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ABSTRACT

Behavioral Economics of Education: Progress and Possibilities^{*}

Behavioral economics attempts to integrate insights from psychology, neuroscience, and sociology in order to better predict individual outcomes and develop more effective policy. While the field has been successfully applied to many areas, education has, so far, received less attention – a surprising oversight, given the field's key interest in long-run decision-making and the propensity of youth to make poor long-run decisions. In this chapter, we review the emerging literature on the behavioral economics of education. We first develop a general framework for thinking about why youth and their parents might not always take full advantage of education opportunities. We then discuss how these behavioral barriers may be preventing some students from improving their long-run welfare. We evaluate the recent but rapidly growing efforts to develop policies that mitigate these barriers, many of which have been examined in experimental settings. Finally, we discuss future prospects for research in this emerging field.

JEL Classification: D03, D87, I2, J24

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"The roots of education are bitter, but the fruit is sweet" -Aristotle (384 BC-322 BC)

I. Introduction

A six-year old does not go to school because she wants a better life. She must be persuaded that school is fun now, or given no better option. That's because her brain is not yet well-developed.¹ While parts of her brain corresponding to motor and sensory processing mature early, higher cognitive areas like the prefrontal cortex, which underlie executive functions such as planning, working memory and self control, take longer to improve.² Without them, the six-year old is simply not conditioned to think about long-run consequences from immediate actions.

Over time and with experience, a remarkable process of neural circuitry expansion and pruning occurs that makes it possible to hold information in mind before deciding what to do with it.³ The cortex (outer layers that primarily distinguish the primate brain) thicken as neural connections proliferate.⁴ Then, rarely used connections are selectively trimmed, improving efficiency, while others are grouped together, improving specialization.⁵ Nerve cell conductivity also improves, allowing information to pass more quickly from one part of the brain to another so that the brain becomes more interconnected.⁶ Impulses, feelings, and distractions can then be held in check while imagining the future before reacting.

Until recently, many neuroscientists believed this maturation process occurred largely before puberty.⁷ Neuroimaging studies have demonstrated otherwise: maturation takes more than twenty years, with the circuitry responsible for executive function being among the very last areas to fully develop.^{8 9} Preferences, therefore, change with age,

¹ Excellent overviews of brain development are provided by Fuster, 2002; Romine and Reynolds, 2005; Teffer and Semendeferi, 2012; Johnson et al., 2009; and in the book, 'The Adolescent Brain,' edited by Reyna et al., 2012.

² Romine and Reynolds, 2005; Teffer and Semendeferi, 2012.

³ Romine and Reynolds, 2005.

⁴ Giedd et al., 2012.

⁵ Fuster, 2012.

⁶ Giedd et al., 2012; Chick and Reyna, 2012.

⁷ Fuster, 2002.

⁸ Giedd et al., 2012; Romine and Reynolds, 2005; Fuster, 2012; Teffer and Semendeferi, 2012

⁹ Late development in executive function also helps explain a declining time preference for immediate monetary gains against larger later gains (Giedd et al., 2012). Several researchers have found, starting as far back as age 10 until age 30, a steady decline in people's willingness to forgo a fixed monetary future

and children spend most - if not all - of their school years with less interest in the future than their future adult selves.¹⁰ The timing is unfortunate, given the many important long-term investments that can occur during this period.

Teenagers are particularly more susceptible to overemphasizing the present due to their more fully developed limbic system, a mid-brain area which registers desires for immediate rewards and pleasure.¹¹ The limbic system is highly sensitive to monetary, novel, and social rewards.¹² It also reacts more independently from other systems when in states of high emotional arousal or conflict -- states that occur more frequently in teenage years.¹³ While brain systems associated with higher order critical thinking skills also undergo a rapid expansion childhood, they remain unrefined and less integrated until adulthood. Many neuroscientists suggest that the rapid development of the limbic system relative to executive function systems contributes to the observed increase in pleasure-seeking and risk-taking behavior.¹⁴

Our tendency to overemphasize the present when making decisions involving immediate desires against long-term, incremental and uncertain benefits dissipates with age but does not go away. Even as adults, there is evidence that the tradeoff between immediate outcomes compared to distant ones is implemented in neural systems that yield hyperbolic discounting.¹⁵ A substantial research literature has firmly established that, in a variety of settings, adult responses deviate from those predicted by a time-consistent intertemporal utility model that assumes a constant discount rate:¹⁶ future gains are discounted more than future losses; small changes to outcomes are discounted more than large changes;¹⁷ small probability events, when emphasized, are discounted less than when not emphasized; and responses depend on context, emotional state¹⁸ and

amount for a smaller immediate amount (Steinberg et al., 2009; Green, Fry, and Myerson, 1994; Stanovich et al., 2012).

¹⁰ Read and Read, 2004.

¹¹ Chapman et al., 2012; Galvan, 2012.

¹² Giedd et al., 2012.

¹³ Galvan, 2012.

¹⁴ Atkins et al., 2012; Schneider et al., 2012.

¹⁵ McClure et al., 2004; Kable and Glimcher, 2007; 2010.

¹⁶ Frederick et al., 2002; Stanovich et al., 2012.

¹⁷ Frederick et al, 2002.

¹⁸ Rick and Loewenstein, 2008.

perceived social identity.¹⁹ ²⁰ Sometimes we do not even try to think in the long-term, relying instead on rules of thumb or past habits.²¹

The emerging field of behavioral economics attempts to integrate research from psychology, neuroscience, and sociology in order to better understand individual decision making and to develop policies that address the shortcomings in our decision-making processes. While classical economics often assumes that individuals always make correct short- and long-run trade-offs (ex ante), behavioral economics does not. Instead, the field acknowledges the possibility that deviations from time-consistent preferences, due to cognitive and perceptual aspects of our brain's architecture, may lead to suboptimal outcomes.²² Behavioral economics seeks not to reject the standard intertemporal decision-making model but to enrich it by incorporating more realistic assumptions that sometimes lead to profound differences in predicted actions, including those that are not in an individual's long-run best interest.

The field has attracted wide and growing attention, both for helping explain seemingly irrational outcomes and for its policy implications.²³ Compared to traditional programs with the same goals, interventions that draw from insights in behavioral economics may be more cost-effective, given that the research suggests that even small changes in the way choices are presented or in the way information is conveyed can lead to large changes in behavior. A prototypical example concerns saving for retirement. When deciding about whether to start saving for retirement, standard economic models assume that individuals are forward looking, are able to forecast how much they will need to save (or have access to services that help them do this), and face little difficulty following through with their plans. Several studies note, however, that the behavior of at least some people deviates from this model.²⁴ Simply changing the default action, from having to opt-into pension plans to being automatically enrolled, or requiring individuals to make an active decision regarding their contributions, increases savings significantly.²⁵

¹⁹ Benjamin, Choi and Strickland, 2010.

²⁰ Galvan, 2012.

²¹ Stanovich et al., 2012.

²² DellaVigna, 2009.

²³ Madrian, 2014.

²⁴ Benartzi and Thaler, 2007.

²⁵ Beshears, Choi, Laibson and Madrian, 2010; Carroll et al, 2009.

Other areas in which behavioral economics has been actively applied include finance, health and law.²⁶

One discipline that has received less attention from behavioral economists is education. This is surprising to us, given the field's key interest in long-run decision making and the propensity of youth to make poor long-run decisions. Economic models usually describe education as a well-thought-out investment: if students exert little effort in school, it is because they feel it is *optimal* to do so.²⁷ Clearly, this outcome need not be the case for a six-year old, and the slower development of the cortex suggests it need not be the case for a teenager either.

Education outcomes, ranging from performance on standardized tests to high school and postsecondary attainment, are determined by many factors that include parental inputs, school inputs and environmental factors. But perhaps just as important are inputs from students themselves. Paying attention in class, doing homework, completing assignments on time, and attending lectures or tutorials are all important determinants of student success. While parents and teachers may play a significant role in the extent to which these investments are undertaken, actions by students themselves ultimately determine the effectiveness of these inputs. These investments begin at early ages; the implication is that actions taken by as early as primary or middle school may have an important impact on later outcomes, especially if learning is cumulative. As a result, a serious consideration of the role of students in the production of education outcomes, even at an early age, is fundamental to both understanding differences in outcomes across students and for designing effective policies.

Overall, the area of education is a fruitful environment in which researchers and policy makers should consider possible deviations from the traditional human capital investment model and how behavioural economics might explain these deviations. This paper synthesizes the recent and growing literature on the behavioral economics of education and, in doing so, encourages others to recognize opportunities for further research. We argue that brain development over time and environmental context play an important role in determining educational outcomes and that education itself may affect

²⁶ DellaVigna, 2009; Diamond and Varitiainen, 2012; Thaler, 2005; Thaler and Sunstein, 2008; Sunstein, 2000, Hough, 2013.

²⁷ Becker, 1962.

brain development and, therefore, individuals' preferences. We discuss how policies that make learning opportunities easier, continually remind students of long-term goals, teach strategies to develop self-control, and encourage youth to take pride in their own skill development are promising approaches for helping foster academic achievement.²⁸

With these ideas in mind, in Section II we describe a general framework for thinking about why youth may not take full advantage of education opportunities. We summarize specific psychological barriers that may get in the way of realizing lifetime gains. In Section III, we identify particular educational outcomes worth encouraging, such as attainment, attendance, and homework. Section IV reviews the recent but rapidly growing efforts to develop policies that address behavioral barriers, many of which have been examined in experimental settings. We conclude in Section V by discussing prospects and possibilities for making further progress in this emerging field.

II. Barriers to Treating Education as Investment

In considering why some individuals may not necessarily treat education as an investment, we find it helpful to conceptualize the process of long-term decision making as involving two broad systems – one that is forward looking and one that is not.²⁹ Economists often assume that individuals only use a rational, forward-looking system to maximize lifetime welfare given various resource constraints. While this simplifying

²⁸ Schneider and Caffray, 2012.

²⁹ Recent neuroscientific evidence rejects the overly-dichotomous notion that there are separate, competing, neural systems for processing immediate vs. delayed rewards (Kable and Glimcher, 2007; 2010; Glimcher and Fehr, 2014). Instead, it is increasingly recognized that multiple neurobiological systems interact with each other to yield hyperbolic discounting, and this might arise from neurobiological constraints (possibly in the interaction between multiple systems). The distinction is not important for our policy discussion. We have chosen a framework that highlights that the process of valuing immediate outcomes is different from the process of evaluating (much) later ones (Glimcher, 2014). We do not require that two separate neural values systems compete with one another, only that the systems which implement the inter-temporal tradeoff are not yet fully developed prior to adulthood, and this leads to behaviour or preferences which change with development. This work also distinguishes between overemphasizing the present versus overemphasizing outcomes that happen sooner rather than later. In an 'As Soon As Possible' (ASAP) model, subjective values of outcomes are steeply discounted relative to the soonest currently available reward (Kable and Glimcher, 2010). Since the intertemporal decisions we focus on trade-off immediate costs for longer-term, uncertain benefits, the implications of both models are very similar.

assumption helps in many settings, research from neuroscience and psychology shows it can lead us astray in other settings, especially in cases where youth, still in cognitive development, are making the decisions.

Framing the discussion in terms of the dual system approach is a useful way to think about how the development of the brain interacts with current neuro-biological evidence for how decision-making is implemented. The current evidence suggests a model for inter-temporal choice in which the brain produces subjective values for different outcomes, these values can be measured on a single common scale, and the largest-valued outcome chosen (Glimcher, 2014). However evidence for signals can be found both in cortical areas (the medial pre-frontal cortex) and in the limbic system (the striatum), and it is still unclear how these signals interact in the course of a decision. How these different signals are integrated across cortex and the striatum, possibly in the face of constraints and/or the state of development, can yield distant outcomes which are discounted and perhaps even ignored depending on a number of factors, including salience, stress, distractions, and age.³⁰ The discounting or ignorance of long-term consequences is particularly useful for describing suboptimal education behavior. For the remainder of the chapter, it will be helpful to keep in mind four key implications from this model: (1) some students focus too much on the present; (2) some rely too much on routine; (3) some students focus too much on negative identities; and (4) mistakes are more likely to occur with many options or with little information. We discuss each implication in turn.

1) Some students focus too much on the present

Assessing how you feel this instant is much easier than assessing how you expect to feel 10 years from now. Whereas System 1 quickly and intuitively gauges current feelings, System 2 is tasked with anticipating how one will feel in the future. This means that immediate costs associated with investments that yield future payoffs are salient and relatively easy to assess. On the other hand, future feelings seem vague and uncertain..

³⁰ Mullainathan and Shafir, 2013; Mani et al., 2013.

The imbalance can lead to myopia, with System 1 downplaying the importance of the future and overemphasizing the present. System 1 also evaluates probabilities based on its assessment of what it finds to be salient and most important in the present.³¹ In contrast, System 2 is more deliberate and weighs current and future benefits differently than System 1. The tendency to emphasize the present relative to the future varies both across people and within individuals, depending of factors such as stress, distractions or cognitive development.³²

The differences between System 1 and System 2 in their weighting of current and future expected costs and benefits can potentially explain why individuals make a variety of poor economic choices. In the System 1 and System 2 framework, individuals may act myopically or in a manner that appears time-inconsistent: System 1 may react quickly and decide against a trade-off with a cost today and a benefit tomorrow, especially if the current cost is particularly salient, but a trade-off that requires the same cost tomorrow and a benefit the following period may require more abstract and deliberate thought for System 2 to peruse. The outcomes that result from this decision-making process are consistent with individuals having quasi-hyperbolic preferences, with System 1 and System 2 thinking underlying these preferences.³³ Recent empirical evidence of myopic behavior stemming from this System 1 and System 2 framework can be found in a variety of fields. The retirement savings literature, for example, finds that many people spend little time deciding how much to save for retirement, despite the complexity and importance of this decision.³⁴ When asked to reflect on their savings decisions, many believe that they should be saving more. A majority of them say they plan to start saving soon, yet fail to follow through with those plans (Choi et al., 2002).

Children and adolescents are especially prone to short-term thinking. For example, Bettinger and Slonim (2007) find that more than 43 percent of children (aged 5 to 16) in their sample made choices in line with hyperbolic discounting. When asked to choose between a \$10 gift certificate to be distributed immediately after the experiment

³¹ See Kahneman, 2003 and the citations therein, especially Kahneman and Tversky, 1973; and Tversky and Kahneman, 1983.

³² Kahneman and Frederick, 2002; Kahneman, 2003.

³³ Quasi-hyperbolic discounting is the most commonly used form of discounting to model the behavior of individuals with time-inconsistent preferences (i.e. Laibson, 1997).

³⁴ Benartzi and Thaler, 2007.

or a larger amount (up to \$25) in 2 months, these children picked the immediate reward. When asked to evaluate a similar tradeoff where the \$10 gift certificate was distributed in two months or the same larger amount in 4 months, these children choose the later. Bettinger and Slonim (2007) also find that more than 25 percent of children choose options inconsistent with any type of rational behavior, but that these irrational choices were less likely to occur among older children.

Present-biased behavior has important implications in education. Doing homework, studying for exams, researching colleges or potential opportunities for financial aid and completing applications all involve salient up-front costs. At the same time, temptations to procrastinate abound; games, television, friends and food are all much more attractive than an extra hour of studying. In many cases, the potential benefits from these actions may seem incremental, uncertain and distant. When deciding whether to stay home and complete homework or enjoy time with friends, more salient up-front costs may lead a student to overemphasize the costs of studying relative to the potential future benefits. Similarly, deciding against taking advanced (and difficult) math or science courses in high school may seem particularly appealing to a high school senior despite the fact that doing so would make it difficult to transition to higher-paying STEM fields in college.³⁵

These examples highlight how education decisions may be sub-optimal when viewed through the System 1 and System 2 framework. Instead of reflecting forward-looking maximizing behavior, individuals can make decisions driven by System 1 that are very different than those they would make had they paused more to deliberate. Decisions may be high-stakes, such as which program of study to pursue or whether to attend college, or they may seemingly be low-stakes, such as whether to study for an extra hour. Over time, as the benefits of learning compound, marginal decisions on how much to study or practice also become consequential. That many of these decisions are made by students early in life makes myopic behavior more likely due to underdeveloped executive functioning skills.^{36 37}

³⁵ Harackiewicz et al., 2012.

³⁶ Castleman 2013, and Baum and Schwartz 2013, also note that the neurological systems in adolescents are particularly likely to favor immediate rewards, which may hinder the ability of students to be forward looking in their educational decisions.

More education may itself improve executive function, thus helping minimize subsequent sub-optimal decisions. Self-control, patience, and focus are skills that some studies suggest can be improved, though much work remains for understanding mechanisms and external validity.³⁸ Becker and Mulligan (1997) suggest that more schooling may reduce the remoteness of students' future preferences. They argue that problem-solving tasks assigned to students in school teach them to imagine alternative scenarios, in particular those involving adult lives and their future selves. Another channel through which increased education may help students focus less on the present is by decreasing the current disutility from costly actions such as studying or completing assignments.³⁹ If learning is cumulative, taking actions today which increase understanding of course material or improve essential skills such as reading, writing and numeracy, make it easier for students to understand future material.

