euros in four years?
6. The third tree of questions has the same mechanism but started with the question: What would you prefer 800 Euros in one year or 1200 euros in two years?
7. The average answer to the statements: 1. I can imagine well what my next job will look like, 2. My life now is totally different from what I expected it to be 3 years age (-). 3. I clearly see what I can expect the coming year, 4. The last year has been quite different from what I expected (-), 5. If I have to make an important decision, I make an elaborate image of the consequences of the decision, 6. If I have made an important decision, the outcome usually resembles the image I had on beforehand to a large extent. The answer categories varied between 1. Do not agree at all….7. Agree totally. We recoded the answers to the questions indicated with (-) to get positive scales.
8. The average answer to the statements: 1. I sometimes imagine what my life will look like in 15 years, 2. I have a clear image of what my life will look like in 10 years, 3. My life now is totally different from what I expected 5 years ago (-). The answer categories varied between 1. Do not agree at all….7. Agree totally. We recoded the answers to the question indicated with (-) to get positive scales.
9. The average answer to the statements which had an ex ante character: 1. I can imagine well what my next job will look like, 2. I clearly see what I can expect the coming year, 3. If I have to make an important decision, I make an elaborate image of the consequences of the decision, 4. I sometimes imagine what my life will look like in 15 years, 5. I have a clear image of what my life will look like in 10 years.
10. The average answer to the statements which had an ex post character: 1. My life now is totally different from what I expected it to be 3 years age (-). 2. The last year has been quite different from what I expected (-), 3. If I have made an important decision, the outcome usually resembles the image I had on beforehand to a large extent. 4. My life now is totally different from what I expected 5 years ago (-).
11. The average answer to all the above mentioned statements.

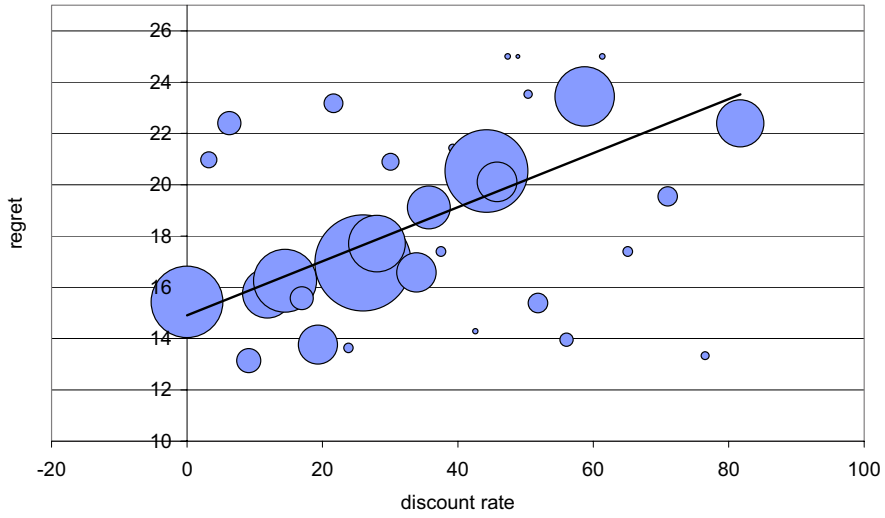
Table 11
Relationship between measures about doubt and uncertainty related to the educational choice and imagination[1]

		Imagination[2]		
		Beta	t-value	
When did you decide which education you were going to follow?	1. I never really doubted…6 . Right before the start of the education	-0.134	-7.996	***
How much did you doubt the choice of your educational discipline?	1. Hardly any doubt…4. Doubted very strongly	-0.135	-8. 027	***
Is the image you now have of your education in line with the image you had at the moment you chose?	1. The image is not at all in line with the image I had…5. The image is completely in line with the image I had	0.240	14.529	***
In general, has the image you now have of your education become more or less favorable in comparison with the image you had at the moment you chose?	1. Much more favorable 2. more favorable, 3. remained similar, 4. less favorable 5. Much less favorable	-0.094	-5.575	***
In general, has the image you now have of your education become more or less favorable in comparison with the image you had at the moment you chose?	1 remained similar, 2. more favorable OR less favorable, 3. much more favorable OR much less favorable	-0.124	-7.330	***
How did you experience the transition from this education to what you do now?	1 Hardly a transition … 5 A very big step	-0.215	-12.960	***

* = Significant at 10% level, ** = Significant at 5% level, *** = Significant at 1% level.
Source: Supplement Research Centre for Education and the Labour Market Graduate Survey 2005.

