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Nudging in education

Mette Trier Damgaard and Helena Skyt Nielsen



DEPARTMENT OF ECONOMICS
AND BUSINESS ECONOMICS
AARHUS UNIVERSITY

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Mette Trier Damgaard[†] and Helena Skyt Nielsen[‡],
Aarhus University and Trygfonden's Centre for Child Research

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Abstract:

Can we nudge children, youth and their parents to make better decisions on education? Such decisions involve immediate costs and potential, future benefits. Research suggests that behavioural barriers (e.g. lack of self-control, limited attention and social norms) likely influence choices in such settings. This raises the question as to whether low cost 'nudges' can improve people's educational choices. While nudging does not always have desired effects, interventions providing commitment devices for study effort, non-monetary incentives and targeting cognitive or attentional limitations generally seem to be effective.

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[†] Corresponding author: Fuglesangs Allé 4, 8210 Aarhus V, Denmark, mdamgaard@econ.au.dk

[‡] Fuglesangs Allé 4, 8210 Aarhus V, Denmark, hnielsen@econ.au.dk

[P]eople will need nudges for decisions that are difficult and rare, for which they do not get prompt feedback, and when they have trouble translating aspects of the situation into terms that they can easily understand.

— Cass R. Sunstein and Richard H. Thaler, *Nudge: Improving Decisions about Health, Wealth, and Happiness*

1. Introduction

Globalisation and rapid technological progress have increased the focus on efficient investment in high-quality skills. One issue that is high on the political agenda in many countries is (under)performance on PISA tests (e.g. European Commission, 2016). Another is the need for a stronger focus on non-cognitive (or socio-emotional) skills from early life throughout the course of education (e.g. Kautz et al., 2014). These two issues indicate a need for more knowledge about how to push youths gently in the desired direction towards further skill attainment and better decision-making when it comes to their educational pathways.

At the same time, the past 10–20 years have seen a steady increase in the number of intervention studies using behavioural economics to inform intervention design across a wide range of policy areas. Practitioners and academics are increasingly adopting *nudging* policies aimed at altering people’s behaviours in a predictable way without forbidding any options or significantly changing their economic incentives (Thaler & Sunstein, 2008). The popularity of nudging interventions is partly due to low implementation costs and the potential for high benefit–cost ratios.

Education policy is no exception. This is unsurprising, as the economics of education have traditionally relied heavily on the human capital model, which emphasises the long-term investment aspects of schooling decisions. Accounting for the fact that many education-related decisions are difficult, rare and taken at young ages before the brain is fully developed, there is scope for numerous behavioural biases, and the field lends itself to approaches from behavioural economics (as synthesised in Koch, Nafziger & Nielsen, 2015). Understanding these behavioural biases can motivate interventions that mitigate their detrimental effects by de-biasing or nudging.

The contribution of this paper is to distil research, which employs field interventions that work through *nudging*.¹ Our goal is to provide an overview of studied nudging interventions and their effectiveness in the education sector from pre-school through higher education;² that is, when and under what conditions can the educational decisions of children, adolescents, parents and teachers be nudged? Recent empirical work suggests that nudges sometimes backfire from a social welfare perspective (see e.g. Carroll et al., 2009; Handel, 2013; Damgaard & Gravert, 2016). It is therefore critical to synthesise the circumstances under which nudging can and cannot be successful.

As a consequence of our delimitation to studying nudging, we do not fully represent the vast literature on interventions that explicitly aim at offsetting immediate costs with immediate benefits, nor do we include

¹ Other recent review papers have considered similar topics. Lavecchia et al. (2016) synthesise evidence from field interventions addressing a set of specific behavioural challenges and do not solely focus on nudging nor do they draw conclusions for different types of interventions. French & Oreopoulos (2017) review empirical evidence for simplifying the transition to higher education; their scope is, thus, more limited than ours.

² List et al. (forthcoming) discuss behavioural economics in the context of early childhood interventions.

interventions that impose mandatory requirements or in other ways restrict the choice sets. However, the definition of nudging provided by Thaler & Sunstein (2008) gives some leeway for interpretation. We include both so-called ‘non-educational’ or ‘pure’ nudges (e.g. priming, framing, defaults) that target systematic biases in behaviour to achieve behavioural changes without promoting *active* decision-making as well as ‘educational’ nudges (e.g. information provision) that potentially induce better *active* decision-making. We also include so-called ‘boost’ (Grüne-Yanoff & Hertwig, 2015) or ‘educate’ (Katsikopoulos, 2014) interventions deliberately aimed at improving decision-making capabilities. We choose to put the most weight on field interventions in the education sector that strictly adhere to the definition of nudging and less on other interventions motivated by behavioural economics but not nudges per se. Some of the interventions discussed also involve more traditional policy tools, however, such as monetary incentives and mandatory requirements (e.g. participating in tutoring sessions). When possible, we discuss differential effects of the different types of interventions for students and parents with high and low socio-economic status (SES) and at different stages in their education (e.g. primary school, secondary school, university).

The remainder of the paper is organised as follows: Section 2 discusses the benefits of education and provides a brief introduction to the behavioural economics of education. Section 3 is the core of the paper and presents the application of nudging as used in the field of education. We begin with the field interventions that most strictly adhere to the definition of a nudge and gradually proceed towards field interventions involving economic incentives to a higher extent. Section 4 concludes and discusses policy implications.

2. Benefits of educational attainment and behavioural barriers

This section briefly presents the benefits of educational attainment as known from the literature on the economics of education before introducing the main behavioural barriers to educational attainment.

2.1 Benefits of educational attainment

The traditional view on educational attainment comes from the early studies of Mincer (1958), Schultz (1961), Becker (1964) and Ben-Porath (1967), among others, who regard education as a core component of the human capital stock. According to this line of thinking, agents invest time, effort and money in education, which provides knowledge and characteristics enhancing productivity and, thus, lifetime earnings. At each stage in the education cycle, the agent weighs the costs and benefits of education and decides whether to pursue further education. The costs and benefits of education may depend on innate ability and cognitive capacity.

It is well established that formal education increases productive benefits (i.e. lifetime earnings) as well as non-productive benefits (benefits extending beyond increases in individual labour market productivity), such as health, crime and good citizenship (Lochner, 2011). Heckman et al. (2006) report large internal rates of return for schooling under rather flexible assumptions. In line with other studies, they report returns that are particularly large for secondary school completion in the US. A more recent study, Bhuller et al. (2017), finds that even in a country like Norway, with its progressive tax and pension systems, the internal rate of return from schooling is around 10%. Lochner (2011) studies the non-production benefits of education and reports the most striking beneficial effects when it comes to crime reduction, particularly around the final years of secondary school. The main reasons why education reduces contemporaneous crime are the so-called incapacitation effect (i.e. youth have no time to commit crime while in school) and the human capital effect (i.e. the opportunity cost of crime increases when in school). Conversely, the social network effect means that many crime-susceptible youth are gathered at school, and this effect works in the opposite direction, thus increasing crime. Some of the candidate explanations for why education reduces subsequent crime are that the

opportunity costs of crime go up, preferences for crime go down and non-cognitive skills are acquired that reduce the propensity to commit a crime. When it comes to health and good citizenship, convincing reasons for non-productive benefits are manifold, but supporting evidence is scarce. Although there is a strong association between education and health, Lochner (2011) concludes that the most credible studies only find modest health improvements and limited reductions in mortality resulting from further education. Similarly, he reports substantial effects for the US but only modest effects for other countries regarding good citizenship, as measured in terms of voting behaviour and political participation.

Based on the above literature, it remains puzzling why individuals drop out or perform poorly in education considering its high estimated financial and non-financial returns. The remainder of this paper points out numerous potential explanations that are relevant at various points in the education process.