Interestingly, the psychology literature identifies a mechanism through which additional schooling may make future educational investments less costly. With repetition and the acquisition of relevant skills, tasks that previously relied (almost) entirely on System 2 may migrate towards the automatic activity of System 1. Prototypical examples include driving a vehicle, mastering chess or performing at a high-level in sports.⁴⁰ A novice chess player will find that with practice and time, analyzing the board will become more automatic, intuitive and effortless. As it relates to education, investments in schooling may initially appear costly and salient because they require significant cognitive effort in addition to time. With practice and better developed skills, however, these immediate costs may seem less daunting.

2) Some students rely too much on routine

³⁷ See footnote 9 for examples of empirical studies which suggest that discounting decreases with age, particularly from adolescence until about age 30.

³⁸ In a complementary review article on behavioral economics of education, Koch, Nafziger, and Nielsen 2014, focus on the development and importance of these kinds of non-cognitive or soft skills. They discuss how soft skills fit in the education production function, both in terms of influencing education outcomes and being influenced by education.

³⁹ Oreopoulos and Salvanes, 2011.

⁴⁰ Kahneman and Frederick, 2002; Kahneman, 2003.

While the incorrect assessment of present versus future described above results in students optimizing poorly, relying too much on routine and automatic thinking can also lead to sub-optimal outcomes. Our predisposition to automatically make decisions by relying on familiar knowledge leads to new information being discounted while familiar decisions and routines become the default.

We often rely and benefit from routine. It makes it easier to get through daily tasks without feeling mentally strained. It also frees up bandwidth to focus on new or more complicated tasks. Grade school is one example of a setting in which routines form to make daily life easier. For most children, showing up to class on weekdays becomes routine. Students do not have to decide each day whether to go.⁴¹ When they complete a grade, they are automatically registered for the next. When they complete elementary school, a system is in place to help them to secondary school.

Problems arise, however, when routines must be disrupted in order to take advantage of opportunities for improving welfare. At the end of high school, for example, students that stick with their current routine will generally find themselves out of school (and out of work). Transitioning to college requires first deviating from one's daily routine to prepare to go, such as finding time to fill out forms, write entry essays, choose a program of study, pick courses, and apply for financial aid. It also requires changing routine, such as a new commute, study schedule, work schedule, and social schedule. To deliberately address each of these tasks, students must resist relying on System 1's autopilot preferences. Failing to modify routine for any one of them may close or limit college options.

Another implication from following automatic thought patterns and routines is that new information (or awareness about the existence of new information) will only be relevant for decisions if it immediately comes to mind. Individuals may miss out on acquiring better information not only because they do not have enough money or time, but also because the cognitive processes underlying System 1 rely on immediate accessibility and the ease with which facts, attributes and thoughts come to mind.⁴² As a result of System 1's automatic thinking, individuals may not even realize that they should

⁴¹ Social norms, especially those of a student's family and friends may also be important. We expand on this point in the following subsection.

⁴² Kahneman, 2003.

seek out new information. Students (or their parents) may make decisions using only readily available information or options, even if other information *seems* relatively easy to access.⁴³ This has significant implications for many situations in education, especially the transition to college.

To give one example, Hoxby and Avery (2013) find that bright students from disadvantaged backgrounds often fail to apply to selective colleges that have lower out-of-pocket costs than less selective schools they know about. This occurs despite the fact that information about various schools, programs and costs is available freely online. Sending information about school availability directly to students in the form of an information package appears to significantly increase application and enrollment rates at selective schools, a point we expand upon in Section 3.⁴⁴ Information about college options, tuition fees and even financial aid opportunities may be less accessible for students from low-income families⁴⁵ who are burdened by concurrent stressors associated with poverty and who are exposed to fewer resources from parents and high school counsellors about the transition process.⁴⁶

Even after entering college, issues of information inaccessibility persist. Scott-Clayton (2011b) notes that information about available courses is located separately from information about degree or program requirements and college counselors often have insufficient time for individual students.⁴⁷ Due to this lack of convenient and timely access to relevant information, a student must disrupt her predisposition to rely on default choices and routine in order to choose the right courses. Moreover, the sudden lack of routine that accompanies college means that a student must not only expend more effort into planning his or her day, but also have enough self-control to follow up on these tasks.

⁴³ Students and their families may also ignore or discount new information because of biased beliefs about the information they already have (DellaVigna, 2009). For example, they may be overconfident that the information they already have is correct and subsequently decide not to see new information. While we know of no studies that explicitly test for biased beliefs in education due to overconfidence, Hoffman (2012) finds evidence that supports this hypothesis among business experts.

⁴⁴ Hoxby and Avery, 2013; Hoxby and Turner, 2013.

⁴⁵ Avery and Kane, 2004; Dynarski and Scott-Clayton, 2006; Scott-Clayton, 2012b; Oreopoulos and Dunn, 2013.

⁴⁶ Castleman, 2013; Levine, 2013.

⁴⁷ Baum and Scott-Clayton, 2013.

With System 1's reliance on automatic thinking and routine, differences in exposure to information (even information freely and quickly available) may have important implications for student behavior. Without sufficient exposure, recent efforts by policymakers to improve the quantity and quality of information available to students and their families about college and financial aid are ultimately limited. Policies that expose information, compared to making it easily available, are more likely to be effective in a variety of fields, from consumer retail behavior to health.⁴⁸ For example, experimental evidence in Chetty et al. (2009) suggests that displaying the after-tax price of items at the grocery store can greatly affect consumers' purchasing decisions. While most consumers would normally have no trouble in computing the after-tax price of items, they would have to pause to do the relevant calculation. Our reliance on System 1 and its propensity to make quick decisions and focus only on salient factors implies that even simple optimizing decisions may not always be made. However, with a better understanding of our tendency to rely on routine, possibilities exist to leverage this knowledge to design more effective policies and improve individual outcomes.

3) Some students focus too much on negative identities

Concerns about identity predominate adolescent thinking and behavior.⁴⁹ The questions "what kind of person am I?" and "what are others like me doing?" serve as powerful reference points for deciding how to act. These extremely salient concerns about identity may have significant implications for how students trade-off between immediate costs and long-term benefits from education. Akerlof and Kranton (2002) argue that students care about the extent to which their behavior deviates from that of their social group (e.g. based on gender, race or being athletic or studious). In this

⁴⁸ In the field of health economics, Kling et al., 2012 show that the accessibility of information about Medicare prescription drug plans had a large effect on plan choice. Specifically, individuals in one experimental group were sent a one page letter with the web address to the Medicare website to view various drug plan options and prices. This group was also given information on how access and navigate the website. Individuals in the treatment group however were sent a different one page letter that detailed the cost of their current drug plan as well as the potential cost savings from switching to another plan. These relatively minor differences in the way information was presented led to large differences in plan choice and hundreds of dollars in cost savings for those in the treatment group.

⁴⁹ Akerlof and Kranton, 2000,2002, 2010; Coleman, 1961; Cusick, 1972; Everhart, 1983; Gordon, 1957; Hall, 1904; Hollingshead, 1975; Jackson, 1968; Roderick, 1993; Willis, 1997.

context, investments in education, such as effort in school, depend not only on individual benefits, such as test scores and grades, but also on social benefits, such as whether a particular level of effort is consistent with the behavior of one's social group. If an individual's friends preoccupy themselves with trying to have fun while avoiding the subject of planning for the future, that individual will feel pressure to do the same in order to conform. System 1's focus on the immediate present may lead students to overemphasize the current benefits associated with gratification from one's peer group relative to what their future selves or even their current, more reflective selves would prefer.⁵⁰ Since social interactions occur daily both in and outside of school from kindergarten and beyond, they are frequently a priority for many students. As a result, education decisions may overemphasize the value of immediate social gratification relative to a more deliberate consideration of long-term consequences.

Students may also fail to anticipate that their circumstances and friends may change. Imagining themselves with a career or family in the future may be difficult while still in school. Students may also forgo worthwhile education opportunities, such as going to a more selective out-of-state college, because they fear losing touch with their friends. In particular, they may not realize that their future interests, and ultimately their friends might change over time. This tendency is known as projection bias and may reinforce any predisposition toward being present-biased.⁵¹

People hold multiple identities based on their gender, race and other characteristics. Sociologists have long demonstrated that particular identities can be made more salient by prompting or 'priming' individuals to focus on them.⁵² Identities may relate to social groups, but may also relate to attitudes, such as being 'resilient,' 'capable,' 'incapable,' or 'unworthy'. Attitudes can also be primed, for example by reading motivational passages or watching tragic movies.⁵³ Priming students to focus on positive identities related to learning and intellectual curiosity may be one approach for trying to improve education outcomes.

⁵⁰ We expand on this point with evidence from recent studies by Bursztyn and Jensen in Section IV. Importantly, the benefits associated with gratification from one's peer group may either reinforce or mitigate the tendency to focus on the present.

⁵¹ Busse, et al., 2012; DellaVigna, 2009; Loewenstein et al., 2003.

⁵² Benjamin, Choi and Stickland, 2010.

⁵³ Dweck and Legget, 1988; Dweck and Sorich, 1999.

4) Mistakes are more likely with too little information or too many options

A growing body of evidence suggests that many children and parents are not fully informed about education costs, benefits, and options. This especially applies to those from low-income backgrounds. Avery and Kane (2004) demonstrate that high school students from low-income family backgrounds have very little understanding of actual college tuition levels, financial aid opportunities, and the admissions process. A report by the Advisory Committee on Student Financial Assistance (2001) notes that students and families, as well as adult learners, are often intimidated by news stories about college being unaffordable. These stories may contribute to the fact that individuals often greatly overestimate the cost of higher education (Horn, Chen, and Chapman 2003). Usher (1998) finds that low-income individuals overestimate tuition costs by an average factor of two and underestimate the average annual income differential between high school and university graduates. Misinformation or unawareness can lead to suboptimal outcomes, as high school students who view all postsecondary programs as unaffordable may miss out on significant returns. On the other hand, students only focused on university options may struggle to complete and miss out on more enjoyable careers from vocational schooling or other community college options.

While more information helps individuals make better decisions, more choice may not. Neoclassical economic models predict that giving individuals more choices makes them at least as well off as before. Expanding an individual's choice set increases the likelihood that an option that best matches one's preferences is available. This argument, however, relies on two assumptions. First, individuals do not find it too difficult to survey the menu of choices and identify the option that is the best fit for them. Second, they are able to easily keep all choices in mind when making their decision (e.g. when presented with a lengthy list of specials and entrées on a restaurant menu, you still remember promising options on page one by the time you get to page five). Yet, as discussed earlier, individuals have limited cognitive capacity and attention, and evaluating an abundance of choices requires cognitive effort, which may be especially costly if one's mental bandwidth is already burdened by other concerns.

Indeed, research in retail food purchases,⁵⁴ consumer credit,⁵⁵ and finance⁵⁶ suggests that people may respond unexpectedly to an abundance of choices. For example, Iyengar et al. (2004) find a strong negative correlation between the number of mutual funds offered in company pension plans and enrollment rates. Experimental evidence suggests that when presented with more choice, savers are more likely to choose the default option even if that option may not best suit their individual circumstances.⁵⁷ Overwhelmed by the number of options, individuals may rely on heuristics characteristic of System 1 such as choosing the simplest or most familiar option or deferring their decisions indefinitely.

More recently, evidence that more choice doesn't necessarily lead to better decisions and outcomes has also been found in education. Scott-Clayton (2011b) argues that the abundance of choices available to students in college for programs of study, courses and schedules may be contributing to high dropout rates, especially when combined with a lack of structure. Similarly, when students and parents are given the option of choosing primary and secondary schools, many choose the nearest school and sometimes fail to consider school quality.⁵⁸

III. Opportunities for Improvement

In the human capital investment model all choices are ex-ante optimal. Observed actions like skipping class, ignoring homework, or dropping out of school stem from a well thought-out decision in which alternative actions would likely leave one worse off. In contrast, behavioral theory does not assume that observed actions necessarily reveal what is ex-ante optimal; the roles of Systems 1 and 2 in decision-making imply that students make choices that do not always maximize lifetime well-being. In some cases, students may come to regret automatic or short-sighted decisions driven by System 1, wishing instead that they had considered future consequences more carefully. The fact

⁵⁴ Iyengar and Lepper, 2000

⁵⁵ Bertrand et al, 2010.

⁵⁶ See also Benartzi and Thaler, 2007; Choi et al., 2004.

⁵⁷ Agnew and Skzykman, 2005

⁵⁸ Hastings and Weinstein, 2008; Ross et al., 2014.

that education attainment decisions may be sub-optimal, relative to what students' future and more deliberate selves would prefer, suggests that policies designed to address barriers leading to these decisions have potential to improve outcomes and, ultimately, well-being.

How can policy makers know which behaviors are best to encourage? They cannot. As Bernheim and Rangel (2009) note, without additional assumptions or insights, researchers cannot distinguish at face value whether an observed behavior stems from a suboptimal choice or from the possibility that individuals are rationally weighing their own long-term costs and benefits. In the latter case, imposing constraints on individuals would make them worse off, but ultimately, the goal of interventions is to help individuals achieve their own goals, not to satisfy policymakers' preferences.⁵⁹ In this section, we draw attention to several domains in education where the ex-ante optimality of choices by parents and students is suspect, in turn suggesting that policies or tools to improve decisions and ultimately outcomes may be warranted.

One way in which we identify instances of suboptimal choices is through the success of "nudges." Nudges are interventions that encourage certain outcomes, but which do not meaningfully alter costs and restrict individual choice.⁶⁰ Seemingly trivial changes to upfront costs or to how choices are presented should not affect outcomes under models of rational decision making and yet, as we present evidence below, they do. Nudging opportunities likely exist because of our overreliance on System 1 thinking. Specifically, the salience of up-front costs together with seemingly vague and distant potential future benefits may lead students and parents to overemphasize the present.

This section identifies potential opportunities for improvement across several domains in education. By discussing examples where nudges have meaningfully impacted behavior in educational contexts, we suggest that particular issues of interest to educators – such as encouraging more parental involvement, more time doing homework and becoming eligible for financial aid – may also serve as promising opportunities for nudges. Although a nudge that changes behavior does not necessarily prove that the underlying intervention improves welfare, it does require that researchers and policy

⁵⁹ Rabin, 2013.

⁶⁰ Thaler and Sunstein, 2008.

makers seriously consider the possibility that pre-intervention decisions by students and parents may not have been ex-ante optimal.⁶¹ On the other hand, an ineffective nudge is not evidence that economic agents optimize in the way that the human capital investment model predicts; it may simply be that the nudge targeted the incorrect behavioral barrier.

While students' ex-post regret and reflections about past behavior are not direct evidence that ex-ante decisions are sub-optimal, it can also provide insights into why certain choices are made and identify possible opportunities for improvement. For example, that the majority of high school dropouts regret their decision to leave school while also attributing their decision to "too much freedom" and "not enough rules" suggests that the long-term consequences of their decisions may not always be at the top of mind.⁶² In some cases, we argue that the large financial gains from encouraging a particular behavior, such as graduating from high school, parental involvement or increasing class attendance, is sufficient to be skeptical about the ex-ante optimality of pre-intervention behavior.

a. Parental Involvement

Parental inputs are critical in determining children's cognitive and non-cognitive skills as well as education attainment.⁶³ The decisions parents make early on for their children have consequences not only on their quality of schooling, but also on peers they interact with and their future dispositions towards learning. Levels of parental involvement vary widely, with children from lower-income and minority families receiving less involvement, on average, than their higher-income classmates.⁶⁴

Many traditional models attribute these differences to differences in returns to education for children from different socioeconomic backgrounds. Investing in education may be more costly for low-income parents, so choosing to invest less is optimal.

⁶¹ Bernheim and Rangel, 2009.

⁶² Bridgeland et al., 2006.

⁶³ Cunha and Heckman, 2008; Todd and Wolpin, 2007.

⁶⁴ Sirin, 2005.

Another explanation is that low-income parents are less involved because they have less information about how to effectively invest. A policy that makes it easier to acquire information should therefore increase investment among affected parents relative to those who were not exposed to the policy. Recent experimental evidence suggests that small changes in the timing of information or in the way information is presented to parents can increase parental involvement and produce significant and often long-lasting results.⁶⁵ For example, Bergman (2014) finds virtually all parents who are offered text messages to inform them of their middle school child's incomplete homework agree to receive the messages, and that the children of these randomly selected parents perform significantly better than those whose parents do not receive the offer.