1. All regressions are OLS and have been run separately per indicator controlling for male, a university dummy and age.
2. The average answer to the statements related to imagination which had an ex post character: 1. My life now is totally different from what I expected it to be 3 years age (-). 2. The last year has been quite different from what I expected (-), 3. If I have made an important decision, the outcome usually resembles the image I had on beforehand to a large extent. 4. My life now is totally different from what I expected 5 years ago (-).

Graph 7
Discount rate and regret[1]



Source: Research Centre for Education and the Labour Market Graduate Survey 2003.

1. Regret is a dummy variable with the value 1 for graduates who answered no to the question 'In retrospect, would you choose the professional college education you followed again?' and 0 for those who answered yes. In this graph we multiply this by 100 and hence define the regret rate in percentages.
2. Discount rate is measured by the following question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated the answer at 50 days and calculate the annual discount rate as ((10+days)/10)^(1/3)-1. In this graph we multiply this by 100 and hence indicate the discount rates as percentages.

Table 12
Relationship between the discount rate and regret[1]

	Coef	*t-value*		*Coef*	*t-value*	
Constant	0.149	22.416	***	0.249	9.967	***
Discount rate[2]	0.105	5.872	***	0.084	4.356	***
Male				-0.004	-0.548	
Age				-0.003	-3.719	***
Educational level father[3]				0.003	1.299	
Educational level mother[3]				0.005	2.342	**
Immigrant[4]				0.048	3.901	***
Level high school[5]				0.071	7.701	***
Average grade[6]				-0.023	-6.806	***
Field dummies[7]				included		

* = Significant at 10% level, ** = Significant at 5% level, *** = Significant at 1% level.
Source: Research Centre for Education and the Labour Market Graduate Survey 2003.

1. The dependent variable is a dummy variable with the value 1 for graduates who answered no to the question 'In retrospect, would you choose the professional college education you followed again?' and 0 for those who answered yes. Both regressions are OLS.
2. Discount rate is measured by the following subjective question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated our measure at 50 days and calculate the annual discount rate as ((10+days)/10)^(1/3)-1.
3. The educational level of the father or the mother is reported by the respondent. There were 8 categories varying from primary school to university.
4. A person is defined to be an immigrant if he is not born in the Netherlands or one or both of his parents are not born in the Netherlands.
5. Level high school is a dummy variable with the value 1 if the person had followed a high level high school and 0 if he followed a low level high school.
6. This is the average grade the person scored during the professional college education.
7. Field dummies are 9 groups of educational disciplines at the professional college level: Agriculture, Education, Technics, Economics, Health, Behavior and society, Language and culture, Law and public order, and Science.

Table 13
Relationship between the willingness to investment in different domains of life and the clarity of the image[1]

	Coef	*t-value*	
Constant	2076.697	22.903	***
Clear image[2]	-12.829	-2.438	**
Discount rate[3]	8.420	10.822	***
M2[4]	172.778	4.791	***
M3[5]	210.713	5.699	***
M4[6]	195.364	5.167	***
Vocational school dummy	316.071	6.877	***
Professional college dummy	-134.042	-3.144	***
University dummy	-413.048	-8.565	***
Age	22.192	6.884	***
Male	-190.031	-7.279	***

* = Significant at 10% level, ** = Significant at 5% level, *** = Significant at 1% level.
Source: Supplement Research Centre for Education and the Labour Market Graduate Survey 2005.

1. The dependent variable is the answer to the question 'Suppose the government wants to stimulate that people save money for events later in their life. For instance, there could be a fund in which money is put which you may spend on expenses when you have got children, e.g. for childcare. The money is invested as long as you do not need it, hence the amount grows over time. If you do not have children when you are 40 years of age, you receive the amount of money including interest. If you may choose between receiving 1000 euros in cash now or having a larger amount of money invested in the fund, how much money would at least have to be invested in the fund before you would agree with this destination?' Similar questions were asked with respect to having a house, being ill, and being retired. We pooled the data for these 4 sets of questions. The regression is OLS. We selected people who did not have children, a serious disease, a house or were retired and selected answers between 1,000 and 10,000 euros.
2. We asked 'Often people get children at a certain moment in their lives. Do you have a clear image why it would be fun to have children? (1 No image at all…7 A very clear image) Do you have a clear image of the disadvantages related to having children? (1 No image at all…7 A very clear image)'. Similar questions were asked with respect to having a house, being ill, and being retired. We pooled the data for these 4 sets of questions. The average of the advantages and the disadvantages is the measure for the clarity of the image.
3. Discount rate is measured by the following subjective question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated our measure at 50 days and calculate the annual discount rate as ((10+days)/10)^1/3-1.
4. Dummy for the set of questions related to having a serious disease.
5. Dummy for the set of questions related to being retired.
6. Dummy for the set of questions related to having a house.