2.2 Behavioural barriers to educational attainment

While most people enjoy clear economic benefits from obtaining education at all levels, human capital accumulation may be hindered by a range of behavioural barriers. This subsection briefly discusses some of the most important barriers and introduces key concepts from behavioural economics, highlighting their relevance for educational decisions.³

2.2.1 Self-control

Decisions on education and other investment decisions have long-term consequences and involve the potential for higher future earnings. Investing time and effort in studying or attending classes involves a trade-off between immediate costs (effort costs and foregone earnings) and future benefits (higher future income). When making these intertemporal trade-offs, students and their parents may be influenced by present-biased or time-inconsistent preferences (e.g. captured by $\beta\delta$ -preferences, where an additional discount factor is applied to costs and benefits occurring in the future (Laibson, 1997)). Such preferences may leave students and their parents excessively impatient when making choices involving immediate costs and benefits, which may in turn lead to self-control problems where students do not properly regulate their own behaviour to achieve long-term goals. For example, while students who start secondary school may clearly prefer graduating over dropping out, they might fail on an everyday basis to resist the temptation to do something more enjoyable than studying or attending class, which could lead to declining class participation. Evans et al. (2016) show empirically how student participation may be declining over time. Students with self-control problems also tend to put off important decisions, such as what university to apply to. Moreover, students with self-control problems may lack non-cognitive skills, such as grit and perseverance.

In the context of education decisions, it is worth noting that children and adolescents are particularly likely to be influenced by self-control problems (Green, et al. 1994; Bettinger & Slonim, 2007), because their brains and in particular their executive function are less developed.⁴ There is also evidence indicating that boys are more impatient than girls (Duckworth & Seligman, 2006) and therefore more likely to have self-control problems. Empirical evidence suggests that individuals who are impatient are more likely to drop out of school despite having higher expected returns, and they are more likely to express regret at middle age and earn significantly less on average than their patient counterparts (Cadena & Keys, 2015). Parents, who are an important influence on early-life education decisions, could potentially compensate for their children's poor

³ For a more detailed introduction to barriers to decision making discussed in behavioural economics and a broad discussion of the available evidence, see e.g. DellaVigna (2009). For discussions in the context of education economics, see Koch et al. (2015) and Lavecchia et al. (2016).

⁴ See e.g. Lavecchia et al. (2016) for a review of the literature on brain development.

self-control. However, self-control problems are correlated with poor socio-economic characteristics (Mischel, et al., 1989; Golsteyn, et al., 2014), meaning that low-SES children and parents tend to lack self-control (and such parents may be unable to compensate for their children's lack of self-control).

2.2.2 Limited attention and cognitive ability

Standard economic theory assumes that individuals consider all of the relevant alternatives and all of the available and cost-free information when making decisions. When choosing whether and to which college or field to apply, for example, prospective students consider – in theory – all of the possible alternatives, seek out all information about those alternatives (including the specific costs and benefits associated with each degree and institution) and then make an informed choice about what to study and where. In practice, however, decisions are likely to be influenced by both cognitive and attentional limitations, and attention may be viewed as a scarce resource (DellaVigna, 2009). This means that there is a limit to how much information can be processed, how many alternatives can be considered, and some information may be forgotten to make room for new information. For example, students may forget to do tasks (e.g. completing homework), and prospective college students may not consider all of the alternatives.

Cognitive and attentional limitations may be particularly important for complex choices such as education decisions and might therefore pose an important barrier to good decision-making. There is evidence that students lack accurate information about the returns to education (Oreopoulos & Dunn, 2013; McGuigan et al., 2016), even though such information is freely available. The evidence also suggests that (as with self-control problems) the effects of limited attention and limited cognitive ability are greater for students from low-income families (Avery & Kane, 2004).

In order to process large amounts of information and make choices, people often adopt a number of heuristics to simplify the choice (DellaVigna, 2009). First, people may avoid making choices if they are too complex. Interventions outside the area of education policy suggest that people may react adversely to more alternatives and simply fail to choose (Iyengar & Lepper, 2000; Choi, et al., 2004; Bertrand, et al., 2010). We do not know of any studies which explore this regarding education.

A second coping mechanism is placing excessive weight on the most salient information or the most salient option (Bordalo et al., 2012). For example, the costs of attending university may be more salient than the benefits because tuition costs are paid up-front and featured in university materials. The overemphasis on salient information also implies that decisions may be sensitive to how information is framed (i.e. how it is presented). Furthermore, decision-making may be sensitive to priming, where people are presented with some stimulus that may or may not be relevant to the decision problem.

2.2.3 Loss aversion

Experimental studies have consistently shown that people evaluate outcomes relative to their reference point. As an illustrative example, suppose that someone applies for financial aid and receives a grant covering half of their tuition fees. If they had expected to get two-thirds of the costs covered, then such a grant will be disappointing. Conversely, if they had only expected to get one third of their costs covered, the same grant would feel like a surprising gain. Experimental evidence suggests that a loss relative to the reference point looms larger than an equal-sized gain. As captured by several referent-dependent theories (Kahneman & Tversky, 1979; Köszegi & Rabin, 2006; Köszegi & Rabin, 2007), this loss aversion leads to a strong aversion to downside risk. Investing in education involves some uncertainty with respect to the possible gains; consequently, students may underinvest in education to avoid possible losses.

2.2.4 Default bias

A common empirical finding is that people tend to stick to the default or status quo (Kahneman et al., 1991). This is known as the default bias, status-quo bias or the endowment effect. Default bias relates to several of the concepts mentioned above. First, limited attention means that people do not pay adequate attention to other options, because the status quo is the most salient option. Second, loss aversion often leads to a default bias because the status quo serves as a natural reference point and people stick to the status quo to avoid losses compared to that reference point. Finally, present bias combined with immediate switching costs could make people choose the default.

In the context of education, the default bias might help explain why some parents refrain from exploiting the opportunity to choose a primary school for their child, simply choosing the default instead. As people from low socio-economic backgrounds are more likely to be influenced by present bias and attention limitations, they are also more likely to be influenced by defaults.

2.2.5 Social preferences and self-image concerns

Laboratory experiments and field data suggest that most people are influenced by social preferences (DellaVigna, 2009) such as fairness, reciprocity, inequality aversion, altruism, social norms and self- and social-image concerns.

Two of these concepts seem particularly relevant in the context of education: social norms and self- and social-image concerns. Education choices may have important effects for how people perceive themselves and are perceived by others. Typically, people care about how they are perceived and may go to some length to preserve a favourable social-image and self-image (as demonstrated in the laboratory experiments by Falk & Szech, 2016). This can be captured by social-image and self-image concerns (Benabou & Tirole, 2002; Benabou & Tirole, 2006) and might explain why some people make so-called self-handicapping choices (i.e. choices in conflict with their own interests). For example, going out drinking the night before an important exam could be motivated by an interest in maintaining a favourable self-image, because it allows the student to attribute poor exam performance to being hungover rather than limited ability.

Social identity is closely related to (self- and) social-image concerns. People like having a sense of social belonging, and one means of achieving that is by using one's actions to reveal information to others (Austen-Smith & Fryer, 2005). Hence, actions may be motivated by the reputational effects of one's actions in terms of shaping one's (self- and) social-image and social identity. In turn, this may lead to preferences for following the social norms in one's social comparison group (Akerlof & Kranton, 2002; Benabou & Tirole, 2006). In the context of education, it is worth noting that the prevailing social norm in the social comparison group may be detrimental to education attainment (Akerlof & Kranton, 2002; Austen-Smith & Fryer, 2005). For example, it may be the norm not to exert effort, to skip classes or to drop out of secondary school. In other cases, the social norm may be conducive to education attainment, such as a norm to obtain a university degree. Hence, from the perspective of the individual, social norms may lead to underinvestment in some circumstances, overinvestment in education in others.

2.2.6 Biased beliefs

Choices are also likely to be influenced by biased or faulty beliefs. Evidence suggests that beliefs about the probability of events are often biased (Kahneman & Tversky, 1979), that people tend to be overconfident in their own abilities (Benabou & Tirole, 2002), and that people are influenced by projection bias, meaning that they wrongly believe future preferences will be identical to current preferences (DellaVigna, 2009).

The impact of self-confidence (with respect to ability) on education decisions likely depends on whether effort is best considered complementary or supplementary to ability (Benabou & Tirole, 2002). If effort and ability are complementary (e.g. such that high effort combined with high ability leads to higher grades), then overconfidence is expected to have a motivational effect. Chen and Schildberg-Hörisch (2017) present empirical evidence from the lab in favour of the motivational value of overconfidence. In other situations, such as applying to a particular university or in the context of ‘pass/fail’ exams, effort and ability can be characterised as substitutes, and overconfidence is predicted to have negative effects on effort provision because students (wrongly) believe that their high ability level can substitute for study effort. Opposite effects are predicted for underconfident students.