Given the strong association between academic achievement and long-run outcomes such as college attendance and earnings,⁶⁶ the magnitude of the effects from these small interventions suggests that either classroom information is difficult to obtain, or that the value from obtaining it is not salient enough for parents to want to access it. Stress exacerbates these barriers. Whether from money, time, or other circumstances, added stress reduces the brain's capacity to focus on other tasks, including parental involvement. As a result, simply making information more available may not be effective because stressed-out parents are distracted. Effective policies to increase parental involvement, therefore, may include those that reduce stress or make it easier to change routine.

b. High School Completion

High school dropouts face daunting challenges over the rest of their lives. Among recent dropouts in the United States, 16 percent are unemployed and 32 percent live below the poverty line; those with jobs earn an average of only \$12.75 per hour with the most common jobs found in the construction, food services, and landscaping services industries.⁶⁷ Labor-market outcomes remain bleak. Dropouts aged fifty earn an average of \$16.50 an hour. In addition to difficulties in the labor market, social outcomes are

⁶⁵ Avvisati, et al., 2014; Bergman, 2014.

⁶⁶ Chetty et al., 2011.

⁶⁷ Messacar and Oreopoulos, 2013.

worse for dropouts compared to any other education attainment group. More of them are separated or divorced, unhealthy and unhappy.

There is, of course, no single explanation why students drop out of high school: conflicts at home, urgent financial difficulties, or unexpected pregnancies are only a few examples. Some dropouts say they are too poorly prepared to complete high school. Bridgeland et al. (2006) report a majority say they are unmotivated or uninspired to go to class, but most also say they regret their decision later in life and, with the benefit of hindsight, wish they had stayed. Present bias may be at play, as suggested by Cadena and Keys (forthcoming), who find that adolescents classified by a surveyor as “impatient” are more likely to dropout, even if they stated an intention to finish. This behavior is difficult to reconcile with the human capital investment framework and suggests short-sightedness or the salience of an immediate distaste for school may be getting in the way of realizing larger lifetime gains.

Compulsory schooling laws have existed for decades (and sometimes more than a hundred years), primarily because of the belief that students wishing to leave school early are, in fact, better off by not doing so. For example, in the United Kingdom, Prime Minister David Cameron offers paternalistic reasons for wanting to raise the school leaving age from sixteen to eighteen, “Think about it: with your children, would you dream of just leaving them to their own devices, not getting a job, not training, nothing? No – you'd nag and push and guide and do anything to get them on their way ... and so must we.”⁶⁸ Many studies have exploited historical differences in compulsory schooling laws to examine whether high school students benefited from facing more restrictive dropout options. They often estimate substantial increases to adult annual earnings, in the range of 10 percent from an additional year of school due to facing more restrictive laws.⁶⁹ Other studies find non-pecuniary benefits, such as less crime,⁷⁰ lower use of cigarettes and illicit drugs,⁷¹ improved health,⁷² reduced incidence of teen pregnancy,⁷³ and improved memory and other cognitive abilities.^{74,75}

⁶⁸ Watt, 2013. <http://www.theguardian.com/politics/2013/oct/02/tory-housing-benefit-under-25-david-cameron-tory-conference>.

⁶⁹ Angrist and Krueger, 1991; Acemoglu and Angrist, 2001; Harmon and Walker, 1995, and Oreopoulos, 2005.

⁷⁰ Anderson, 2012; Lochner and Moretti, 2004.

⁷¹ Mensch and Kandel, 1988.

To be clear, policies that force children to stay in school by threat of fine or jail are not nudges. Constraining all individuals towards one action relies on the strong assumption that everyone who would behave differently without the constraint would actually be worse off in that event.⁷⁶ As this is unlikely, compulsory schooling legislation often does allow for exceptions. Students are often allowed to leave if they work full-time or are parents. Sometimes students are allowed to leave early after explicitly agreeing they understand the long-term risks from such actions. Enforcement is also not strict. To our knowledge, no parent has ever gone to jail under compulsory schooling legislation and very few have been fined. However, the law serves to set expectations and efforts to encourage youth to stay in class. Truant students are given more attention. They or their parents are often first contacted by teachers, principals, or caseworkers in an effort to reengage the students and address reasons behind the truancy. More resources for addressing or enforcing truancy may also come from changes to compulsory-schooling laws. Ideally, while past evidence suggests that many high school dropouts (but not all) miss out on large lifetime benefits, effective approaches to keep students interested and engaged in learning are needed to help them make better choices to stay in school, even when dropping out is permissible.

⁷² Lleras-Muney, 2005; Meghir, Palme, and Simeonova, 2013.

⁷³ Black, Devereux, and Salvanes, 2005.

⁷⁴ Banks and Mazzonna 2012.

⁷⁵ Two important caveats must be mentioned. First, estimated benefits to compulsory schooling vary widely outside North America (Brunello, Fort, and Weber, 2009; Brunello, Weber, and Weiss, 2012; Devereux and Hart, 2010; Grenet, 2011; Meghir and Palme, 2005; Pischke and von Wachter, 2008). One possibility is that returns are individual-specific and even change over the life cycle. Studies that estimate returns by looking at different samples of workers in different age brackets might produce inconsistent results. Other explanations discussed by Grenet, 2011 are that institutional factors, like minimum wage policies, affect returns, or that the implementation and enforcement of the laws vary across countries. Pischke and von Wachter, 2006 suggest that the tracking of students into vocational or academic schools at early ages in some countries will result in different returns to basic labor market skills. The other caveat is that another recent study, Stephens and Yang, 2014, calls into question the robustness of findings from some U.S. studies that use changes in compulsory schooling laws over time. Estimated returns become small and statistically insignificant after trying to control for region-specific time trends. Their critique does not apply to findings from Angrist and Krueger, 1991, who use static differences in school entry ages to estimate returns to compulsory schooling. Perhaps regional trend controls absorb a delayed effect. At the very least, the study suggests a need for additional research to determine whether these laws really did generate large returns. Even small average returns from compulsory schooling may still imply sub-optimal behaviour for some, since large and small effects are being averaged together. Under the human capital investment model, individuals affected by the laws should either be indifferent or expect to be negatively impacted. In this case, we should expect to find very low or even negative returns from constraining this entire group to stay on.

⁷⁶ Alternatively, the costs to those who would not have been worse off without the constraint are smaller than the perceived benefits for those who would have been worse off.

c. College Attainment

Past and recent evidence suggests that there are still large returns to a college degree that are also difficult to reconcile within a school investment model.⁷⁷ While benefits vary significantly across all college programs and occupations, college graduates enjoy an earnings premium in all major occupation sectors. The empirical evidence suggests that those at the margin of attending benefit at least as much as those from the more general college population at large.⁷⁸ Many researchers believe skill-biased technological change has caused a large growth in demand for college educated workers, especially those with skills that cannot easily be automated. Other empirical research argues that there are likely large non-monetary returns to higher education, including higher job satisfaction and better health outcomes.⁷⁹

A possible behavioral explanation for no college experience is lack of encouragement and approval from friends and family. Qualitative research on the college decision-making process suggests that students develop predispositions towards higher education at an early age based in part on parents' experiences and level of encouragement, as well as friends' interests in going, the high school resources available to them, and access to college information.⁸⁰ Salient information from these sources – as well as the social implications of a college-going identity – may therefore play an important role in actual attainment.⁸¹

Another behavioral barrier to college is having to change routine to get there. College transition costs are typically considered too small to matter in the education-investment model. However, there are many transition points from high school to college that require deliberate attention around short and long-term trade-offs. Prospective students must decide where to go, how long to go, how to afford to go, and then actually apply. Upon gaining admission, they must choose courses, set up meetings, fill out forms,

⁷⁷ See Oreopoulos and Petronijevic, 2013 for one recent review of the estimates of the financial returns to postsecondary education. See also Baum, Kurose, and Ma, 2013.

⁷⁸ Zimmerman, forthcoming.

⁷⁹ Oreopoulos and Salvanes, 2011.

⁸⁰ Cabrera and La Nasa, 2000.

⁸¹ Demming and Dynarski, 2009; Oreopoulos and Petronijevic, 2013.

and finally show up for class. While many underprivileged students express intent to go on to college, they sometimes fail to complete application requirements.⁸² Some students plan to attend college, get accepted, register for courses, yet fail to show up when their program begins. Others attend for years only to drop out before graduating despite often only requiring a few more credits.⁸³

Benefits from college appear more associated with program completion, even for programs lasting 1 or 2 years. In the United States, earnings of workers who only complete some college are only marginally higher than the earnings of high school graduates.⁸⁴ Yet while college enrollment rates have risen over the past few decades, completion rates have not followed suit. As with high school dropout, reasons for college dropout may be from overreliance on System 1 thinking. Several promising behavioral policies designed for increasing college completion are discussed in Section IV.

d. Program Suitability

College-bound youth must choose where to go and what to study from a wide array of options. Without adequate deliberation, many of them may end up in places not best suited to their abilities or interests. Recent evidence suggests that high-achieving students from low- and middle-income families are less likely to apply to selective institutions to which they would likely be admitted.⁸⁵ Moreover, many students may not consider the breadth of program and school opportunities available to them (i.e. vocational programs, relative to General Arts and Sciences programs at a local community college), especially if they are unfamiliar with them. Given that postsecondary completion rates, per-student instructional resources and career advising services vary widely across various institutions and programs, enrolling in schools that do

⁸² Avery and Kane, 2004.

⁸³ See Cadena and Keys, forthcoming

. Evidence that some students, especially those categorized as being “impatient” drop out of college with one year (or less) remaining is difficult to reconcile with traditional investment models. In particular, uncertainty about one’s personal ability or benefits and costs of going to college should be resolved by the third or fourth year of study.

⁸⁴ Oreopoulos and Petronijevic, 2013.

⁸⁵ Baum and Scott-Clayton, 2013; Hoxby and Avery, 2013.

not best match abilities and interests can be very costly for students. Mismatch between student interests and college services may also increase chances of dropout.

e. Homework

Homework often involves trading off more enjoyable activities now for uncertain, incremental benefits later. Bridgeland et al. (2006) find that high school dropouts report that they were doing little, if any, homework prior to leaving school. More than 60 percent of these respondents indicated that they could have completed high school had they worked harder at it and done more. At the college level, experimental evidence suggests that completing homework assignments lowers the probability that students drop a course and significantly increases grades without lowering performance in other courses.⁸⁶ Despite this, many students fail to complete assignments on time.⁸⁷

Empirical evidence suggests a strong negative association between impatience and study habits, especially homework.⁸⁸ As one example, we consider the amount of self-reported study time at school or at home by students in the 1979 National Longitudinal Survey of Youth (NLSY79).⁸⁹ Figure 1 shows the distributions of study times of those classified as patient or impatient using a measure of present bias introduced by DellaVigna and Paserman (2005) and also used in Cadena and Keys (forthcoming). In Figure 1, the average amount of time spent studying or working on class projects is lower among impatient students. In particular, impatient students are more likely to report spending no time studying.⁹⁰ This example is consistent with the results from a large and growing literature in psychology which finds that children who

⁸⁶ Grodner and Rupp, 2013.

⁸⁷ For example, Bergman, 2014 finds that more than 20 percent of students fail to complete assignments on time, with completion rates work to be done at home lower than those assigned to be completed in class.

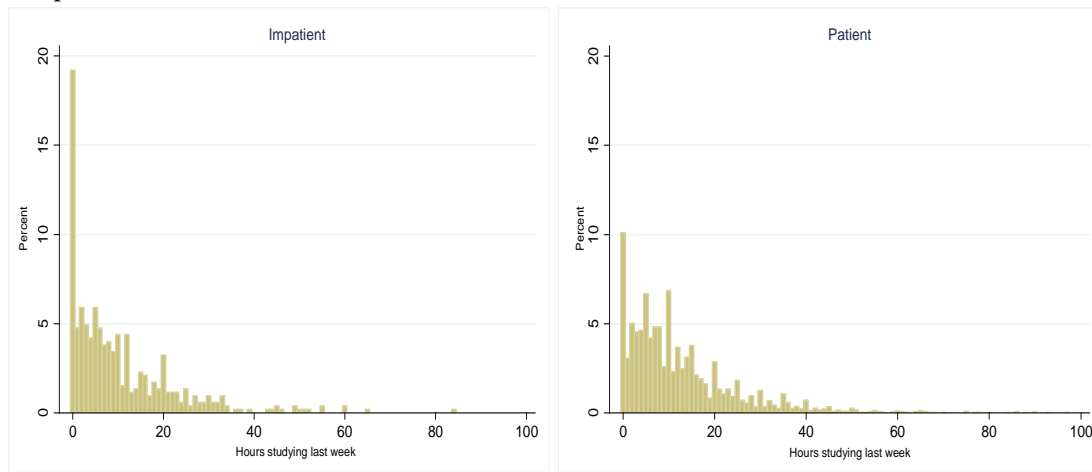
⁸⁸ See also Oreopoulos and Salvanes, 2011, who show a strong association between education attainment and individuals self-reporting they agree people should live for today and let tomorrow take care of itself.

⁸⁹ Specifically, we consider a sample of NLSY79 respondents who report being enrolled in school or college in 1981. The study time variable is defined as the sum of hours spent studying or working on class projects at school, on campus or away from school during the last 7 days.

⁹⁰ These relationships still hold in regressions that control flexibly for age, gender, race, mother's education (4 categories), father's education (4 categories), family income quartile as a child, poverty status as a child, magazines in the home as a child, newspapers in the home as a child, having a library card as a child, urban status and region indicators. In particular, NLSY79 respondents classified as "impatient" are 2.2 percentage points more likely to report spending no time studying (8.8 versus 11 percent), and report studying 1.35 hours fewer per week (7.09 versus 8.44 hours per week) than those classified as "patient".

are better able to exhibit self-control have better study habits, are more likely to regularly do homework, get better grades and have higher education attainment.⁹¹ Importantly, this research suggests that the ability to self-regulate can be influenced and improved, leaving open the possibility that targeted interventions can lead to significant gains in education attainment.⁹²

Figure 1: The distribution of hours spent studying and working on class projects by impatient and patient students



Notes: This sample includes all NLSY79 respondents reporting being enrolled in formal schooling in 1981. The graph shows the distribution of reported time spent studying or working on class projects between students classified as impatient (left panel) and those classified as patient (right panel). This measure of impatience was introduced by DellaVigna and Passerman (2005) and classifies a respondent as being impatient if surveyors report that the respondent was “impatient or restless” in any of the annual NLSY79 waves between 1980 and 1985. The study time variable is defined as the sum of hours spent studying or working on class projects at school, on campus or away from school during the last 7 days.

f. Attendance

By the time high school students decide to drop out, there is typically a long history of truancy and absenteeism that extends as far back as early elementary school.⁹³ Efforts to target early disengagement and keep students in class may therefore help

⁹¹ Duckworth, Quinn and Tsukayama, 2011; Duckworth and Carlson, 2013; Duckworth and Steinberg, 2014.

⁹² Duckworth, Gendler and Gross (2014) propose a model where agents choosing between an immediately rewarding activity and a valued distant goal can exercise self-control in several ways. When facing such a choice (such as checking Facebook instead of doing homework), agents can exercise self-control by anticipating the temptation and choosing to remove themselves from the situation (i.e. study in an area without a computer, tablet or cell-phone) or by paying a cost to directly suppress the urge at the time the choice must be made.

⁹³ E.g., Barrington and Hendricks, 1989.

prevent at-risk students from falling into a downward spiral, in which missing school causes them to fall behind in their studies, which, in turn, makes them feel even less motivated to attend classes and puts them further behind.⁹⁴ In college, absenteeism rises sharply when attendance is mostly voluntary. Past studies estimate about one-third of undergraduate college students regularly fail to show for class.⁹⁵

Both high school and college absenteeism are highly correlated with poor academic performance.⁹⁶ Past studies have struggled in determining whether these uniformly robust relationships represent direct causal influences. Dobkin et al. (2010) use a clever regression discontinuity design, in which college instructors insist on subsequent mandatory attendance for students with midterm grades below a specified cut-off. Students with grades just below the cut-off and facing mandatory attendance fare significantly better on the final exam than those with grades just above it.

A students' classroom environment clearly helps determine whether he desires to attend school. Students who feel engaged, motivated, and among friends are more likely to go (Brewster and Bowen, 2004; Catterall, 1998; Croninger and Lee, 2001; Lee and Burkam, 2003). Students may overemphasize these factors, however, and place less weight on the incremental and uncertain benefits from attendance. For example, the primary reason students gave for missing class in Dobkin et al.'s study was having slept in.

Students may also put off attending meetings outside the classroom, such as tutorials, after-school workshops, or advising. Unless attendance is mandatory, participation rates in these services are often very low. Some recent studies, discussed in detail below, suggest that mandatory tutoring or advising services are much more promising for boosting academic performance than voluntary ones. Our System 1 and 2 framework for decision-making points to the problems of leaving students to reorganize routines on their own. Bettinger, Boatman and Long (2013) suggest that from this lack of structure, students manage time poorly and become disengaged.

g. College Aid Savvy

⁹⁴Lamdin, 1996; Peterson and Colangelo, 1996; Strickland, 1998.

