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The Effect of Education on Time Preferences

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LABOR AND POPULATION

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Abstract

I examine whether education increases patience. Admission decisions in a public college in Mexico are determined through a lottery. I find that applicants who were successful in the draw were more likely to study in the following years. I surveyed the applicants to this college almost two years after the admission decision was made and measured their time preferences with a series of hypothetical inter-temporal choice questions. I find that individuals who were successful in the admission lottery were, on average, more patient. I argue that this evidence points towards a causal effect of education on time preferences.

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1 Introduction

Economists have hypothesized that education might change time preferences.[1] This can explain why more educated people make more investments for their future and thus have better life-outcomes. However, the difficulty in finding an appropriate estimation strategy has prevented researchers from even attempting to establish a causal link between schooling and patience.

Besides being a potential explanation of the correlation between education and a variety of outcomes, it is important to study the causal effect of schooling on time preferences for its implications about education policy. For example, if the hypothesis that schooling increases patience were correct, it would suggest that governments can, by facilitating access to schools, encourage individuals to invest more throughout their lives. Suppose more patient individuals make more investments with positive returns (such as financial investments and investments in health or in further education), then making someone stay in school an additional year would have a larger impact on the individual's lifetime wealth than the increase solely associated with the labor-market return of a single year in school.

The researcher faces two main difficulties when studying the impact of education on patience. The first one is that time preferences are not readily observable. To solve it, many studies have used hypothetical choice questions where the interviewee is asked to choose between current and future rewards. Although the measures thus obtained are not perfect, they have been shown to correlate with behaviors in the way we would expect them to (i.e. the most patient individuals save more, take better care of their health, etc.). Previous studies have also used these measures to establish a correlation between schooling and patience.

[1] See, for example, Becker and Mulligan (1997), Cutler and Lleras-Muney (2006) and Oreopoulos and Salvanes (2010)

The second difficulty is finding an estimation strategy that allows disentangling the causal effect from reverse causality and from third, unobserved, factors. The major concern in this case is that the correlation between education and time preferences occurs because the most patient individuals decide to obtain more schooling. This difficulty has prevented previous research from providing a causal estimate of schooling on time preferences.

This paper uses a natural experiment to study this issue. A public college in Mexico City, which I call the Uni throughout, randomizes all applicants into a group that can enter immediately (which I call the *immediate admission group*) and a group that has to wait one year before enrolling (the *delayed admission group*).

For the 2007/2008 academic year, the lottery took place in June of 2007. Individuals who were successful in the lottery were enrolled to start classes in September 2007, whereas *delayed admission* individuals had to wait until September of 2008 to do so. Instead of waiting, some *delayed admission* applicants started college in some other institution. However, a large proportion of them did not study in any college during the 2007/2008 academic year; furthermore, some did not study in 2008/2009 either. In the 2007/2008 academic year, about 80% of *immediate admission* applicants and 42% of *delayed admission* were studying in some college (i.e. at the Uni or elsewhere). Therefore, by the fall of 2008, the average number of education years within the *immediate admission group* was larger than within the *delayed admission group*.

In the fall of 2008, I surveyed the cohort of applicants for the 2007/2008 academic year. The survey instrument included a series of questions intending to measure time preferences. Respondents were presented with a scenario where they had to choose between a present reward and a larger future reward. In a first set of questions the options were either immediately

receiving a certain amount of money or receiving a larger sum one year later. A second set of questions was similar to the first, except that the rewards consisted of trips of different durations.

I find that individuals in the *immediate admission* group tended to give "more patient" answers to the time preference questions that use trips as a reward (that is, they were more likely to choose the longer trip in the future over the present reward). However, I don't find a statistically significant difference when using monetary rewards.

I argue that since the lottery outcome does not depend on the characteristics of the applicant, its impact on time-preferences (when measured with the trip questions) must have come through its effect on the activities the applicants took on (namely, making some more likely to study while making the rest less likely to do so but more likely to work-). That is, either schooling increases the level of patience or working reduces it.

One possible interpretation of these results is that there is in fact a causal effect of schooling on time preferences, but the questions with monetary rewards do not provide a good measure of patience. Consistent with this interpretation, I find that the responses to the questions with the trip rewards are much better predictors of behavior such as smoking than the responses to the questions with the monetary rewards. It is possible that the questions using monetary rewards are worse in eliciting time preferences since respondents are more likely to be thinking about liquidity issues when answering them.

However, the fact that the results are only significant with one set of measures is a cause of concern, and the results here presented are less conclusive because of that. Furthermore, even if it is the case that the *immediate-admission* individuals ended up being more patient than the *delayed-admission* ones, we cannot be sure if that happened because school made the former more patient, or because work made the latter less patient.

I start by reviewing the literature that documents the correlation between education and survey measures of time preferences, between time preferences and behavior and outcomes, and the research that suggests that education might have a causal effect on patience. In section 3, I describe the setting of this study. In section 4, I explain the empirical strategy, section 5 presents the results and discuss potential problems. Section 6 presents my conclusions.

2 Literature Review

A. Observed relationships between time preference, education, health and wealth.

Different studies have established a relationship between time preferences and life outcomes. This research spans different disciplines. Psychologists were the first to establish a link between the ability to delay gratification and lifetime outcome: 4-year old children who were able to delay gratification were found, over a decade later, to do better at school and to be better at coping with frustration and stress. This early strand of research is reviewed at Mischel, Shoda and Rodriguez (1989). More recent work has added by showing that these children grow into adults who are better at establishing social relationships (Carduchi, 2009). Recent research has focused on establishing the conditions under which the ability to delay gratification can be developed (Mischel and Ayduk, 2003; Carduchi, 2009).

Economists have studied this issue as well. Most have used hypothetical choice questions where individuals are asked to choose between present rewards and larger future rewards. The

first studies used questions that involved monetary rewards but more recently researchers have used rewards in other domains such as health and recreation. Most studies have found relationships between time preference and behavior, although some studies find this relationship with only a subset of the measures used.

In 1982, Fuchs conducted a survey of 500 individuals to study the relationship between health, education and time preferences. The survey included hypothetical questions where subjects were asked to choose between monetary rewards at different points in time. He studied the correlation between the answers to these hypothetical inter-temporal choice questions and the decision to smoke, finding a weak relationship between them. He found, however, that time discounting is significantly correlated with education.

Many have followed Fuchs in searching for correlations between behavior and measures of time preferences derived from hypothetical choice questions. Donkers and van Soest (1999) used a survey of Dutch households to obtain estimates of discount rates using hypothetical questions regarding tradeoffs between future and current payouts. They found that discount rates are correlated with the decision to own a home.

Stehphens and Krupka (2006) examined a survey of 4,800 households that was conducted in Seattle and Denver in the early 1970s. These surveys asked hypothetical inter-temporal choice questions in three different ways: by a simple choice of an X amount of money and a larger amount one year later (choice question), by asking respondents to match the amount of money that would be required one year later in order for them to be indifferent to the immediate X amount (matching questions), and by iterating the choice question to obtain a more precise estimate (titration question). The surveys analyzed contained information on assets held and on hours worked. All three subjective discount rate measures indicated that more patient households

accumulate more assets. They also found that more patient individuals worked more hours. From the three measures used, the coefficients from the titration response and the choice response were highly significant, while the matching response was only marginally significant; however, the estimated impact on hours worked was roughly the same across all three measures.

Ameriks, Caplin and Leahy (2003) showed that the propensity to plan, a characteristic associated with patience, is correlated with wealth accumulation. This holds even after controlling for income.

Khwaja, Silverman and Sloan (2007) do not find a statistical association between smoking choices and discounting when the measure of the latter comes from questions with monetary rewards, but do find it when they use alternative measures of time preference (such as financial planning).

Public health researchers have been interested in the link between time preferences and health-related behavior, mainly smoking, drinking and drug use. Bickel, Odum and Madden (1999) analyzed the time preference of smokers, individuals who had never smoked and individuals who had quit smoking. Current smokers discounted the value of delayed money more than the comparison groups. Kirby et al. (2002) performed a similar analysis to establish a correlation between impatience and heroin use.

