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The today and tomorrow of kids: Time preferences and educational outcomes of children ☆

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ABSTRACT

We experimentally investigate the distribution of children's time preferences along gender and racial lines. We find that boys are more impatient than girls and black children are more impatient than white children. Black boys have the highest discount rates of all groups. Most importantly, we show that impatience has a direct correlation with behavior that is predictive of economic success. An increase of one standard deviation in the discount rate is associated with an increase in the number of disciplinary referrals that a child has the following school year by 14%. Our results suggest that impatience might play an important role in determining the success of performance incentive programs for school children.

1. Introduction

In the U.S., there are persistent demographic differences in educational outcomes. For example, by all measures, girls graduate high school at higher rates than boys, and whites do so at higher rates than blacks. Recent cohort estimates by Heckman and LaFontaine (2007) show high school graduation rates of 79.9% for girls and 75.2% for boys.[1] Eighty percent of whites graduate compared to 69% for blacks. The rate is even lower for black boys: 63.4%. There are other indicators of racial differences as well. Fryer and Levitt (2006) show a test score gap between blacks and whites that grows as children age. This gap appears at a young age, even though there is no evidence of differences in cognitive ability early in life (Fryer and Levitt, forthcoming).

These observed differences in educational outcomes may depend in part on how much the future is valued. Not all children may solve inter-temporal problems in the same way. If time preferences, or the perceived benefits of patience, vary across demographic groups, educational paths may differ. Indeed, Heckman et al. (2006) show that differences in human capital formation can be attributed in part to differences in non-cognitive abilities. Observed differences in time preferences, however, cannot be taken as innate. The evolution of these preferences may be endogenous (as suggested by Becker and Mulligan, 1997) and thus would imply that children could be taught to be more forward thinking.

Relatively little is known about the nature of children's time preferences, how these preferences relate to the social environment, and what effect they have on outcomes.[2] In this paper, we investigate experimentally if children's time preferences vary across observable characteristics, such as race and sex. Most importantly, we investigate if measured time preferences correlate with a marker of potential educational failure: disciplinary referrals.

There is a large literature in psychology and neuroscience on impulse control and its effects on behavior (see D'Amasio, 1994; Hollander and Evers, 2001; McClure et al., 2004). Most related to our research, Mischel et al. (1989) found that the ability of children to refrain from immediate gratification predicted education outcomes

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[1] High school graduates are those who receive a traditional high school diploma from an accredited high school program. The percentages of high school graduates cited in this paper come from Table 1, using the NLSY97 data, in Heckman and LaFontaine's (2007).

[2] This paper is not the first to look experimentally at patience in children. For example, Bettinger and Slonim (2007) use economic experiments to examine the patience of children in between the ages of 5 and 16 years.

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later in life. Whereas Mischel et al. study impulse control, we focus on eliciting the time preferences of children by incorporating a front-end delay in our experiments.[3] Our design allows us to examine patience, not impulse control, and our sample allows us to detect heterogeneity in preferences. If heterogeneity in time preferences exists, we should expect that any economic policy offering alternative delayed incentives might have different treatment effects across populations.

After testing for heterogeneity in time preferences in our sample, we estimate how time preference affects disciplinary referrals two years after the experimental data were collected. Discipline has been shown to be a predictor of economic outcomes later in life, such as education achievement and lower wages (see Bowles et al., 2001; Heckman et al., 2006; Lang and Ruud, 1986; Segal, 2006), as well as high school drop-out rates (Alexander et al., 1997; Rumberger, 1995). Discipline incidents therefore constitute an ideal test bed for the influence of time preference on behavior. We would expect patient and forward-looking students to refrain from such behavior.

We conduct artefactual field experiments (Harrison and List, 2004) to elicit children's time preferences. The experiments were conducted with a large proportion of the population of 8th grade students in a rural/suburban school district in Georgia. We conducted the experiments with a population of this age because the education literature recognizes that this age is critical to determine future education outcomes, such as the decision to drop out of school (Kaufman et al., 2004; Olson, 2006). We also collected data from the students' records. With these records, we can investigate the relationship between our elicited discount rates and discipline.[4]

Our study provides two main findings. First, we observe that boys have higher discount rates than girls and that black children have higher discount rates than white children. A difference in patience between boys and girls was previously found by Bettinger and Slonim (2007). However they did not find a difference by race. Our finding is robust to alternative measures of patience, socio-economic background and measures of cognitive abilities and joint estimation of discount rates and risk preferences. This latter result is important because previous research suggests differences in elicited discount rates might reflect differences in risk preferences (Andersen et al., 2008; Andreoni and Sprenger, 2010b) or the existence of field substitutes for lending or borrowing (Cubitt and Read, 2007; Harrison et al., 2002). We find no evidence to support these explanations in our sample.