Projection bias has potentially different effects. Students influenced by projection bias may not fully recognise that their life situation and needs change over time, regardless of their education choices. Instead they may think that the current situation is a good future predictor. Hence, education choices (e.g. whether or not to move to a different part of the country to obtain a certain university degree) may be made given their current life situation and preferences and not taking their future life situation and preferences into account.

3. Applications of nudges in education

The existence of behavioural barriers influencing decision-making may motivate interventions that target these barriers and potentially try to remove them. For example, intervention that recognises self-control problems might use interim deadlines to get students to increase total study effort or teach them to exercise more self-control. This section provides an overview of the use of nudging and related behavioural interventions in education. The discussion is organised according to the intervention type and discusses which behavioural barrier(s) the intervention targets and its effects.

3.1 Deadlines

Students with self-control problems may repeatedly procrastinate doing tasks such as homework, written assignments and exam preparation. Interim deadlines may serve as a commitment device for students to study sooner rather than later (O'Donoghue & Rabin, 1999a). Models with present-biased preferences (Laibson, 1997; O'Donoghue & Rabin, 1999b) predict that students benefit from such commitment devices and that sophisticates (who are aware of having self-control problems) will actively choose to use deadlines as a commitment device when given the choice.

The empirical evidence on the effectiveness of deadlines focuses on the impact on university students and is generally positive (see Table 1 for an overview).⁵ Ariely & Wertenbroch (2002) tested the effect in a setting with ninety-nine executive students at the Massachusetts Institute of Technology who had to write three term papers for a course. They were assigned to one of two deadline treatments. In the first treatment, participants were given evenly spread deadlines, whereas the students set their own deadlines in the second one. In both treatments, there was a 1% grade penalty for each day of delay beyond the deadline. Ariely & Wertenbroch (2002) found that students exposed to evenly spread deadlines achieved better grades than those

⁵ Studies of non-field interventions with students also produce diverging results. While the studies consistently show a demand for self-imposed deadlines as a commitment device, Ariely & Wertenbroch (2002) find that completion and performance on a non-study related task are better with deadlines than without, but Bisin & Hyndman (2014) find the opposite effect. Other (non-educational) field contexts have found limited support for deadline effects (Bertrand et al., 2010; Damgaard & Gravert, 2017).

without such intermediate deadlines. They also found that, when given the choice, more than two-thirds of the students did set intermediate deadlines. Grades were lower with self-imposed deadlines than externally imposed deadlines, however, suggesting that students did not set deadlines optimally. Notably, there was no effect on the completion rate, as all of the students completed all the three papers regardless of the treatment.

While these results indicate a positive effect of deadlines, they were obtained for a very specific sample of highly motivated students with strong incentives to complete the course (non-refundable fees). This might explain why task completion was not an issue. In contrast, Burger et al. (2011) studied a field intervention where motivation was manipulated by a randomly controlled intervention. University students were paid \$95 for 75 hours of monitored studying over a five-week period. Students were randomly assigned to one of two treatments. In the first, they were free to plan their study time as they wished over the five weeks; in the second, they were given intermediate deadlines and required to study 12 hours per week or no payment was made. Burger et al. (2011) found lower completion rates in the treatment with intermediate deadlines, suggesting that deadlines are not always beneficial.

Tests and exams may also be regarded as natural study deadlines that students often have strong incentives to meet. There is some indication that increased test (and hence deadline) frequency affects performance positively. In the De Paola & Scoppa (2011) study, students in the control group had one exam at the end of the semester covering the full material of the course, whereas the treatment group students had a mid-term exam covering half of the material and a final exam at the end of the semester covering the other half. The final grade was determined by the average grade on the two exams. The treatment group students achieved higher grades and were more likely to pass the course. High-ability students appeared to benefit more from frequent exams than low-ability students, and there was no negative (nor positive) spillover on exams in subjects not included in the intervention.⁶ Moreover, Tuckman (1998) provided some evidence that heavy procrastinators may benefit from frequent testing. As procrastination would be expected to be associated with lower secondary school grades, this finding appears to contradict the result in De Paola & Scoppa (2011): that high-ability students (students with good secondary school grades) benefitted most from the interim exam. The differential effects may be due to the fact that the control group students in Tuckman (1998) were given additional homework instead of additional tests, which was not the case in De Paola & Scoppa (2011). If high-ability students indeed have higher self-control, then they might be expected to benefit more from the homework assignments, which may explain the lower treatment effects for low procrastinators in Tuckman (1998).

Instead of changing the exam frequency, some US interventions have aimed at reducing procrastination leading up to exams, because such behaviour can be associated with lower performance. For example, using an online exam environment, one study attempted to motivate more than 1,000 students to complete an exam sooner by setting up interim deadlines that, if met, meant students would have more time to work on the exam (Levy & Ramim, 2013). The study found that this intervention reduced procrastination (more people completing the exam earlier), but there was no effect on grades.⁷

⁶ Moreover, De Paola & Scoppa (2011) provided evidence suggesting that the positive effect of frequent examinations was not driven by additional feedback but instead by a workload division or commitment effect, as treatment differences were of similar magnitude for the exam questions relating only to the first half of the course for which feedback effects could be excluded for both groups.

⁷ Another study rewarded students for meeting interim deadlines by providing them with (earlier) access to study material relevant for an upcoming test (Perrin, et al., 2011). While the study had a very small sample (only 10 students),

Table 1: Studies varying deadline and exam frequency

Paper	Target group	Intervention	Outcome	Effect
Ariely & Wertenbroch (2002)	US. Executive students	Interim deadlines (external)	Grades	Positive
			Completion	No
		Self-imposed	Grades	Small
			Completion	No
Burger et al. (2011)	US. University students	Interim deadlines (external)	Completion	Negative
De Paola & Scoppa (2011)	Italy. University students	Frequent exams	Grades	Positive (especially for high-ability students)
			Passing	
Tuckman (1998)	US. University students	Frequent testing	Grades	Positive (for high procrastinators)
Levy & Ramim (2013)	US. Students at unknown academic institution	Interim deadline	Grades	No
			Procrastination	Positive (less procrastination)

3.2 Goal-setting

Recent interventions have focused on another type of commitment device: goal-setting. Theoretically, present-biased agents who invest too little effort in their education can benefit from self-set goals as internal commitment devices. Once set, goals become salient reference points that students (and parents) will be motivated to meet in order to avoid losses compared to them (Koch & Nafziger, 2011; Jain, 2009; Clark et al., 2017).

The results of interventions using goal-setting suggest that self-set goals can have positive effects on effort provision and performance, especially if goals are linked to specific tasks within the control of the student (for an overview, see Table 2). Clark et al. (2017) tested the effect of self-set, task-specific and performance goals for American university students. They found that task-specific goals led students to engage more with the task and, ultimately, perform better on exams. In contrast, performance goals for exams and an overall course grade had little effect. The authors argue that task-specific goals involving less risk make the outcome more controllable for students. At the same time, performance goals are more long-term and procrastination might therefore reduce the effectiveness. However, van Lent & Souverijn (2017) did find positive effects on grades of a performance-based goal where Dutch university students set a target grade for a course. The effects were strongest for students who initially performed poorly, and there were no negative spill-over effects to other courses. Interestingly, van Lent & Souverijn (2017) found negative effects of suggestions by others to raise

the results suggest that such incentives to meet interim deadlines could work. However, the authors found no evidence that students had a demand for this kind of commitment device.

the goal, meaning that such suggestions may reduce commitment to the goal or render it seemingly unattainable.