In addition to findings suggesting that individuals deemed to be more patient have better wealth and health outcomes, the literature suggest that they tend to be more educated. Such a correlation was reported in Fuchs (1982), Kirby et al. (2002) and Ameriks, Caplin and Leahy (2003). Analyzing the General Social Survey, Oreopolous and Salvanes (2010) reported a correlation between education and the response to a question that intends to measure patience: “Do you agree with the following?: ‘Nowadays, a person has to live pretty much for today and

let tomorrow take care of itself'." This correlation holds even when controlling for family background variables. The next piece of evidence suggesting that the educated are more patient is provided by Ghez and Becker (1975), who showed that life-cycle consumption growth is correlated with schooling, a finding that is consistent with the educated being more patient and therefore saving more for future consumption.

B. The Causal Effect of Education Hypothesis

The research reviewed so far finds correlations between time preferences and long-term outcomes, and between time preferences and education. The latter relationship, however, is commonly interpreted as a causal effect of preferences on education, as economists hypothesize that more patient individuals are more likely to take on an investment whose payoff comes later in life.

To my knowledge, no study has attempted to establish empirically the causal impact of education on time preferences. However, many researchers have hypothesized that a causal effect on time preferences might be behind the impact of education on improved health (Cutler and Lleras-Muney, 2006). In their 2010 review, Oreopolous and Salvanes state, "Schooling could also lead individuals to make better decisions about health, marriage, and parenting style. Some suggest schooling improves patience, making individuals more goal-oriented and less likely to engage in risky behavior."

Why might education affect time preferences? Becker and Mulligan (1997) give the following explanation: "Schooling focuses students' attention on the future. Schooling can communicate images of the situations and difficulties of adult life, which are the future of childhood and

adolescence. In addition, through repeated practice at problem solving, schooling helps children learn the art of scenario simulation. Thus educated people should be more productive at reducing the remoteness of future pleasures" (pp. 735-736).

3. Setting

A. The Uni and its admission process.

About a third of young Mexico City residents obtain some college education (Perez-Arce, 2010). Although most public universities are free, admission is highly selective. For example, UNAM, the largest university, uses an entrance exam to screen its applicants, and this exam is passed by only 10% of the approximately 100,000 test takers (Salcedo, 2009).

There are a growing number of education options in the private sector. Originally, this sector consisted of only a few expensive and prestigious universities but has recently grown to include many small colleges spread out across the city. These institutions charge tuition but are more affordable than the more prestigious private universities.

The Uni is a relatively new, public university in Mexico City founded in 2001 by the city's government to try to meet the increasing demand for higher education. No tuition is charged to students, and admission is randomized. The only requirements to enter are having a high school diploma and a home in Mexico City. Students fill an online application, where a required field is a phone number with a Mexico City area code. Applicants have to choose two combinations of major, campus and time of day when they want to study (morning or afternoon). Throughout the paper, I call these combinations the 'options'.

From the available slots for new entrants, the Uni first assigns slots to individuals in a waitlist (applicants from previous years who did not secure a slot) and then offers spots to graduates of a system of high schools with which it has an agreement of direct entry. In 2007, this took about half of the total available places. The remaining slots are offered to new applicants through a lottery. I focus solely on the lottery applicants.

The Uni uses this system because its administration believes that everyone has the right to education and that past achievement partly reflects the opportunities students have had in the past; it believes that basing admissions on a test would worsen such inequalities.

I study the population of new applicants for the 2007/2008 academic year. About 40% of the 5,437 new applicants for this academic year were admitted, and the rest were placed on the waitlist. Those in the waitlist had priority for the following year and, in fact, every applicant ended up having the chance to enter in 2008/2009.

Each applicant was assigned a random number, and applicants were sorted by these numbers within separate lists for each ‘option’. A pre-set number of spaces were allocated to the lowest numbers within each list. Applicants who were not given a space in their first-choice ‘option’ were then considered for their second-choice ‘option’, but, because most ‘options’ were filled with the initial lists, few were admitted to their second-choice. The key feature of this process for my purposes is that admission was random conditional on the applicant's stated preferences (that is, conditional on the ‘option’ chosen); thus, two students who chose the same ‘option’ had the same probability of admission.

B. The survey

At least one telephone number was obtained for each of the 5,437 applicants to the 2007 lottery. I attempted to contact all of them[2]. The interviews took place between September and December of 2008. Each applicant was telephoned six times or until a response was obtained (either answering the survey or declining to participate). For about 1,000 applicants, none of the phone numbers were working (I cannot know whether the numbers were false or whether they had been permanently disconnected between the time of the application and the time of the survey). I obtained 2,344 answered interviews, which yields a response rate of 45% (or 55% if estimated by the valid phone numbers alone).[3] Most of the failures happened because the applicant could not be contacted, usually because he or she was not home during our attempts. Less than 10% directly rejected participating in the survey. Responding to the instrument took respondents approximately 10 minutes. It included questions about the respondent's current and previous-year activities, socioeconomic background and a series of questions intended to measure time preferences. An English translation of the survey instrument is included as Appendix 1. The original version in Spanish constitutes Appendix 2.

The survey included a module to obtain background information on the applicants. In addition to parental education, the survey included a series of questions on the socioeconomic status of the family when the applicant was 16 years old. Panel A of Table 1shows the mean characteristics of the population who responded to the survey. The average paternal education in

[2] 196 applicants were previously contacted for a pilot survey and were not interviewed again in this round.

[3] None of this information is checked before the draw; therefore, many of the applications probably contained false information. This can explain the large proportion of invalid or erroneous phone numbers.

the sample is nine years of schooling. The vast majority of respondents were brought up in a family that did not own a car. Many of the applicants were well above the typical age for a recent high school graduate, with about 50% of the applicants being older than 21.

Panel B of Table 1 provides comparable characteristics for the average population in Mexico City using the ENIGH[4] of 2004, a household survey that includes a representative sample of Mexico City's population.

Two sections of the questionnaire inquired about the activities of the respondent. The first of these started by asking the outcome of the admission lottery. After that, the interviewer asked about the activities pursued in the year immediately following the lottery. In particular, the survey asked the question: "Between September 2007 and June 2008, were you studying?" Additionally, it asked about the name of the institution attended, the course load and hours studied. A series of questions about employment followed.

After these questions, the instrument followed with questions intending to measure time preferences (which I discuss in detail below). A battery of questions about current activities followed. The measure of current college attendance comes from the question: "Are you currently a student?" As in the previous-activities section, this included more detailed questions about the type and name of institution, the course load, and a series of questions about work (hours, pay, etc.)

I included two sets of questions in the survey instrument with the purpose of measuring the degree of patience of the applicants. The first was a series of hypothetical choice questions about preferences for monetary rewards in the present or in the future. The interviewees were asked:

[4] INEGI (2004): "Encuesta Nacional de Ingresos y Gastos de los Hogares"

"Assume someone you fully trust offered you as a gift 20,000 pesos today.[5] However, he tells you that you can wait for one year and receive 22,000 pesos instead. Which would you prefer?" The answer to this question is used as a measure of time-preference (which I refer to as *monetary-initial*).

In an attempt to obtain a more refined measure of patience, the survey asked additional questions where the amount of the future reward was varied. Depending on the answer to the initial question, the question was repeated with a higher or lower reward offered in the future. For example, if the individual chose 20,000 pesos now, the next question was the same but with a future reward of 30,000 pesos. On the contrary, if the respondent chose 22,000 pesos now, the following question had a smaller future reward of 21,000 thousand pesos. This question was iterated to divide individuals into seven categories (from the most impatient individual, who preferred 20,000 pesos at the moment to 100,000 pesos delayed by a year, to the most patient, who preferred 21,000 delayed pesos to 20,000 current pesos).