⁹⁵Romer, 1993.

⁹⁶Stanca, 2006.

Some students receiving college financial aid could be getting more. Others fail to qualify for aid entirely: each year, more than one million college students in the United States who are eligible for grant aid fail to complete the necessary forms to receive it.⁹⁷ Bird and Castleman (2014) estimate that nearly 20 percent of annual Pell Grant recipients in good academic standing fail to refile a FAFSA after their freshman year, and subsequently miss out on financial aid for the following academic year. Missing out on financial aid opportunities lowers the expected financial return to obtaining postsecondary credentials and, among those who do manage to apply for and receive financial aid, some could benefit from selecting a better financial aid package. The quality of a financial aid package is evaluated both by the quantity and the types of aid given: for instance, a financial aid package with a higher proportion of grants rather than loans or work-study funding is “better” because it may allow students to spend more time studying or enjoying leisure.⁹⁸ However, Avery and Hoxby (2004) find that some students are just as attracted to financial aid in the form of work-study and loans as they are grants, despite the fact that grants are less costly. The authors also find that some students are attracted by superficial aspects of financial aid offers, such as calling grants “scholarships,” and forgo better opportunities as a result.

An aversion to holding debt may also lead to students missing out on financial aid opportunities. In the human capital investment framework, the inability to borrow enough is the main reason why individuals who would benefit from attending college might not attend. This liquidity constraint can arise because the financial benefits of college occur in the future, while the costs of college must be paid in the present. Recent studies suggest that increasing numbers of students may face credit constraints, even when they have access to government aid.⁹⁹ Yet, an inability to borrow is not the same as a preference not to borrow. Students are considered debt averse if they prefer more school, can borrow to go, but end up not going in order to avoid incurring debt. Such behavior occurs because immediate (psychological) discomfort from holding debt can

⁹⁷ Council of Economic Advisors: National Economic Council, 2009.

⁹⁸ Avery and Hoxby, 2004; Bettinger, 2004; Stinebrickner and Stinebrickner, 2003.

⁹⁹ Lochner and Monge-Naranjo, 2012; Oreopoulos and Petronijevic, 2013.

lead to students underinvesting in education.¹⁰⁰ In one study of postsecondary financial aid applicants in Latin America, Caetano et al. (2011) find that survey respondents are about ten percent less likely to choose arrangements labeled as “debt” or “loan” contracts, as opposed to other financially equivalent contracts without these labels. Baum and Schwartz (2013) argue that students with no alternative means of financing postsecondary education, particularly those from low-income or minority backgrounds, may be more likely to be reluctant to finance college with loans.

In addition to educational underinvestment, debt aversion may lead students to engage in suboptimal study strategies, such as working part-time when that time could be used for homework. It can also affect enrollment decisions and career choices. For example, law school applicants who were offered tuition *waivers* conditional on finding employment in the public sector, compared to tuition *loans* that are waived after finding employment in the public sector, were far more likely to both enroll in the program and have a public sector job.¹⁰¹ Students, therefore, showed a strong preference to remain out of debt both while in school and after graduation.

h. College Cost Savvy

Low-income students and their parents are more likely to overestimate costs of attending college.¹⁰² Reports in the popular media that describe a crisis in student borrowing or that highlight extreme examples of students graduating with high debt levels may contribute to and further exacerbate the over-estimates of attending college among low-income families.¹⁰³ But why don't families discount these extreme examples about the costs of obtaining postsecondary credentials? One reason may be that these reports are particularly easy to recall when beginning to think about the college application process and this accessibility may lead to sub-optimal decisions.

¹⁰⁰ See Scott-Clayton, 2012a, 2012b. Aversion to holding debt may also be viewed in the standard rational economic framework if the variance to post-college earnings is high and risk aversion is sufficiently high (Baum and Schwartz, 2013).

¹⁰¹ Field, 2009.

¹⁰² Kane and Avery, 2004, Usher, 1998.

¹⁰³ Jabbar, 2011; Avery and Turner, 2012.

Lower-income families are also less likely to take advantage of government incentives to save for postsecondary education. The benefits of tax incentives for education saving, such as the 529 account in the United States, are highest for those with high incomes.¹⁰⁴ Use of Registered Education Savings plans (RESPs) in Canada is also concentrated among high-income and high-wealth families, despite the fact that the accounts were originally intended to lower the postsecondary among low-income families.¹⁰⁵ Students from low-income families who open an RESP account qualify for up to \$2,000 without any additional contribution, yet a large fraction of eligible students fail to do so. Making it easier to complete the application increases take-up rates substantially.¹⁰⁶

IV. Policies and Programs to Address Behavioral Barriers

This section reviews the growing literature of interventions designed to overcome behavioral barriers in education. Earlier we classified barriers into four general categories: 1) some students focus too much on the present, 2) some rely too much on routine, 3) some focus too much on negative identities, and 4) mistakes are more likely with many options or with little information. We selected interventions based on their likelihood of helping with at least one of these barriers. Some of them target a specific event, like helping complete an application. Some target a one-time change in school environment, like introducing more regular tests. Other interventions target recurring barriers and thus occur in multiple doses, like reminding students each week to attend tutorials. Whether a one-time or continuous intervention is preferred or warranted depends on a number of factors, especially cost and effectiveness. One-time interventions are not always cheaper. For example, a motivational presentation to think about the future is more expensive than a weekly email linking to motivational videos. With regard to the effectiveness of a behavioral intervention, a key determinant is the timing between it and when the actual decision being targeted needs to be made. In the

¹⁰⁴ Dynarski, 2004.

¹⁰⁵ Milligan, 2005.

¹⁰⁶ Nayar, 2013.

case of applying to college, reminding students in Grade 11 will not be as effective as reminding them in Grade 12. Inviting students to an after-school presentation on college application completion will not be as effective as inviting them to complete the form now, in class. Follow-up interventions may also be necessary in order to sustain behavioral changes or to reinforce habits; as such, research on the duration of these behavioral changes will be valuable.

In most cases, the studies we discuss below use random assignment as the source of variation, allowing for convincing and straightforward causal inference. We also describe programs designed to address behavioral barriers that have been proposed but not yet rigorously tested or that are currently being evaluated and whose preliminary results seem promising. Our goal is to both review the evidence accumulated to date, as well as to encourage other researchers to develop and test new policies that leverage these ideas. We mention key examples in the text. Tables 1 to 5 provide a more comprehensive list. Whenever possible we report the estimated effects of interventions for binary dependent variables in percentage points while results for outcomes such as test scores or grades are reported in standard deviations. In cases where grades are not standardized we report effects in terms of change in GPA points and note the baseline average. Unless otherwise indicated, all reported effects are statistically significant at conventional levels.

a. Interventions that aim to offset immediate costs with immediate benefits

One approach to address present bias is simply to remind students to think more about their future. For example, in an online study with at-risk undergraduate students from McGill University, a random sample was asked to take about two hours to participate in a goal-setting exercise in which they wrote down specific long-term goals and proposed intermediate steps to achieve them.¹⁰⁷ The end-of-year Grade Point Average for students assigned to the exercise was half a point higher than control students assigned to a basic personality test, a 0.7 standard deviation difference. While a seemingly trivial exercise, “interrupting” individuals at the cusp of a decision involving short- and long-run trade-offs and encouraging them to think deliberately may effectively

¹⁰⁷ Morisano et al., 2010.

deter them from overemphasizing the present. Requiring students to regularly write or think about their future appears to be a promising avenue for additional research.

Another approach for addressing present bias is to offer immediate incentives that offset immediate costs.¹⁰⁸ Parents often adopt this strategy in offering small rewards (like television or dessert) for future-enhancing behaviour (like doing homework or eating vegetables). Yet, some social scientists advise caution on the use of external incentives to motivate behavior.¹⁰⁹ Students, they note, can be intrinsically motivated to learn based on own desires for self-improvement, fun, and challenge, or they can be extrinsically motivated to do an unwanted task in order to attain a wanted outcome attached to it.¹¹⁰ A concern is that, by offering external incentives to make immediate tasks seem more worthwhile, students may become subsequently reliant on them or the incentive itself may become less attractive over time. Ideally, extrinsic incentives complement intrinsic motivation so that the extrinsic goal is self-endorsed and students recognize the importance of the behaviour and appreciate the added incentive. Students may also come to internalize the incentivized behavior if their own self-confidence or self-identity from doing it improves. For example, conditions attached to a scholarship or non-monetary award, such as a minimum GPA or required courses, may increase student effort if the student views the scholarship or award program as part of his or her identity.

Studies on the effectiveness of offering immediate incentives for improving grades or attendance yield mixed results. Table 1 summarizes these. One of the earliest experiments offered Grade 3 to 6 students in rural Ohio \$15 for obtaining grades above a proficiency cut-off in four subjects.¹¹¹ Math scores increased by 0.15 standard deviations in the year incentives were offered, but this effect dissipated the year after, with no effects found in Reading, Social Science, and Science. Using an array of award schemes for primary and middle school students in an impressive variety of settings, Fryer (2011) found very modest or no effects. One exception was an experiment in Dallas, in which Grade 2 students were paid to read books rather than to do well on tests. Reading scores improved by 0.25 standard deviations, suggesting that incentivizing learning *inputs*, like

¹⁰⁸ Hershfield et al, 2011.

¹⁰⁹ Ryan and Deci, 2010.

¹¹⁰ Grades are themselves a type of extrinsic incentive to study and learn.

¹¹¹ Bettinger, 2010.

reading or homework time, may be more promising than incentivising learning outputs like grades.

The effects of financial incentives may be sensitive to context, such as the age of students or timing of payments. For instance, Levitt et al. (2012) find that an incentive offered immediately before a test and awarded minutes after improves performance, whereas offering the same incentive awarded a month later does not. Perhaps performance incentives are more effective when awarded soon after the exertion of effort required to achieve them.¹¹²

Participation incentives compared to grade incentives target lower performing students and generally show more promise. Dearden et al. (2009) evaluate a program in the United Kingdom offering low-income high school students money for staying in school beyond the minimum dropout age. The fraction in school for at least two additional years increased from 61 to 68 percent. Ford et al. (2012) examine The Future to Discover program in New Brunswick, which provided high school students, starting in Grade 9, 'learning accounts' that accumulated to \$8,000 by time of graduation and could only be used for college-related expenses. College enrollment and graduation increased by 8 percentage points for students randomly offered these accounts compared to a control group. Annual information and reminders about the learning accounts, plus verification that students and parents understood the program, may have increased salience and interest.

Many colleges and universities offer financial incentives in the form of merit scholarships. One of the more rigorous studies of an existing program exploits a regression discontinuity design to look at West Virginia's PROMISE scholarship and finds substantial increases in four and five-year graduation rates (Scott-Clayton, 2011). The PROMISE scholarship provides a tuition waiver to students who maintain a minimum GPA and course load. Students who receive the scholarship are more than 6 percentage points more likely to receive at least a 3.0 GPA through college (46 versus 40 percent) and are 7 percentage points more likely to graduate within 4 years than students who just missed out on receiving the award (33 versus 26 percent). Importantly, the effects on GPA disappear in the final year of college, when the scholarship cannot be

¹¹² Levitt, List, Neckermann and Sadoff, 2012.

renewed, suggesting that students are motivated to work harder as a result of the financial incentive.

Experimental evidence on the effectiveness of college merit scholarships is less impressive. Angrist, Lang and Oreopoulos (2009), for example, test the effects of offering \$1000 to \$5,000 awards for first year undergraduates to attain grade averages above 70 percent, with and without additional mentorship support. Females offered both the scholarship incentive and mentor support receive grades 0.30 standard deviations higher by the end of the first and second year compared to a control group. The second year results are important, as they suggest sustained effort or learning, even after incentives are removed, yet the program had no significant long-term impact on females offered only the scholarship and no impact on males. A follow-up experiment offering large course-based incentives for incrementally higher grades above 70 percent, plus mentorship support, failed to generate significant long-term effects.¹¹³

An alternative type of merit aid targets course credit accumulation for students already enrolled in college in an effort to encourage on-time completion and retention. The lower (or non-existent) grade thresholds make these programs more expensive since a larger fraction of students achieve the credit target, including those who would have achieved it without the incentive. Several recent experiments suggest these kinds of merit-awards can increase retention. Barrow et al. (2014) find significant effects on credit accumulation from an experiment paying college students in Louisiana for enrolling at least half-time and attaining C-averages or better. Similar experiments were initiated in other states, all targeting low-income college students using credit accumulation incentives and grade targets no greater than C averages. Results show small but significant increases in cumulative earned credits by the first or second term.¹¹⁴ MacDonald et al. (2009) also find significant increases in GPA and retention from a Canadian experiment offering community college students \$750 for each of three semesters for obtaining a GPA above 2.0, maintaining a full course load, and accessing a minimum amount of student services. Graduation rates were 3 percentage points higher

¹¹³ Angrist, Oreopoulos and Williams, 2014.

¹¹⁴ Miller et al, 2011; Richburg-Hayes, Sommo, and Welbeck, 2011.

for the treatment group (27 versus 24 percent) and 9 percentage points higher among students from low-income backgrounds (34 versus 25 percent).

Significant latitude exists in designing immediate incentives to offset immediate costs, including the type of incentive, the target population, and whether it encourages performance outputs or specific inputs. The current research does not generate obvious conclusions on the potential of these approaches (Table 1 summarizes this research). Impacts have generally been modest or nonexistent, although they have not been negative, as some would predict given that extrinsic rewards could potentially crowd out intrinsic motivation. Thus far, the research literature has mainly focused on offering money, with one exception being Springer, Rosenquist and Swain (2014), who find large effects on tutorial attendance from offering middle-school students certificates of completion signed by the district superintendent, compared to the monetary gift certificates given to control students. Non-monetary incentives might appeal to students in ways that monetary ones do not.

Present bias arises not just from an immediate preference for leisure but also an immediate preference for spending money. College financial aid is typically distributed only at the beginning of the semester and deposited into a bank account. Once the challenges and distractions that accompany the start of a college semester begin, students may forget that these funds are intended to last for the whole year. The Aid Like A Paycheck program seeks to combat this short-sightedness by changing the way financial aid is delivered. After first paying off tuition and fees, students receive their remaining aid in equal biweekly installments tied to academic requirements. Researchers are looking at whether the program affects work hours, grades, and, ultimately, graduation.¹¹⁵

¹¹⁵ Ware, Weissman and McDermott, 2013.

Table 1: Interventions that aim to offset immediate costs with immediate benefits

Authors	Treatment	Data	Research Design	Findings
<i>Panel A: Primary, middle or high schools</i>				
Angrist and Lavy (2009)	Achievement Awards demonstration: \$1500 for passing the Israeli high school matriculation exam	Administrative data for high school seniors from 40 low-performing Israeli schools	Field experiment (randomization at the school level)	Eligibility for the cash reward increase the probability of passing the matriculation exam by (i) 5.2 percentage points for boys and girls (29 versus 24 percent) (not significant); (ii) 10.5 percentage points for girls (39 versus 29 percent); (iii) -2.2 percentage points for boys (18 versus 20 percent) (not significant).
Bettinger (2012)	\$15 (\$20) for each proficient (advanced) score in each state reading, math, writing, science, and social studies test	Administrative data for third, fourth, fifth and sixth grade students in Coshocton, Ohio	Field experiment (randomization at the school-grade level)	Eligibility for the Coshocton Incentive Program (i) increased math test scores by .15 standard deviations; (ii) increased reading test scores by .01 standard deviations (not significant); (iii) increased social science test scores by .02 standard deviations (not significant); (iv) increased science test scores by -.04 standard deviations.
Dearden et al. (2009)	Education Maintenance Allowance (EMA): (i) ~\$50 per week for each week of Grade 12 or 13 attendance; (ii) ~\$75 bonuses for term completions (iii) \$75-\$200 for course completion	Survey data for low-income high school students in England	OLS and Propensity Score Matching	Eligibility for the EMA (i) increased full-time grade 12 enrollment by 4.5 percentage points (74 versus 69 percent); (ii) increase full-time grade 13 enrollment by 6.7 percentage points (68 versus 61 percent).