Table 2: Studies using goal-setting

Paper	Target group	Intervention	Outcome	Effect
Clark et al. (2017)	US. University students	Task-specific goals	Study effort	Positive (driven by males)
			Grades	Positive (driven by males)
		Performance-based goals	Grades	No
van Lent & Souverijn (2017)	The Netherlands. University students	Self-set performance goals	Grades	Positive (especially for low-performing students)
		Suggestions to raise the goal	Grades	Negative

3.3 Social nudges

The term ‘social nudges’ refers to nudging designed to promote behavioural change by exploiting or creating social settings. Some nudging appeals to positive social norms, some is designed to create positive social interaction, whereas other nudging aims at promoting group identity.

3.3.1 Social norms

As people generally like to belong to groups and adhere to their social norms, it might be possible to use positive social norms to promote better education decisions. However, this requires knowledge of the norms in place and alignment between the norms and the desired behaviour. A German study illustrates the difficulties involved. Wagner & Reiner (2015) found negative effects of an intervention that made test performance public, either to peers in the classroom or to parents. Negative effects only appeared for students attending *Gymnasium* (academic-track upper secondary school), which generally attracts higher-SES students. No effects were found for students attending *Hauptschule*, *Realschule* (non-academic-track secondary schools) or *Gesamtschule* (comprehensive secondary school). The negative effects were mitigated when students were able to select the type of public information provided (i.e. whether parents or classmates would learn that they had improved their performance).

Similar effects were found in a US intervention introducing a performance-based leader board announcing the top three performers in the classroom, school and among all users in computer-based secondary school courses (Bursztyn & Jensen, 2015). This led to a 24% decrease in performance, primarily driven by a decline in effort provided by students who were top performers prior to the introduction of the leader board. This suggests that the students wanted to avoid such mention. Another intervention offered students access to an online test preparation course, and students were randomly told that the decision to enrol in the course would be kept private from other students (Bursztyn & Jensen, 2015). In advanced classes, the sign-up rates were unaffected by whether the enrolment decision was public. In less advanced classes, however, the enrolment rate was 11 percentage points lower when the decisions were made public. The response of those students enrolled in *both* advanced and non-advanced courses appeared to depend on the type of course and, hence, the type of peers and social norms in the classroom. In advanced classes (where many people enrolled), these students were eight percentage points more likely to sign-up for the course. In contrast, in less advanced classes (where fewer

people enrolled), they were 15 percentage points less likely to sign-up. These results suggest that the social norm may be to make relatively little effort in some classrooms; in such settings, it may be counterproductive to make effort choices public.

3.3.2 Peer group interaction

Peer interaction can help improve the sense of social belonging and enforce or create social norms. Studies of peer effects in student housing have found mixed effects on academic performance (Carrell, et al., 2009). If peer effects arise, they may do so either due to social norms of effort provision or through study partnerships. A US intervention assigned half of the freshmen at the United States Air Force Academy to peer groups to help the lowest-ability students (Carrell, et al., 2013). Low-ability students were placed with high-ability students in an attempt at creating positive spill-overs of norms and skills. Medium-performing students were placed together in more homogenous groups. Students in the control group were randomly allocated. The study found negative and significant effects on the grades of the low-ability students, who the intervention otherwise intended to help. The high-ability student performance was unchanged, and medium-ability students performed significantly better. The high- and low-ability students who were supposed to interact instead appeared to form subgroups and avoid each other. The fact that medium-ability students performed better suggests that they may have been better able to create a sense of group belonging. The results also highlight how it can be very difficult to create a sense of group belonging exogenously.

A recent German intervention finds that children can be influenced by their social environment (Kosse, et al., 2016). The German intervention targeted children aged 7–9 with low SES. Children in the treatment sample interacted regularly with a mentor over roughly a one-year period. Their mentors were mostly university students. While Kosse et al. (2016)⁸ only focus on the effect of mentoring on pro-sociality (not academic achievement), more recent results suggest that there is also a positive, statistically significant effect on upper secondary (*Gymnasium*) attendance (Falk et al., 2017). Several other coaching and mentoring interventions (discussed in more depth below) have also attempted to use peer influence by exposing secondary school graduates to interaction with college students. For example, Castleman & Page (2015) study a US intervention where college students provided outreach to secondary school graduates intending to attend college. Peers had conversations with secondary school graduates regarding their plans to attend college and their progress towards completing the enrolment. The authors find little evidence of an effect of the peer outreach programme. Although the effects are in the expected direction of higher enrolment, they are not statistically significant.

3.3.3 Informational nudges to create group identity

Other studies have experimented with simpler informational nudging to create a sense of social belonging. As discussed below, informing students of peer performance can have positive effects on grades and persistency (Wilson & Linville, 1982). Similar effects on grades can be obtained by giving new university students fictional descriptions of other students' difficulties in fitting in during the first year of university and asking them to describe their own difficulties to other students (Walton & Cohen, 2011).⁹ A US intervention has also shown that providing teachers and students with information about similarities in their values, interests etc. led to improved grades (Gehlbach, et al., 2016). The effects appeared strongest for African-American students. This result matches well with the results of non-experimental studies showing that minority students perform

⁸ The study found that children in the treatment group behaved significantly more prosocially in lab experiments after the mentoring period compared to the control group. In fact, the behaviour of the treated low-SES children comes to resemble that of non-treated, high-SES children.

⁹ We note, however, that the use of fictional descriptions in general could raise ethical concerns about the possibility of manipulation and might also harm the credibility of those providing the information.

better when taught by teachers or instructors with similar ethnicity or race (Fairlie, et al., 2014; Lusher, et al., 2015). This suggests that the most promising social nudges might be the simplest – namely nudging that provides information about peers in order to enhance a sense of group belonging (for an overview, see Table 3).

Table 3: Studies using social nudges

Paper	Target group	Intervention	Outcome	Effect
Studies appealing to social norms by making performance and choices public				
Wagner & Reiner (2015)	Germany. Secondary school students (age 10–11)	Disclosure of test performance	Test scores	Negative (for high-ability students)
Bursztyn & Jensen, 2015	US. Secondary school students	Disclosure of top-3 on leader board	Number of correct answers	Negative (especially for top students)
		Disclosure of enrolment in test preparation course	Enrolment	Negative (for students in less advanced courses)
Studies with peer group interaction				
Carrell et al. (2013)	US. Air Force Academy students	Interaction between high and low-ability students	Grades	Negative effects for low-ability students. Small positive effects for medium-ability students, no effects for high-ability students
Falk et al. (2017)	Germany. Low-SES children (age 7–9)	Interaction between low-SES children and university students	Academic secondary track enrolment	Positive
Castleman & Page (2015)	US. Secondary school students (age 17–18)	Interaction between university students and secondary school students	College enrolment	No effect
Studies with informational nudges to create group identity				
Wilson & Linville (1982)	US. University students	Information about older students’ struggles	Grades	Positive
			Persistency	Positive
Walton & Cohen (2011)	US. University students	Information about older students’ struggles	Grades	Positve
Gehlbach et al. (2016)	US. Secondary school students (age 14–15)	Information about teacher and student similarities	Grades	Positive

3.4 Priming

Priming may be used to bring certain (and possibly seemingly irrelevant) information to students' minds in order to influence behaviour subconsciously. Some US interventions have used priming (about self-confidence, values and effort) to improve academic performance with mixed results (see overview in Table 4). In one study, students were randomly assigned to treatment and control groups, both of which were given a 15-minute, in-class written assignment (Cohen, et al., 2006). The assignment required that the treatment group students focus on values important to them, whereas the control group students focused on values that were not particularly important to them. The teachers did not know which students were in which groups, and they resumed their lesson plan immediately after the assignment was complete. Despite the seemingly small intervention, the study found significant improvements in grades for African-Americans but no effects for Caucasian Americans. The authors argue that the differential effects are due to the reaffirmation of personal values in the treatment group working to lessen the impact of negative stereotypes.¹⁰ A replication study undertaken on a larger US sample failed to replicate these results, however, and on average found no statistically significant effect of the affirmation treatment (Dee, 2015). Positive grade effects for minority students were found only in more supportive classrooms (i.e. with a high growth in peer achievement), and the intervention was found to have a negative impact on the female students in these classrooms.

In another study, low-performing students in an undergraduate psychology class were sent a weekly review question, and the students in treatment groups were primed to think either about the effects of having a high level of self-confidence or to think about grades as being determined by effort rather than by external factors (Forsyth, et al., 2007). The study found no or negative effects on final exam grades for any of the treatments compared to the control group, which only received the review question. Hence, simple priming does not necessarily deliver positive effects.