Interviewers asked a second set of questions, similar to the first except that the reward offered was a trip. The interviewers read: "Assume someone you fully trust offered you as a gift a 5-day trip to a destination of your choice. You can use this trip anytime you want, between today and September 20, 2009. However, they give you the option to exchange it for a 7-day trip, also with all expenses paid and to your choice destination but to be used between September 20, 2009 and September 20, 2010 (that is, you have to wait at least one year to use it). Which would you prefer?" The answer to this question is also used a patience measure, which I call *trip-initial*.

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[5] At the time of the survey, 20,000 pesos was equivalent to roughly 2,000 US dollars or about four months' wages for the average respondent who worked full-time.

Again, in an attempt to refine the measure, a similar iteration process was followed that divided individuals into five categories from the most patient individual, who preferred a future 6-day trip to a present 5-day trip, to the least patient individual, who preferred a 5-day trip sometime soon to a 15-day trip one year later.

From this full iteration of questions, I construct two different measures of patience to complement *monetary-initial* and *trip-initial*. The first one, which I call *patience-money,* is constructed from the questions with the hypothetical monetary rewards. The index goes from 1 to 7, with a larger number representing a higher patience level. Similarly, I construct the variable *patience-trip* with the hypothetical questions using trip rewards. This variable takes values from 1 to 5, again with a higher value representing a higher degree of patience. The correlation between *patience-trip* and *patience-money* is 0.353, which is statistically different from zero. The cross-tabulation of these measures is shown in Panels C and D of Table 1.

4 Method

The empirical strategy consists of comparing the level of patience of the individuals in the *immediate admission* and *delayed admission* groups. Because applicants in the first group had the option of being enrolled in the Uni starting the year prior to the survey, they had, by the time of the survey, higher average education.

Recall that applicants had to choose an 'option' which consists of the combination of a major, campus and time of day. Admissions were then determined by a lottery where the randomization was made at the 'option' level, that is, any two individuals that chose the same 'option' had the exact same probability of being randomized in. Therefore, all comparisons have to account for

the ‘option’ chosen. All models that I estimate include dummy variables for each of the ‘option’. Regressing patience on admission status and ‘option’ dummies is numerically equivalent to regressing patience on admission separately for each ‘option’, and then taking the weighted average of the admission coefficients (where the weights are constructed from the number of observations in each ‘option’).

I do not attempt to estimate the magnitude of the effect of education on the discount rate but solely aim to identify whether schooling shifts preferences in one direction. The reason for this approach is that it is difficult to pinpoint a discount factor using hypothetical choice questions of the sort used here. Shane, Lowenstein and O’Donoghue (2002) show that there are a wide range of discount factors obtained by different researchers using variations of hypothetical choice questions (see Figure 1). This precludes me from trying to find the magnitude of the effect of education on discount factors. From the survey’s time-preference questions I construct a series of variables such as *monetary-initial, trip-initial, patience-money* and *patience-trip.* Throughout, I treat these variables as ordinal.

If the only differences between the two groups are the amount of education and work experience they have acquired, and the variables I use are in fact measuring time preferences, then a statistically significant coefficient for admission can be interpreted as a causal effect of the activities taking during that year on the measures of time preference. Thus, a positive coefficient of admission would imply that going to school increases patience more than working does (or that working reduces the level of patience more than schooling does).

5. Results

A. Randomization

The identification strategy depends on the randomized nature of the admission process. To gauge whether the randomization was carried out effectively, I run regressions of each predetermined characteristic on admission status, always controlling for the 'option' chosen. These characteristics, which we know cannot be affected by the randomization, are in fact similar across the two groups. Table 2 shows these coefficients are statistically indistinguishably from zero. Alternatively, one can regress admission status on all the predetermined variables (controlling for 'option' dummies), which again yields no statistically significant coefficient and the hypothesis that all coefficients are equal to zero cannot be rejected (the p-value equals 0.66).

B. The impact of admission on schooling

Table 3 shows the percentage of applicants who were studying during the academic years 2007/2008 and 2008/2009. Eighty percent of individuals in the *immediate admission group* studied in 2007/2008. Even though individuals in this group could have studied at the Uni, a fair number did not enroll or dropped out soon after classes started. As discussed earlier, applicants randomized to the *delayed admission group* were not allowed to enroll at the Uni for the 2007/2008 academic year. Among them, 42% studied during that year in some other institution. Thus, for the 2007/2008 academic year, the proportion studying anywhere among the *immediate admission* was almost double the proportion in the comparison group. Interestingly, many among

the *delayed admission* group did not enroll at Uni for the 2008/2009 academic year and there remained a gap in enrollment rates during that year.

Remember, however, that admission is only random at the 'option' level. Thus, any causal statement must be based on regression models that include 'option' dummies. Table 4 shows the results of estimating a regression of studying status on admission (i.e., allocation into the *immediately admitted* group) when including these 'option' dummies. Columns 1 to 3 show that there was a significant difference between the amount of education achieved by the admitted and the rejected groups caused by the outcome of the lottery. Being successful in the lottery was a strong predictor of studying (in any college) during 2007/2008. Furthermore, being successful on the lottery also predicts studying during 2008/2009 (results are shown in columns 4 to 6).

C. Time preference measures and behavior

Before analyzing the impact of schooling on patience, it is important to analyze whether the time preference questions can predict behavior. The literature review section describes a number of studies that have found that variables deriving from the type of questions used here do predict behavior in the ways that we would expect. I find similar significant correlations using the patience measures deriving from the trip questions, but not when using the measures deriving from the monetary questions.

This might be reflecting that the monetary rewards measures *are* worse measures of time preferences. Although the variables *patience-trip* and *patience-money* are correlated (the joint distribution is shown in Panel C of Table 1), they are quite different and, as shown in this subsection, *patience-trip* predicts behavior more than *patience-money*. In the next subsection I

present results that show that there is an impact of admission on responses to the trip questions but not on the responses to the monetary ones. This pattern might be a consequence of the monetary variables being poor measures of patience.

Individuals deemed more patient by the *trip* measures are less likely to smoke. Regressing whether an individual smokes on *patience-trip* yields a statistically significant negative coefficient, indicating that smokers tend to be less patient (see Panel A of Table 5). In contrast, the coefficient is close to zero and insignificant when using *patience-money*.

I have argued that patience variables should be treated as indexes. To accordance with this claim, I present the results of regressing smoking status on dummy variables for each value of the patience variables (first two columns of Panel C of Table 5). The coefficient for the least patient is significantly higher than the coefficient for the most patient (the omitted category). If patience monotonically predicts the likelihood of smoking, all coefficients should be positive and increasing. In effect, all coefficients are positive but they are not increasing in all cases. A χ^2 test, shows that the first four coefficient are significantly different from the fifth (the omitted category) when using *patience-trip*; but the same test fails to reject that the first six coefficients are different from the seventh (the omitted category) when using *patience-money* –see Panel C of Table 5-.

Previous studies have found that workers deemed more patient by their responses to surveys tend to work longer hours (Stephens and Krupka, 2006). I can test whether this relationship holds within a particular subsample of my data: those that worked full time and did not study. It is important to note that such population of full-time workers is a very particular sample. If the more patient tended to go to college, the population of those who worked full time contains mainly impatient individuals. Still, among this self-selected sample of less patient individuals,

there can still be differences in the levels of patience, and it might be that the more patient among them work longer hours. I find this to be the case (significantly so when patience is measured with *patience-trip).*

Among full-time workers (i.e. interviewees who worked full time in both 2007/2008 and 2008/2009), patience is correlated with working more hours. Panel B of Table 5 shows the results of regressing hours worked on the patience indexes for the population of applicants who worked full-time and were not studying at the time of the survey. Again, this relationship is only significant for the *patience-trip* measure. In column 3 of Panel C, we can appreciate the differences in hours worked among the different levels of patience (using *patience-trip*). Mostly, the coefficients are increasing, indicating that the more patient an individual is, the more hours he or she works per week. The least patient worked fewer hours than the most patient. In this case, the relationship is only marginally significant when using *patience-money*, as shown by the F-test for all coefficients being equal to zero.