Fryer Jr. (2011)	(i) \$2 payment for each book read in Dallas public schools (Earning by Learning); (ii) payment for performance on a series of tests in NYC public schools (NYC Spark); (iii) payment for grades in 5 core courses in Chicago (Paper Project)	Administrative data from 203 public schools in Chicago, Dallas and New York City	Field experiment	(i) Earning by Learning: (a) .012 standard deviation increase in reading scores, (b) .079 standard deviation increase in math scores; (ii) NYC Spark: (a) -.026 to .004 standard deviation increase in reading scores, (b) -.031 to .062 standard deviation increase in math scores; (iii) Paper Project: (a) -.006 standard deviation increase in reading scores, (b) -.010 standard deviation increase in math scores. No main effect estimates above are significant.
Jackson (2010)	Texas Advanced Placement Incentive Program (APIP): pays students between \$100 and \$500 for taking and passing AP exams; substantial financial incentives for teachers	Administrative data from 57 Texas high schools for the 1994 to 2005 period	Difference in differences using schools that do not adopt the APIP as the control group	Eligibility for the APIP led to: (i) a 2.4 percent increase in the percentage of 11 th and 12 th graders taking AP exams; (ii) a 13.5 percent increase in the number of students scoring above 1100 (24) on the SAT (ACT); (iii) a 5 percent increase in the number of students attending college.
Kremer, Miguel and Thornton (2009)	The Girl's Scholarship Program (Keyna): Girls who place in the top 15% of all girls in the program (treatment) schools on standardized tests received a scholarship to cover school fees and supplies for 2 years	Administrative data for 6 th grade girls at Kenyan primary schools	Field experiment	Eligibility for the scholarship increased test scores by .13 standard deviations during the program year.

Levitt, List, Neckermann and Sadoff (2012)	(i) Incentives to improve test score performance framed as gains and losses; (ii) pecuniary vs. non-pecuniary rewards; (iii) immediate vs. non-immediate rewards	Administrative data for more than 7,000 elementary and high schools from three school districts near Chicago	Field experiment	(i) .08 to .17 standard deviation improvement in test scores for incentives framed as losses relative to those framed as gains; .25 standard deviation improvement in test scores for non-financial incentives relative to financial incentives for elementary school students; (iii) non-immediate awards have no effect on test scores
Riccio et al. (2013)	Opportunity NYC: Various health, workforce, and education incentives directed at children including: (i) \$25 per month for 95% school attendance; (ii) \$300 to \$600 for passing or proficiency on standardized exams (amount varies for primary/middle/high school students); (iii) \$25 per parent-teacher conference attended (up to 2 per year)	Administrative and survey data for more than 11,000 children in New York	Field experiment	Students in 4 th grade at random assignment: effects on math proficiency (i) 2.1 percentage points in Year 1 (not significant) (73 versus 71 percent); (ii) 1.7 percentage points in Year 2 (not significant) (80 versus 79 percent). Students in 7 th grade at random assignment: effects on math proficiency: (i) 0.8 percentage points in Year 1 (not significant) (60 versus 59 percent); (ii) -1.6 percentage points in Year 2 (not significant) (62 versus 64 percent).
Rodriguez-Planas (2012)	Quantum Opportunity Program (QOP): \$1.25 per hour devoted to prescribed educational and developmental activities + a lump sum payment matching their earnings paid upon obtaining a high school diploma or GED and enrolled in postsecondary education or	Administrative and survey data from low-achieving students from low performing high schools entering in Grade 9 in 1995 in the United States	Field experiment	Eligibility for the QOP: (i) increased high school or GED completion by 4.3 percentage points (71 versus 67 percent) (not significant); (ii) increased postsecondary education enrollment by 5 percentage points (36 versus 31 percent).

training

Springer, Rosenquist and Swain (2014)	Students who attended 25 percent and 75 percent of their allotted supplemental education services (SES) tutoring hours received (i) a signed certificate of recognition from the district superintendent; OR (ii) \$25 plus an additional \$50 upon completing 100 percent of allotted hours	Administrative data for more than 300 primary and middle school students	Field experiment	Students randomly assigned to receive the non-monetary award (certificate) attended 43 percent more tutoring hours than control group students (60 versus 17 percent). Students randomly assigned to receive the monetary award attended 6 percent more tutoring hours than control group students (23 percent versus 17 percent) (not significant).
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Panel B: Postsecondary education

Angrist, Lang and Oreopoulos (2009)	The Student Achievement and Retention Project (STAR) (i) GPA based scholarship (SFP); (ii) mentoring from upper-year undergraduates (SSP); (iii) SFP + SSP	Administrative data for first year students at a large public Canadian university	Field Experiment	Students randomly assigned to the SFP treatment arm (i) .01 standard deviation increase in first-year GPA (not significant); (ii) -.02 standard deviation increase in second-year GPA (not significant). Students randomly assigned to the SFP + SSP treatment arm (i) .23 standard deviation increase in first-year GPA; (ii) .08 standard deviation increase in second-year GPA (not significant).
Angrist, Oreopoulos and Williams (2014)	\$100 reward for course grades of 70 percent + \$20 for each percentage point higher than this	Administrative data for first and second-year students at a large public Canadian university	Field experiment	Students randomly assigned to the treatment group (i) earned first-year GPAs -.021 standard deviations higher than those for the control group (not significant); (ii) earned a second-year GPA .107 standard deviations higher than those for the control group (not significant).

Barrow et al. (2014)	For each of two semesters, (i) \$250 for at least half-time enrollment; (ii) \$250 for a “C-“ average or better at the end of midterms; (iii) \$500 for maintaining a “C-“ average; (iv) optional counselling	Administrative data for low-income parents beginning community college in Louisiana	Field experiment	Students randomly assigned to the treatment group (i) earned 3.345 more credits (10.7 versus 7.4 credits) during first year; (ii) earned first-year GPAs 0.068 points higher (2.23 versus 2.17 GPA) (not significant).
Castleman (2014)	(i) Florida Medallion Scholars (FMS) scholarship: 75% of public college tuition and fees paid for students with a 3.0 high school GPA and at least 20 on the ACT (or 970 on the SAT); (ii) Florida Academic Scholars (FAS) scholarship: 100% of public college tuition and fees paid for students with a 3.5 high school GPA and at least 28 on the ACT (or 1270 on the SAT)	Administrative data for	Differences-in-differences design	Students eligible for FMS were 3 percentage points more likely to graduate with a BA five years after high school (not significant) (41 versus 38 percent). Students eligible for FAS were 10 percentage points more likely to graduate with a BA five years after high school (54 versus 44 percent).
Cohodes and Goodman (2014)	John and Abigail Adams Scholarship Program (MA): MA public school tuition waived for students who score in the top 25 th percentile of their school district and attain minimum absolute benchmarks on the statewide 10 th grade test; must maintain 3.0 GPA in college	Administrative data for Massachusetts public high school students (Massachusetts Department of Elementary and Secondary Education, National Student Clearing House)	Regression discontinuity design on 10 th grade test scores	Eligibility for the MA scholarship (i) increased the likelihood of enrolling in a college immediately by 1.7 percentage points (80 versus 78 percent); (ii) decreased the likelihood of graduating from a college within 6 years by 2.5 percentage points (69 versus 66 percent).

Cha and Patel (2010)	\$1,800 for earning a grade of “C” or better in 12 or more credits or \$900 for a “C” or better in 6 to 11 credits. All payments made at the end of each semester	Administrative data for low-income Ohio college students with children and eligible for TANF	Field experiment	Students randomly assigned to the treatment group earned 2.0 more credits (15.4 versus 13.4 credits).
Cornwell, Lee and Mustard (2005)	Georgia Hope: Full tuition/fees at GA public colleges for students with a 3.0 high school GPA; must maintain a 3.0 GPA in college	Administrative data for all undergraduate students enrolled at the University of Georgia	Difference in differences using non-Georgia residents as the control group	Eligibility for the Georgia Hope scholarship (i) decreased the likelihood of freshman full course load enrollment by 4.2 percentage points (85 versus 81 percent); (ii) decreased the likelihood of completing a freshman full course load by 6.0 percentage points (70 versus 64 percent).
De Paola, Scoppa, and Nistico (2012)	(i) \$1,000 for students with the 30 highest cumulative scores on all exams; (ii) \$350 for students with the 30 highest cumulative scores on all exams	Administrative data from first-year business students at the University of Calabria	Field experiment	Students randomly assigned to the \$1,000 reward treatment (i) scored .19 standard deviations higher on exams; (ii) earned 2.335 more credits (20.8 versus 18.5 credits). Students randomly assigned to the \$350 reward treatment (i) scored .16 standard deviations higher on exams; (ii) earned 2.194 more credits (20.7 versus 18.5 credits).
Dynarski (2008)	Arkansas (AR): \$1000 to \$2500 for tuition and fees at AR colleges for students with at least 19 on the ACT and a 2.5 core high school GPA; Georgia: full tuition/fees at GA public colleges for students with a 3.0 high school GPA; must maintain a 3.0	Survey (census, 1 percent PUMS) data for all 22 to 34 year olds in 2000	Difference in differences design using other states (not GA or AR) as the control group	The fraction of the age 22 to 34 population with a college degree increased by 2.98 percentage points in states that enacted merit scholarship programs (GA and AR) (37 versus 34 percent).

GPA in college

Ford et al. (2012)	Future to Discover (FTD): “Learning Accounts” up to \$8,000 in funds for college related expenses	Administrative data from high schools in two Canadian provinces	Field experiment	Eligibility for Learning Accounts increased postsecondary enrollment by 8 percentage points (71 versus 63 percent)
Leuven, Oosterbeek, and van der Klaauw (2010)	(i) \$600 for completion of all first-year requirements; (ii) \$200 for completion of all first-year requirements	Administrative data from first-year business and economics students at the University of Amsterdam	Field experiment	Students in the \$600 treatment arm were 4.6 percentage points more likely to complete first-year requirements (24 versus 19.5 percent) (not significant). Students in the \$200 treatment arm were 0.7 percentage points more likely to complete first-year requirements (20 versus 19.5 percent) (not significant).
Leuven et al. (2011)	(i) \$1250 for the student with the top microeconomics exam score; (ii) \$3750 for the student with the top microeconomics exams score; (iii) \$6250 for the student with the top microeconomics exam score.	Administrative data from first-year business students at the University of Amsterdam	Field experiment (pre-randomization students could select which treatment arm (\$1250,\$3750,\$6250) they wanted to be eligible for)	Students randomly assigned to the treatment groups (i) were 6.8 percentage points more likely to attend the first tutorial meeting (81 versus 74 percent); answered 0.895 (\$1250 incentive), 1.246 (\$3750 incentive), and -0.629 (\$6250 incentive) more questions correctly on the 35 question final exam.
MacDonald et al. (2009)	\$750 each of three semesters for (i) obtaining a 2.0 GPA or higher; (ii) meet eligibility requirements for the following semester; (iii) completing at least 12 hours of tutorial, case management or career workshops	Administrative data for at-risk community college students in Ontario, Canada	Field experiment	Students randomly assigned to the treatment group earned GPAs (i) 0.07 points higher during the first semester of college (2.18 versus 2.11) (not significant); (ii) 0.12 points higher during the second semester (2.06 versus 1.88); (iii) 0.01 points higher during the third semester (2.10 versus 2.09) (not significant). Larger effects were observed for women and

				older students.
Miller et al. (2011)	\$1,000 each of four semesters for (i) obtaining a 2.0 GPA or higher; (ii) enrolling full time;(iii) completing two extra advisor meetings per semester	Administrative data for low-income students starting at the University of New Mexico	Field experiment	Students randomly assigned to the treatment group (i) earned 0.0 more first semester credits (baseline average of 12.8 credits) (not significant); (ii) earned 0.6 more second semester credits (8.7 versus 8.1 credits) than students in the control group.
Ritchburg-Hayes, Sommo and Welbeck (2011)	Up to \$1300 each of two or three semesters, paid in installments for achieving (i) registration; (ii) continued mid-semester enrollment; (iii) a 2.0 GPA in at least 6 credits.	Administrative data for New York City community college students between ages 22 and 35 who also required remediation	Field experiment	Students randomly assigned to the treatment group (i) earned 0.6 more first semester credits (8.7 versus 8.1 credits); (ii) were 7.4 percentage points more likely to enroll full time (60 versus 53 percent); (iii) experience no difference in GPA than students in the control group.
Scott-Clayton (2011a)	West Virginia's PROMISE scholarship: WV public college tuition waiver for students we earn a 3.0 high school GPA and an ACT score of 21 or higher + maintain a 3.0 college GPA (with credit requirements)	Administrative data from public colleges in West Virginia	Regression discontinuity design on ACT score	Eligibility for the PROMISE scholarship increases the likelihood that a student (i) maintains a 3.0 GPA in college by 6.3 percentage points (46 versus 40 percent); (ii) graduates with a BA within 4 years by 6.7 percentage points (43 versus 37 percent).
Sjoquist and Winters (2012a)	Arkansas (AR): \$1000 to \$2500 for tuition and fees at AR colleges for students with at least 19 on the ACT and a 2.5 core high school GPA; Georgia: full tuition/fees at GA public colleges for students with a 3.0 high school GPA; must maintain a 3.0	Survey (census, 5 percent PUMS) data for all 22 to 34 year olds in 2000	Difference in differences design using other states (not AR or GA) as the control group	The fraction of the age 22 to 34 population with a college degree increased by 0.9 percentage points (not significant) in states that enacted merit scholarship programs (GA and AR) (35 versus 34 percent).

	GPA in college			
Sjoquist and Winter (2012b)	25 state-based merit aid programs with requirements on high school GPA, ACT/SAT scores, college credit enrollment, and college GPA	Survey data from the 2000 census (1% and 5% PUMS) and the 2000 to 2010 American Community Survey	Difference in differences design using non-merit scholarship states as the control group	The fraction of the age 24 to 30 population with a college degree increased by -0.2 percentage points (not significant) in states that enacted merit scholarship programs (38.6 versus 38.8 percent).

b) Interventions that help reduce inertia and change routine

Relying on routine usually makes our lives easier by reducing cognitive costs of decision making, but sometimes it can lead us astray as we ignore other available opportunities. In this subsection, we review policies and programs designed to change routines or encourage students and parents to reconsider their default plans. Tables 2, 3, and 4 summarize this research, respectively categorized by whether interventions target students, parents, or environment.

i. Text messages, Email reminders, Mailings, and Videos

Many students who commit to attending a particular college in spring are nowhere to be found on campus the following fall. Whether due to forgetfulness regarding paperwork, a lack of true interest, or anxiety regarding a new environment, as many as 20 percent of recent high school graduates in the United States who accept offers of admission fail to actually enroll after their senior year. This phenomenon is commonly known as summer melt.¹¹⁶ In a study of approximately 5,000 recent high school graduates who had indicated intent to go to college, Castleman and Page (2014c) asked whether low-cost reminders could effectively reduce summer melt. Some students were randomly assigned to receive text messages in the summer between high school and college informing them of tasks required by their intended college and offering additional assistance if needed. These students were 3 percentage points more likely to ultimately

¹¹⁶ Castleman and Page, 2014a; Castleman, Arnold and Wartman, 2012.

enroll at a two-year college (but not four-year college) than students who received no intervention (23 versus 20 percent). Treatment effects were concentrated among those with less definite college plans and less access to college-planning supports.¹¹⁷

Another example of a low-cost intervention with minimal personal contact comes from Hoxby and Turner (2013), who focus on high-achieving students from low-income family backgrounds. The authors were interested in this group's tendency to disproportionately apply to less selective colleges, despite being able to get into better schools. Across the United States, 39,000 students were randomly selected into a treatment or control group. The treatment group received a package of information about more selective colleges, an application fee waiver, and encouragement to apply. The package listed differences in graduation rates across schools, instructional resources of various selective colleges, instructions on how to apply, and expected out-of-pocket costs of attending. Students from the treatment group applied to more colleges, and were 40 percentage points more likely to apply to a selective college¹¹⁸ (92 versus 52 percent) and 5 percentage points (9 versus 4 percent) more likely to enroll in a selective school. Importantly, Hoxby and Turner (2013) find no evidence that students induced to attend more selective colleges are persisting at lower rates than their control group peers, suggesting that the high-achieving, low-income students who were induced to apply to and enroll in more selective colleges by the intervention were not underprepared.

Providing information about education's benefits can also increase motivation to attend. Jensen (2010) surveys students from the Dominican Republic and finds that while the measured returns to schooling are high, the returns perceived by students are extremely low. Students presented with information on the higher measured returns reported increased perceived returns several months later and an increase in schooling by 0.20 years, on average.

¹¹⁷ A similar strategy can be adopted in targeting potential high school dropouts. For example, in August of each year, retired teachers and guidance counselors attempt to telephone Grade 11 and 12 students in Toronto not yet registered for the upcoming school year, but not yet graduated. They do not leave voice mail, but rather keep trying until they speak with the student. In 2011, of the 1,667 students contacted, the callers reached all but 15 and convinced 864 to come back. Of those, 300 graduated that year (Hammer, 2012).

¹¹⁸ Here, we define "selective college" as an institution 5 percentiles above schools for which the student was prepared to attend. See Hoxby and Turner, 2013.