¹⁰ This finding is complemented by lab experiments showing how priming students to think about negative student-athlete stereotypes can reduce performance on tests for athletes compared to non-athletes (Yopyk & Prentice, 2005; Harrison, et al., 2009; Dee, 2014). Similar results have been found for racial priming in the lab (see e.g. Steele & Aronson, 1995).

Table 4: Studies using priming

Paper	Target group	Intervention	Outcome	Effect
Cohen et al. (2006)	US. Middle school children (age 12–13). (Lower-) middle class	Priming with personal values	Grades	Positive (for minority students)
Dee (2015)	US. Middle school children (age 12–14)	Priming with personal values	Grades	No effects for minority students, positive effects only in classrooms with high growth in peer achievement
Forsyth et al. (2007)	US. University students	Priming with high self-confidence	Grades	Negative (for low-ability students)
		Priming with grades being caused by effort	Grades	Negative (for low-ability students)

3.5 Information provision: Reminders

Reminders can be used to nudge people to take action when there is a risk that they might otherwise forget due to limited attention (see e.g. Karlan et al., 2016). By refocusing attention on important deadlines or tasks, reminders may also emphasise the benefits of meeting deadlines and completing tasks, thereby mitigating self-control problems. Reminders may also have informational value, reminding people of already known information or providing easy access to new information. Reminders typically have positive effects on behaviour (see overview of studies in Table 5) and low implementation costs in the order of \$7 or less per contacted student or family (York & Loeb, 2014; Castleman & Page, 2015; Castleman & Page, 2016).

3.5.1 Reminding students

The results of studies nudging students with reminders are promising. As part of a US intervention, for example, text message reminders were sent to secondary school graduates intending to go to college and their parents (Castleman & Page, 2015). The reminders in the study contained information about upcoming deadlines and tasks required for enrolment in their intended college as well as information about available means of assistance. The results suggest that reminders can increase enrolment to some colleges but only in regions where students have little access to assistance to complete the enrolment process (Castleman & Page, 2015). The effects are largest for students with less clearly formulated college plans and less access to help from other sources. These characteristics are likely to be correlated with lower SES.

A related study used text message reminders to remind first-year US college students to apply for financial aid for their second year (Castleman & Page, 2016). Again, the reminders contained information about upcoming deadlines and requirements together with information about how to get assistance. The intervention had large effects among students at community colleges, where recipients were about 12–14 percentage points more likely to remain enrolled in the next two semesters. There was little effect among students at four-year institutions, however, possibly because of already high enrolment rates. Hence, this evidence is also consistent with the strongest effects arising for students with lower SES.

3.5.2 Reminding parents

Parental involvement has been shown to improve children's skills (Andersen & Nielsen, 2016). Like the students, however, parents are also potentially affected by behavioural barriers (e.g. limited attention and self-control problems), which may hinder sufficient parental involvement and learning among young children. A few US studies have used text message reminders in combination with other behavioural tools, with the aim of increasing parental involvement. For example, parents of pre-school children in San Francisco received three informational text message reminders per week with simple information about key components of early childhood learning and practical tips for initiatives they could implement at home to support their child's learning (York & Loeb, 2014). The programme significantly increased home literacy activities and parental involvement as well as some aspects of student learning. Similar reminder effects were obtained in an earlier US study with printed reminders to involve parents in homework (Balli, et al., 1998). The reminders were associated with greater parental involvement, but there were no effects on test scores. However, this earlier study consisted of only three school classes with randomisation at the class level into three different treatment groups. Hence, the effects could be confounded with other class-specific effects.

Another intervention combined text messages reminding parents to read to their child with goal-setting, information provision and extrinsic motivation (Mayer, et al., 2015). Every week, the treatment group parents were asked to set goals for the amount of time they would spend reading to their child in the coming week. They were then reminded via text messages to read to reach the goal, and they would receive a congratulatory text message as a non-monetary reward upon reaching it. The treatment group parents were also provided with information about the importance and benefits of parental involvement. Goal-setting was included to induce psychological costs (from loss aversion) of not reaching the target. The non-monetary reward was also intended to increase incentives to reach the goal. In combination, the treatment components resulted in more than a doubling of parental reading time. The effect of the treatment was particularly strong for parents who were classified as impatient and, hence, more likely to suffer from self-control problems. Without the intervention, low-patience parents read on average less to their children than high-patience parents. With the intervention, this order was reversed. This suggests that the reminder intervention reduced self-control problems. We note that as self-control problems are also correlated with low SES, the evidence is consistent with larger effects arising for low-SES students as in the case of reminders to students. There is also indication that the effect was not driven by the informational content because the beliefs about the effects of parental involvement were found to be similar *ex post* in the treatment and control groups.

Table 5: Studies using reminders

Paper	Target group	Intervention	Outcome	Effect
Castleman & Page (2015)	US. Secondary school students (age 17–18)	Reminders of college enrolment	College enrolment	Positive (in regions with little existing support for enrolment. Largest effects for students with unclear college plans)
Castleman & Page (2016)	US. University students	Reminders of financial aid applications	Persistence	Positive (for students at community colleges)
York & Loeb (2014)	US. Parents of pre-school children	Reminders of home literacy activities	Home literacy activities	Positive
			Early literacy assesment	Positive (on some measures)
Balli et al. (1998)	US. Parents of middle school children (age 11–12)	Reminders of parental involvement	Parental involvement	Positive
			Test scores	No
Mayer et al. (2015)	US. Parents of pre-school children	Reminders of reading time (combined with goal-setting)	Parental reading time	Positive (especially for ‘impatient’ parents)

3.6 Information provision: Easy access to information

Attention limitations may also imply that students and parents do not acquire all of the relevant and important information when making decisions. By providing important information in an easily accessible manner, it may be possible to overcome attention limitations. In addition, choice architects can ensure that some information is more salient than other information. Consequently, information provision may target both attention limitations and other behavioural barriers, such as self-control problems. Information provision might also boost the decision-making skills of students and parents.

3.6.1 Financial aid

Several studies investigate the effects of providing information about financial aid. By bringing attention to the available financial aid schemes, these interventions potentially lower the perceived immediate costs of continuing education and, hence, might indirectly reduce the effects of self-control problems. The results are mixed, suggesting that such interventions do not necessarily lead to positive results (see Table 6). A Dutch study randomly provided students with information about student loan conditions in a setting where students were believed to be aware of the universal eligibility for student loans (Booij, et al., 2012). The study found that students who received the information remained better informed about loan conditions six months later but that their borrowing decisions were no different than those in the untreated group. This suggests that the student loans take-up rate in the Netherlands is not constrained by any lack of information. Similarly, an American study providing low-income individuals with information comparing estimates of financial aid with the tuition costs of nearby colleges found no effects on financial aid applications or college enrolment

(Bettinger, et al., 2012). It is worth noting that the information was given to people receiving tax preparation help living in a household with someone aged 15–30 years. The information was therefore not exclusively given to individuals in the process of applying to a higher education institution.

Interestingly, there may even be adverse effects in some cases of information provision on the take-up rates for financial aid. An experiment among college student loan applicants in Baltimore found that applicants who received text messages with simplified information about loan rules, loan flexibility and repayment possibilities were less likely to take out a loan (Barr, et al., 2016). The effects were greatest among low-SES students. It remains too soon to evaluate the effect on academic achievement and it is not obvious that lower borrowing would lead to better educational outcomes.

However, positive effects have been found in some cases. For example, an intervention in Chile found positive effects on college preparatory secondary school enrolment, school attendance and financial aid knowledge for eighth grade students shown a video with financial aid information (Dinkelman & Martinez, 2014). The gains came from medium- and high-grade students and did not increase if parents were also provided access to the same video. Similarly, a US intervention mailing information about i) application steps, ii) net costs of attending college or iii) fee waivers to high-achieving low-income students has been shown to make students apply to more universities and specifically to more selective universities (Hoxby & Turner, 2015). It also led to higher admission, enrolment and progression.