Our second main finding is that discount rates are correlated with the likelihood that a child has more disciplinary referrals. A one standard deviation increase in a child's discount rate is associated with a 14.3% increase in disciplinary referrals two years after the experiment (the average is 1.7 referrals).

With this second important result, we go beyond establishing that discount rates differ among children. We establish that our experimentally-elicited discount rates help to explain variability in important behaviors, apart from demographic, socioeconomic and cognitive factors. Our results suggest that time preferences are an important component of the economic decisions of children and that experimental methods are a simple and direct way to measure them. Unlike, for example, self-reported personality tests, experimental methods have the advantage of using real stakes and being standardized.

The paper is organized as follows. Section 2 discusses the sample. Section 3 describes the experimental design. Section 4 discusses the distribution of preferences. Section 5 relates time preference measures to future disciplinary referrals. Section 6 concludes.

2. Study area and sample selection

The setting for our study is a suburban/rural county school district in Georgia. The district is typical of suburban/rural school districts in the U.S. in that income and education levels are lower compared to urban areas. For example, 1999 per capita income in the district was $16,791 ($21,154 in Georgia). Thirty-two percent of the population over 25 had not completed high school in 2000, over 50% higher than for Georgia, and less than half (46%) of the class of 2004 graduated in four years.

Our experiment was conducted at all four public middle schools in the district and our sample represents 82% of the entire student population.[5] The students in our sample come from a broad range of socio-economic backgrounds (sample statistics are presented in Table 2). At the time of the experiment, 97% of our subjects were 13 or 14 years old (mean = 13.80, SD = 0.20), while the remaining 3% were 15 years old. In Georgia, students can make the decision to drop out of school at the age of 16. Thus, we wanted to elicit discount rates in the period prior to when this important decision would be made.

3. Experimental design

To measure time preferences among adults, both revealed and stated preference methods have been used.[6] Given the potential sources of bias inherent in stated preference methods and the difficulty in observing the consumption and investment decisions of children, we opted to use a controlled experiment to reveal preferences. We also conducted a controlled experiment to reveal risk preferences on a smaller sample of children during the last school year in which we conducted the time preference experiment. We discuss the time preference experiment first.

We measure time preferences by eliciting discount rates with the front-end delay design used by Harrison et al. (2002), instead of allowing an option of payment immediately after the experiment. This design mitigates the potential for confounding trust and patience in the experiment and makes the transaction costs of receiving payment

[3] McClure et al. (2004) find that inter-temporal choices with and without front-end delay are governed by separate neural systems, with the prefrontal and parietal cortices more often involved in choices between delayed rewards. These cortices are the brain regions related to general cognitive ability.

[4] Indeed, our estimates are "naïve" in the sense that a person's discount rate may comprise many things we are not measuring. We use the term discount rate merely to be consistent with previous work.

[5] Using administrative records of the number of students enrolled on September 1st of the school year in which we conducted the time preference experiments, we can calculate the proportion of the student population who participated in the experiment by demographic group. Using these data, we get the following participation rates: black boys, 74.8%, black girls, 84.5%, white boys, 84.6% and white girls, 82.1%. Overall, the participation rate is 81.5%. Using a Chi-Squared test of distributions, we reject the null hypothesis that proportions are equal across these subgroups at the level alpha=0.05. Conducting pairwise comparisons, the only significant differences at the 0.01 level are between black boys and black girls and black boys and white boys. Note that the calculated participation rates are most likely a lower bound on the actual participation rate because in two of the three years, the experiments were conducted earlier than the September 1st date on which we could obtain official enrolment data. By this date, there is a lot of movement of children in and out of the school district. This is especially true for black boys. Finally, only about twenty children declined to participate in the experiment. Thus attrition bias is very low.

[6] In the economics literature, several revealed preference methods have been used. One estimates discount rates from observations of the use of financial instruments (e.g., Ausubel, 1991) or of the purchase of durable consumer goods (e.g., Gately, 1980; Hartman and Doane, 1986; Hausman, 1979; Ruderman et al., 1986). Another uses natural experiments in which individuals are forced to choose among alternative payoffs with differential time dimensions (e.g., Warner and Pleeter, 2001). A third uses controlled experiments in which subjects are offered real monetary payoffs that vary in their timing (Andreoni and Sprenger, 2010a; Bettinger and Slonim, 2007; Coller and Williams; 1999; Eckel et al., 2005; Harrison et al., 2002; Holcomb and Nelson, 1992; Meier and Sprenger, 2006; Pender, 1996). Finally, stated preference methods elicit discount rates by asking individuals to make hypothetical choices in the revealed preference settings described above (Benzion et al., 1989; Bradford et al., 2004; Curtis, 2002; Loewenstein, 1988; Shelley, 1993; Thaler, 1981).