The patience measure derived from the trip question is correlated with behavior in the ways we would expect a measure of patience to be, but that derived from the monetary questions turned out to be a very poor prediction of behavior. One possibility is that *patience-money* is a very poor, if at all, measure of patience.

D. The impact of schooling on time preferences

I compare the answers to hypothetical choice questions and estimate whether being accepted increased the probability of choosing a more patient answer. With each of the two measures of patience, I estimate the impact of being admitted on the probability of choosing the more patient

answer. Given the poor performance of the monetary reward questions in predicting behavior, it is not surprising that I do not find a significant effect of being admitted on that variable. However, I do find differences in patience levels between *immediate* and *delayed admission* groups when the outcome variable is a measure of patience derived from the trip reward questions.

Recall that all of the patience measures are coded so that a higher number represents a more patient level. Therefore, a positive coefficient in a regression of a patience variable on admission status (controlling for 'option') is consistent with education increasing patience.

Table 6 shows the estimates of the main specifications. The dependent variables are the responses to the first of each of the time-preference set of questions. The variable *monetary-initial* takes a value of 1 if and only if the respondent answered that he preferred 22,000 pesos in the future instead of 20,000 pesos now and equals 0 otherwise (38% of respondents made the patient choice). Similarly, the variable *trip-initial* equals 1 if the respondent answered that he preferred a seven-day trip in the future instead of a five-day trip in the present (57% of respondents said so). Running a probit of these variables on admission status (controlling for the 'option' chosen), I find that being admitted increased the probability of choosing the more patient answer by about three percentage points with the monetary-reward question (statistically insignificant) and by about eight percentage points with the trip-reward question; the latter is significant at the one-percent level. The insignificance of the coefficient when the *monetary-initial* is used might reflect that the questions with the monetary rewards are not effectively measuring patience, which, as mentioned, is consistent with their lack of correlation with behavior (as documented in Table 5, described in the previous subsection).

Table 7, panel A shows the results of estimating ordered probit models when the dependent variables used are those deriving from the full set of time-preference questions (namely: *patience-trip* and *patience-money*). In all cases, the coefficient for admission status is positive. However, only with the *patience-trip* variable is the result significant at the 5% level. Again, given the lower correlation with behaviors (described in subsection C), it is not surprising that the regressions of *patience-money* do not achieve statistical significance. Panel B of Table 7 shows the estimates of similar specifications using linear regressions (implicitly assigning meaning to the magnitude of the jumps); the results do not qualitatively change.

I estimate probit models where the dependent variables are dummies that equal one if the patience level is higher than a determined level. For example, I construct four of these variables from *patience-trip*: the first one - *patience≥2*- equals one if and only if *patience-trip* is larger or equal to two, and the last one - *patience≥5*- equals one if and only if *patience-trip* takes on the highest (most patient) level. Panel C of Table 7 presents these results. Coefficients are positive and monotonically increasing. It does not seem to be the case that the impact of schooling is concentrated in one particular step (as would happen if schooling had only the impact of moving individuals away from the most impatient level or into the most patient level). Coefficients for similarly constructed variables with *patience-money* are insignificant.

The results presented so far analyze the relationship between the outcome of the lottery and patience. I argue that, because the lottery outcome does not depend on the characteristics of the applicant, its impact must have come through its effect on the activities the applicants took on during 2007/2008 (namely, making some more likely to study while making the rest less likely to do so but more likely to work-). I look at the impact of admission instead of looking directly at the relationship between studying and time preference because one could expect the latter

relationship to be affected not only by the impact of schooling on patience, but also by the more patient taking on more education. That is, I would expect the direct relationship to be biased upwards. The following analyses this issue. Table 8 presents, in panels A and B, the results of estimating OLS regressions of the indexes of time preferences on schooling and, in panels C and D, the estimation of instrumental variable regressions of the same measures of patience on schooling but where the latter is instrumented with admission status. Panels A and C present the OLS and IV results respectively when the patience variables are derived only from the initial question (*trip-initial* and *monetary-initial* described above). Panels B and D use *patience-trip* and *patience-money*. The instrumental variable coefficients for the patience measures derived from the trip questions are not smaller than the OLS ones. It is surprising that coefficients for the IV estimates are, in fact, larger than the OLS ones. However the standard errors in the IV are large and therefore it is difficult to learn anything from that comparison. In all cases, results for *patience-money* and *monetary-initial* are insignificant.

One possible interpretation of these results is that there is a causal effect of the activities (studying versus working) on patience, which is being picked up when the latter is measured with the trip questions*;* but does not show up when measured by monetary questions because the latter provide poor measures of time preferences.

E. Identification Threats

In this subsection, I analyze whether the relationship between the lottery outcome and the patience measures deriving from the trip questions is biased because of problems with the identification. I discuss alternative explanations of the relationship between admission status and

initial-trip and *patience-trip.* For completeness, I also mention issues with the results for *patience-money* even though those results were insignificant in the first place.

i. Are interviewees conforming to social norms?

In studies with subjective questions, one has to worry that the interviewee might answer not according to her preference but might instead try to give the answer that will make her "look good" to the interviewer, that is, *conform to social norms* (Converse and Presser, 1988; Bradburn, Seymour and Wasnsink, 2004). To minimize this problem, as is commonly done in this type of study, interviewers assured respondents that there is no such thing as a "correct" answer. Of course, there is no guarantee that this eliminates the problem. However, even if some interviewees report an answer different from their true preference, our results still show a causal effect on time preferences as long as schooling does not affect the likelihood of altering an answer. As long as more-educated individuals do not try to *conform* more than the less-educated, the results presented here still can be interpreted as showing that schooling increases patience. Furthermore, if there is an impact of education on patience, there could be some bias against finding an effect as the *delayed admission* would be more likely to have to lie in order to conform.

ii. Issues with comprehension of time preference questions

A potential issue arises if education improves the understanding of the questions. Imagine that some individuals could not understand the hypothetical-choice questions. Presumably, going to

school could improve the understanding of the question. If people who do not understand the question tend to give a less patient answer, the results presented here could be biased upwards.

In addition to being as clear as possible, I included in the survey instrument a series of questions to the interviewers to help determine whether comprehension was an issue. At the end of each call, interviewers had to answer whether they thought the respondent had any problems when answering the hypothetical choice questions and whether they had paid attention. They were also asked the same thing but about the interview as a whole. Few problems were reported, and these problems were not strongly correlated with studying status. Excluding observations with this type of problem does not change the results by any significant amount (results are shown in Table 9 panel A).

I also run the regressions while excluding the individuals with the lowest high-school GPAs. If individuals with the lowest cognitive skills did not understand the questions, and going to college reduced this deficiency for these individuals (those with the lowest initial skills), then limiting the sample to individuals without this problem could reduce this bias. Table 9 panel B shows that limiting the sample in this way has no important effect on results, and the impact of admission on *initial-trip* remains significant.

iii. Different current activities

A more general concern arises because *immediate admission* individuals were more likely than the *delayed admission* ones to be studying at the time of the survey. Although some of the *delayed admission* applicants came back to study in 2008/2009, many did not, and there was still a significant difference in enrollment rates (see Table 3). Therefore, my estimates could be

reflecting not only the lasting effects of accumulated education, but also any effect arising from current activities.

Regarding the trip set of questions, the main concern is that the respondents' answers might be influenced not only by preferences but also by the circumstances such as how many days-off they can take. Suppose, for example, that some workers cannot take days off in the near future because they have already taken all the vacations that their employers allow. Then, even a very impatient worker might say that he wants to wait for the longer vacation simply because he knows he would not be able to take the days off from work soon. Since *delayed-admission* applicants are more likely to work, this could bias downwards the estimate of schooling on patience.

