

Eric A. Hanushek Stephen J. Machin Ludger Woessmann

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## Handbook of THE ECONOMICS OF EDUCATION

## Handbook of THE ECONOMICS OF EDUCATION

## Volume 5

Edited by

**ERIC A. HANUSHEK** Stanford University

**STEPHEN MACHIN** University College London

**LUDGER WOESSMANN** University of Munich



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### INTRODUCTION TO THE SERIES

The aim of the *Handbooks in Economics* series is to produce Handbooks for various branches of economics, each of which is a definitive source, reference, and teaching supplement for use by professional researchers and advanced graduate students. Each Handbook provides self-contained surveys of the current state of a branch of economics in the form of chapters prepared by leading specialists on various aspects of this area of economics. These surveys summarize not only received results but also newer developments, from recent journal articles and discussion papers. Some original material is also included, but the main goal is to provide comprehensive and accessible surveys. The Handbooks are intended to provide not only useful reference volumes for professional collections, but also possible supplementary readings for advanced courses for graduate students in economics.

Kenneth J. Arrow and Michael D. Intriligator Founding Editors

## CONTENTS

Cont	ributors	xi
Edito	rs' Introduction	xiii
1.	Behavioral Economics of Education: Progress and Possibilities A.M. Lavecchia, H. Liu, P. Oreopoulos	1
	1. Introduction	2
	2. Barriers to Treating Education as Investment	5
	3. Opportunities for Improvement	14
	4. Policies and Programs to Address Behavioral Barriers	24
	5. Conclusion	62
	Acknowledgments	63
	References	64
2.	<b>Education Research and Administrative Data</b> D. Figlio, K. Karbownik, K.G. Salvanes	75
	1. Introduction	76
	2. The Benefits of Using Administrative Data in Education Research	77
	3. Case Studies	80
	4. Challenges Associated With the Use of Administrative Data	91
	5. The Use of Administrative Data Around the World	95
	6. Conclusions	123
	References	123
3.	Charter Schools: A Survey of Research on Their Characteristics	
	and Effectiveness	139
	D. Epple, R. Romano, R. Zimmer	
	1. Introduction	140
	2. What Is a Charter School?	141
	3. Location and Clientele	144
	4. Effectiveness of Charter Schools	169
	5. Inside the Black Box	182
	6. Competitive Effects	195
	7. Summary and Conclusions	202
	Acknowledgments	203
	References	203

4.	Competition Among Schools: Traditional Public and Private Schools M. Urquiola	209
	1. Introduction	210
	2. A Simple Framework	212
	3. The Evidence	218
	4. Conclusion	232
	Acknowledgments	233
	References	233
5.	<b>Technology and Education: Computers, Software, and the Internet</b> G. Bulman, R.W. Fairlie	239
	1. Introduction	240
	2. Technology Use in Schools	242
	3. Technology Use at Home by Students	259
	4. Conclusions	275
	References	276
6.	<b>Teacher Pensions</b> C. Koedel, M. Podgursky	281
	1. Introduction	281
	2. Background on Retirement Benefit Plans for Educators	283
	3. Incentives for Educators	290
	4. Pension Plan Financing	294
	5. The Changing US Pension Landscape	298
	6. Teacher Pensions in Other OECD Countries	299
	7. Conclusion	300
	References	301
7.	The Analysis of Field Choice in College and Graduate School:	
	Determinants and Wage Effects J.G. Altonji, P. Arcidiacono, A. Maurel	305
	1. Introduction	306
	2. Descriptives	308
	3. Model	333
	4. Estimating the Return to College Majors	342
	5. Choice of Major	372
	6. Conclusion	390
	Appendix A: Distribution of Male and Female College Graduates by Field	392
	Acknowledgments	392
	References	392

8.	Student Loans and Repayment: Theory, Evidence, and Policy L. Lochner, A. Monge-Naranjo	397
	<ol> <li>Introduction</li> <li>Trends</li> </ol>	398 400
	3. Current Student Loan Environment	411
	4. Can College Students Borrow Enough?	420
	5. Do Some Students Borrow Too Much?	424
	6. Designing the Optimal Credit Program	433
	7. Key Principles and Policy Guidance	465
	8. Conclusions	472
	Acknowledgments	474
	References	474
9.	Government-Sponsored Vocational Education for Adults B. McCall, J. Smith, C. Wunsch	479
	1. Introduction	481
	2. Theory: Provision	488
	3. Theory: Participation in Training Programs	506
	4. Methods for Evaluating Vocational Training Programs	509
	5. United States	541
	6. United Kingdom	557
	7. Germany	572
	8. France	586
	9. Sweden	593
	10. Denmark	609
	11. Matching Participants to Training	619
	12. Conclusion	632
	Acknowledgments	635
	References	050
10.	Improving Education Outcomes in Developing Countries: Evidence, Knowledge Gaps, and Policy Implications	653
	P. Glewwe, K. Muralidharan	055
	1. Introduction	654
	2. Trends in Education Outcomes, 1990 to 2014	656
	3. Conceptual Issues	665
	4. Review of the Evidence	673
	5. Interpreting the Evidence, and Implications for Future Research	725
	6. Conclusion	735
	Acknowledgments	736
	Keterences	/36
Inde,	X	745

ix

### **CHAPTER 1**

## Behavioral Economics of Education: **Progress and Possibilities**

## **A.M. Lavecchia\*, H. Liu<sup>†</sup>, P. Oreopoulos**\*,<sup>‡</sup> <sup>\*</sup>University of Toronto, Toronto, Ontario, Canada

<sup>†</sup>Harvard University, Cambridge, Massachusetts, United States

<sup>\*</sup>National Bureau of Economic Research (NBER), Cambridge, Massachusetts, United States; Canadian Institute for Advanced Research (CIFAR), Toronto, Ontario, Canada

#### Contents

1.	Introduction	2
2.	Barriers to Treating Education as Investment	5
	2.1 Some Students Focus Too Much on the Present	7
	2.2 Some Students Rely Too Much on Routine	9
	2.3 Some Students Focus Too Much on Negative Identities	11
	2.4 Mistakes Are More Likely With Too Little Information or Too Many Options	12
3.	Opportunities for Improvement	14
	3.1 Parental Involvement	15
	3.2 Attendance	16
	3.3 Homework	17
	3.4 High School Completion	19
	3.5 College Attainment	21
	3.6 Program Suitability	22
	3.7 College Aid Savvy	22
	3.8 College Cost Savvy	23
4.	Policies and Programs to Address Behavioral Barriers	24
	4.1 Interventions That Aim to Offset Immediate Costs With Immediate Benefits	25
	4.2 Interventions That Help Reduce Inertia and Change Routine	37
	4.3 Interventions That Strengthen Positive Identities	55
	4.4 Interventions That Simplify Options and Combat the Paradox of Choice	62
5.	Conclusion	62
Ac	knowledgments	63
Re	ferences	64

#### Abstract

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.

#### Keywords

Behavioral economics of education, Present bias, Education, Policymakers

The roots of education are bitter, but the fruit is sweet

Aristotle (384-322 BC)

#### **1. INTRODUCTION**

A 6-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.<sup>1</sup> 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 (Romine and Reynolds, 2005; Teffer and Semendeferi, 2012). Without them, the 6-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 (Romine and Reynolds, 2005). The cortex (outer layers that primarily distinguish the primate brain) thickens as neural connections proliferate. Then, rarely used connections are selectively trimmed, improving efficiency, while others are grouped together, improving specialization (Fuster, 2002). 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 (Chick and Reyna, 2012; Giedd et al., 2012). 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 (Fuster, 2002). Neuroimaging studies have demonstrated otherwise: maturation takes more than 20 years, with the circuitry responsible for executive function

<sup>&</sup>lt;sup>1</sup> 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).

being among the very last areas to fully develop (Fuster, 2002; Giedd et al., 2012; Romine and Reynolds, 2005; Teffer and Semendeferi, 2012). Patience, for example, increases as children grow (Bettinger and Slonim, 2007; Kosse and Pfeiffer, 2012; Thompson et al., 1997).<sup>2</sup> Preferences, therefore, change with age, and children spend most — if not all — of their school years with less interest in the future than their future adult selves (Read and Read, 2004). 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 midbrain area which registers desires for immediate rewards and pleasure (Chapman et al., 2012). The limbic system is highly sensitive to monetary, novel, and social rewards (Giedd et al., 2012). 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 (Galvan, 2012). While brain systems associated with higher order critical thinking skills also undergo a rapid expansion during 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 (Atkins et al., 2012; Schneider et al., 2012).