3.6.2 Returns to schooling

Information may also be provided in an attempt at de-biasing beliefs about the returns to schooling and different educational paths. By making the benefits of schooling more salient, interventions providing information about the returns to schooling possibly also reduce self-control problems. British (McGuigan et al., 2014) and Canadian (Oreopoulos & Dunn, 2013) studies show that information campaigns informing secondary school students about tuition costs and potential earnings can influence beliefs about the net returns to education. But (like with financial aid information) the change in beliefs does not necessarily translate into a change in behaviour (for an overview, see Table 6). In one US intervention, secondary school students identified as being on the margin of applying to college received letters highlighting the financial and non-pecuniary benefits of attending college (Carrell & Sacerdote, 2017). In some cases, the information was combined with personalised follow-up letters encouraging the students to apply. The study found no effect on college enrolment. Similar results were found in other studies. A field experiment in Finland revealed that, on average, an intervention informing secondary school graduates about the earning distribution and employment rates for different post-secondary educations did not increase enrolment into post-secondary education or the type of educational programmes selected (Kerr, et al., 2015). However, there was evidence that students were updating their views on employment prospects and that a small group of students who were disappointed by the information changed their educational choice in response to the intervention. A Chilean experiment providing applicants for post-secondary federal student aid with information about earning potentials and costs (Hastings, et al., 2015) also found no effect on enrolment, but some effects on educational choice for low-SES students who tended to switch to study programmes with a higher net value.

The positive effects for low-SES students are supported by similar studies in developing countries that have generally had positive effects. A study among boys in the last year of compulsory schooling in the Dominican Republic showed that students significantly underestimated the returns to education and an intervention providing students at randomly selected schools with accurate information about the returns to secondary schooling led to an approximately 0.2-year increase in the number of completed years of schooling (Jensen,

2010). Interestingly, the effects were greatest for students from higher income families. Jensen (2010) argues that this is because credit constraints are less important for higher income families, and they are therefore better able to change their educational choice in response to the information provided. However, it is also possible that (other) behavioural barriers are more important in poorer households. A similar intervention in Madagascar found that parents updated their beliefs in response to statistical information about earnings potential and that test scores and attendance subsequently improved (Nguyen, 2008). An alternative to providing statistical information about earnings potentials is to use role models. Nguyen (2008) tested a role model intervention wherein an actual person told students and families about their family background, educational experience and current occupation. Importantly, the role models were moderately or highly successful and therefore share success stories. The study found that role models from poor backgrounds had almost the same effect on test scores as statistical information, whereas role models from rich backgrounds had no effect.

3.6.3 Other information

Limited attention may also reduce access to information once enrolled. For example, students may (intentionally or not) lack information about what constitutes plagiarism. Moreover, students with self-control problems might find plagiarism an appealing alternative to hard work. A US intervention, informing students about what plagiarism is and how to avoid it substantially decreased the likelihood of plagiarism (Dee & Jacob, 2012). The effects were strongest among students with low test-scores, who otherwise had the highest rates of plagiarism. A follow-up survey suggested that the randomised intervention significantly improved awareness of what constitutes plagiarism among students in the treatment group but did not influence beliefs about the likelihood that plagiarism would be identified. We note that an important difference between providing information on plagiarism and the informational nudges discussed above is that informing about plagiarism naturally also brings up the morality issue, which may be important for the success of the nudge.

University students may also lack information enabling them to judge whether they personally are likely to graduate given their current performance. Consequently, some students may drop out too soon, give up trying to learn a subject, or apply to degree programmes that do not fit their skill level. A US experiment gave first-year university students information indicating that grades typically improve from the first year to later years (Wilson & Linville, 1982). The information provided therefore not only addressed possible limited attention, it might also influence social identity by strengthening the student's sense of belonging to the university student group. The sample in the study was rather small (20 students in the control group, 20 in the treatment group), but the study nevertheless suggested that information about the academic performance of peers positively influenced grades and reduced the drop-out rate.

A similar intervention provided 9th and 10th grade students in the US with information about the struggles of famous scientists (Lin-Siegler, et al., 2016). One treatment provided students with information about the academic struggles of Albert Einstein, Marie Curie and Michael Faraday over a five-week period. Another treatment provided students with information about the same scientists' personal struggles, while the control treatment provided students with information about their scientific achievements. The intervention led to an increase in science grades for students in both struggle treatments. We emphasise that the studies of Wilson & Linville (1982) and Lin-Siegler et al. (2016) both provide information that may be interpreted as illustrative of ability being malleable rather than fixed and, as discussed in Section 3.7, interventions with the purpose of teaching students that ability is malleable generally have positive results.

In France, a reform providing secondary school students in their senior year with personalised assessments from their preferred university degree programme was intended to lead to a better match between student skills and degree programmes (Pistolesi, 2015). University admission is non-restricted in France, and there was concern that this meant that students applied for and enrolled in programmes they did not have the skills to complete. This could potentially explain the very high drop-out rate among first-year students. Pistolesi (2015) studied the effect of the information on enrolment into the economics programme in Toulouse, finding that negative student evaluations reduced enrolment. Positive evaluations had no impact on enrolment. Similar diverging results were found in a Mexican study that provided disadvantaged students with feedback on their performance on a mock version of an admission test before they had to apply for secondary schools and take the real test (Bobba, et al., 2016). The study found that feedback information substantially reduced the gap between perceived and actual performance and that students who updated their beliefs upward responded to the new information by applying for and enrolling in more academically oriented secondary schools. The study found no effects on grades at the end of the first year of secondary school, but students who switched to a more academic track may nevertheless be expected to have the potential to achieve better education and labour market outcomes.

3.6.4 Parental information

Information can also target parents, and interventions doing so generally have positive effects (for an overview, see Table 6). An evaluation of a policy providing information about average school test scores to parents of children enrolled in low-performing schools found that the information led more parents to choose higher performing schools (Hastings & Weinstein, 2008). The effect was strongest if there were high performing schools nearby. The evidence also suggests that these effects occur regardless of the level of simplification of the information (Hastings & Weinstein, 2008).

Information provided to parents could also attempt to alleviate possible negative effects of asymmetric information in the child–parent relationship. Children are better informed about the effort that they exert than their parents. The asymmetric information problem is well-known, even in classical economic theory, and is not directly related to behavioural biases. Some interventions to alleviate the problems are somewhat behavioural, however, in the sense that they reduce information barriers by providing parents with easy access to standardised information. For example, a Dutch intervention introduced a smartphone app allowing parents of 7th, 8th and 9th grade students to track their child's use of an online learning tool (Haelermans & Ghysels, 2016). On average, the app had no effect on students' use of the learning tool. However, there was evidence of positive effects on the study efforts of 7th and 8th grade students but negative effects for 9th grade students. The positive results for 7th and 8th grade students were driven by male and low-SES students, whereas the negative results for 9th grade students were driven by high-SES students. The app had no effect on language test scores but a positive effect on maths test scores.

Another intervention addressing information asymmetries provided parents in Los Angeles with frequent and detailed information about their child's missed assignments and grades via email, text messages and phone (Bergman, 2016). Both student effort and grades improved significantly as a result. Kraft & Rogers (2015) also obtain positive effects of a similar but more light-touch intervention providing parents of secondary school students in the US with weekly, one-sentence messages about their child's performance. The intervention led to a decrease in the number of students who failed to earn course credits primarily due to reduced drop-out rates. Messages emphasising areas for improvement appear to have been more effective than messages emphasising good performance.