To minimize this potential problem, the question stated that the vacation could be taken at any point during the following year (or, for the future reward, at any point between one and two years after the moment when the question was asked). Even if that does not eliminate the bias, it is likely that its direction would be against what I find: since students typically have more vacation time during the year than jobs allow, and the *immediate admission* group had more students in it, the estimated effect of education on patience would be biased downward.

However, there might be other ways in which being currently a student might affect answers to the patience questions (for example, studying might affect mood differently than working, and mood might affect the way individuals answer the time preference questions). Therefore, I cannot fully rule out that being currently in school (as opposed to having studied one more year) is driving the result. Furthermore, this setting does not permit me to disentangle short run from long run effects of schooling on patience.

I haven't yet discussed an important concern which relates to liquidity. The next subsection discusses the biases that might be occurring due to differences in liquidity between individuals who were studying and working during the two years following the lottery.

F. Liquidity

An issue could arise if the time preference variables are not solely measuring preferences. In real life, choices are made according not only to preferences but also to situational factors such as budget constraints. Although the literature on time preferences interprets answers to inter-temporal choice questions as reflecting true preferences, they might equally well reflect budget constraints. Thus, for example, two individuals with identical preferences might respond differently if they have different budgets and they take their actual situation into account when responding to these questions. Suppose that one individual is not credit constrained, so even if he wants to consume more in the present, he will say he wants to take on the future reward if the implicit interest rate is higher than the market one. Supposed that a second individual, in contrast, is credit constrained and states that he prefers the present reward not because he is more patient but because he does not have the opportunity to take the future reward and then take a loan to consume presently.

Although this is a concern for both measures, it is specially so for the variable *patience-money* because money is fully fungible. I argue in this subsection that, if at all, the liquidity issue is likely to be biasing the results downwards, and perhaps it is the cause why the impact on *patience-money* is insignificant.

Presumably, the *delayed admission* individuals were less credit constrained because they worked in higher proportions during 2007/2008. This would bias my method towards finding a negative effect of education on patience, perhaps explaining the lack of significance for the monetary measures. Because the *delayed admission* individuals had earned more money by the time of the survey, the existence of credit constraints would be less significant for them. Therefore, I would expect a *delayed admission* respondent with identical preferences to an *immediate admission* respondent to give a response that is, if at all different, more patient. Therefore, this would cause the estimated impact of admission on patience to be biased downwards.

However, a skeptical reader might think of the following explanation: individuals who worked in 2007/2008 had more money, which induced them to involve themselves in higher consumption patterns (as would happen if, for example, they got married or had children). The higher level of spending could offset the higher income in the interim year and thus make them more credit constrained. Although this explanation is plausible a priori, two different sets of facts point against it. The first is that there is no discernible effect of being admitted for immediate entry on marriage or child-bearing. The second is that the correlation between earnings and patience turns out to be positive, as the simple credit-constraint explanation would suggest.

Table 10 shows the results of regressing marriage and other living arrangements on admission status, controlling for the 'option' chosen. The survey included questions on marital status, cohabitation status, and the number of children. Additionally, the month and year of marriage and the start of cohabitation were asked when relevant. For respondents with children, the age (in months) of the youngest child was elicited. Additionally, they were asked whether they were expecting to have children (for women, whether they were pregnant).

The date of the marriage/start of cohabitation and the age of the youngest children allow me to determine whether the interviewee had changed her civil status or become pregnant after the Uni lottery. I created the following variables: whether the individual is engaged, whether the individual started cohabitation after the admission process, whether the individual got married and whether the individual had only one child who is younger than six months or is expecting. Because the behavior of men and women might be markedly different, I perform the analysis separately. I estimate probit models by gender, with each of the above-mentioned items as the dependent variables, and with admission status and 'options' as the regressors. The random nature of the admission process ensures that these models yield unbiased coefficients on the admission status variable. Panel A of Table 10 shows the results for women. No regression provides any sign of a causal effect of being admitted on changing marital status. Admitted applicants were not less likely to get married and were actually slightly more likely to start living with their partner (column 3). The corresponding results for men are shown in Panel B. Similarly, I do not detect an effect of admission status in this group.

It could still be the case that *immediately admitted* individuals engaged in other types of consumption habits different to the ones analyzed here and about which the survey did not inquire. Under that scenario, individuals who earned more money got engaged in consumption patterns that made them even more credit constrained, leading them to respond to the hypothetical choice questions as if they were impatient since their present need for money would be larger. If that were the case, results would be biased in favor of the hypothesis that there is a causal effect.

6 Conclusions

It is important to understand the effects of education on time preferences. Economists have hypothesized that schooling increases patience. However, no study had attempted to determine empirically whether there are causal impacts of education on time preferences. This study uses a natural experiment to provide the first causal estimate of the impact of schooling on time preferences.

I compare the level of patience of individuals who were randomized into directly entering college and those who had to wait. Those who were randomized in had more education and less work experience on average at the time of the survey but had similar background characteristics to the applicants who were randomized out. These individuals tended to make more patient choices when facing hypothetical situations in which they had to choose between immediate and delayed reward trips, but there was no significant difference in their responses when they had to choose between immediate and delayed monetary rewards.

The difference in patience levels between *immediately admitted* and *delayed admission* respondents is statistically significant when choosing between a trip to be taken soon and a longer trip to be taken later, but insignificant when choosing between a present and future monetary reward. One possibility, consistent with the empirical results presented here, is that there is in fact a causal impact of schooling on time preferences but the questions with monetary rewards yield a poor measure of time preferences.

One could worry that results are biased. The most pressing identification threat to this study arises from the fact that the randomization affected not only the amount of education accumulated but also the activities they were doing during the months when the interviews were

made. Careful wording of the questions, and further statistical analysis, helps to mitigate some of these concerns such as having the number of vacation days or credit constraints affecting the results. Furthermore, I can only attempt to detect the impact on time preference of going to school versus working, without being able to distinguish whether it is schooling that increases patience or working that reduces it. Further research is needed to strengthen these results, tease out whether the effect of schooling is long-lived and if it arises in different circumstances.

References

Ameriks, John, Andrew Caplin and John Leahy, 2003. "Wealth accumulation and the propensity to plan". Quarterly Journal of Economics, 118 (3):1007-1047

Ameriks, John, Andrew Caplin, John Leahy, and Tom Tyler, 2007. "Measuring Self-Control Problems." American Economic Review 97, no. 3: 966-972

Ashraf, Nava, Dean Karlan and Wesley Yin, 2006. "Tying Odiseus to the Mast: Evidence from a Commitment Saving Product in the Philippines". Quarterly Journal of Economics, 121(12):635-672

Barsky Robert B., Miles Kimball, Thomas Juster and Mathew Shapiro, 1997. "Preference Parameters and Behavioral Heterogeneity. An Experimental Approach Using the Health and Retirement Survey", Quarterly Journal of Economics, 112 (2): 537-579

Becker, Gary S., and Casey B. Mulligan, 1997. "The Endogenous Determination of Time Preference." Quarterly Journal of Economics 112, no. 3: 729-758.

Bickel W.K, Odum A.L and Madden G.J, 1999. "Impulsivity and Cigarrete Smoking; delay discounting in current, never and ex-smokers" Psychopharmacology, 146, 447-454

Bradburn, Norman, Seymour Sudman and Brian Wansink. "Asking Questions". Jossey-Bass, Cambridge. 2004.

Carducci, Bernardo J, 2009. *The Psychology of Personality: Viewpoints, Research and Applications.* Wiley-Blackwell, 763 pp.

