



Time preferences, study effort, and academic performance[☆]



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ABSTRACT

We analyze the relation between time preferences, study effort, and academic performance among first-year business and economics students. Time preferences are measured by stated preferences for an immediate payment over larger delayed payments. Data on study efforts are derived from an electronic learning environment, which records the amount of time students are logged in, the number of exercises generated, and the fraction of topics completed. Another measure of study effort is participation in an online summer course. We find no statistically significant relationship between impatience and study effort. However, we find that impatient students obtain lower grades and fail final exams more often, suggesting that impatient students are of lower unmeasured ability. Impatient students do not earn significantly fewer study credits, nor are they more likely to drop out as a result of earning fewer study credits than required.

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1. Introduction

People are often confronted with the choice to take a costly action now in order to obtain a benefit in the future. Although people generally tend to attach less weight

to future outcomes than to present outcomes, there is substantial heterogeneity in how individuals behave in those kind of situations. It has been found that experimental measures of individuals' time preferences correlate with their alcohol consumption, smoking behavior, body mass index (Borghans & Golsteyn, 2006; Chabris, Laibson, Morris, Schuldt, & Taubinsky, 2008; Sutter, Kocher, Glätzle-Rützler, & Trautmann, 2013), and credit card borrowing (Meier & Sprenger, 2010). Differences in individuals' time preferences may also help to explain the extent to which individuals are successful in education. Ultimately, being successful in education requires putting in effort. Individuals' choice of effort typically involves an intertemporal trade-off: effort costs of studying an additional hour are incurred immediately, while the benefits materialize in the future. We might therefore expect that impatient individuals exert less effort, resulting in lower educational attainment and performance. This hypothesis holds true regardless of whether one thinks of impatient individuals

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as exhibiting high exponential discount rates, or as strong hyperbolic discounters, reflecting a self-control problem.¹

A number of recent papers find evidence in line with this hypothesis. Kirby, Winston, and Santiesteban (2005) find that, in a sample of undergraduate students of two American colleges, impatient students have significantly lower grade point averages. Cadena and Keys (2015), using panel data representative of the US population, show that individuals who are classified as impatient by their interviewer, are more likely to drop out from high school and from college. Lavecchia, Liu, and Oreopoulos (2016) exploit the same data to show that students classified as impatient report spending fewer study hours. Golsteyn, Grönqvist, and Lindahl (2014) link individuals' time preferences measured at age 13 with several outcomes in later life, up to 40 years later. They conclude that individuals who make impatient choices at age 13 obtain lower grade point averages in compulsory school and high school, and are less likely to graduate from both high school and university. De Paola and Gioia (2013) find that, in a sample of Italian university students, impatient students obtain lower grades, while they find no differences in the number of study credits earned three years after enrollment.

In this paper, we contribute to this literature by investigating the relation between time preferences, study effort, and academic performance. In contrast to previous studies, we explore data on actual study efforts rather than analyzing data on study outcomes only.² We collect information on study efforts of 794 first-year business and economics students for an obligatory course in quantitative methods. An interesting feature of this course is that students are supposed to practice the course material in an electronic learning environment, which automatically records for each student the amount of time logged in, the number of exercises generated, and the percentage of topics completed without help of the electronic assistance tools. We use this information as measures of study effort. We further measure effort by voluntary participation in an online summer course that addresses deficiencies in basic mathematical skills. We measure performance in the course in quantitative methods by the final exam grade and whether this grade was sufficient to pass the course. We do not have information on study effort in other courses, but our effort measures predict performance in other courses just as well as in the quantitative methods course. To investigate how impatience relates to first-year academic

performance more broadly, we use four different performance measures. The first two are based on final exam performance in other first-year courses: the average grade obtained (excluding results obtained in re-examinations) and the number of final exams failed in the first attempt. The other two capture study progress: the number of study credits obtained during the first year (i.e. the number of courses passed weighted by the number of study credits assigned to each course), and whether students fulfill the university's minimum requirements for first-year performance. Specifically, failing too many courses or both first-year courses in quantitative methods leads to exclusion from the study program. Failing the exam in quantitative methods may therefore have serious consequences. We measure time preferences by a survey question that confronts students with three hypothetical choices between an immediate payment of €1000 or a larger delayed payment, the respective amounts being €1100, €1050, and €1250.³

By analyzing students' actual study efforts, we provide direct evidence on the existence of a causal relationship between time preferences and academic performance. Establishing causality is challenging if not impossible, as there is typically no exogenous variation in time preferences that can be exploited. A promising alternative strategy is therefore to investigate the channel underlying the relation between time preferences and academic performance, namely whether and to what extent impatient students actually exert less effort. This yields direct evidence on how time preferences influence study behavior, which is important as study outcomes may be correlated with time preferences for other reasons than study effort.

We find little support for the hypothesis that impatient students actually exert less effort. We find no statistically significant differences in the amount of time students are logged in, the number of exercises generated, and in summer course participation. Although the effects are generally imprecisely estimated, the point estimates are consistently close to zero. However, in line with findings of previous studies, we find that impatience is associated with weaker academic performance. Impatient individuals obtain lower final exam grades, and fail a final exam more often. In particular, students who always prefer the immediate payment are estimated to fail 34% more final exams than students of similar observed ability, amounting to 0.5 additional failed final exams per academic year. Taking into account that impatience may also affect performance via a reduction in the skills and knowledge students possess at the start of the academic year, the cumulative effect of impatience may be as large as 55%. These effects are mainly driven by relatively able students, as measured by their score on an entry test.

The most plausible explanation for this paradoxical result is that impatient students are of lower unmeasured ability. Consistent with this interpretation, we find that impatience is negatively correlated with measures of ability. Although our measures of ability (score on an entry test and prior education) arguably reflect accumulated

¹ The model we have in mind is that individuals trade off future benefits and present costs. In terms of the β/δ model (Laibson, 1997), future benefits are discounted by $\beta\delta^t$, where β reflects a self-control problem and δ is a time-invariant discount factor. The theoretical prediction is therefore that impatient individuals study less, regardless of whether impatience is captured by a low δ or a low β . Making the distinction between β and δ would be highly relevant from a policy perspective, as the existence of self-control problems increases the scope for welfare-improving policy interventions. Our measure of time preferences does not distinguish between the two, as reliable measurement of time-inconsistent preferences is difficult (Dohmen, Falk, Huffman, & Sunde, 2012).

² A noteworthy exception is the evidence provided by Lavecchia et al. (2016) in their survey of the literature on behavioral economics of education. An important difference is that they use self-reported data, whereas we use data from an electronic learning environment.

³ Falk, Becker, Dohmen, Huffman, and Sunde (2016) show that non-incentivized survey measures of time preferences are highly correlated with incentivized measures of time preferences.

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