Table 6: Studies easing access to information

Paper	Target group	Intervention	Outcome	Effect
Financial aid information				
Booij et al. (2012)	The Netherlands. Higher education students (avg age 21)	Information provision	Borrowing	No
			Awareness	Positive
Bettinger et al. (2012)	US. Tax preparatory assistance recipients with low SES and household member aged 15–30 years (avg 18 yrs)	Information provision	Financial aid applications	No
			College enrolment	No
Barr et al. (2016)	US. Low-SES loan applicants (avg. age 29)	Information provision	Borrowing	Reduced (especially for low SES)
Dinkelman & Martinez (2014)	Chile. Eighth grade (avg. age 15) low-SES students (and their parents)	Information provision	College preparatory secondary school enrolment	Positive (greatest for medium to high-ability students)
			School attendance	
			Financial aid knowledge	
Hoxby & Turner (2015)	US. High-achieving low-income secondary school students	Information provision	University applications, admissions, and enrolment	Positive
Returns to education				
Carrell & Sacerdote (2017)	US. Secondary school students (age 17–18)	Provision of statistical information	University enrolment	No
Kerr et al. (2015)	Finland. Secondary school students (age 18–19)	Provision of statistical information	University enrolment	No
			Educational choice	No
Hastings et al. (2015)	Chile. Secondary school students	Provision of statistical information	University enrolment	No
			Educational choice	Some (for low-SES students)
Jensen (2010)	Dominican Rep. Grade 8 students (age 13–14)	Provision of statistical information	Years of schooling completed	Positive (especially for high-SES students)
Nguyen (2008)	Madagascar. Grade 4 children (age 9–10) and their parents	Information from role models	Test scores	Positive
			Attendance	Positive
Other information				
Dee & Jacob (2012)	US. University students	Information about plagiarism	Plagiarism	Reduced

Lin-Siegler et al. (2016)	US. Secondary school students (age 14–16)	Information about academic struggles of scientists	Science grades	Positive
Pistolessi (2015)	France. Secondary school students (age 17–18)	Information about match quality of student skills and Economics programme	Enrolment in Economics programme	Reduced (by negative evaluations)
Bobba et al. (2016)	Mexico. Middle school students (age 14) with low SES	Information about performance on a mock test	Secondary school applications and enrolment	Positive
			Grades	No
Parental information				
Hastings & Weinstein (2008)	US. Parents at low-performing schools	Information about school performance	School choice	Positive
Haelermans & Ghysels (2016)	The Netherlands. Parents grades 7–9 (age 12–15)	Information about child effort	Use of learning tool	No
			Language test scores	No
			Maths test scores	Positive
Bergman (2016)	US. Parents of middle and Secondary school students (age 11–17)	Information about child performance	Student effort	Positive
			Grades	Positive
Kraft & Rogers (2015)	US. Parents of secondary school students (age 14–18)	Information about child performance	Earned course credits	Positive
			Drop-out rate	Reduced

3.7 Information provision: Framing

Information and choices are framed in a manner that can influence the salience of different parts of the relevant information and, hence, influence the extent to which different behavioural barriers are at play. In contrast to the interventions providing easy access to information, framing interventions do not boost decision-making skills, as the interventions work through the subconscious (for an overview, see Table 7).

For example, a US intervention randomly allocated incoming university law students to two different financial packages with the same monetary value (Field, 2009). One package involved tuition loans which would be repaid by the university if the student chose a low-paying public interest job after graduation. The other package consisted of tuition waivers issued by the university that had to be repaid after graduation if the student chose a high-paying job not in public interest law. By not framing the aid as a loan, the tuition waiver package attempted to reduce the effects of debt aversion. In addition, by making the waiver conditional on job placement, the intervention could use loss aversion to nudge students towards public interest jobs, because loss-averse students will try to avoid having to repay waivers to which they feel entitled. The different framings

led to significant behavioural differences. Students offered tuition waivers were 36–45% more likely to choose a low-paying public interest job after graduating, and if they received the details of the financial package before enrolment, students with tuition waivers were twice as likely to enrol. The behavioural responses are consistent with debt aversion, as students seem to avoid debt when possible. The response is also consistent with default bias and loss aversion because students behave to minimise losses relative to the status quo endowment

An additional framing intervention was carried out in Morocco, where parents of school-age children received a modest transfer (Benhassine et al., 2015). The transfer was labelled as a transfer to facilitate education, and enrolment into the programme was administered by schools although eligibility was not contingent on school enrolment or performance. While the programme therefore did not provide new incentives for children to be enrolled in school, it nevertheless led to significant enrolment increases and reduced drop-out rates by 70%, re-entry by previous drop-outs increased by 85%, and the share of never-schooled dropped by 43%. Remarkably, the study found the labelled transfer to be more effective than a transfer that was conditional on enrolment.

Another US randomised trial used a gain/loss framing manipulation for incentives offered to students to motivate them to improve their test results (Levitt et al., 2016a). Some randomly selected students were told that they improved test scores would be rewarded. Another group of students was given the reward before the testing began and told that they would have to return it if their scores did not improve. To induce a greater sense of loss, students in the latter treatment had to sign a sheet to confirm that they had received the reward and had to indicate what they planned to do with the reward. Loss aversion would predict that the motivating effect would be greater in the loss framing than in the more typical gain framing. While the results indeed did go in that direction, the differences between the two frames were not statistically significant. It should be noted that incentives were provided immediately before students were tested and students therefore could not respond by increasing study effort. Instead, students could only respond by increasing their test efforts. Hence, the results do not provide predictions on the effects on overall study effort but do suggest that students may perform better on tests if incentives are framed as losses rather than gains.

A similar study testing the effect of framing teacher performance incentives as a loss (i.e. teachers are paid in advance and asked to return the money if test scores do not improve sufficiently) rather than a gain (an end-of-year bonus contingent on student performance), shows significant improvements in maths test scores only for the loss framing (Fryer, et al., 2012). In this study, incentives were provided over a longer period and teachers could therefore respond by changing their teaching effort and/or strategy.

Table 7: Studies using framing

Paper	Target group	Intervention	Outcome	Effect
Field (2009)	US. University students	Tuition waiver (vs. loan) framing	Enrolment	Positive
			Public interest job choice	Positive
Benhassine et al. (2015)	Morocco. Parents	Education (vs. unlabeled) transfer	Enrolment	Positive
			Drop-out	Reduced
Levitt et al. (2016a)	US. Primary, middle and secondary school students	Test incentives framed as losses (vs. gains)	Test scores	No
Fryer et al. (2012)	US. Teachers at primary/middle school	Incentives with loss (vs. gain) framing	Maths test scores	Positive

3.8 Boost policies

As already mentioned, some nudging also contains boost elements. For example, the provision of easily accessible information can help people to make better decisions but can also work subconsciously, making certain information more salient. For example, information about the availability of financial assistance may raise awareness of the assistance and at the same time lower perceptions of the immediate costs of attending college. Boosting and nudging policies therefore cannot always be distinguished. In this section, we consider policies that deliberately aim to boost decision-making capabilities by teaching people about possible behavioural barriers and skills to mitigate the effects. Students and parents can then subsequently use the skills independently when making decisions.

Some recent interventions fall into this category and show positive effects (for an overview, see Table 8). For example, a field intervention in Turkey taught 4th grade students to be ‘grittier’ by providing cases and videos highlighting the role of effort and goal setting in skill enhancement and goal achievement (Alan, et al., 2016). Education outcomes are likely to be influenced by grit, which is generally defined as perseverance in a productive task and closely related to self-control. In addition, by highlighting the role of effort in skill enhancement, the intervention may potentially improve self-confidence and benefit students’ self- and social-image, because failure becomes a signal that more effort is required rather than a signal of poor innate ability.¹¹ The intervention was shown to increase standardised test scores in maths and Turkish by 0.28 and 0.13 standard deviations, respectively. Earlier interventions in the US teaching secondary school and undergraduate students that intelligence is malleable rather than fixed have also shown positive effects on academic behaviour (Blackwell, et al., 2007; Aronson, et al., 2002; Good, et al., 2003).

Also in Turkey, a learning programme aimed at teaching 3rd and 4th graders to be more forward-looking had positive effects on their behaviour (Alan & Ertac, forthcoming). Similarly, an Italian study has found that encouragement to attend a learning programme that included instruction in how students should organise their

¹¹ For a discussion of the motivational effect of believing that intelligence is malleable, see, among others, Dweck (1986) and Dweck (1999).

time and material, how to set goals and stay motivated, positively influenced the number of credits acquired in the following two years at university (De Paola & Scoppa, 2015). The positive effects were driven by people classified as heavy procrastinators. Similarly, a US study has found that intensive goal-setting learning programmes impact grades positively (Morisano, et al., 2010).