Converse, Jean M. and Stanley Presser, 1988. "Survey Questions. Handcrafting the Standardized Questionnaire". Sage Publications, California 1988

Cutler, David and Adriana Lleras-Muney, 2006. "Education and Health: Evaluating Theories and Evidence," NBER Working Papers 12352

Donkers, Bas and Arthur van Soest, 1999. "Subjective Measures of Household Preferences and Financial Decisions." Journal of Economic Psychology 20(6): 613-42

Frederick, Shane, George Lowenstein and Ted O'Donoghue, 2002. "Time Discounting and Time Preference: A Critical Review". Journal of Economic Literature, American Economic Association, 40(2): 351-401

Fuchs, Victor, 1982, "Time preference and Health. An Exploratory Study". NBER Working Paper No. 539

Gilbert Ghez and Gary S. Becker, 1975. "The Allocation of Time Over the Life Cycle," NBER Chapters in: The Allocation of Time and Goods over the Life Cycle, pp 83-132

Khwaja, Ahmed, Daniel Silverman and Frank Sloan, 2007. "Time preference, Time Discounting and Smoking Decisions". Journal of Health Economics, 26(5): 927-949

Kirby, Petry and Bickel, 1999. "Heroin Addicts Have Higher Discount Rates for Delayed Rewards than Non-Drug-Using Controls." Journal of Experimental Psychology

Oreopolous, Philip and Kjell Salvanes, 2010. “How Large are Returns to Schooling? Hint: Money Isn't Everything.” Unpublished Manuscript

Mischel, Walter; Ozlem Ayduk and Rodolfo Mendoza-Denton, 2003. “Sustaining Delay of Gratification Over Time: A Hot-Cool Systems Perspective” in: *Time and Decision: Economic and Psychological Perspectives on Intertemporal Choice*, George Lowenstein, Daniel Read and Roy Baumister (editors). Russel Sage Foundation, 569p.

Reynolds, Brady, 2006. "The experimental discounting task is sensitive to cigarette-smoking status and correlates with a measure of delay discounting". Behavioural Pharmacology,(17):133–142

Salcedo, Alejandrina, 2009. “Entry Systems to University: Evidence on the Trade-offs of Early versus Late Tracking” Unpublished Manuscript.

Stephens, Melvin and Erin Krupka, 2006. "Subjective Discount Rates and Household Behavior” Unpublished Manuscript.

Table 1. Summary Statistics per Age Group

Age	Rooms per person[(a)]	Cars per person[(b)]	Years of Parental Education	Years of Maternal Education	Private High School [(c)]	% College*
(1)	(2)	(3)	(4)	(5)	(6)	(8)
Panel A: UNI Applicants						
16-19	0.91	0.08	9.64	9.21	0.10	
20-24	0.90	0.09	9.47	8.97	0.11	
25-29	0.91	0.08	9.54	8.56	0.15	
30-34	0.83	0.09	9.38	7.79	0.13	
Percentile	Age					
25	19.00					
50	21.00					
75	24.00					
Panel B: All population in Mexico City[(t)]						
16-19	0.97	0.11	9.44	8.58		0.14
20-24	0.96	0.14	9.60	7.78		0.34
25-29	1.00	0.15	8.90	6.74		0.29
30-34	0.99	0.14	7.11	5.63		0.25

(a) Number of rooms divided by number of inhabitants of houehold when the respondent was 16 years old

(b) Numbers of cars owned by family, divided by number of family members when the respondent was 16 years old

(c) Proportion of individuals whose high school was private

* Either attends college or has at least one year of college education

(t) Source: ENIGH 2005 Either assists college or has at least one year of college education

Table 1 (continued).

Panel C. Distribution of the Two Measures of Patience.

	Patience-Trip, V1	Patience-Trip, V2	Patience-Trip, V3	Patience-Trip, V4	Patience-Trip, V5	Row Totals
Patience-Money, Value 1	0.051	0.008	0.011	0.015	0.015	0.099
Patience-Money, Value 2	0.015	0.013	0.012	0.019	0.010	0.069
Patience-Money, Value 3	0.021	0.020	0.023	0.037	0.026	0.128
Patience-Money, Value 4	0.018	0.016	0.044	0.058	0.031	0.166
Patience-Money, Value 5	0.013	0.013	0.038	0.052	0.041	0.157
Patience-Money, Value 6	0.012	0.011	0.035	0.051	0.050	0.158
Patience-Money, Value 7	0.016	0.009	0.039	0.039	0.120	0.222
Column Totals	0.146	0.089	0.201	0.270	0.294	1.000
Correlation	0.353	F test for correlation	F(1, 2340) = 332.79 Prob>F=0.000			

Panel D. Distribution of Patience-Money for each value of Patience-Trip

	Patience-Trip, V1	Patience-Trip, V2	Patience-Trip, V3	Patience-Trip, V4	Patience-Trip, V5
Patience-Money, Value 1	0.352	0.087	0.053	0.054	0.052
Patience-Money, Value 2	0.103	0.144	0.059	0.071	0.035
Patience-Money, Value 3	0.144	0.226	0.115	0.137	0.090
Patience-Money, Value 4	0.120	0.183	0.219	0.213	0.104
Patience-Money, Value 5	0.088	0.144	0.189	0.193	0.141
Patience-Money, Value 6	0.085	0.120	0.172	0.188	0.170
Patience-Money, Value 7	0.109	0.096	0.193	0.144	0.408
Column Totals	1.000	1.000	1.000	1.000	1.000

Note: Each cell shows the percentage of interviewees who fall in that cagegory for the *patience-money given each value of the patience-trip* variables.

Table 2. Testing Randomization

	Dependent variable						
	Female	Rooms per person	Car	Years of Parental Education	Years of Maternal Education	Private High School	High School system 1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Admitted	-0.025	-0.013	0.019	-0.311	-0.178	0.014	-0.002
	(0.022)	(0.022)	(0.022)	(0.216)	(0.192)	(0.015)	(0.022)
Obs.	2234	2220	2234	2234	2234	2223	2234
R-squared	0.124	0.021	0.032	0.038	0.043	0.038	0.031

	Dependent variable					
	High School system 2	High School system 3	High School system 4	High School system 6	High School system 7	High School system 8
	(8)	(9)	(10)	(11)	(12)	(13)
Admitted	-0.006	-0.008	-0.013	-0.005	0.003	-0.006
	(0.017)	(0.013)	(0.012)	(0.007)	(0.011)	(0.008)
Obs.	2234	2234	2234	2234	2234	2234
R-squared	0.031	0.037	0.044	0.019	0.057	0.022

Note: All include "option" dummies. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0. All are linear regressions.

Table 3. Percentage of Applicants Attending* College

	Admitted	Rejected
2007/2008 academic year	80%	42%
2008/2009 academic year	80%	64%

Note : includes individual who either answered yes to the question: "Do you study?" or answered study to "What is your Main Activity?". Includes individuals who said they were "enrolled at the Uni".

Table 4. The Impact of the Lottery Outcome on Enrollment

Panel A. Linear Regression Models

	Dependent variable:					
	Studied in the 2007/2008			Studied in the 2008/2009		
Coefficient	(1)	(2)	(3)	(4)	(5)	(6)
Admitted	0.256***	0.259***	0.261***	0.172***	0.177***	0.179***
	(0.022)	(0.022)	(0.022)	(0.021)	(0.021)	(0.021)
Female		0.018	0.033		-0.023	-0.015
		(0.022)	(0.022)		(0.020)	(0.020)
Age		-0.006***	-0.005***		-0.013***	-0.012***
		(0.002)	(0.002)		(0.002)	(0.002)
Rooms per perso			0.028			0.028
			(0.022)			(0.021)
Car			0.053**			-0.020
			(0.023)			(0.021)
Years of Paterna			0.001			0.005**
			(0.003)			(0.002)
Years of Materna			0.007**			0.002
			(0.003)			(0.003)
Private High Sch			-0.218			-0.133
			(0.169)			(0.159)
Background controls	No	No	Yes	No	No	Yes
Option Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.116	0.121	0.136	0.067	0.091	0.104
Observations	2234	2234	2234	2234	2234	2234

Note: Models also include Dummy Variables for each option (where an option is a major*campus*time-of-day). Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0. Background controls: age, sex, rooms per person, homes per dwelling, family owned car, years of paternal education, years of maternal education, private high school. High school system 1-8 are dummies for the system to which the student's