How information is presented or *who* is targeted matter as well. Dinkelman and Martinez (2013) examined effects from showing Grade 8 Chilean students DVDs of young disadvantaged adults describing their path towards college or vocational schools. While the presentation increased understanding about financial aid, there was little change in students' expectations of overall educational attainment. In Finland, Kerr, Pekkarinen, Sarvimaki and Uusitalo (2014) evaluate an experiment in which high school seniors across 97 randomly chosen schools were provided with information about average earnings and employment outcomes for graduates across a variety of postsecondary programs. While they find evidence of information updating, they find no impact on school choice or program of study.

ii. Personal Assistance

Text messages, email reminders, mailings, and video presentations cost little, but are also easy to ignore. A more intensive approach to helping students with inertia is personal assistance, in the form of one-on-one help from someone trusted and someone with experience. These opportunities to speak directly to students offer an important social component to nudge attempts and can be tailored to individual circumstances. By making the application process more convenient and appealing, personal assistance reduces procrastination. Offering help to "get it done now" in an existing interaction minimizes disruption and lowers opportunity costs of time. Personal assistance could also help reduce anxiety about making mistakes; it speeds up and simplifies the process, avoiding the need for detailed instructions and review. Offering assistance may increase perceptions about the value in the help being offered: personal encouragement may empower individuals to more fully consider the possibility of change.

Table 2: Interventions to Help Reduce Inertia and Change Routine for Students

Authors	Intervention	Data	Research Design	Findings
<i>Panel A: Text messages, Email reminders, Mailings, and Videos</i>				
Castleman and Page (2014b)	12 text message reminders about re-filing the FAFSA to renew financial aid after the freshman year	Administrative data from the National Student Clearinghouse and uAspire (a non-profit organization) for 808 college students in Boston and Springfield, Massachusetts	Field experiment	Community college students randomly assigned to receive text message reminders were 12 percentage points (19 percent) more likely to persist into their sophomore year (baseline persistence rate of 64 percent). The intervention had no effect on 4-year college students (baseline persistence rate of 87 percent).
Castleman and Page (2014c)	Text message reminders and mentoring support to complete college enrollment process	Administrative data from Texas, Massachusetts and Pennsylvania	Field experiment	Students randomly assigned to receive text message reminders were 3 percentage points more likely to enroll in a two year college (23 versus 20 percent). Treatment effects were largest for students with moderate high school GPAs and less defined college plans
Dinkleman and Martinez (2014)	15 minute informational video on the higher educational experience of 13 adults, including information on eligibility for financial aid	Survey and administrative data for more than 6000 eight grade students in Chile	Field experiment (randomization at the school level)	Students randomly assigned to receive treatment were 6 percentage points more likely to be enrolled in college-preparation high school (66 versus 60 percent). Effects were largest for students randomly assigned to take DVDs home to view with their families.
Hoxby and Turner (2013)	Mailed semi-customized information on college options plus application fee waiver for high-achieving, low-income students	Administrative data from 12,000 high school seniors in the US	Field experiment	Treated students (i) applied to 2.2 more colleges (6.9 versus 4.7 schools); (ii) 40 percentage points more likely to apply to a selective college (92 versus 52 percent); (iii) 5 percentage points more likely to enroll in a selective school (8.8 versus 3.5 percent).
Jensen (2010)	Information on the difference in earnings between university, secondary and primary school educated men between the ages of	Survey data from 8 th grade boys in the Dominican Republic	Field experiment (randomization at the school level)	Students randomly assigned to receive information on the returns to education (i) were 4.1 percentage points more likely to enroll in school for grade 9 (59 versus 55 percent); (ii) completed 0.2 more years of schooling (10 versus 9.8 years of schooling). Treatment effects were

Kerr et al. (2014)	Information session on the earnings differences between various postsecondary degrees and program	Survey and administrative data for the 3500 Finnish graduating high school students	Field experiment (randomization at the school level)	The college application and enrollment behavior of students randomly assigned to the information treatment was no different than control group students.
McGuigan, McNally and Wyness (2012)	Information on the potential earnings benefits and net costs of attending college, as well as information on financial aid options. Treated students also received a postcard and a 5 minute video on the same topic	Survey data for more than 12000 high school students at 56 schools in London	Field experiment (randomization at the school level)	Students randomly assigned to the treatment group were (i) 3.9 percentage points less likely to believe that the costs of higher education are a barrier to attending (7.8 versus 11.7 percent); (ii) 3.3 percentage points more likely to believe that university graduates have better labor force outcomes (83.7 versus 80.4 percent); (iii) 0.6 percentage points more likely to express university application intentions (59.6 versus 59 percent) (not significant).
Nguyen (2008)	Information on the returns to education delivered through (i) presenting national statistics on the average returns to education; (ii) a role model; (iii) national statistics and a role model	Administrative and survey data for primary school students in Madagascar	Field experiment (randomization at the school level)	Students randomly assigned to receive information on the returns to education through national statistics scored .24 standard deviations higher on standardized tests. Students randomly assigned to receive information on the returns to education through a mentor score .08 standard deviations higher on standardized tests (not significant).
Oreopoulos and Dunn (2013)	Short video on the potential earnings gains from postsecondary education (PSE), costs of PSE, eligibility for financial aid and a personalized financial aid calculator to estimate financial aid	Survey data from 1,600 low-income high school students (5 high schools) in Toronto, Canada	Field experiment	Among students unsure about their education attainment, random assignment to treatment led to a (i) 24.1 percentage point decrease in the belief that costs are a barrier to attending college (37.6 versus 61.7 percent); (ii) 15 percentage point increase in community college aspirations (23 versus 8 percent); (iii) 23 percentage point increase in university aspirations (65 versus 42 percent)

Panel B: Personal Assistance

Avery (2013)	Tutoring and college application assistance	Administrative data from the College Possible Program	Field experiment	Students randomly assigned to the College Possible program were (i) 30 percentage points more likely to apply to a 4-year college; (ii) 44 percentage points more likely to apply to a selective institution; (iii) 15 percentage points more likely to enroll in a 4-year college.
Berman, Ortiz and Bos (2008)	Counselling on college options, costs and application procedure	Administrative data from the Los Angeles Unified School District	Field experiment	Students randomly assigned to receive treatment were (i) 5 percentage points more likely to write the SAT (83 versus 78 percent); (ii) 2 percentage points more likely to apply to a college (96 versus 94 percent); (iii) 5 percentage points more likely to enroll at a state-college (55 versus 50 percent); (iv) no more likely to be enrolled in college overall.
Bettinger, Long, Oreopoulos and Sanbonmatsu (2012)	(i) Personalized advice in completing FAFSA (FAFSA Treatment Group); (ii) Personalized financial aid estimates and encouragement to complete the FAFSA on their own (Information Only Treatment Group)	Administrative data from H&R Block in Ohio and North Carolina, the Department of Education and the National Student Clearing House	Field experiment	Students randomly assigned to the FAFSA Treatment group were (i) 16 percentage points more likely to complete a FAFSA (56 versus 40 percent); (ii) 11 percentage points more likely to be enrolled in college and receive financial aid (41 versus 30 percent); (iii) 9.4 percentage points more likely to be enrolled full time (31 versus 22 percent); (iv) 8 percentage points more likely to be enrolled in college for 2 years (36 versus 28 percent). Students randomly assigned to the Information Only Treatment group had outcomes similar to those in the control group.
Carrell and Sacerdote (2013)	Personalized mentoring and assistance in completing financial aid and college application forms	Administrative data from New Hampshire high schools	Field experiment	Students randomly assigned to receive coaching were (i) 5.4 percentage points more likely to enroll in college (57.2 versus 51.8 percent); (ii) 5.6 percentage points more likely to enroll in a 4-year college (28.3 versus 22.7 percent); (iii) no more likely to enroll in a 2-year college; (iv) 13 percentage points more likely to be enrolled in college 2 years after high school (47 versus 34 percent).
Castleman, Arnold and Wartman (2012)	Counselling to relieve information and financial barriers to mitigate summer melt	Administrative data from 7 high schools in Rhode Island	Field experiment	Students randomly assigned to receive counselling were (i) 15 percentage points more likely to be enrolled in college full time (47 versus 32 percent); (ii) 15 percentage points more likely to be enrolled in a 4-year college (41 versus 26 percent); (iii) no more likely to be enrolled in a 2-year college; (iv) 19 percentage points more likely to have followed through with intentions from

senior year (56 versus 37 percent).

Castleman, Page and Schooley (2014)	Counselling to low-income high school graduates to mitigate summer melt	Administrative data from high schools in Massachusetts and Georgia	Field experiment	Students randomly assigned to receive counselling were (i) 3.3 percentage points more likely to enroll in college in the fall (86 versus 82.7 percent); (ii) 5 percentage points more likely to be enrolled in college in their sophomore year (71 versus 66 percent).
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Panel C: Coaching and Advising

Borghans, Golsteyn and Stenberg (2013)	Advice from counselling while in secondary school on college program choices	Survey data from more than 4000 high school graduates in the Netherlands	OLS and Instrumental Variables	Meeting with a high school counsellor is associated with a reduction in the likelihood that a student wishes they had chosen a different program by 2 percentage points (20 versus 22 percent). Male students and those with parents from low socioeconomic statuses are affected the most by high school counselling.
Bettinger and Baker (2014)	Coaching to improve college completion	Administrative data from 8 public and private colleges from InsideTrack	Field experiment	Students randomly assigned to InsideTrack were 4 percentage points more likely to complete college (35 versus 31 percent).
Cook et al. (2014)	Mandatory intensive math tutoring and weekly social-cognitive skill training	Administrative data for 106 at-risk ninth and tenth grade high school students in Chicago	Field experiment	Students randomly assigned to receive treatment scored (i) .51 standard deviations higher on standardized math tests (TOT .65 standard deviations); (ii) earned .43 standard deviations higher math GPAs (TOT .58 standard deviations); (iii) -.06 standard deviations higher on standardized reading tests (not significant).

Bettinger et al. (2012) offer an example of the power of personal assistance with an experiment that takes place in H&R Block offices, which provide income tax preparation services primarily for lower- and middle-income families across the United States. Families in Ohio and North Carolina were randomly assigned into one of three groups. The first group was given personalized assistance in completing the FAFSA; after preparing the family’s tax return, H&R Block professionals offered families the opportunity to complete the application, a process which typically took an additional ten minutes. Using software which took advantage of information on the family’s tax return

to pre-populate most of the FAFSA questions, treatment recipients were not only guided through the application process, but also provided with a financial aid estimate and tuition estimates at nearby colleges. A second treatment group was provided with the same information and aid estimates as the first, but were left to complete the FAFSA on their own.

Relative to the control group, FAFSA application rates and college enrollment rates did not increase for students whose families received the Information Only Treatment. The full personal assistance treatment, however, was very effective: On average, graduating high school students whose families received the FAFSA Treatment were 16 percentage points (56 percent versus 40 percent) more likely to have filed the FAFSA than those in the comparison group, and were 8 percentage points (35 versus 27 percent) more likely to attend college for at least *two* years. This suggests that those induced to enroll were not underprepared for college.¹¹⁹

A number of studies explore the potential for personal assistance to help with other aspects of the college application process. We mention three key ones here. First, Avery (2013) evaluates the College Possible program, a comprehensive mentoring intervention that targets disadvantaged students in Minnesota. In addition to free tutoring services designed to help students improve their ACT scores, College Possible provides students with personalized assistance in choosing a college and completing paperwork. Students randomly assigned to receive treatment were 30 percentage points more likely to apply to four-year colleges and submitted almost five more applications, on average, than students in the comparison group. The results also suggest that program participants were induced to apply to four-year colleges relative to two-year colleges. If these low-income students were prepared to attend four-year colleges but would otherwise have applied to two-year schools, then the College Possible program may be alleviating information constraints about programs at four-year institutions, leading students to be matched with programs that better meet their abilities and interests. Indeed, students eligible for the

¹¹⁹ Building on the positive effects of targeted personal assistance, the U.S. Department of Education's FAFSA Completion Project notifies high schools of students who have not completed a FAFSA. Such information allows guidance counsellors to provide targeted assistance, ask students until they complete the form, or offer positive (e.g. a discounted prom ticket) or negative incentives (e.g. can't go to the prom without filling out a FAFSA).

program were 15 percentage points more likely to enroll in a four-year college than those in the control group.

Second, Carrell and Sacerdote (2013) study the effects of a program designed to increase college enrollment rates among New Hampshire high school seniors who had demonstrated an interest in applying to a postsecondary program, but who failed to begin the application process by January of their senior year. Students randomly assigned to a treatment group received personalized assistance to help complete college applications, with all of their application fees paid for. Students offered this service had college enrollment rates 15 percentage points higher than the comparison group (65 versus 50 percent), with the majority of the effect concentrated among female students. The percentage of students attending college for at least two years also increased.¹²⁰

Finally, Castleman et al. (2012) evaluate an intervention in seven urban Rhode Island schools that randomly offered active college counseling to high school graduates during the summer before college in seven urban schools. Program recipients received assistance from counselors throughout the summer to secure additional financial aid, complete necessary paperwork and alleviate any other concerns about going to college. The authors found that eligibility for the program increased college enrollment rates by 15 percentage points (60 versus 45 percent). Similarly strong effects were found for full-time enrollment at four-year colleges.

iii. Coaching and Advising

The examples above demonstrate how a program's application process can itself prevent individuals interested in the program from taking it up, and how personal assistance can be a very effective tool to help. The approach could also be useful in many other settings besides college applications, such as helping students choose courses to place them on an academic track or towards timely graduation, helping them open an education savings plan, helping them with good time management, or reminding them to

¹²⁰ A similar project is underway in Canada, in which a three class workshop is incorporated into the Grade 12 curriculum at low-college-transition schools: First, students are assisted in picking programs they are interested in and can get into; Second, they apply in class, for free, and third, they are assisted in applying for financial aid.

utilize student services. As a specific example, Bettinger and Baker (2014) evaluate the InsideTrack program, where mostly non-traditional college students were randomly assigned a coach whose job was to contact and motivate students regularly (through email, text, and phone) to help set goals and develop a strategy towards achieving them. Coaches were proactive, providing outreach without waiting for students to ask. Students offered the program for one school year were about 5 percentage points more likely to persist the following year and 4 percentage points more likely to complete their degree after two years (35 versus 31 percent). While the mechanisms behind these effects are not entirely clear, coaching could be helping to address several behavioral barriers discussed in Section II.¹²¹

However, making similar coaching services available does not guarantee participation because students may procrastinate, ignore the opportunity, or not believe in its effectiveness; the proactive outreach of the coaches – and other forms of mandatory assistance – may be important for addressing these limitations. In Chicago, disadvantaged Grade 9 and 10 students were randomly provided with mandatory intensive tutoring, during school-hours, along with weekly social-cognitive skill training.¹²² Students participated in one hour of tutoring, as part of their everyday class schedule. While the weekly skill training sessions were voluntary, because they took place during the school day, they were preferred over the alternative of going to class. Had the tutoring been voluntary or the training less convenient, it is not likely that participation would have remained above 70 percent. As a result of the program and its high participation rate, math test scores increased remarkably by 0.65 standard deviations.

iv. Helping Parents

The assumption that parents make education investment decisions on behalf of their children is common in economics. However, everyday concerns related to parents' own

¹²¹ Some schools are beginning to consider mobile nudges as a means to provide electronic coaching advice and motivation. The University of Washington Tacoma, for example, offers students a personalized mobile support system called 'Persistence Plus,' which "helps keep students on track by delivering a mobile "nudge", a daily text message that reminds them about quizzes and tests, helps with time, stress, and performance management, and encourages appropriate behavioral responses". (Fuhrman, 2014).

¹²² Cook et al, 2014.

jobs and careers, household finances and other family responsibilities may distract them from paying more deliberate attention to their children's educational progress. In this context, parents may fail to incorporate low-stakes but important investments, such as asking about their children's day at school or encouraging daily homework completion in their children's daily routines. This can occur even if parents realize that greater involvement can improve their child's academic outcomes. If the path to more parental involvement were simpler or more salient, perhaps behavior would change. Below we present some examples of interventions that adopt this approach.