Table 14
Regret, duration of the stay in education, probability of continued education and hours studied for students who formed an image about their field due to family working in this field and those who did not gain from such information[1]

	Regret[2] *%*	*Duration of stay in education (months)*[3]	*Continue education*[4] *%*	*Hours studied*[5]
No specific information from family member	22.3	54.2	28.3	26.8
Specific information from family member	18.5**	53.3*	29.7	26.9

* = Significant difference at 10% level, ** = Significant difference at 5% level, *** = Significant difference at 1% level.
Source: Supplement Research Centre for Education and the Labour Market Graduate Survey 2005.

1. Indicate in which way you formed an image of the education you followed or the profession you can practice with the education. Answer categories were: 1. by the job or education of my father, 2. by the job or education of my mother, 3. by the job or education of other relatives, 4. by the job or education of friends, 5. by the media, 6. apprenticeship, 7. courses at school, 8. study counselor. The variable specific information from family members is a combination of the first three answer categories.
2. Regret is a dummy variable with the value 1 for graduates who answered no to the question 'In retrospect, would you choose the professional college education you followed again?' and 0 for those who answered yes. In this table we multiply this by 100 and hence define the regret rate in percentages.
3. The length of education is the number of months the respondent indicates to have needed to complete the professional college education or the university.
4. Continuing education is a dummy variable with the value 1 for graduates with a professional college education or university degree who continue studying and 0 for those who do not continue. In this table we multiply this by 100 and hence define the continuing rate in percentages.
5. Average amount of hours studied in the first four years of the professional college or university education.

Table 15
Variables

Psychological variables		*Mean answer on 7-point scale (1=totally do not agree, 7=totally agree)*
Imagination	I sometimes imagine what my life will look like in 15 years	4.70
	I have a clear image about what my life will look like in 10 years	3.48
	My life now is very different from what I thought five years ago	4.58
Locus of control	Set backs are usually due to mistakes people make	3.77
	Most people do not realize to what extent their life is determined by coincidences	4.26
	Whether I reach targets that I have in my life is not a matter of luck	4.80
Anxiety	I often think about unpleasant events in the past	3.57
	I often tend to check whether I did everything right	4.96
	I think it is scary to go to places I have never been to	3.03
Self-image	My opinions about myself seem to change regularly	3.28
	In general I have a clear idea about who and what I am	5.38
	I often doubt about decisions because I do not know exactly what I want	3.58
Self-confidence	I tend to think someone else is better than I am	3.83
	I think I have enough reason to be proud of myself	5.38
	The difference between who I am and what I want is large	3.09
Cognitive skills		% Respondents answering question correctly
	Together, a ball and a cap cost 1.10 Euros. The ball costs 1.00 Euros more than the cap. How much does the cap cost?	22.3
	If you toss a fair coin twice, how large is the chance that 'Head' comes up at least once?	12.3
	If 5 machines need 5 minutes to produce 5 things, how long do 100 machines need to make 100 things?	36.7
	Two cars are approaching each other in the same lane. Car A drives at a speed of 120 km/h. Car B at 60 km/h. How large is the distance between these two cars one minute before they collide?	48.2
	In a lake there is a patch of lily pads. Every day the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half the lake?	52.4
	If Timo drinks a bottle of water in 6 days and Esther takes 12 days to finish a bottle, how long does it take before they finish one bottle together?	41.7
	If three salesmen can pack six toys in half an hour, how many salesmen would one need to pack 20 toys in one hour	70.3
	At a match, Bart comes in at the 15^{th} place and at the 15^{th} last place. How many people participated at the match?	44.9