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 (Kable and Glimcher, 2007, 2010; McClure et al., 2004). 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 (Stanovich et al., 2012): future gains are discounted more than future losses; small changes to outcomes are discounted more than large changes (Frederick et al., 2002); small probability events, when emphasized, are discounted less than when not emphasized; and responses depend on context, emotional state (Rick and Loewenstein, 2008) and perceived social identity (Benjamin et al., 2010; Galvan, 2012). Sometimes we do not even try to think in the long-term, relying instead on rules of thumb or past habits (Stanovich et al., 2012).

The emerging field of behavioral economics attempts to integrate research from psychology, neuroscience, and sociology in order to better understand individual decision

<sup>&</sup>lt;sup>2</sup> 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 childhood, a steady decline in people's willingness to forgo a fixed monetary future amount for a smaller immediate amount (Bettinger and Slonim, 2007; Green et al., 1994; Kosse and Pfeiffer, 2012; Stanovich et al., 2012; Steinberg et al., 2009; Thompson et al., 1997).

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 instead suggests that deviations from time-consistent preferences due to cognitive and perceptual aspects of our brain's architecture, may lead to suboptimal outcomes (DellaVigna, 2009).

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 of interest to practitioners and policy makers. To that end, the field has attracted wide and growing attention: 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.<sup>3</sup>

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 (eg, Benartzi and Thaler, 2007). 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 (Beshears et al., 2013; Carroll et al., 2009; Chetty et al., 2014). Other areas in which behavioral economics has been actively applied include finance, health, and law (DellaVigna, 2009; Diamond and Vartiainen, 2007; Hough, 2013; Sunstein, 2000; Thaler, 2005; Thaler and Sunstein, 2008).

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 (Becker, 1962). Clearly, this outcome need not be the case for a 6-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 including 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

<sup>&</sup>lt;sup>3</sup> Madrian (2014).

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 behavioral 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 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 (Schneider and Caffrey, 2012).

With these ideas in mind, Section 2 describes a general framework for thinking about why youth may not take full advantage of education opportunities. We argue that brain development over time and environmental context play an important role in determining education outcomes, and that education itself may affect brain development and, therefore, individuals' preferences. This framework implies that the actions of students and parents may deviate from the predictions of the traditional human capital investment model because of tendencies to (1) focus too much on the present; (2) rely too much on routine and disregard information that is not salient; (3) focus too much on negative identities; and (4) make mistakes due to little information or too many options. In Section 3, we map the mechanisms discussed in Section 2 onto particular educational outcomes worth encouraging, such as attainment, attendance, and homework. While it is not possible to predict for any particular student whether such encouragement would make them better off, we discuss evidence why, for at least for some students, this is likely the case. Section 4 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 5 by discussing prospects and possibilities for making further progress in this emerging field.

#### 2. 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.<sup>4</sup> Economists often assume that individuals only use a rational, forward-looking system to maximize lifetime welfare given various resource constraints. While this simplifying 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 neurobiological evidence for how decision making is implemented. The current evidence suggests a model for intertemporal 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 prefrontal cortex) and in the limbic system (the striatum), and the interaction between these signals during a decision is still unclear. 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 (Mani et al., 2013; Mullainathan and Shafir, 2013). 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.

<sup>4</sup> Recent neuroscientific evidence rejects the overly dichotomous notion that there are separate, competing, neural systems for processing immediate versus delayed rewards (Glimcher and Fehr, 2014; Kable and Glimcher, 2007, 2010). 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 intertemporal tradeoff are not yet fully developed prior to adulthood, and this leads to behavior or preferences which change with development. This work also distinguishes between overemphasizing the present versus overemphasizing outcomes are steeply discounted relative to the soonest currently available reward (Kable and Glimcher, 2010). Since the intertemporal decisions we focus on tradeoff immediate costs for longer-term, uncertain benefits, the implications of both models are very similar.

#### 2.1 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. 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.<sup>5</sup> 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 (Kahneman, 2003; Kahneman and Frederick, 2002).

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 tradeoff with a cost today and a benefit tomorrow, especially if the current cost is particularly salient, but a tradeoff 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.<sup>6</sup> 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 (Benartzi and Thaler, 2007). 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% of children (aged 5–16) 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 or a larger amount (up to \$25) in 2 months, these children picked the immediate reward.

<sup>&</sup>lt;sup>5</sup> See Kahneman (2003) and the citations therein, especially Kahneman and Tversky (1973) and Tversky and Kahneman (1983). Also see Fudenberg and Levine (2006) for a model treating System 2 as principal and System 1 as agent.

<sup>&</sup>lt;sup>6</sup> Quasi-hyperbolic discounting is the most commonly used form of discounting to model the behavior of individuals with time-inconsistent preferences (ie, Laibson, 1997).

When asked to evaluate a similar tradeoff where the \$10 gift certificate was distributed in 2 months or the same larger amount in 4 months, these children chose the latter. Bettinger and Slonim (2007) also find that more than 25% 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 (Castillo et al., 2011; Golsteyn et al., 2014; Sutter et al., 2013; Wulfert et al., 2002). Doing homework, studying for exams, researching colleges or potential opportunities for financial aid and completing applications all involve salient upfront 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 upfront 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 (Harackiewicz et al., 2012).

These examples highlight how education decisions may be suboptimal 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. For instance, 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.<sup>7</sup>

More education may itself improve executive function, thus helping minimize subsequent suboptimal 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.<sup>8</sup> Becker and Mulligan (1997) suggest that more schooling may reduce

<sup>&</sup>lt;sup>7</sup> See footnote 9 for examples of empirical studies which suggest that discounting decreases with age, particularly from adolescence until about age 30.

<sup>&</sup>lt;sup>8</sup> In a complementary review article on behavioral economics of education, Koch et al. (2015) focus on the development and importance of these kinds of noncognitive 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. Some examples include differences in personality traits (Borghans et al., 2008), altruism (Benenson et al., 2007; Fehr et al., 2013), trust (Sutter and Kocher, 2007), and cooperation (Fan, 2000; Lergetporer et al., 2014).

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 (Oreopoulos and Salvanes, 2011). 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 toward the automatic activity of System 1. Prototypical examples include driving a vehicle, mastering chess or performing at a high-level in sports (Kahneman, 2003; Kahneman and Frederick, 2002). 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.

#### 2.2 Some Students Rely Too Much on Routine

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 suboptimal 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.<sup>9</sup> 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

<sup>&</sup>lt;sup>9</sup> Social norms, especially those of a student's family and friends may also be important. We expand on this point in the following section.

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 (Kahneman, 2003). As a result of System 1's automatic thinking, individuals may not even realize that they should 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.<sup>10</sup> 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-ofpocket 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 2.3 (Hoxby and Turner, 2013). Information about college options, tuition fees and even financial aid opportunities may be less accessible for students from low-income families (Avery and Kane, 2004; Dynarski and Scott-Clayton, 2006; Oreopoulos and Dunn, 2013; Scott-Clayton, 2012b) who are burdened by concurrent stressors associated with poverty and who are exposed to fewer resources from parents and high school counselors about the transition process (Castleman, 2013; Levine, 2013).

Even after entering college, issues of information inaccessibility persist. Scott-Clayton (2011) 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 (Baum and Scott-Clayton, 2013). 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.

<sup>&</sup>lt;sup>10</sup> 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.

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 selfcontrol to follow up on these tasks.

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.<sup>11</sup> 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.