(t) Outcome when the respondent was 16 years old

Table 4 (continued)

	Panel B. Probit Models					
	Studied in the 2007/2008			Studied in the 2008/2009		
Marginal Effects	(1)	(2)	(3)	(4)	(5)	(6)
Admitted	0.265***	0.270***	0.275***	0.178***	0.186***	0.190***
	(0.023)	(0.023)	(0.023)	(0.021)	(0.021)	(0.021)
Female		0.022	0.040*		-0.022	-0.011
		(0.024)	(0.024)		(0.022)	(0.022)
Age		-0.007***	-0.006***		-0.013***	-0.012***
		(0.002)	(0.002)		(0.002)	(0.002)
Rooms per person(t)			0.029			0.030
			(0.025)			(0.023)
Car(t)			0.059**			-0.022
			(0.025)			(0.023)
Years of			0.001			0.006**
			(0.003)			(0.003)
Years of Maternal Education			0.007**			0.002
			(0.003)			(0.003)
Private High			-0.238			-0.147
			(0.184)			(0.167)
High School System Dummiess	No	No	Yes	Yes	Yes	Yes
Option Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared						
Observations	2234	2234	2232	2216	2216	2214

Note: Models also include Dummy Variables for each option (where an option is a major*campus*time-of-day). Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0. Background controls: age, sex, rooms per person, homes per dwelling, family owned car, years of paternal education, years of maternal education, private high school. High school system 1-8 are dummies for the system to which the student's high school belonged.

(t) Outcome when the respondent was 16 years old

Table 5. Observed behavior and the measures of patience

Panel A. Are more patient individuals less likely to smoke?

	Dependent Variable:			
	Smokes			
	(1)	(2)	(3)	(4)
Patience-Trip	-0.012*	-0.015**		
	(0.007)	(0.007)		
Patience-Money			0.006	0.005
			(0.005)	(0.005)
Background controls	No	Yes	No	Yes
Observations	2,342	2,310	2,344	2,312
Pseudo R-squared	0.000986	0.0417	0.000470	0.0405

Panel B. Do more patient workers work longer hours?

	Dependent Variable:			
	Hours Worked [(t)] (Among "always working" workers*)			
Patience-Trip	1.124**	1.178**		
	(0.520)	(0.540)		
Patience-Money			0.376	0.407
			(0.364)	(0.382)
Background controls	No	Yes	No	Yes
N	436	430	438	432
R-squared	0.011	0.049	0.002	0.043

Note: Panel A reports marginal effects and the sample includes all survey respondent. Sample in Panel B is only individuals who were working and were not studying, and who were also working and not studying during 2007/2008. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0. Background controls: age, sex, rooms per person, homes per dwelling, family owned car, years of paternal education, years of maternal education, private high school. High school system 1-8 are dummies for the system to which the student's high school

[(t)] Hours worked per week

*Sample includes only respondents who were full time workers both in 2007/2008 and 2008/2009

Table 5 (Continued) Observed behavior and the measures of patience

Panel C. Behavior and the level of the patience-index

	Dependent Variable			
	Smokes		Hours Worked	
Sample	All respondents		Only "always working" respondents*	
	(1)	(2)	(3)	(4)
Patience-Trip, Value 1	0.083***		-5.537**	
	(0.032)		(2.286)	
Patience-Trip, Value 2	-0.053		-2.351	
	(0.035)		(2.712)	
Patience-Trip, Value 3	0.038		-3.261	
	(0.028)		(2.071)	
Patience-Trip, Value 4	0.032		-3.118	
	(0.026)		(1.994)	
	$\chi2$ test all above different from *Patience-Trip,Value 5*	$\chi2(4)=13.34$ Prob>$\chi2$ =0.0097	F test all above different from *Patience-Trip,Value 5*	F(4,431)=1.6 Prob>$\chi2$ =0.17
Patience-Money, Value 1		-0.036		-2.842
		(0.035)		(2.651)
Patience-Money, Value 2		-0.048		3.035
		(0.040)		(2.912)
Patience-Money, Value 3		0.011		-3.258
		(0.034)		(2.518)
Patience-Money, Value 4		0.021		-2.248
		(0.031)		(2.402)
Patience-Money, Value 5		0.032		3.286
		(0.032)		(2.252)
Patience-Money, Value 6		0.012		-0.318
		(0.032)		(2.476)
$\chi2$ test all above different from *Patience-Money,Value 7*		$\chi2(4)=5.78$ Prob>$\chi2$ =0.4478	F test all above different from *Patience-Money,Value7*	F(6,431)=1.84 Prob>$\chi2$ =0.09
Observations	2,342	2,344	436	438
Pseudo R-squared/Rsquare	0.00467	0.00202		
R-squared			0.015	0.025

Note: Column 1 and 2 are probit models, marginal effects shown. Columns (3) and (4) report coefficients of linear regressions where sample includes only individuals who were working and were not studying, and who were also working and not studying during 2007/2008. Independent variables are dummies for each of the values that the patience measures can take. Higher values indicate more patience. Ommited categories are Patience-Trip Value 5 in columns 1 and 3, and Patience-Money Value 7 in columns 2 and 4. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

(t) Hours worked per week

*Sample includes only respondents who were full time workers both in 2007/2008 and 2008/2009

Table 6 . The impact of admission on the level of patience, using only the initial question of each of the measures

	Dependent Variable			
	Trip-Initial	Trip-Initial	Monetary-Initial	Monetary-Initial
	(1)	(2)	(3)	(4)
Admitted*	0.081***	0.080***	0.031	0.034
	(0.025)	(0.025)	(0.025)	(0.026)
Background controls	No	Yes	No	Yes
N	2340	2308	2334	2302
Pseudo-R2	0.022	0.031	0.018	0.031

Note: Probit models, marginal effects reported. Besides admission status, all models include option dummies. In Panel A, dependent variable is a dummy variable that equals one if and only if the patience index level is higher than the reported value. In Panel B , columns (1) and (2) the Trip initial equal 1 if prefered a 7 day trip in the future to a 5 day trip now. In columns (3) and (4) the Money initial equals 1 if prefered 22,000 pesos in the future to 20,000 pesos now and 0 otherwise. Models also include Dummy Variables for each option (where an option is a major*campus*time-of-day). Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0. Background controls: age, sex, rooms per person, homes per dwelling, family owned car, years of paternal education, years of maternal education, private high school and h.s. system.

Table 7. Reduced form estimates of the impact of admission on time preferences using full patience measures

Panel A. Ordered Probit Models

	Dependent Variable			
	Patience-Trip		Patience-Money	
Admitted	0.205***	0.209***	0.061	0.078
	[0.055]	[0.055]	[0.053]	[0.054]
Female		-0.087*		0.079*
		[0.048]		[0.047]
Age		-0.013***		-0.021***
		[0.004]		[0.004]
Observations	2,341	2,336	2,343	2,312
Pseudo R-2	0.0105	0.0123	0.00482	0.00969

Panel B. Linear Regression Models

	Dependent Variable			
	Patience-Trip	Patience-Trip	Patience-Money	Patience-Money
Admitted	0.244***	0.248***	0.111	0.139
	(0.070)	(0.070)	(0.099)	(0.099)
Female		-0.096		0.154*
		(0.061)		(0.087)
Age		-0.018***		-0.039***
		(0.005)		(0.008)
Background Controls	No	Yes	No	Yes
Observations	2341	2336	2343	2312
R-squared	0.031	0.037	0.019	0.038

Note: All Models include Dummy Variables for each option (where an option is a major*campus*time-of-day). Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0. Background controls: age, sex, rooms per person, homes per dwelling, family owned car, years of paternal education, years of maternal education, private high school and high school system dummies (1-8 for the system to which the student's high school belonged).