Avvisati, Gurgand, Guyon and Maurin (2014) test whether an intervention that encourages parents to incorporate greater involvement in their child's middle school as part of their daily routine improves behavior and academic performance. Prior to randomization, middle school parents in a Parisian suburb were asked whether they wanted to volunteer to participate in a series of seminars in which parental interest in the daily activities at their child's school, homework completion and supervision were stressed as factors of student success. The authors then randomly assigned some volunteer parents to participate in these seminars while other volunteer parents received no intervention.¹²³ Eligibility to attend the seminars led to substantial increases in parent involvement, as reported by parents and corroborated by teachers (who were not aware which parents were assigned to treatment), as well as on student behavior. Treated parents scored .27 standard deviations higher on an overall parenting score. Students of treated parents accumulated 25 percent fewer absences and were less likely to be disciplined for misbehaving than untreated students. Additionally, the increase in parental involvement led to significant improvements in academic outcomes. Students in the treatment classes overall had French (language) grades that were .12 standard deviations

¹²³ As a result of the timing of the randomization, some students of parents who both volunteered and were assigned to receive treatment were placed in classrooms with students from non-volunteer, non-treated parents. Other students of volunteer parents who were not assigned to participate in the seminars were also in classrooms with non-volunteer, non-treated students. This allowed the authors to test whether peer effects led to change in the behavior of non-treated students who happened to be in the same classroom as volunteer, treated students. Interestingly, the authors find evidence of peer effects: classmates in the treatment classes were 2.4 percentage points less likely to be punished for disciplinary reasons and 4.6 percentage points more likely to earn higher behavior marks.

higher than that of the control group, although test scores did not significantly improve.¹²⁴

In Los Angeles, parents with middle and high school children were randomly selected to participate in a pilot that informed them of missing homework and absences through email and text messages. Parents selected for this treatment were more likely to report accurate beliefs about their children's missed assignments, as well as 7.9 percentage points (23 versus 15 percent) more likely to attend parent-teacher conferences compared to those in a comparison group. Impressively, this inexpensive intervention improved student GPAs by .23 standard deviations, as well as attendance, assignment completion, in-class work habits, and cooperation.¹²⁵

¹²⁴ Kraft and Rogers, 2014, examine a related program in which teachers sent parents weekly one-way communication about advice on what students needed to improve in class (as opposed to messages that focused on what students were doing well in class). The probability a student earned course credit by 9 percentage points (96 versus 87 percent).

¹²⁵ Bergman, 2013.

Table 3: Interventions to Help Reduce Inertia and Change Routine for Parents

Authors	Intervention	Data	Research Design	Findings
Avvisati et al. (2014)	Three meetings, focused on how parents can help their children do well in school (with an emphasis on homework completion), every 2-3 weeks from November to December	Administrative data from 6th grade students from a school district outside of Paris, France	Field experiment (randomization done after consent; randomization at class level so can get peer effects)	Treated parents are 3.4 percentage points more likely to contact the school regularly (82 versus 79 percent) and 6.7 percentage points more likely to monitor their child's homework (27 versus 21 percent). Children of parents eligible for the intervention accumulate 25 percent fewer absences and achieve French grade .12 standard deviations higher than those of non-treated students
Banergi et al. (2013)	Three interventions in rural India (i) ML: mother literacy and numeracy intervention; (ii) CHAMPS: teaching mothers about education system and how to help their children; (iii) ML + CHAMPS	Survey data from 480 villages in two Indian states	Field experiment	ML treatment mothers were 3 percentage points more likely to review their child's school work (25 versus 22 percent). CHAMPS treatment mothers were 6.5 percentage points more likely to review their child's school work (28.5 versus 22 percent). Children of treated mothers scored .037 to .069 standard deviations higher on numeracy tests than children of untreated mothers
Benhassine et al. (2013)	Small "labeled cash transfer" (LCT) to fathers of children in poor rural communities	Survey data for more than 47000 primary school students in 5 Moroccan regions	Field experiment	Students of families randomly assigned to receive LCTs were (i) 5.1 percentage points less likely to drop out of school after 2 years (2.5 percent versus 7.6 percent); (ii) 7.9 percentage points more likely to complete primary school (72.3 percent versus 64.4 percent).
Bergman (2013)	Biweekly calls/texts/emails to middle and high school parents about missed assignments and tests	Administrative data from 462 students in grades 6-11 at a school in Los Angeles	Field experiment	Students whose parents were eligible for treatment experienced (i) a .23 standard deviation increase in GPA, sensitive to past GPA as a control; (ii) marginal increase in test scores; (iii) improvement in classroom behavior (iv) 6 percentage points less likely to exhibit (teacher reported) unsatisfactory classroom behavior (20 versus 26 percent); (v) 6.9 percentage points more likely to exhibit (teacher reported) excellent classroom behavior (41 versus 34 percent). Treated parents were 7.9 percentage points more likely to attend parent-teacher conferences (23 versus 15 percent).

Bursztyn and Coffman (2012)	Solicited whether parents would be willing to choose a cash transfer (CT) program over their CCT program that included a feature which monitored children's school attendance	Survey data from 210 families with adolescent children in Brazil	Framed field experiment	Treated parents willing to give up about 6% of monthly income to keep the CCT with monitoring. When offered an alternative technology that sent text messages to the parent when the child was absent from school, parents were willing to switch from the CCT to the CT.
Harackiewicz et al. (2012)	Parents were mailed two mailed brochures and the link to a website that discussed the value of STEM courses	Administrative and survey data from Wisconsin 10th and 11th grade students and their families	Field experiment	Students of parents eligible for treatment enrolled in nearly 1 more semester of STEM courses than students of untreated parents (8.31 versus 7.50 semesters). Treated parents were 17 percent more likely to value STEM courses and 17 percent more likely to have conversations about the importance of advanced STEM courses with their children.
Kraft and Dougherty (2013)	Daily phone calls/text messages to parents of 6 th and 9 th grade students at MATCH charter school in Boston. Messages focused on what child did that day, what assignments and homework was assigned and ways for the child to improve.	Administrative data from 6th and 9th grade charter school students in Boston	Field experiment (randomization at the class level)	Students of parents eligible for treatment (i) increased homework completion by 5.9 percentage points (85 versus 79 percent); (ii) increased in-class participation by 0.59 times per-day (6.84 versus 5.25 times per day).
Kraft and Rogers (2014)	Weekly calls/emails/text messages to parents of high school students highlighting (i) what the student was doing well behaviorally or academically; OR (ii) what the student needed to improve on	Administrative data for 435 summer program high school students	Field experiment	Students of parents who received messages highlighting positive behavior were 4.5 percentage points more likely to earn course credit (91.7 versus 87.2 percent) (not significant) Students of parents who received improvement messages were 8.8 percentage points more likely to earn course credit (96 versus 87.2 percent).

Harackiewicz et al. (2012) tested an intervention that sent parents brochures promoting the career benefits from studying science, technology engineering and mathematics courses (often referred to as STEM courses). Parents were also directed to a web site and given advice on how to discuss these benefits with their children. On average, grade 10 and 11 students of parents randomly assigned this information increased their enrollment in STEM courses by nearly a semester. Additionally, parents reported increased positive perception of STEM courses and indicated that the materials provided helped them discuss the importance of course selection with their children. Students of college educated parents were the most likely to respond to the treatment by taking additional advanced STEM courses; given that these students are more likely than their peers to have passed foundational STEM courses early in high school, it is possible that the most prepared students were also the students more encouraged to enroll.

Beyond the classroom, behavioral economists are now examining interventions that could be brought into the home. For example, Ariel Kalil and Susan Mayer are currently studying how disadvantaged parents might more frequently engage in educational play with their child. Parents with children in Chicago preschools are given electronic tablets with education games installed. Some are randomly provided information about the importance of educational play, then asked to select a preschool staff member to help “keep score” on playtime spent with the child. Parents also receive advice for scheduling playtime and awards of recognition for meeting goals. More explicitly, Banerji, Berry and Shotland (2013) examine the effects of training parents in rural India about concrete ways to engage with their child’s learning. Treated mothers were 6.5 percentage points (24 to 52 percent) more likely to review their children’s school work, though math test scores for children of these parents only marginally improved.

v. Changing Defaults and Adding Structure

The interventions discussed above address students' tendency to stick to routine by providing salient reminders, information, or personal assistance to help consider other options. Another approach is to change routine externally by changing default options or

by imposing more structure.¹²⁶ One clear example of this comes from the ACT college entrance exam. Before Fall 1997, students who took the ACT were allowed to send their test scores to three schools for free, with each additional report costing \$6. Nearly 80 percent of ACT takers sent exactly three reports. After Fall 1997, students were allowed to send an additional (fourth) free report, while the cost of additional reports remained the same. Pallais (2013) finds that after allowing students to send four reports for free, less than 20 percent of ACT takers sent three test score reports and more than 70 percent sent exactly four reports, suggesting that the default number of free reports dominated student application behavior. Allowing an additional free report also changed types of schools some students applied to. Specifically, low-income students submitted more applications and were more likely to apply to a selective institution. With only three default submissions, some students for whom applying to a selective school would have been a realistic option may have decided not to apply in order to retain three safer options.

As another example of changing defaults, Oreopoulos and Ford (in progress) propose helping all Grade 12 students from disadvantaged high schools to apply to at least one postsecondary program in class, for free. They develop an experiment in Canada in which a three class workshop is incorporated into the Grade 12 curriculum at low-college-transition schools: first, students receive assistance in picking programs they are interested in and can get into; second, they apply in class, for free; and third, they receive assistance in applying for financial aid. The slogan of the program is "Keep Your Options Open"; by exiting high school with both an offer of acceptance from a program the student helped choose and a financial aid package, the idea of going to college becomes less abstract. The path becomes more salient and easier to take.

Encouraging students to follow better routines can also occur through imposing more structure. Elementary and secondary school students follow a clearly defined path to graduation, including taking mandatory courses and completing frequent tests. College programs, on the other hand, often expect students to independently determine what they need to learn through homework, readings and attending lectures. Attending class and doing coursework is optional in many cases; the expectation is that students are already able to prioritize school work in spite of the many demands on their time and

¹²⁶ Scott-Clayton, 2011 provides a focus on the need for more structure in community colleges.

tempting alternatives to studying. In some cases, adding structure to coursework and academic programs may actually “free up” students’ time to be more productive. The additional freedoms that accompany going to college, such as living independently for the first time, parties, or non-academic extra-curricular activities may lead students to procrastinate. Although adding more structure to academic programs, either through mandatory attendance or homework, reduces flexibility in students’ schedules, it may also make procrastination seem more costly and improve course performance. Structure may also help students get a clearer picture of what behaviors are necessary to be successful in college.

With these ideas in mind, the Guttman Community College was established in 2012 in New York with an all new academic curriculum and core structure to improve students' chances of graduation. Entering students commit to attending full time and are required to attend a three-week Summer Bridge Program in August that sets academic expectations, encourages students to understand their strengths and challenges as a learner, builds social networks, introduces the school's electronic resources, and provides a refresher in reading, writing, and mathematics. All students take the same courses in the first year, including an interdisciplinary liberal arts and science course, ethnography, statistics, and composition. Each student is assigned a “student success advocate,” whose job is to help with the college transition in first year. Students choose a major by the end of their first year, with a set curriculum. Scheduling of writing assignments and tests are coordinated among faculty throughout the year.

Another way to restructure the college environment is to create resources for student support, coupled with incentives so that students actually utilize them. Students participating in the Accelerated Study in Associate Program (ASAP) across several City University of New York (CUNY) campuses are required to 1) enroll full time, 2) take developmental courses, 3) graduate within three years, 4) take a noncredit seminar about goal setting and academic planning, 5) attend tutoring frequently, 6) meet with an assigned advisor at least twice a month, 7) meet with a career and employment specialist once a semester and 8) take block-scheduled classes so that students have similar classmates and faculty can coordinate across courses. In exchange for fulfillment of

these requirements, the program waives tuition fees, provides free public transportation passes, pays for all textbooks, and offers social activities.¹²⁷

ASAP students are 9.5 percentage points more likely than the comparison group to be enrolled in college by the end of their second year (58.3 versus 67.8 percent). They earn 7.6 more total credits (37.6 versus 30.0) and are 5.7 percentage points more likely to have completed an associate's degree after two years than students in the control group (14.5 versus 8.7 percent). Results at the third year are expected to show even larger effects, given that program participants are required to graduate within three years. Though these results are encouraging, determining which aspects of ASAP contribute the most to student success will be important for allocating scarce resources in the most effective way.¹²⁸

Changing the class environment to incorporate more structure can also improve student outcomes through both creating a regular routine and by limiting the potential for procrastination. For example, courses with assignments or exams due only at the end lead many students to wait until the end to study. Frequent, mandatory assignments can combat these tendencies to procrastinate. Moreover, these relatively low-stakes assignments provide the opportunity for students to be given regular feedback on their performance, allowing confidence to be built by successes and making the benefits of learning more salient. Grodner and Rupp (2013) test whether mandatory regular homework assignments improve academic performance for undergraduate students in North Carolina. Students randomly selected into a treatment group were required to submit regular homework assignments that were worth 10 percent of their final grade. The remaining 90 percent was comprised of marks on four exams, each worth 22.5 percent of their final grade. Students in the control group were evaluated only based on the four exams (each worth 25 percent); the homework assignments were voluntary and ungraded. The authors find that students who were required to complete homework assignments scored between 3.5 and 5.7 percent higher on tests than students in the control group.

¹²⁷ Scrivener and Weiss, 2013.

¹²⁸ Oreopoulos, Brown, and Lavecchia, 2014 evaluate a similar program offered to disadvantaged high school students and estimate large impacts on high school graduation and college enrollment.

Aside from the temptation to procrastinate on homework, college students are also tempted to avoid coming to class altogether. As we discussed earlier, absenteeism is common in many college programs and courses; those that take place early in the morning find it especially difficult to encourage regular attendance. Dobkin et al. (2010) find that a mandatory attendance policy in one class raises overall academic performance. In their quasi-experimental design, students were informed after their midterms that attendance would become mandatory for those who scored below the median. This policy increased attendance by 28 percentage points for students scoring just below the median on the midterm. Those at the margin of being required to attend class also increased final exam scores by more than .46 standard deviations compared to those who just missed the requirement. Notably, grades in other courses were not affected.

Table 4: Interventions to Help Reduce Inertia and Change Routine by Changing Defaults and Adding Structure

Authors	Intervention	Data	Research Design	Findings
Ariely and Wertenbroch (2002)	Students allowed to choose and commit to deadlines for assignments vs. traditional firm deadlines	Administrative data from an executive-education course at MIT	Field experiment (randomization done at course section level) and lab experiment	(i) Students allowed to choose assignment deadlines, on average, chose to pre-commit to less-flexible, evenly spaced deadlines; (ii) Students required to submit at evenly spaced deadlines performed better on a proof-reading task than those with flexible deadlines.
Dobkin, Gil and Marion (2010)	Mandatory attendance policy for students scoring below the median on the class midterm	Administrative data from three large undergraduate economics classes	Regression Discontinuity Design	(i) The mandatory attendance policy increased attendance rates by 28 percentage points; (ii) A 10 percentage point increase in attendance led to a .16 standard deviation increase in final exam scores.
Duckworth et al. (2011)	Mental Contrasting with Implementation Intentions (MCII) intervention: students are asked to (i) articulate a goal, including why achieving it is positive; (ii) named a critical obstacle to achieving the goal; (iii) outline strategies for how they intended to deal with the obstacle.	Administrative data from school and PSAT records for 66 tenth grade students at a selective high school	Field experiment	Students randomly assigned to the MCII intervention completed 56 more PSAT-prep questions than students in the control group (140 versus 84).
Grodner and Rupp (2013)	Mandatory homework assignments worth 10 percent of the final course grade	Administrative data from an undergraduate economics class in North Carolina	Field experiment	3.5 to 5.7 percent increase in test scores for students assigned to the mandatory homework group
Oreopoulos, Brown and Lavecchia (2014)	Comprehensive intervention for at-risk high school students including: mandatory (free) tutoring sessions, one-on-one and group mentoring, free public transit tickets (conditional on	Administrative data for more than 6000 disadvantaged high school students in Toronto, Ontario	Difference-in-differences	Eligibility for the Pathways to Education Program increases: (i) 5-year high school graduation rates by 15 percentage points (60 percent versus 45 percent); (ii) college enrollment rates by 19 percentage points (57 percent versus 38 percent);

	school attendance), up to \$4000 for college tuition and fees, college application assistance and fee waivers.			(iii) math and English test scores by .15 standard deviations
Pallais (2013)	Before 1997, college applicants were able to send 3 free ACT score reports to schools for free. After 1997, 4 free reports were allowed with additional reports costing \$6.	American Freshman Survey	OLS and difference-in-differences	Before 1997, more than 70 percent of ACT takers sent exactly 3 reports. After 1997, fewer than 20 percent sent exactly 3 reports and 70 percent sent exactly 4 reports. After 1997 students applied to colleges with 0.35 to 0.50 points higher on the ACT.
Pennebaker et al. (2013)	Daily online testing with personalized feedback	Administrative data from an undergraduate psychology course at the University of Texas at Austin	OLS (comparing "treated" students with those from prior cohorts)	Students in course sections with daily online testing (i) scored 6 percentage points higher on tests in the psychology course (77 versus 71 percent grade); (ii) scored marginally higher on other courses taken the following semester. Results were strongest for low-income students.
Scriviner and Weiss (2013)	Comprehensive community college program intervention: mandatory full-time enrollment, mandatory block classes, "quick" graduation, financial assistance, mentoring and career counselling	Administrative data from 6 CUNY colleges	Field experiment	Students randomly assigned to the treatment group (i) 9.5 percentage points more likely to be enrolled in college after two years (67.8 versus 58.3 percent); (ii) accumulated 7.6 more credits by the end of the second year of college (37.9 versus 30.4 credits); (iii) 5.7 percentage points more likely to complete their associate's degree after two years (14.5 versus 8.7 percent)
Stanca (2006)	Mandatory attendance policy on college course performance	Survey data from an undergraduate economics course at the University of Milan	OLS and IV with panel data	A one percentage point increase in lecture attendance was associated with a 0.1 percent increase in test scores.