#### 2.3 Some Students Focus Too Much on Negative Identities

Concerns about identity predominate adolescent thinking and behavior (Akerlof and Kranton, 2000, 2002, 2010; Bishop, 2006; Coleman, 1961; Cusick, 1973; Everhart, 1983; Gordon, 1957; Hall, 1904; Haun et al., 2013; Hollingshead, 1975; Jackson, 1968; Roderick, 1993; Willis, 1977). 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 tradeoff 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 (eg, based on gender, race or being athletic or studious). For example, gendered norms surrounding socially appropriate levels of competition emerge and are sustained early on (Buser et al., 2014; Sutter and Glätzle-Rützler, 2015). In this context, investments in education, such as effort in school, depend

<sup>&</sup>lt;sup>11</sup> 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.

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.<sup>12</sup> 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 (Haun et al., 2013).<sup>13</sup> 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 (Busse et al., 2012; DellaVigna, 2009; Loewenstein et al., 2003).

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 (Benjamin et al., 2010). 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 (Dweck and Leggett, 1988; Dweck and Sorich, 1999). Priming students to focus on positive identities related to learning and intellectual curiosity may be one approach for trying to improve education outcomes.

## 2.4 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

<sup>&</sup>lt;sup>12</sup> Bishop (2006) reviews the literature on how student effort is affected by social norms and by the threat of harassment of peers. We refer interested readers to Bishop's review in Volume 2 of this Handbook and the many citations therein.

<sup>&</sup>lt;sup>13</sup> We expand on this point with evidence from a recent study by Bursztyn and Jensen in Section 4. Importantly, the benefits associated with gratification from one's peer group may either reinforce or mitigate the tendency to focus on the present.

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 et al., 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 (eg, 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 (Iyengar and Lepper, 2000), consumer credit (Bertrand et al., 2010), and finance (Benartzi and Thaler, 2007; Choi et al., 2004) suggests that people may respond unexpectedly to an abundance of choices. For example, Iyengar et al. (2005) 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 (Agnew and Szykman, 2005). 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 (2011) 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 (Hastings and Weinstein, 2008; Ross et al., 2013).

#### 3. 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 that education attainment decisions may be suboptimal, 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 (Rabin, 2013). 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 (Thaler and Sunstein, 2008). 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 upfront costs together with seemingly vague and distant potential future benefits may lead students and parents to overemphasize the present. <sup>14</sup>

<sup>14</sup> Chetty (2015) advises against framing the debate on behavioral economics around whether individuals are rational or not. He argues for a more "pragmatic, policy-oriented" perspective by focussing instead on models that best predict behavior and improve policy. In our context, our framework is useful because it helps explain why students and parents react to nudges in the first place, and therefore may also serve as a useful framework for explaining overall low student grades, attainment, and skill development.

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 home-work 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 makers seriously consider the possibility that preintervention decisions by students and parents may not have been ex-ante optimal (Bernheim and Rangel, 2009). 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 suboptimal, 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 (Bridgeland et al., 2006). 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 preintervention behavior.

#### 3.1 Parental Involvement

Parental inputs are critical in determining children's cognitive and noncognitive skills as well as education attainment (Cunha and Heckman, 2008; Todd and Wolpin, 2007). 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 toward learning. These inputs may also include personality traits such as risk attitudes, which may affect how students and parents both view long-term investments in education (Dohmen et al., 2011; Levin and Hart, 2003) and in turn, concrete decisions such as school choice (Wölfel and Heineck, 2012). Levels of parental involvement vary widely, with children from lower-income and minority families receiving less involvement, on average, than their higher-income classmates (Sirin, 2005).

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. Alternatively, parents may simply value education differently, although that valuation may be similarly impacted by the same behavioral barriers that affect students (eg, the low salience of long-term benefits). 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 (Avvisati et al., 2014; Bergman, 2014). 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 (Chetty et al., 2011), 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.

#### 3.2 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 (Barrington and Hendricks, 1989). Efforts to target early disengagement and keep students in class may therefore help 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 (Lamdin, 1996; Peterson and Colangelo, 1996; Strickland, 1998). 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 (Romer, 1993).

Both high school and college absenteeism are highly correlated with poor academic performance (Stanca, 2006). 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 Burkham, 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 frameworks for decision-making point to the problems of leaving students to reorganize routines on their own. Bettinger et al. (2013) suggest that from this lack of structure, students manage time poorly and become disengaged.

#### 3.3 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% 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 (Grodner and Rupp, 2013). Despite this, many students fail to complete assignments on time. For example, Bergman (2014) finds that more than 20% of students fail to complete assignments on time, with homework completion rates lower than in-class assignments.

Empirical evidence suggests a strong negative association between impatience and study habits, especially homework.<sup>15</sup> As one example, we consider the amount of self-reported study time at school or at home by students in the 1979 National Longi-tudinal Survey of Youth (NLSY79).<sup>16</sup> Fig. 1 shows the distributions of study times of those classified as patient or impatient using a measure of present bias introduced by DellaVigna and Daniele Paserman (2005) and also used in Cadena and Keys (2015). In Fig. 1, the average amount of time spent studying or working on class projects

<sup>&</sup>lt;sup>15</sup> Oreopoulos and Salvanes (2011) also 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.

<sup>&</sup>lt;sup>16</sup> 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.



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

is lower among impatient students. In particular, impatient students are more likely to report spending no time studying.<sup>17</sup> This example is consistent with the results from a large and growing literature in psychology which finds that children who 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 (Duckworth and Carlson, 2013; Duckworth and Steinberg, 2014; Duckworth et al., 2012). 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.<sup>18</sup>

*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 Daniele Paserman (2005) and classifies a respondent as being impatient

<sup>&</sup>lt;sup>17</sup> These relationships still hold in regressions that control flexibly for age, gender, race, mother's education (four categories), father's education (four 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% more likely to report spending no time studying (8.8% vs. 11%), and report studying 1.35 h fewer per week (7.09 vs. 8.44 h per week) than those classified as "patient."

<sup>&</sup>lt;sup>18</sup> Duckworth et al. (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 (ie, study in an area without a computer, tablet or cell-phone) or by paying a cost to suppress directly the urge at the time the choice must be made.

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.

#### 3.4 High School Completion

High school dropouts face daunting challenges over the rest of their lives. Among recent dropouts in the United States, 16% are unemployed and 32% 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 (Messacar and Oreopoulos, 2013). Labor-market outcomes remain bleak. Dropouts aged 50 earn an average of \$16.50 an hour. In addition to difficulties in the labor market, social outcomes are 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 (2015), 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 shortsightedness 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 100 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" (Watt, 2013). 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% from an additional year of school due to facing more restrictive laws (Acemoglu and Angrist, 2001; Angrist and Krueger, 1992; Harmon and Walker, 1995, and Oreopoulos, 2005). Other studies find nonpecuniary benefits, such as less crime (Anderson, 2014; Lochner and Moretti, 2004), lower use of cigarettes and illicit

drugs (Mensch and Kandel, 1988), improved health (Lleras-Muney, 2005; Meghir et al., 2013), reduced incidence of teen pregnancy (Black et al., 2005), and improved memory and other cognitive abilities (Banks and Mazzonna, 2011).<sup>19</sup>

To be clear, policies that force children to stay in school by threat of fine or jail are not nudges. Constraining all individuals toward one action relies on the strong assumption that everyone who would behave differently without the constraint would actually be worse off in that event.<sup>20</sup> 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.

<sup>19</sup> Two important caveats must be mentioned. First, estimated benefits to compulsory schooling vary widely outside North America (Brunello et al., 2009; Brunello et al., 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 (2008) 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 US 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 (1992), 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 suboptimal behavior 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.

<sup>20</sup> 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.

#### 3.5 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.<sup>21</sup> 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 (Zimmerman, 2014). 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 nonmonetary returns to higher education, including higher job satisfaction and better health outcomes (Oreopoulos and Salvanes, 2011).

A possible behavioral explanation for no college experience is lack of encouragement and approval from friends and family. Qualitative research on the college decisionmaking process suggests that students develop predispositions toward 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 (Cabrera and La Nasa, 2000). 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 (Demming and Dynarski, 2009; Oreopoulos and Petronijevic, 2013).

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, and finally show up for class. While many underprivileged students express intent to go on to college, they sometimes fail to complete application requirements (Avery and Kane, 2004). Some students plan to attend college, get accepted, and 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 (Cadena and Keys, 2015).