Table 7. The impact of admission on the level of patience (continued)

Panel C. Cumulative models for the impact of admission on patience

	Dependent Variable									
	Patience-Trip				Patience-Money					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Patience≥2	Patience≥3	Patience≥4	Patience≥5	Patience≥2	Patience≥3	Patience≥4	Patience≥5	Patience≥6	Patience≥7
Admitted	0.017	0.061***	0.081***	0.087***	0.005	0.008	0.020	0.026	0.031	0.018
	(0.017)	(0.020)	(0.025)	(0.024)	(0.015)	(0.019)	(0.023)	(0.026)	(0.025)	(0.022)
Observation	2,330	2,330	2,340	2,330	2,299	2,312	2,340	2,334	2,334	2,319
Pseudo-R2	0.0232	0.0246	0.0216	0.0173	0.0181	0.0106	0.0135	0.0145	0.0179	0.0113

Note: Probit models, marginal effects reported. Besides admission status, all models include option dummies. In Panel A, dependent variable is a dummy variable that equals one if and only if the patience index level is higher than the reported value. In Panel B , columns (1) and (2) the Trip initial equal 1 if prefered a 7 day trip in the future to a 5 day trip now. In columns (3) and (4) the Money initial equals 1 if prefered 22,000 pesos in the future to 20,000 pesos now and 0 otherwise. Models also include Dummy Variables for each option (where an option is a major*campus*time-of-day). Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0. Background controls: age, sex, rooms per person, homes per dwelling, family owned car, years of paternal education, years of maternal education, private high school and h.s. system.

Table 8. OLS and IV estimates of the impact of education on patience

Panel A. Regressing patience on schooling: Using only initial question, Ordinary Least Squares

	Dependent Variable: Patience					
	Monetary-Initial			Monetary-Initial		
	(1)	(2)	(3)	(4)	(5)	(6)
Studied	0.126**	0.133**	0.127**	0.041	0.036	0.002
	[0.056]	[0.057]	[0.059]	[0.057]	[0.058]	[0.060]
Option Dummies	No	Yes	Yes	No	Yes	Yes
Background Controls	No	No	Yes	No	No	Yes
Observations	2,344	2,340	2,308	2,344	2,334	2,302
Pseudo R-squared	0.00160	0.0201	0.0291	0.000167	0.0176	0.0308

Panel B. Regressing the complete measure of patience on schooling: Ordinary Least Squares

	Dependent Variable: Patience					
	Trip	Trip	Trip	Money	Money	Money
	(1)	(2)	(3)	(4)	(5)	(6)
Studied	0.116*	0.124**	0.110*	0.054	0.044	-0.018
	(0.061)	(0.062)	(0.063)	(0.086)	(0.088)	(0.089)
Option Dummies	No	Yes	Yes	No	Yes	Yes
Background Controls	No	No	Yes	No	No	Yes
Observations	2,342	2,341	2,310	2,344	2,343	2,312
R-squared	0.002	0.027	0.041	0.000	0.018	0.037

Panel C. Instrumental Variable estimates of the impact of schooling on patience (using only initial question)

	Dependet Variable			
VARIABLES	Trip-Initial		Monetary-Initial	
	(1)	(2)	(3)	(4)
Studied	0.231**	0.236**	-0.082	-0.070
	[0.102]	[0.101]	[0.089]	[0.088]
Option Dummies	Yes	Yes	Yes	Yes
Background Controls	No	Yes	No	Yes
Observations	2,234	2,205	2,234	2,205

Panel D. Instrumental Variable estimates of the impact of schooling on patience

	Dependet Variable			
	Trip	Trip	Money	Money
	(1)	(2)	(3)	(4)
Studied [2]	0.299	0.347	0.275	0.341
	(0.248)	(0.246)	(0.244)	(0.241)
Option Dummies	Yes	Yes	Yes	Yes
Background Controls	No	Yes	No	Yes
Observations	2,232	2,203	2,343	2,312
R-squared	0.018	0.033	0.015	0.031

Note: Variable "Studied" is a dummy variable, equals 1 if individual studied. In Panel 2 left-out variable is admission status in all four columns and vairable "studied" is instrumented with admission Status. Background controls: age, sex, rooms per person, homes per dwelling, family owned car, years of paternal education, years of maternal education, private high school and High school system dummies. Higher values of the patience measures indicate more patience. Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1.

Table 9. Excluding observations with potential misunderstanding of questions

Panel A. Excluding observations where interviewer reported problem[t]

	Dependent Variables			
	Trip-Iinitial	Patience-trip	Monetary-Initial	Patience-money
Admitted	0.194***	0.205***	0.095	0.0877
	(0.067)	(0.057)	(0.068)	(0.055)
Observations	2157	2155	2157	2157
Pseudo R2	0.022	0.0114	0.006	0.006

Panel B. Excluding observations for individuals with low high school gpa'

	Dependent Variables					
	Trip-Initial			Monetary-Initial		
	Excl.10%	Excl. 25%	Excl. 50%	Excl.10%	Excl. 25%	Excl. 50%
	(1)	(2)	(3)	(4)	(5)	(6)
Admitted	0.171***	0.230***	0.172**	0.064	0.069	0.049
	(0.066)	(0.075)	(0.090)	(0.067)	(0.076)	(0.091)
Observations	2094	1619	1178	2096	1620	1179
Pseudo R2	0.0109	0.0136	0.0150	0.0060	0.0080	0.0092

Note: All Models include Dummy Variables for each option (where an option is a major*campus*time-of-day). Standard errors in parentheses *** p<0.01, ** p<0.05, *p<0. 01

[t] Excludes all observations for which the interviewer reported that the respondent did not pay attention to the hypothetical choice questions, showed little interested throughout the survey or there was some other particular problem during interview.

' Models in Panel B presents the impact of admission when excluding the observations corresponding to individuals whith the lowest high-school grade point

Table 10. The Impact of Admission on Marital Status

	Panel A. Women			
	Dependent Variable			
	The Applicant is Engaged	Got married after Lottery	Started cohabitation after Lottery	Had kids or got pregnant after Lottery
	(1)	(2)	(3)	(4)
Admitted	0.008	0.008	0.014	-0.011
	(0.016)	(0.010)	(0.010)	(0.016)
R-squared	0.058	0.057	0.030	0.049
Observations	1197	1197	1197	1197
	Panel B. Men			
Admitted	0.017	-0.002	0.006	0.002
	(0.018)	(0.008)	(0.010)	(0.016)
R-squared	0.103	0.048	0.063	0.059
Observations	1037	1037	1037	1037

Notes : All include 'option' dummies and background characteristics. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Figure 1. **From Shane, Lowenstein and O'Donoghue (2002)**

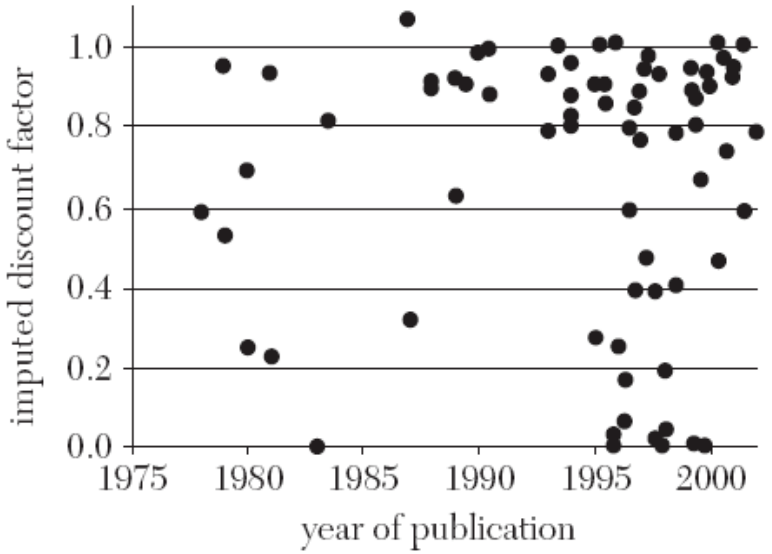

Figure 2. Discount Factor by Year of Study Publication