Aside from required assignments, the timing of due dates may also be important for improving academic performance. Many college courses cluster deadlines at the end of the term, but giving students three to four months to finish their assignments may exacerbate tendencies to procrastinate. Students who are aware of this tendency may want tools that help them commit to certain deadlines,¹²⁹ while students who are not short sighted and have no procrastination problems may prefer traditional end of term deadlines that provide the most scheduling flexibility. To test whether students have a preference for pre-commitment for assignment deadlines, Ariely and Wertenbroch (2002) randomly assigned multiple sections of a semester-long course to one of two conditions. In the choice condition, students in one section of the course were allowed to choose their own deadlines for three papers. Students were free to choose any deadline but were required to commit to these dates by the end of the first week of the term. As the control group, students in the other section were given fixed, evenly spaced deadlines for the same papers. Surprisingly, students in the choice group chose to commit to submitting their assignments in relatively evenly spaced intervals throughout the term. On average, students chose to submit the first paper 42 days before the end of the term, the second 26 days before the end of the term and the third 10 days early. The fact that students chose to constrain themselves through earlier deadlines suggests that at least some of them attempted to mitigate their expected procrastination.

To test whether allowing students more flexibility to choose deadlines improves performance, the authors hired proofreaders for a three-week field experiment, in which they were randomly assigned to one of three groups. The first group was asked to submit one proofread document at the end of each week. The second group was allowed to submit their documents anytime, as long as they were all submitted by the end of three weeks. Finally, similar to the choice condition in the first study, a third group committed to self-imposed deadlines for the documents. As in the previous study, the authors found that participants assigned to the third group chose deadlines that were spread out. These proofreaders also performed better on the tasks than those randomly assigned to submit all three tasks by the end of the third week (group 2). However, those who were allowed

¹²⁹ For example, this would be the case if students were sophisticated time-inconsistent discounters (i.e. Laibson, 1997).

to choose their own deadlines performed worse than those who were required to submit a task weekly (group 1), suggesting that some were unable to choose deadlines “optimally” to maximize their performance. Altogether, these results suggest that setting fixed deadlines can improve academic outcomes, especially for students who have a tendency to procrastinate. These results may also be particularly relevant for increasingly prevalent online courses, which encounter higher dropout rates than traditional courses.¹³⁰

c. Interventions that strengthen positive identities

The need for social interaction and the need to feel liked are powerful influences on behavior.¹³¹ These influences can have negative consequences, such as when hard-working students are harassed for making less future-oriented classmates feel bad,¹³² or when peers collectively focus on enjoying the present, reinforcing each others’ present bias. One approach to mitigate negative social influences is to help students focus on more positive identities. Sociologists have repeatedly demonstrated that individuals behave differently when prompted or “primed” to think of themselves as associated with one group compared to another.¹³³ For instance, in Cohen et al. (2006), seventh-graders from a school with a large proportion of low-income and minority students were randomly assigned to one of two groups. In the treatment group, students were asked at the start of the semester to consider and write about which value was most important to them. In the control group, students chose a “least important” value, but explained why those values might be important to other people. Treated African-American students had significantly higher fall semester grades than those in the control group, closing the racial achievement gap by 40 percent with an increase of more than 0.25 GPA points on a 4 point scale.

In another experimental study, university freshmen in a treatment group read results from an upperclassman survey that emphasized that feeling out of place in college during one’s first year was a common, temporary phenomenon. The treated freshmen

¹³⁰ Price and Shireman, 2013.

¹³¹ E.g. Akerlof and Kranton, 2002, 2010.

¹³² A more specific example is the case of 'Acting White', where black peers impose costs on their members trying to do well at school (Austen-Smith and Fryer, 2005).

¹³³ Steele, 1997; Steele and Aronson, 1995; Mangels et al., 2012.

were then asked to write an essay and record a video for future freshmen, in which they related the survey results to their present experience. In contrast, freshmen in the control group read a survey and wrote an essay and speech on how college could change their pre-existing political attitudes. The African American participants in the treatment group showed steady improvements in GPA across the four years of college, reducing the racial gap in GPA between African Americans and European Americans by 52% overall – without any intermediate interventions.¹³⁴ Reducing students' immediate concerns about their social identity or feeling out of place can lead to significant long-term gains.

Students may also identify themselves as failures, or less able than others. A substantial amount of research by Carol Dweck (2007) and others suggests that the beliefs about themselves that people bring to new situations and opportunities can affect how much they learn and how well they do. Students who think that most of the factors contributing to success are innate also are more likely to become discouraged from initial setbacks, or avoid more challenging tasks after initial successes. In contrast, students who assume that effort matters most view failure more as an indication that they do not currently know enough, and should learn more, or that they have to increase the amount of time and effort spent on that activity. As an example of the consequences of these different mindsets, Wilson and Lindville (1982) randomly assigned 40 Duke University freshmen to watch pre-taped videos and read accounts of upperclassmen's initial academic struggles in adjusting to college life. Upperclassmen in the videos recalled having a low GPA during their own freshmen year, but that their grades began to improve later in their college careers as they grew accustomed to the increased workload and academic expectations at the university. In contrast, students in the control group watched videos of the same upperclassmen in which the older students described their academic and non-academic interests. The authors found that students randomly assigned to the treatment group were 20 percentage points less likely to drop out of college by the end of their sophomore year (from a baseline dropout rate of 25 percent). Students in the treatment group also earned better grades; their GPAs increased by 0.34 points (on a 4 point scale) from the first semester of their freshmen year to the end of

¹³⁴ Walton and Cohen, 2011.

their sophomore year, while the GPAs of those in the control group were unchanged.¹³⁵ Similar results have been replicated in other settings.¹³⁶

Another approach to improving students' academic identities at younger ages is to reduce negative subjective experiences by teaching that the brain is malleable and that through hard work, intelligence can be improved. Blackwell et al. (2007) tested this intervention in an experimental setting on 7th grade students in New York City. Specifically, once a week for 8 weeks, students randomly selected into a treatment group were taught that intelligence is not fixed and that through effort, intellectual ability can improve. Students in the control group were only taught study skills. As is common with middle school students, the GPAs of those in the control group fell from 2.7 to about 2.4 (on a 4 point scale) between the spring of 6th grade and the spring of 7th grade. The grades of students assigned to the treatment group, however, remained unchanged, which corresponds to a .55 standard deviation increase relative to the control group. Yeager and Walton (2011) discuss how these seemingly small interventions can have such large and lasting effects. They argue that timely interventions which reinforce students' academic identities can improve outcomes by decreasing the likelihood that small failures cause students to believe that academic success is unachievable. This, in turn, mitigates the potential that a self-reinforcing cycle of disbelief in one's abilities leads to even worse academic performance. We describe other studies that examine the effect of reinforcing students' academic identities on various outcomes in Table 5.

¹³⁵ In particular, if the treatment led relatively weaker, less prepared students to drop out, the average preparedness of students in the control group would have been higher than the treatment group, biasing the effect on GPA downward.

¹³⁶ Wilson and Lindville, 1985 replicate the findings from their initial study for a larger sample of freshmen students at the University of Virginia. See Yeager and Walton, 2011 and the citations therein for other replications and similar interventions.

Table 5: Interventions that strengthen positive identities

Authors	Intervention	Data	Research Design	Findings
Aronson et al. (2002)	Participants were taught that intelligence is not a finite endowment and that it can grow with effort. They were also asked to write a pen-pal letter to a fictitious, struggling middle school student explaining that intelligence is malleable.	Administrative data from 109 Stanford University undergraduate students	Field experiment	African-American students randomly assigned to the treatment group earned GPAs that were (i) 0.27 points higher than those assigned to an unrelated pen-pal treatment (3.32 versus 3.05 GPA); (ii) 0.22 points higher than those assigned to the control group (3.32 versus 3.10 GPA). Effects were smaller and insignificant for white students.
Blackwell, Trzeniewski and Dweck (2007) (Study 2)	8 sessions over 8 weeks teaching students that the brain is malleable and that intelligence grows with effort	Administrative data from 91 7 th grade students in New York City	Field experiment	.55 standard deviation GPA increase from the spring of 7 th grade to the spring of 6 th grade for students randomly assigned to receive the treatment, relative to the control group.
Bursztyn and Jensen (2014)	Students given the opportunity to sign up for a free SAT prep course were told that their decision to sign up for the course would be kept private from everyone except their classmates OR private from everyone, including their classmates	Administrative and survey data for more than 800 low-income high school students in Los Angeles	Field experiment	Students randomly assigned to have their sign up decision disclosed to their classmates were 11 percentage points less likely to sign up for the course (61 versus 72 percent). Among students taking two honors classes, those randomly assigned to have their sign up decision disclosed were (i) 25 percentage points less likely to sign up they happened to be in a non-honors class during the experiment (54 versus 79 percent); (ii) 25 percentage points more likely to sign up if happened to be in an honors class during the experiment (97 versus 72 percent).
Bursztyn and Jensen (2014)	Students using an in-class, computer-based learning system to prepare for high school	Administrative data on prep question performance for 13000 remedial math and	OLS	Disclosing the names of top performers is associated with one fewer correct answer per

	exit exams given access to information on the top three performers in their class (and school). The names of top performers for the course were revealed part-way through the semester and without prior notice.	English students in 200 high schools.		day (7 versus 8 per day). For students in the top quartile of performance before the disclosure change, making the names of top performers public is associated with 3 fewer correct answers per day (9.5 versus 12.5 per day).
Cohen, Garcia, Apfel and Master (2006)	Targeted reaffirmations of personal adequacy and self-integrity	Administrative data from a seventh grade school	Field experiment	Students randomly assigned to the treatment group earned a fall semester GPA 0.3 points higher than the control group (on a 4 point scale). Treatment effects were largest for African American students; those for white students were small and insignificant.
Dee (2014)	To test whether stereotype threat due to being a student-athlete affects academic performance, participants were primed by asking whether their athletic commitments interfered with academic commitments prior to writing a test	Administrative data for 91 students and student-athletes at Swarthmore College	Frame field experiment	Student-athletes randomly assigned to the stereotype condition scored .84 standard deviations lower on a standardized (GRE) test.
Gollwitzer, et al. (2011)	Participants are asked to write about potential barriers to completing a foreign language quiz successfully	Classroom data from 49 German elementary school students and 63 U.S. middle school students	Field experiment	Treated participants scored slightly more than 1 point higher (6.23 versus 5.13 out of 10) on the vocabulary quiz.
Good, Aronson and Inzlicht (2003)	In three treatment conditions, middle school students were either taught that (i) intelligence is malleable; (ii) academic struggles are common at the beginning of middle school (attribution condition); (ii) a combination of the first two interventions	138 middle school students in rural Texas	Field experiment	Students randomly assigned to the malleable intelligence condition scored 8 percentage points higher on a standardized math test (82 versus 74 percent). Students randomly assigned to the attribution condition scored 11 percentage points higher on a standardized math test (85 versus 74 percent).

				Students randomly assigned to receive both interventions scored 10 percentage points higher on the standardized math test (84 versus 74 percent).
Morisano et al. (2010)	Web-based program that asked participants to write about their ideal future, their goals towards this future, and the concrete steps for achieving these goals	Administrative data for 85 undergraduates at McGill University, with GPAs below 3.0	Field experiment	Students randomly assigned to the treatment group (i) earned a GPA .48 standard deviations higher than the control group, one semester after the intervention (2.91 versus 2.46 GPA); (ii) All students in the treatment group took a full course load while only 80% of students in the control group did so.
O'Rourke et al. (2014)	An educational game that emphasized that intelligence is malleable. Children are awarded points for effort, persistence and strategy.	Administrative data on performance in the educational game Refraction for more than 15000 children	Field experiment	Children randomly assigned to experimental condition (which emphasized that intelligence is malleable) (i) persisted in the game for 29 more seconds (median 118 versus 89 seconds); (ii) completed 1.2 more levels of the game, on average (6.7 versus 5.5 levels).
Walton and Cohen (2011)	College freshmen were asked read reports from fictitious upperclassmen who described that feeling out of during one's first-year of college was a temporary phenomenon. Students were then asked to record a video detailing their experiences for future students.	Administrative data for 92 freshmen students at a large university campus	Field experiment	African-American students randomly assigned to the control group experienced a 0.3 GPA point increase (3.65 versus 3.35 GPA).
Wilson and Lindville (1982)	Students were shown booklets and videos of upperclassmen who described that struggles during freshman year were temporary and that academic performance would likely improve in subsequent years.	Administrative data for 40 freshmen students at Duke University	Field experiment	Students randomly assigned to the treatment group (i) were 20 percentage points (80 percent) less likely to drop out of college by the end of their sophomore year; (ii) experienced a 0.34 GPA increase (2.92 versus 2.58 GPA). Students in the control group experienced no GPA increase (2.82 versus 2.87

Wilson and Lindville (1985)	Students were given information that grades in freshman year are typically low but improve throughout one's college career.	Administrative data for 80 freshmen students at the University of Virginia	Field experiment	GPA). Students randomly assigned to the treatment group experienced GPA increases of approximately 0.2 GPA points (2.8 versus 2.6 GPA) from the first to second semester of their freshman year.
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d) Interventions that simplify options and combat the paradox of choice

Helping students and parents navigate situations with an abundance of information or choices can also lead to improved outcomes. Often, simplifying how information is conveyed can help students and their families focus on the criteria that matters most. This can be especially helpful in the domain of school choice. Even at the primary and high school levels, evaluating and selecting a school requires comparing hundreds of options on several criteria (i.e. test score performance and non-academic features of the school). Faced with navigating complex information on numerous options, parents may simply choose the path of least resistance, such as enrolling their child in the closest school. Hastings and Weinstein (2008) examine whether simplifying how information on school quality is presented affects the choices parents make. Parents at Charlotte-Mecklenburg Public School District schools randomly selected into a control group received the district's standard information package on school quality – a 100 page book with descriptions of each school in the district. Parents at treated schools were given a simplified one-page information sheet ranking schools by their previous year's test score performance. The authors find that parents in the treatment group were 6 to 7.5 percentage points more likely than parents in the control group to choose a school other than their child's default school. Importantly, this simplified information led parents to choose higher quality schools; on average test scores of schools that parents in the treatment group selected score .1 standard deviations higher than those selected by the control group. Students in the treatment group also subsequently perform better than their control group peers, suggesting that simplifying the way information is presented

can improve academic outcomes through better matching students with schools that best fit their abilities and interests.

VI. Conclusion

By taking into account our frequent difficulty in making short and long-run tradeoffs, behavioral economics has made significant inroads in many different domains. Education represents a relatively new avenue for behavioral economics, one that holds many opportunities. Since executive brain function, which helps focus on the future and control impulses, does not mature fully until an individual's mid-twenties, children and adolescents are even more susceptible than adults to "behavioral barriers" which may lead them to miss out on education opportunities. We categorize these barriers into four categories: 1) some students focus too much on the present, 2) some rely too much on routine, 3) some students focus too much on negative identities, and 4) mistakes are more likely with many options or with little information.

The immaturity of a child's brain also provides opportunities. Students may be more responsive to interventions that target behavioral barriers. This review presents some very promising examples: An online goal-setting exercise raised semester grades by 0.7 standard deviations; setting up a college fund of \$8,000 for disadvantaged Grade 9 students increased college graduation rates by 8 percentage points; text messaging college-bound students preparation advice in their summer after high school increased enrollment by 3 percentage points; help for 10 minutes completing the college financial aid application increased enrollment by 8 percentage points; informing parents through email of middle school children's absences and missed assignments raised GPA by 0.2 standard deviations; mandatory college class attendance increased final exam scores by 0.6 standard deviations; asking Grade 7 students to write about which value was most important to them and why increase end of semester GPA by 0.25 points; and teaching middle school students intelligence is not fixed and that through effort, intellectual ability can improve increased grades by 0.6 standard deviations.

Opportunities abound to simplify applications or schedules, make them more salient, remind students and parents of education opportunities, and motivate them to want to learn. The area is ripe for inquiry. The examples we've presented here suggest that interventions shaped by behavioral theory are likely cost-effective and easy to implement, while delivering significant results. They are exciting, testable and tenable. And for a six-year-old who struggles to get to school, and then, to sit still, they may have the potential to make a real difference – even if she doesn't know it yet.

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