Table 16
Other explanatory variables of the discount rate and imagination

	Imagination[1]			*Discount rate*[2]			*Discount rate*[2]		
	Coef	t-value		Coef	t-value				
Constant		14.324	***		6.294	***		7.103	***
Male	-0.014	-0.766		-0.047	-2.501	**	-0.048	-2.540	**
Age	-0.077	-4.149	***	0.008	0.387		0.002	0.079	
Educational level father[3]	0.035	1.860	*	-0.019	-0.982		-0.017	-0.840	
Educational level mother[3]	-0.008	-0.421		0.016	0.842		0.016	0.830	
Immigrant[4]	-0.060	-3.586	***	0.058	3.307	***	0.053	3.045	***
Level high school[5]	0.045	2.115	**	0.034	1.525		0.037	1.663	*
Average grade[6]	0.057	3.421	***	-0.034	-1.953	*	-0.030	-1.687	*
Dummy university	-0.002	-0.089		0.001	0.048		0.001	0.060	
Locus of control[7]	0.083	5.004	***	-0.023	-1.314		-0.016	-0.928	
Anxiety[8]	-0.014	-0.725		-0.025	-1.267		-0.026	-1.300	
Self-image[9]	0.226	10.350	***	-0.064	-2.776	***	-0.047	-2.031	**
Self-confidence[10]	0.059	2.614	***	0.034	1.417		0.038	1.610	
Cognitive skills[11]	0.055	2.945	***	-0.066	-3.377	***	-0.063	-3.215	***
Risk preference[12]	0.027	1.618		-0.046	-2.591	***	-0.044	-2.510	**
Fun in education[13]	-0.005	-0.307		0.016	0.874		0.015	0.851	
Imagination[1]							-0.074	-4.063	***

* = Significant at 10% level, ** = Significant at 5% level, *** = Significant at 1% level.
Source: Supplement Research Centre for Education and the Labour Market Graduate Survey 2005.

1. The average answer to the statements related to imagination which had an ex post character: 1. My life now is totally different from what I expected it to be 3 years age (-). 2. The last year has been quite different from what I expected (-), 3. If I have made an important decision, the outcome usually resembles the image I had on beforehand to a large extent. 4. My life now is totally different from what I expected 5 years ago (-).
2. Discount rate is measured by the following subjective question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated our measure at 50 days and calculate the annual discount rate as ((10+days)/10)^1/3-1. Both regressions are OLS.
3. The educational level of the father and the mother are reported by the respondent. There were 7 categories varying from primary school to university.
4. A person is defined to be an immigrant if he is not born in the Netherlands or one or both of his parents are not born in the Netherlands.
5. Level high school is a dummy variable with the value 1 if the person had followed a high level high school and 0 if he followed a low level high school.
6. This is the average grade the person scored during the professional college education or the university.
7. Locus of control is defined by the average answer to the statements: 1. Set backs are usually due to mistakes people make, 2. Most people do not realize to what extent their life is determined by coincidences (-), 3. Whether I reach targets that I have in my life is not a matter of luck. These statements were asked on a 7 point scale. We recoded the statements indicated with (-). This is done similarly to the statements below.
8. Anxiety is defined by the average answer to the statements: 1. I often think about unpleasant events in the past, 2. I often tend to check whether I did everything right, 3. I think it is scary to go to places I have never been to.
9. Self-image is defined by the average answer to the statements: 1. My opinions about myself seem to change regularly (-), 2. In general I have a clear idea about who and what I am, 3. I often doubt about decisions because I do not know exactly what I want (-).
10. Self confidence is defined by the average answer to the statements: 1. I tend to think someone else is better than I am (-), 2. I think I have enough reason to be proud of myself, 3. The difference between who I am and what I want is large (-).
11. Cognitive skills is defined by the amount of correct answers to 8 questions taken from Frederick (2005). An example is 'Together, a ball and a cap cost 1.10 Euros. The ball costs 1.00 Euros more than the cap. How much does the cap cost?'.
12. Risk aversion is measured by offering the respondents one amount of money they can get for sure or a higher amount of money with a chance of getting it and a chance of not getting it. We asked 6 questions in which we varied the amounts of money and the chance of getting the money. To deduce information most efficiently, we used follow-up questions. For instance, we started with the question: What would you choose: 800 Euros, or 50% chance on nothing, 50% chance on 2000 Euros. If the respondent chose 800 Euros, he would get the question: What would you choose: 800 Euros, or 50% chance on nothing, 50% chance on 2400 Euros. A respondent who chose 2000 Euros in the first question would get the question: What would you choose: 800 Euros, or 50% chance on nothing, 50% chance on 1600 Euros.
13. Did you have fun during your education? 1. Not at all..7 A lot of fun.