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 (Oreopoulos and Petronijevic, 2013). Yet while college enrollment rates have risen over the past few decades, completion rates have not followed suit. As with high school

<sup>&</sup>lt;sup>21</sup> See Oreopoulos and Petronijevic (2013) for one recent review of the estimates of the financial returns to postsecondary education. See also Baum et al. (2013).

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 4.

#### 3.6 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 (Baum and Scott-Clayton, 2013; Hoxby and Avery, 2013). Moreover, many students may not consider the breadth of program and school opportunities available to them (ie, 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 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.

#### 3.7 College Aid Savvy

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 (Council of Economic Advisors, 2009). Bird and Castleman (2014) estimate that nearly 20% 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 (Avery and Hoxby, 2003; Bettinger, 2004; Stinebrickner and Stinebrickner, 2003). However, Avery and Hoxby (2003) 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 (Lochner and Monge-Naranjo, 2012; Oreopoulos and Petronijevic, 2013). 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 lead to students underinvesting in education (Scott-Clayton, 2012a,b).<sup>22</sup> In one study of postsecondary financial aid applicants in Latin America, Caetano et al. (2011) find that survey respondents are about 10% 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 (Field, 2009). Students, therefore, showed a strong preference to remain out of debt both while in school and after graduation.

#### 3.8 College Cost Savvy

Low-income students and their parents are more likely to overestimate costs of attending college (Avery and Kane, 2004; Usher, 1998). 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 (Avery and Turner, 2012; Jabbar, 2011). 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 suboptimal decisions.

<sup>&</sup>lt;sup>22</sup> Aversion to holding debt may also be viewed in the standard rational economic framework if the variance to postcollege earnings is high and risk aversion is sufficiently high (Baum and Schwartz, 2013).

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 (Dynarski, 2004). 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 (Milligan, 2005). Students from low-income families who open an RESP account qualify for up to \$2000 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 (Nayar, 2013).

#### 4. 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 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 both to review the evidence accumulated to date, and to encourage other researchers to develop and test new policies that leverage these ideas. We mention key examples in the text. Tables 1–5 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.

#### 4.1 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 2 h to participate in a goal-setting exercise in which they wrote down specific long-term goals and proposed intermediate steps to achieve those (Morisano et al., 2010). 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 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 (Hershfield et al., 2011). Parents often adopt this strategy in offering small rewards (like television or dessert) for future-enhancing behavior (like doing homework or eating vegetables). Yet, some social scientists advise caution on the use of external incentives to motivate behavior (Deci and Ryan, 2010). Students, they note, can be intrinsically motivated to learn based on their 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. Grades are themselves a type of extrinsic incentive to study and learn. 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 behavior 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 nonmonetary 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 (Gneezy et al., 2011). Table 1 summarizes these. One of the earliest experiments offered 3rd- to 6th-grade students in rural Ohio \$15 for

Authors	Treatment	Data	Research Design	Findings			
Panel A: primary, r	Panel A: primary, middle, or high schools						
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% for boys and girls (29% vs. 24%) (not significant); (ii) 10.5% for girls (39% vs. 29%); (iii) -2.2% for boys (18% vs. 20%) (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 3rd, 4th-, 5th-, and 6th-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 0.15 standard deviations; (ii) increased reading test scores by 0.01 standard deviations (not significant); (iii) increased social science test scores by 0.02 standard deviations (not significant); (iv) increased science test scores by $-0.04$ standard deviations			
Dearden et al. (2009)	Education Maintenance Allowance (EMA): (i) ~\$50 per week for each week of 12th- or 13th-grade 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 12th- grade enrollment by 4.5% (74% vs. 69%); (ii) increase full-time 13th-grade enrollment by 6.7% (68% vs. 61%)			

Fryer Jr. (2011)	<ul> <li>(i) \$2 payment for each book read in Dallas public schools</li> <li>(Earning by Learning);</li> <li>(ii) payment for performance on a series of tests in NYC public schools (NYC Spark);</li> <li>(iii) payment for grades in five core courses in Chicago</li> <li>(Paper Project)</li> </ul>	Administrative data from 203 public schools in Chicago, Dallas, and New York City	Field experiment	<ul> <li>(i) Earning by Learning:</li> <li>(a) 0.012 standard deviation increase in reading scores,</li> <li>(b) 0.079 standard deviation increase in math scores;</li> <li>(ii) NYC Spark: (a) -0.026 to 0.004 standard deviation increase in reading scores,</li> <li>(b) -0.031 to 0.062 standard deviation increase in math scores; (iii) Paper Project:</li> <li>(a) -0.006 standard deviation increase in reading scores,</li> <li>(b) -0.010 standard deviation increase in math scores. No main effect estimates above are</li> </ul>
Guryan et al. (2015)	Financial incentives (prizes worth up to \$5 per book read) combined with Project READS, a summer reading program	Administrative and survey data for 415 4th and 5th-grade students at a relatively wealthy, large urban school district in the northeastern U.S.	Field experiment and surveys to elicit reading level and preferences (randomization at the classroom level)	A one standard deviation increase in measured reading motivation at baseline lead treatment group students to read 1.3 more Project Reads books that were mailed to them, compared to the control group This estimated effect is highest (4.7 more books) for students whose mailed books were well- matched to their reading interests and level

Continued

Authors	Treatment	Data	Research Design	Findings
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 1994–2005 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% increase in the percentage of 11th- and 12th-graders taking AP exams; (ii) a 13.5% increase in the number of students scoring above 1100 (24) on the SAT (ACT); (iii) a 5% increase in the number of students attending college
Kremer et al. (2009)	The Girl's Scholarship Program (Kenya):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 6th-grade girls at Kenyan primary schools	Field experiment	Eligibility for the scholarship increased test scores by 0.13 standard deviations during the program year
Levitt et al. (2012)	<ul> <li>(i) Incentives to improve test score performance framed as gains and losses; (ii) pecuniary versus nonpecuniary rewards;</li> <li>(iii) immediate versus nonimmediate rewards</li> </ul>	Administrative data for more than 7000 elementary and high schools from three school districts near Chicago	Field experiment	<ul> <li>(i) 0.08−0.17 standard deviation improvement in test scores for incentives framed as losses relative to those framed as gains;</li> <li>(ii) −0.1 to 0.25 standard deviation improvement in test scores for nonfinancial incentives relative to financial incentives for elementary school students;</li> <li>(iii) nonimmediate awards have no effect on test scores</li> </ul>
Oswald and Backes-Gellner (2014)	Eligibility to year a bonus equal to the monthly salary for apprenticeship students. The bonus is tied to grade performance on courses related to the apprenticeship program	Administrative and survey data for 238 vocational students in Switzerland	OLS	Students whose apprenticeships offered bonuses experienced a 0.36 standard deviation GPA increase. This effect is higher (by approximately 0.8 standard deviations) for students identified as impatient using a survey

Table 1 Interventions that aim to offset immediate costs with immediate benefits-cont'd
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 4th grade at random assignment: effects on math proficiency (i) 2.1% in Year 1 (not significant) (73% vs. 71%); (ii) 1.7% in Year 2 (not significant) (80% vs. 79%) Students in 7th grade at random assignment: effects on math proficiency: (i) 0.8% in Year 1 (not significant) (60% vs. 59%); (ii) -1.6% in Year 2 (not significant) (62% vs. 64%)
Rodreíguez-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 training	Administrative and survey data from low- achieving students from low-performing high schools entering 9th grade in 1995 in the United States	Field experiment	Eligibility for the QOP: (i) increased high school or GED completion by 4.3% (68% vs. 64%) (not significant); (ii) increased postsecondary education enrollment by 5% (32% vs. 27%)
Springer et al. (2015)	Students who attended 25% and 75% 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% of allotted hours	Administrative data for more than 300 primary and middle school students	Field experiment	Students randomly assigned to receive the nonmonetary award (certificate) attended 43% more tutoring hours than control group students (60% vs. 17%) Students randomly assigned to receive the monetary award attended 6% more tutoring hours than control group students (23% vs. 17%) (not significant)

Continued

Authors	Treatment	Data	Research Design	Findings				
Panel B: postsecond	anel B: postsecondary education							
Angrist et al. (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) 0.01 standard deviation increase in first-year GPA (not significant); (ii) -0.02 standard deviation increase in second-year GPA (not significant). Students randomly assigned to the SFP + SSP treatment arm (i) 0.23 standard deviation increase in first-year GPA; (ii) 0.08 standard deviation increase in second- year GPA (not significant)				
Angrist et al. (2014b)	\$100 reward for course grades of 70% + \$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 –0.021 standard deviations higher than those for the control group (not significant); (ii) earned a second- year GPA 0.107 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 counseling	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 vs. 7.4 credits) during first year; (ii) earned first-year GPAs 0.068 points higher (2.23 vs. 2.17 GPA) (not significant)				

 Table 1
 Interventions that aim to offset immediate costs with immediate benefits—cont'd

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 Florida high school graduates and post- secondary attendees	Differences-in- differences design	Students eligible for FMS were 3% more likely to graduate with a BA 5 years after high school (not significant) (41% vs. 38%) Students eligible for FAS were 10% more likely to graduate with a BA 5 years after high school (54% vs. 44%)
Cohodes and Goodman (2014)	John and Abigail Adams Scholarship Program (MA): MA public school tuition waived for students who score in the top 25th percentile of their school district and attain minimum absolute benchmarks on the statewide 10th-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 10th-grade test scores	Eligibility for the MA scholarship (i) increased the likelihood of enrolling in a college immediately by 1.7% (80% vs. 78%); (ii) decreased the likelihood of graduating from a college within 6 years by 2.5% (64% vs. 66%)
Cha and Patel (2010)	\$1800 for earning a grade of "C" or better in 12 or more credits or \$900 for a "C" or better in 6–11 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 vs. 13.4 credits)
Cornwell et al. (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% (77% vs. 81%); (ii) decreased the likelihood of completing a freshman full course load by 6% (58% vs. 64%)

Table 1InterventionsAuthors	s that aim to offset immediate co <b>Treatment</b>	sts with immediate benefi <b>Data</b>	ts—cont'd <b>Research Design</b>	Findings
De Paola et al. (2012)	(i) €700 for students with the 30 highest cumulative scores on all exams; (ii) €250 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 $\notin$ 700 reward treatment (i) scored 0.19 standard deviations higher on exams; (ii) earned 2.335 more credits (20.8 vs. 18.5 credits) Students randomly assigned to the $\notin$ 250 reward treatment (i) scored 0.16 standard deviations higher on exams; (ii) earned 2.194 more credits (20.7 vs. 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 GPA in college	Survey (census, 1% 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 22–34 population with a college degree increased by 2.98% in states that enacted merit scholarship programs (GA and AR) (37% vs. 34%)
Ford et al. (2012)	Future to Discover (FTD): "Learning Accounts" up to \$8000 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% (71% vs. 63%)
Leuven et al. (2010)	<ul> <li>(i) €681 for completion of all first-year requirements;</li> <li>(ii) €227 for completion of all first-year requirements</li> </ul>	Administrative data from first-year business and economics students at the University of Amsterdam	Field experiment	Students in the €681 treatment arm were 4.6% more likely to complete first-year requirements (24% vs. 19.5%) (not significant) Students in the €227 treatment arm were 0.7% more likely to complete first-year requirements (20% vs. 19.5%) (not significant)

Leuven et al. (2011)	(i) $\notin$ 1000 for the student with the top microeconomics exam score; (ii) $\notin$ 3000 for the student with the top microeconomics exams score; (iii) $\notin$ 5000 for the student with the top microeconomics exam score	Administrative data from first-year business students at the University of Amsterdam	Field experiment (prerandomization students could select which treatment arm (€000,3000,5000) they wanted to be eligible for)	Students randomly assigned to the treatment groups (i) were 6.8% more likely to attend the first tutorial meeting (81% vs. 74%); answered 0.895 (€1000 incentive), 1.246 (€3000 incentive), and $-0.629$ (€5000 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 vs. 2.11) (not significant); (ii) 0.12 points higher during the second semester (2.06 vs. 1.88); (iii) 0.01 points higher during the third semester (2.10 vs. 2.09) (not significant). Larger effects were observed for women and older students
Miller et al. (2011)	\$1000 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 vs. 8.1 credits) than students in the control group

Continued

Authors	Treatment	Data	Research Design	Findings
Richburg-Hayes et al. (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 six 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 vs. 8.1 credits); (ii) were 7.4% more likely to enroll full time (60% vs. 53%); (iii) experience no difference in GPA than students in the control group
Scott-Clayton (2011)	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% (46% vs. 40%); (ii) graduates with a BA within 4 years by 6.7% (43% vs. 37%)
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 GPA in college	Survey (census, 5% 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% (not significant) in states that enacted merit scholarship programs (GA and AR) (35% vs. 34%)
Sjoquist and Winters (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 nonmerit scholarship states as the control group	The fraction of the age 24–30 population with a college degree increased by $-0.2\%$ (not significant) in states that enacted merit scholarship programs (38.6% vs. 38.8%)

 Table 1
 Interventions that aim to offset immediate costs with immediate benefits—cont'd

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obtaining grades above a proficiency cut-off in four subjects (Bettinger, 2010). 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 2nd-grade 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 reading or homework time, may be more promising than incentivizing 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 (Levitt et al., 2012).In a recent paper, Oswald and Backes-Gellner (2014) find that apprenticeship students in Switzerland identified as impatient respond more to a financial incentive to improve grades.<sup>23</sup>

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%. 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 \$8000 by time of graduation and could only be used for college-related expenses. College enrollment and graduation increased by 8% 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 5-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% more likely to receive at least a 3.0 GPA through college (46% vs. 40%) and are 7% more

<sup>&</sup>lt;sup>23</sup> Guryan et al. (2015) find that elementary school students who initially enjoyed reading, responded more to a financial incentive to read more books over the summer. Although Guryan et al. (2015) do not measure impatience, financial incentives that aim to address short-term impatience may have heterogeneous impacts depending on how well-matched the curriculum is to students abilities and interests.

likely to graduate within 4 years than students who just missed out on receiving the award (33% vs. 26%). Importantly, the effects on GPA disappear in the final year of college, when the scholarship cannot be 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 et al. (2009), for example, test the effects of offering \$1000 to \$5000 awards for first-year undergraduates to attain grade averages above 70%, 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%, plus mentorship support, failed to generate significant long-term effects (Angrist et al., 2014b).

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 nonexistent) 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 (Miller et al., 2011; Richburg-Hayes et al., 2011). 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% higher for the treatment group (27% vs. 24%) and 9% higher among students from low-income backgrounds (34% vs. 25%).

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 et al. (2015), 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. Nonmonetary 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 (Ware et al., 2013).

#### 4.2 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 section, we review policies and programs designed to change routines or encourage students and parents to reconsider their default plans. Tables 2–4 summarize this research, respectively categorized by whether interventions target students, parents, or environment.

#### 4.2.1 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% 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 (Castleman and Page, 2014a; Castleman et al., 2012). In a study of approximately 5000 recent high school graduates who had indicated intent to go to college, Castleman and Page (2015) 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% more likely ultimately to enroll at a 2-year college (but not 4-year college) than students who received no intervention (23% vs. 20%). Treatment effects were concentrated among those with less definite college plans and less access to college-planning supports.<sup>24</sup>

<sup>&</sup>lt;sup>24</sup> 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 11th- and 12th-grade 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 1667 students contacted, the callers reached all but 15 and convinced 864 to come back. Of those, 300 graduated that year (Hammer, 2012).

Another example of a low-cost intervention with minimal personal contact comes from Hoxby and Turner (2013), who focus on high-achieving students from lowincome 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% more likely to apply to a selective college  $^{25}$  (92% vs. 52%) and 5% (9% vs. 4%) 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.

*How* information is presented or *who* is targeted matter as well. Dinkleman and Martinez (2014) examined effects from showing 8th-grade Chilean students DVDs of young disadvantaged adults describing their path toward 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 et al. (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.

#### 4.2.2 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.

<sup>&</sup>lt;sup>25</sup> Here, we define "selective college" as an institution five percentiles above schools for which the student was prepared to attend. See Hoxby and Turner (2013).