Table 17
Other explanations for the duration of the stay in education[1]

	coef	*t-value*		*coef*	*t-value*	
Constant		32.401	***		32.370	***
Discount rate[2]	0.029	2.094	**	0.025	1.807	*
Imagination[3]				-0.056	-3.869	***
Male	0.142	9.505	***	0.141	9.391	***
Age[4]	-0.293	-20.784	***	-0.296	-20.980	***
Educational level father[5]	0.005	0.349		0.007	0.472	
Educational level mother[5]	0.032	2.073	**	0.032	2.069	**
Immigrant[6]	0.043	3.078	***	0.039	2.825	***
Level high school[7]	0.062	3.491	***	0.065	3.677	***
Dummy university	0.440	24.597	***	0.438	24.514	***
Locus of control[8]	-0.030	-2.165	**	-0.024	-1.728	*
Anxiety[9]	-0.046	-2.871	***	-0.048	-2.996	***
Self-image[10]	-0.025	-1.350		-0.012	-0.636	
Self-confidence[11]	-0.018	-0.938		-0.016	-0.838	
Cognitive skills[12]	0.055	3.484	***	0.058	3.656	***
Risk preference[13]	-0.054	-3.858	***	-0.053	-3.753	***
Fun in education[14]	0.002	0.174		0.002	0.153	

* = Significant at 10% level, ** = Significant at 5% level, *** = Significant at 1% level.
Source: Supplement Research Centre for Education and the Labour Market Graduate Survey 2005.

1. Length of the education is the number of months the person has spent in the education. All regressions are OLS.
2. Discount rate is measured by the following subjective question: Suppose you win a 10-day holiday trip to an interesting destination. To spread participation, you are asked if you can delay your trip with three years in exchange for a longer vacation. How many days should you be offered in addition to accept the offer in 3 years? We truncated our measure at 50 days and calculate the annual discount rate as ((10+days)/10)^1/3-1. Both regressions are OLS.
3. The average answer to the statements related to imagination which had an ex post character: 1. My life now is totally different from what I expected it to be 3 years age (-). 2. The last year has been quite different from what I expected (-), 3. If I have made an important decision, the outcome usually resembles the image I had on beforehand to a large extent. 4. My life now is totally different from what I expected 5 years ago (-).
4. Age minus length education.
5. The educational level of the father and the mother are reported by the respondent. There were 7 categories varying from primary school to university.
6. A person is defined to be an immigrant if he is not born in the Netherlands or one or both of his parents are not born in the Netherlands.
7. Level high school is a dummy variable with the value 1 if the person had followed a high level high school and 0 if he followed a low level high school.
8. Locus of control is defined by the average answer to the statements: 1. Set backs are usually due to mistakes people make, 2. Most people do not realize to what extent their life is determined by coincidences (-), 3. Whether I reach targets that I have in my life is not a matter of luck. These statements were asked on a 7 point scale. We recoded the statements indicated with (-). This is done similarly to the statements below.
9. Anxiety is defined by the average answer to the statements: 1. I often think about unpleasant events in the past, 2. I often tend to check whether I did everything right, 3. I think it is scary to go to places I have never been to.
10. Self-image is defined by the average answer to the statements: 1. My opinions about myself seem to change regularly (-), 2. In general I have a clear idea about who and what I am, 3. I often doubt about decisions because I do not know exactly what I want (-).
11. Self confidence is defined by the average answer to the statements: 1. I tend to think someone else is better than I am (-), 2. I think I have enough reason to be proud of myself, 3. The difference between who I am and what I want is large (-).
12. Cognitive skills is defined by the amount of correct answers to 8 questions taken from Frederick (2005). An example is 'Together, a ball and a cap cost 1.10 Euros. The ball costs 1.00 Euros more than the cap. How much does the cap cost?'.
13. Risk aversion is measured by offering the respondents one amount of money they can get for sure or a higher amount of money with a chance of getting it and a chance of not getting it. We asked 6 questions in which we varied the amounts of money and the chance of getting the money. To deduce information most efficiently, we used follow-up questions. For instance, we started with the question: What would you choose: 800 Euros, or 50% chance on nothing, 50% chance on 2000 Euros. If the respondent chose 800 Euros, he would get the question: What would you choose: 800 Euros, or 50% chance on nothing, 50% chance on 2400 Euros. A respondent who chose 2000 Euros in the first question would get the question: What would you choose: 800 Euros, or 50% chance on nothing, 50% chance on 1600 Euros.
14. Did you have fun during your education? 1. Not at all..7 A lot of fun.