## Table 2Interventions to help reduce inertia and change routine for studentsAuthorsInterventionDataResearch designFindings

Castleman and Page (2014b)	12 text message reminders about refiling the FAFSA to renew financial aid after the freshman year	Administrative data from the National Student Clearinghouse and uAspire (a nonprofit organization) for 808 college students in Boston and Springfield, Massachusetts	Field experiment	Community college students randomly assigned to receive text message reminders were 12% (19%) more likely to persist into their sophomore year (baseline persistence rate of 64%). The intervention had no effect on 4-year college students (baseline persistence rate of 87%)
Castleman and Page (2014a)	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% more likely to enroll in a 2 year college (23% vs. 20%). 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 8th- grade students in Chile	Field experiment (randomization at the school level)	Students randomly assigned to receive treatment were 6% more likely to be enrolled in college- preparation high school (66% vs. 60%). 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 United States	Field experiment	Treated students (i) applied to 2.2 more colleges (6.9 vs. 4.7 schools); (ii) 40% more likely to apply to a selective college (92% vs. 52%); (iii) 5% more likely to enroll in a selective school (8.8% vs. 3.5%)

#### Panel A: text messages, email reminders, mailings, and videos

Continued

Table 2 Interve Authors	entions to help reduce inertia Intervention	and change routine for s	tudents—cont'd Research design	Findings
Jensen (2010)	Information on the difference in earnings between university, secondary and primary school educated men between the ages of 30 and 40	Survey data from 8th- 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% more likely to enroll in school for 9th-grade (59% vs. 55%); (ii) completed 0.2 more years of schooling (10 vs. 9.8 years of schooling). Treatment effects were largest for the least poor students
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 et al. (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 five-minute video on the same tonic	Survey data for more than 12,000 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% less likely to believe that the costs of higher education are a barrier to attending (7.8% vs. 11.7%); (ii) 3.3% more likely to believe that university graduates have better labor force outcomes (83.7% vs. 80.4%); (iii) 0.6% more likely to express university application intentions (59.6% vs. 59%) (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 0.24 standard deviations higher on standardized tests Students randomly assigned to receive information on the returns to education through a mentor score 0.08 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 1600 low-income high school students (five high schools) in Toronto, Canada	Field experiment	Among students unsure about their education attainment, random assignment to treatment led to a (i) 24.1% decrease in the belief that costs are a barrier to attending college (37.6% vs. 61.7%); (ii) 15% increase in community college aspirations (23% vs. 8%); (iii) 23% increase in university aspirations (65% vs. 42%)

 Table 2
 Interventions to help reduce inertia and change routine for students—cont'd

 Authors
 Intervention

#### 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% more likely to apply to a 4-year college; (ii) 44% more likely to apply to a selective institution; (iii) 15% more likely to appall in a 4 year college
Berman and Bos (2010)	Counseling 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% more likely to write the SAT (83% vs. 78%); (ii) 2% more likely to apply to a college (96% vs. 94%); (iii) 5% more likely to enroll at a state-college (55% vs. 50%); (iv) no more likely to be enrolled in college overall
Bettinger et al. (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% more likely to complete a FAFSA (56% vs. 40%); (ii) 11% more likely to be enrolled in college and receive financial aid (41% vs. 30%); (iii) 9.4% more likely to be enrolled full time (31% vs. 22%); (iv) 8% more likely to be enrolled in college for 2 years (36% vs. 28%). 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% more likely to enroll in college (57.2% vs. 51.8%); (ii) 5.6% more likely to enroll in a 4-year college (28.3% vs. 22.7%); (iii) no more likely to enroll in a 2-year college; (iv) 13% more likely to be enrolled in college 2 years after high school (47% vs. 34%)

Continued

Authors	Intervention	Data	Research design	Findings
Castleman et al. (2012)	Counseling to relieve information and financial barriers to mitigate summer melt	Administrative data from seven high schools in Rhode Island	Field experiment	Students randomly assigned to receive counseling were (i) 15% more likely to be enrolled in college full time (47% vs. 32%); (ii) 15% more likely to be enrolled in a 4-year college (41% vs. 26%); (iii) no more likely to be enrolled in a 2-year college; (iv) 19% more likely to have followed through with intentions from senior year (56% vs. 37%)
Castleman et al. (2014)	Counseling 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 counseling were (i) 3.3% more likely to enroll in college in the fall (86% vs. 82.7%); (ii) 5% more likely to be enrolled in college in their sophomore year (71% vs. 66%)
Panel C: coac	hing and advising			
Borghans et al. (2013)	Advice from counseling 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 counselor is associated with a reduction in the likelihood that a student wishes they had chosen a different program by 2% (20% vs. 22%). Male students and those with parents from low socioeconomic statues are affected the most by high school counseling
Bettinger and Baker (2014)	Coaching to improve college completion	Administrative data from eight public and private colleges from InsideTrack	Field experiment	Students randomly assigned to InsideTrack were 4% more likely to complete college (35% vs. 31%)
Cook et al. (2014)	Mandatory intensive math tutoring and weekly social-cognitive skill training	Administrative data for 106 at-risk ninth and 10th-grade high school students in Chicago	Field experiment	Students randomly assigned to receive treatment scored (i) 0.51 standard deviations higher on standardized math tests (TOT 0.65 standard deviations); (ii) earned 0.43 standard deviations higher math GPAs (TOT 0.58 standard deviations); (iii) -0.06 standard deviations higher on standardized reading tests (not significant)

 Table 2
 Interventions to help reduce inertia and change routine for students—cont'd

 Authors
 Intervention

 Data
 Research design

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.

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 prepopulate 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 were 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% (56% vs. 40%) more likely to have filed the FAFSA than those in the comparison group, and were 8% (35% vs. 27%) more likely to attend college for at least 2 years. This suggests that those induced to enroll were not underprepared for college.<sup>26</sup>

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% more likely to apply to 4-year colleges and submitted almost five more applications, on average, than students in the comparison

<sup>&</sup>lt;sup>26</sup> 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 counselors to provide targeted assistance, ask students until they complete the form, or offer positive (eg, a discounted prom ticket) or negative incentives (eg, can't go to the prom without filling out a FAFSA).

group. The results also suggest that program participants were induced to apply to 4-year colleges relative to 2-year colleges. If these low-income students were prepared to attend 4-year colleges but would otherwise have applied to 2-year schools, then the College Possible program may be alleviating information constraints about programs at 4-year institutions, leading students to be matched with programs that better meet their abilities and interests. Indeed, students eligible for the program were 15% more likely to enroll in a 4-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% higher than the comparison group (65% vs. 50%), with the majority of the effect concentrated among female students. The percentage of students attending college for at least 2 years also increased.<sup>27</sup>

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% (60% vs. 45%). Similarly strong effects were found for full-time enrollment at 4-year colleges.

#### 4.2.3 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 toward timely graduation, helping them open an education savings plan, helping them with good time management, or reminding them to utilize student services. As a specific example, Bettinger and Baker (2014) evaluate the InsideTrack program, where mostly nontraditional 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 toward achieving them. Coaches were

<sup>&</sup>lt;sup>27</sup> A similar project is underway in Canada, in which a three class workshop is incorporated into the 12thgrade 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.

proactive, providing outreach without waiting for students to ask. Students offered the program for one school year were about 5% more likely to persist the following year and 4% more likely to complete their degree after 2 years (35% vs. 31%). While the mechanisms behind these effects are not entirely clear, coaching could be helping to address several behavioral barriers discussed in Section 2.<sup>28</sup>

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 9th- and 10th-grade students were randomly provided with mandatory intensive tutoring, during school-hours, along with weekly social-cognitive skill training.<sup>29</sup> Students participated in 1 h 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%. As a result of the program and its high participation rate, math test scores increased remarkably by 0.65 standard deviations.

#### 4.2.4 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 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 et al. (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

<sup>&</sup>lt;sup>28</sup> 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).

<sup>&</sup>lt;sup>29</sup> Cook et al. (2014).

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% more likely to contact the school regularly (82% vs. 79%) and 6.7% more likely to monitor their child's homework (27% vs. 21%) Children of parents eligible for the intervention accumulate 25% fewer absences and achieve French grade 0.12 standard deviations higher than those of nontreated students
Banerji 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% more likely to review their child's school work (25% vs. 22%). CHAMPS treatment mothers were 6.5% more likely to review their child's school work (28.5% vs. 22%) Children of treated mothers scored 0.037–0.069 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 47,000 primary school students in five Moroccan regions	Field experiment	Students of families randomly assigned to receive LCTs were (i) 5.1% less likely to drop out of school after 2 years (2.5% vs. 7.6%); (ii) 7.9% more likely to complete primary school (72.3% vs. 64.4%)
Bergman (2014)	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 0.23 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% less likely to exhibit (teacher reported) unsatisfactory classroom behavior (20% vs. 26%); (v) 6.9% more likely to exhibit (teacher reported) excellent classroom behavior (41% vs. 34%) Treated parents were 7.9% more likely to attend parent-teacher conferences (23% vs. 15%)

 Table 3 Interventions to help reduce inertia and change routine for parents

Bursztyn and Coffman (2012)	Solicited whether parents would be willing to choose a cash transfer (CT) program over their a 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 one more semester of STEM courses than students of untreated parents (8.31 vs. 7.50 semesters) Treated parents were 17% more likely to value STEM courses and 17% 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 6th- and 9th-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% (85 %vs. 79%); (ii) increased in-class participation by 0.59 times per day (6.84 vs. 5.25 times per day)
Kraft and Rogers (2015)	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 576 summer program high school students	Field experiment	Students of parents who received messages highlighting positive behavior were 4.5% more likely to earn course credit (88.7% vs. 84.2%) (not significant) Students of parents who received improvement messages were 8.8% more likely to earn course credit (93% vs. 84.2%)

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.<sup>30</sup> 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 0.27 standard deviations higher on an overall parenting score. Students of treated parents accumulated 25% 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 0.12 standard deviations higher than that of the control group, although test scores did not significantly improve. Kraft and Rogers (2015) 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% (96% vs. 87%).

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 (Bergman, 2014). Parents selected for this treatment were more likely to report accurate beliefs about their children's missed assignments, as well as 7.9% (23% vs. 15%) more likely to attend parent-teacher conferences compared to those in a comparison group. Impressively, this inexpensive intervention improved student GPAs by 0.23 standard deviations, as well as attendance, assignment completion, in-class work habits, and cooperation.

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, 10th- and 11th-grade students whose parents were 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

<sup>&</sup>lt;sup>30</sup> 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 nonvolunteer, nontreated parents. Other students of volunteer parents who were not assigned to participate in the seminars were also in classrooms with nonvolunteer, nontreated students. This allowed the authors to test whether peer effects led to change in the behavior of nontreated 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% less likely to be punished for disciplinary reasons and 4.6% more likely to earn higher behavior marks.

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 et al. (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% (24% to 52%) more likely to review their children's school work, though math test scores for children of these parents improved only marginally.

#### 4.2.5 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 (Scott-Clayton, 2012b). 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% 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% of ACT takers sent three test score reports and more than 70% 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 (2014) propose helping all 12th-grade 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 12th-grade curriculum at low-collegetransition 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 that 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 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 nonacademic 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 3-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 3 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

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 precommit 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 et al. (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	<ul><li>(i) The mandatory attendance policy increased attendance rates by 28%;</li><li>(ii) A 10% increase in attendance led to a 0.16 standard deviation increase in final exam scores</li></ul>
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 10th- 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 vs. 84)
Grodner and Rupp (2013)	Mandatory homework assignments worth 10% of the final course grade	Administrative data from an undergraduate economics class in North Carolina	Field experiment	3.5–5.7% increase in test scores for students assigned to the mandatory homework group
Oreopoulos et al. (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 school attendance), up to \$4000 for college tuition and fees, college application assistance and fee waivers	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% (60% vs. 45%); (ii) college enrollment rates by 19% (57% vs. 38%); (iii) math and English test scores by 0.15 standard deviations

 Table 4
 Interventions to help reduce inertia and change routine by changing defaults and adding structure

 Authors
 Data

 Besearch design
 Finding

Authors	Intervention	Data	Research design	Findings
Pallais (2013)	Before 1997, college applicants were able to send three free ACT score reports to schools for free. After 1997, four free reports were allowed with additional reports costing \$6	American Freshman Survey	OLS and difference-in- differences	Before 1997, more than 70% of ACT takers sent exactly three reports. After 1997, fewer than 20% sent exactly three reports and 70% sent exactly four reports After 1997, students applied to colleges with 0.35–0.50 points
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)	higher on the ACT Students in course sections with daily online testing (i) scored 6% higher on tests in the psychology course (77% vs. 71%); (ii) scored marginally higher on other courses taken the following semester. Results were strongest for low-income students
Scrivener and Weiss (2013)	Comprehensive community college program intervention: mandatory full-time enrollment, mandatory block classes, "quick" graduation, financial assistance, mentoring and career counseling	Administrative data from six CUNY colleges	Field experiment	Students randomly assigned to the treatment group (i) 9.5% more likely to be enrolled in college after 2 years (67.8% vs. 58.3%); (ii) accumulated 7.6 more credits by the end of the second year of college (37.9 vs. 30.4 credits); (iii) 5.7% more likely to complete their associate's degree after 2 years (14.5% vs. 8.7%)
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 1% increase in lecture attendance was associated with a 0.1% increase in test scores

 Table 4
 Interventions to help reduce inertia and change routine by changing defaults and adding structure—cont'd

 Authors
 Intervention

 Data
 Besearch design

 Findings

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 (Scrivener and Weiss, 2013).

ASAP students are 9.5% more likely than the comparison group to be enrolled in college by the end of their second year (58.3% vs. 67.8%). They earn 7.6 more total credits (37.6 vs. 30.0) and are 5.7% more likely to have completed an associate's degree after 2 years than students in the control group (14.5% vs. 8.7%). Results at the third year are expected to show even larger effects, given that program participants are required to graduate within 3 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. Oreopoulos et al. (2014) evaluate a similar program offered to disadvantaged high school students and estimate large impacts on high school graduation and college enrollment.

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% of their final grade. The remaining 90% was comprised of marks on four exams, each worth 22.5% of their final grade. Students in the control group were evaluated only based on the four exams (each worth 25%); 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% higher on tests than students in the control group.

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% 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 0.46 standard deviations compared to those who just missed the requirement. Notably, grades in other courses were not affected.

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 3-4 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,<sup>31</sup> 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 precommitment 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 3-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 3 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 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 (Price and Shireman, 2013).

<sup>&</sup>lt;sup>31</sup> For example, this would be the case if students were sophisticated time-inconsistent discounters (ie, Laibson, 1997).

#### 4.3 Interventions That Strengthen Positive Identities

The need for social interaction and the need to feel liked are powerful influences on behavior (eg, Akerlof and Kranton, 2002, 2010). These influences can have negative consequences, such as when hard-working students are harassed for making less futureoriented classmates feel bad,<sup>32</sup> 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. Social psychologists have repeatedly demonstrated that individuals behave differently when prompted or "primed" to think of themselves as associated with one group compared to another (Mangels et al., 2012; Steele, 1997; Steele and Aronson, 1995). For instance, in Cohen et al. (2006), 7th-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% with an increase of more than 0.25 GPA points on a four-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 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 preexisting political attitudes. The African-American participants in the treatment group showed steady improvements in GPA across the 4 years of college, reducing the racial gap in GPA between African Americans and European Americans by 52% overall — without any intermediate interventions (Walton and Cohen, 2011).Ultimately, reducing students' immediate concerns about their social identity or feeling out of place can lead to significant long-term gains. Early evidence also suggests that an urban boarding school program may insulate like-minded students from other students with different priorities (Curto and Fryer, 2014).

Students may also identify themselves as failures, or less able than others. A substantial amount of research by 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

<sup>&</sup>lt;sup>32</sup> 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).

 Table 5 Interventions that strengthen positive identities

Authors	Intervention	Data	Research design	Findings
Abdulkadiroglu et al. (2015)	Enrollment in a school taken over by a charter school	Administrative data for 3173 charter school students in Boston and New Orleans	Matching and 2SLS	Enrollment in a New Orleans charter school due to a grandfathering eligibility rule increases math (English) test scores by 0.21 (0.14) standard deviations. Enrollment in a Boston Charter school increases math (English) test scores by 0.32 (0.39) standard deviations
Angrist et al. (2012)	Enrollment in a KIPP academy. The KIPP curriculum requires students to adhere to a behavioral code	Classroom and administrative data for 531 middle school students in Lynn Massachusetts	Field experiment	Reading and math scores of lottery winners increase by 0.12 and 0.34 standard deviations. Special needs students and students with limited English proficiency show larger gains
Angrist et al. (2014a)	Enrollment in Boston charter schools. The school adheres to a "No Excuses" pedagogy, focusing on discipline and academic success	Administrative data for 8851 applicants to six Boston-area charter high schools	Field experiment	Lottery winners have a 24% (44% vs. 20%) increase in the likelihood of qualifying for a state university scholarship, take one more AP exam on average (1.63 vs. 0.59 exams), are 18% more likely to enroll in a 4-year college (59% vs. 41%), and 11% less likely to enroll in a 2-year college (8% vs. 19%)
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 vs. 3.05 GPA); (ii) 0.22 points higher than those assigned to the control group (3.32 vs. 3.10 GPA). Effects were smaller and insignificant for white students
Blackwell et al. (2007) (Study 2)	Eight sessions over 8 weeks teaching students that the brain is malleable and that intelligence grows with effort	Administrative data from 91 7th-grade students in New York City	Field experiment	0.55 standard deviation GPA increase from the spring of 7th grade to the spring of 6th grade for students randomly assigned to receive the treatment, relative to the control group

Bursztyn and Jensen (2015)	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% less likely to sign up for the course (61% vs. 72%) Among students taking two honors classes, those randomly assigned to have their sign up decision disclosed were (i) 25% less likely to sign up they happened to be in a nonhonors class during the experiment (54% vs. 79%); (ii) 25% more likely to sign up if happened to be in an honors class during the experiment (97% vs. 72%)
Bursztyn and Jensen (2015)	Students using an in-class, computer-based learning system to prepare for high school 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	Administrative data on prep question performance for 13,000 remedial math and English students in 200 high schools	OLS	Disclosing the names of top performers is associated with one fewer correct answer per day (7 vs. 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 three fewer correct answers per day (9.5 vs. 12.5 per day)
Cohen et al. (2006)	Targeted reaffirmations of personal adequacy and self- integrity	Administrative data from a 7th-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 four- point scale). Treatment effects were largest for African-American students; those for white students were small and insignificant
Curto and Fryer (2014)	Enrollment at an urban boarding school 5 days per week	Classroom and administrative data for 221 low-income 6th- to 8th-grade students in Washington D.C. and Baltimore	Field experiment	Reading and math test scores for lottery winners increase by 0.21 and 0.23 standard deviations respectively. Effect sizes are larger for females (0.38 and 0.27 standard deviations)

Authors	Intervention	Data	Research design	Findings
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	Framed field experiment	Student-athletes randomly assigned to the stereotype condition scored 0.84 standard deviations lower on a standardized (GRE) test
Dobbie and Fryer (2011)	Enrollment in the Harlem Children's Zone	School and administrative data for 842 lottery applicants for elementary and middle school students	Field experiment	Math and scores increased by 0.23 standard deviations for middle-school lottery winners. Elementary school lottery winners experienced 0.19 and 0.14 standard deviation higher math and reading scores
Fryer (2014)	Injecting charter schools best practices into low- performing public schools	Administrative data for 12,000 elementary and high school students in Huston, Texas	Field experiment and matching	Students at schools that adopted the best practices experienced standardized math test score increases of 0.14 standard deviations. Test score gains were higher for elementary schools (0.20 standard deviations) than for high schools (0.10 standard deviations)
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 one point higher (6.23 vs. 5.13 out of 10) on the vocabulary quiz

### Table 5 Interventions that strengthen positive identities—cont'd

Good et al. (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% higher on a standardized math test (82% vs. 74%) Students randomly assigned to the attribution condition scored 11% higher on a standardized math test (85% vs. 74%) Students randomly assigned to receive both interventions scored 10% higher on the standardized math test (84% vs. 74%)
Morisano et al. (2010)	Web-based program that asked participants to write about their ideal future, their goals toward 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 0.48 standard deviations higher that the control group, one semester after the intervention (2.91 vs. 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 15,000 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 vs. 89 seconds); (ii) completed 1.2 more levels of the game, on average (6.7 vs. 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 vs. 3.35 GPA)

Table 5	Interventions	that	strengthen	positive	identities—cont'd

	ons that strengthen positive iden		Research	
Authors	Intervention	Data	design	Findings
Walton et al. (2015)	A short intervention designed to help foster a sense of belonging among female engineering students in male dominated (more than 80%) fields	Administrative and survey data for 228 first-year engineering students from three successive cohorts at the University of Waterloo, Canada	Field experiment	Female students randomly assigned to the treatment increase experienced a 4% increase in first-year GPA in Engineering courses (77.5% vs. 73.5%)
Wilson and Linville (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% (80%) less likely to drop out of college by the end of their sophomore year; (ii) experienced a 0.34 GPA increase (2.92 vs. 2.58 GPA). Students in the control group experienced no GPA increase (2.82 vs. 2.87 GPA)
Wilson and Linville (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	Students randomly assigned to the treatment group experienced GPA increases of approximately 0.2 GPA points (2.8 vs. 2.6 GPA) from the first to second semester of their freshman year
Yeager et al. (2014) (Study 2)	30 min intervention designed to help students recognize a self-transcendent purpose for education	338 middle-income 9th-grade students in California	Field experiment	Students randomly assigned to receive the self-transcendent purpose intervention experienced a GPA increase of 0.11 GPA points (3.04 vs. 2.93 out of 4). The impact of treatment was even larger for students with a preintervention GPA below 3.0 (2.1 vs. 1.9)

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 Linville (1982) randomly assigned 40 Duke University freshmen to watch pretaped 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 nonacademic interests. The authors found that students randomly assigned to the treatment group were 20% less likely to drop out of college by the end of their sophomore year (from a baseline dropout rate of 25%). Students in the treatment group also earned better grades; their GPAs increased by 0.34 points (on a four-point scale) from the first semester of their freshmen year to the end of their sophomore year, while the GPAs of those in the control group were unchanged. <sup>33</sup> Similar results have been replicated in other settings.<sup>34</sup>

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 four-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 0.55 standard deviation increase relative to the control group. Yeager and Walton (2011) and Walton (2015) 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. Identity interventions

<sup>&</sup>lt;sup>33</sup> 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.

<sup>&</sup>lt;sup>34</sup> Wilson and Linville (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.

may also occur at an institutional level: in addition to including a more structured curriculum, the KIPP charter school system's values include "High Expectations" and "Choice and Commitment," which together imply that students can achieve difficult goals through their own willpower. Evaluations of KIPP and similar "No Excuses" charter school programs suggest that these underlying values may be associated with higher test scores and academic achievement (Abdulkadiroglu et al., 2015; Angrist et al., 2012, 2014a; Dobbie and Fryer, 2011; Fryer, 2014). We describe other studies that examine the effect of reinforcing students' academic identities on various outcomes in Table 5.

# 4.4 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 (ie, test score performance and nonacademic 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 6-7.5% 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 0.1 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.

## 5. CONCLUSION

By taking into account our frequent difficulty in making short and long-run trade-offs, 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 \$8000 for disadvantaged 9th-grade students increased college graduation rates by 8%; text messaging college-bound students preparation advice in their summer after high school increased enrollment by 3%; help for 10 min completing the college financial aid application increased enrollment by 8%; 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 7th-grade 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. At the same time, not all interventions are successful: increases in elementary students' tests scores disappear the next year, while associated financial incentives report very modest effects. Similarly, merit aid scholarships for college freshmen do not appear to generate long-term changes in behavior. Context, population, timing, and details are all crucial — if subtle changes make a big difference, then it is understandable that not all changes would do so. Future work should explore the conditions under which those changes are successful, especially for high touch interventions that may require more effort and more resources. But ultimately, these opportunities are exciting, testable and tenable. And for a 6-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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