Boost policies can also target parents. As part of a French intervention among schools in deprived neighbourhoods, parents were invited to participate in meetings designed to boost their involvement. The intervention led to an increase in parent involvement activities, student attendance and improvement in classroom behaviour; however, the test scores during the intervention remained unaffected (Avvisati, et al., 2014).

Table 8: Studies using boost policies

Paper	Target group	Intervention	Outcome	Effect
Alan et al. (2016)	Turkey. Grade 4 (avg age 10) Mostly low SES	Boosting grit	Test scores	Positive
Blackwell et al. (2007)	US. Grade 7 (age 12–13)	Boosting grit	Grades	Positive
			Motivation	Positive
Aronson et al. (2002)	US. University students	Boosting grit	Grades	Positive
Good et al. (2003)	US. Grade 7 (age 12–13) Mostly low SES	Boosting grit	Test scores	Positive
Alan & Ertac (forthcoming)	Turkey. Grades 3–4 (age 9–10)	Boosting forward-looking	Behaviour	Positive
De Paola & Scoppa (2015)	Italy. University students	Boosting forward-looking	Earned course credits	Positive (especially for high procrastinators)
Morisano et al. (2010)	US. Low-achieving university students	Boosting goal-setting	Grades	Positive
Avvisati et al. (2014)	France. Low-SES parents	Boosting parent involvement	Parent involvement	Positive
			Student attendance	Positive
			Behaviour	Positive
			Grades	No

3.9 Assistance, coaching and mentoring

Reminders, informational letters etc. are easy and often cheap to provide. Due to limited attention, however, there is no guarantee that recipients pay attention to this type of information, and behavioural barriers (e.g. self-control problems) may be so severe that simple information provision is insufficient to overcome them. Furthermore, even if people pay attention and want to act on the information, cognitive limitations may imply that they are unable to do so. One-on-one assistance, coaching and/or mentoring might therefore be necessary to overcome behavioural barriers.

The type of interventions discussed in this section vary in their intensity and cost: from very low-cost, basic assistance to expensive, comprehensive mentoring programmes (e.g. Cook et al., 2014 report average costs/participant of about \$4,400). Basic assistance (e.g. to fill out a form) will generally fall well within the scope of what can be considered nudging interventions. The programmes are expected to change behaviour in a predictable way without restricting choice or changing economic incentives. However, coaching and mentoring programmes may ex ante have much less predictable outcomes, because there is a much deeper and more elaborate mentor–mentee interaction. The higher costs, more comprehensive intervention approach, and the lower predictability of impacts are not characteristics normally associated with nudging. Instead, coaching and mentoring programmes have clear boost elements, as the aim is often to boost decision-making competencies. As seen in Table 9, studies involving assistance, coaching and mentoring (e.g. interventions using boost policies) generally report positive effects.

3.9.1 Assistance

An intervention in the US has demonstrated that basic assistance may be very effective at changing behaviour. Low-income individuals who had received assistance completing their tax returns were provided with personal assistance to complete financial aid applications (Bettinger, et al., 2012). In addition, individuals were given personalised aid estimates that were compared to local college tuition fees. The intervention potentially targeted several behavioural barriers, including limited attention, cognitive limitations and procrastination stemming from self-control problems. The intervention led to an increase in financial aid applications and college enrolment in the treated families. The effect was coming from both secondary school seniors whose parents were treated and for adult secondary school graduates with no prior college experience.

3.9.2 Coaching and mentoring programmes

Like the assistance programme discussed above, comprehensive coaching and mentoring programmes often include elements addressing several behavioural barriers simultaneously. For example, a coaching programme might include reminders, information provision, assistance, as well as classes that boost cognitive or non-cognitive skills. This renders it impossible to identify the effect of each component separately and possibly makes it difficult to identify the exact mechanism which induces behavioural change.

A US intervention randomised approximately 1800 secondary school students who were identified as being on the margin of wanting to apply for college into treatment and control groups (Carrell & Sacerdote, 2017). Students in the treatment group were offered weekly mentoring meetings with a college student, coverage of all application fees, assistance applying for federal student aid and college, and a \$100 cash bonus for completing the programme. The mentoring programme increased college enrolment considerably, particularly for women, who were 15 percentage points more likely to enrol in college. The effects were driven mostly by the students who were the least prepared to apply prior to the intervention. The mentoring programme also had a positive effect on persistency in college.

Other coaching interventions have had similar positive effects (Bos, et al., 2012; Acker & Rowen, 2013; Avery, 2012). For example, the Canadian *Pathways to Education* is a comprehensive programme combining academic tutoring, group mentoring, career mentoring, financial incentives, scholarships and meetings with student/parent support workers. The programme lowered the secondary school dropout rate by 45 percentage points in the target group and increased post-secondary attendance by 60 percentage points (Acker & Rowen, 2013). The *College Possibility Program* in the US also combines tutoring with coaching and assistance completing college applications (Avery, 2013). The programme targets low-income secondary school students and was found to increase enrolment at four-year colleges by 15 percentage points. However, there was no

effect on overall college enrolment or test scores. The *SOURCE* programme in Los Angeles provided secondary school students with an advisor to support the college and financial aid application process by providing advice, encouragement, reminders, meetings, etc. (Bos, et al., 2012). The programme increased enrolment to four-year colleges but not overall college enrolment. The effects were particularly strong for Hispanic and low-SES students. There were also positive effects on applications for financial aid and persistence in college.

Some coaching programmes also target students after having been admitted to university. New university students must complete a number of tasks, including registering and finding housing, before beginning their studies. American field interventions show that by reaching out to these new students and providing them with information and guidance at a cost of less than \$200 per student, it is possible to increase the share of students who complete the registration by 3 percentage points (Castleman, et al., 2014). The effects are greatest for students with low socio-economic backgrounds (Castleman et al., 2012; Castleman et al., 2014). Interestingly, there is evidence that the effects persist, meaning that the students are also more likely to register for their second year of studies (Castleman, et al., 2014).

Coaching programmes possibly also have positive effects for students enrolled in education. A one-year US coaching programme tested across eight institutions of higher education aimed at encouraging persistency by dealing with academic and non-academic barriers through goal-setting, better time management and enhanced study skills (Bettinger & Baker, 2014). One year after the end of the coaching period, persistency was increased by about 5 percentage points, and the persistency of the treatment group remained about 3 percentage points higher than that of the control group one year later. However, another US mentoring programme among first-year university students found no effect on grades (Angrist, et al., 2009). The latter study tested a mentoring intervention in which older students were trained to advise first-year students on academic and non-academic issues. The mentees were also offered courses to improve their study habits. When combined with financial incentives, however, there was a large positive effect on grades.

At the secondary school level, another US intervention combined mandatory daily maths tutoring with a voluntary group coaching programme teaching students about behavioural barriers, such as biased beliefs and the use of heuristics in decision-making (Cook, et al., 2014). The intervention was tested on a relatively small sample of 106 male students who were predominantly black and from low-income backgrounds. The programme led to significant improvements in maths test scores and grades.

Table 9: Studies using assistance, coaching and mentoring

Paper	Target group	Intervention	Outcome	Effect
Bettinger et al. (2012)	US. Tax preparatory assistance recipients with low SES and household member aged 15–30 years (avg 18 yrs)	Assistance applying for financial aid	Financial aid applications	Positive
			College enrolment	Positive
Carrell & Sacerdote (2017)	US. Secondary school (age 17–18)	Mentoring	College enrolment	Positive (particularly for women. Driven by those least ready to apply)
			College persistency	Positive
Acker & Rowen (2013)	Canada. Low-SES secondary school students.	Mentoring	Post-secondary attendance	Positive
			Drop-out	Reduced
Avery (2013)	US. Low-SES secondary school students (age 17–18)	Mentoring	Enrolment at 4-year colleges	Positive
			Total college enrolment	No
			Test scores	No
Bos et al. (2012)	US. Secondary school students (age 17–18)	Mentoring	Enrolment at 4-year colleges	Positive (especially for minority and low-SES students)
			Total college enrolment	No
			Financial aid applications	Positive
			College persistency	Positive
Castleman et al. (2012) and Castleman et al. (2014)	US. Newly admitted university students	Coaching	College registration	Positive
Bettinger & Baker (2014)	US. Students at higher education institutions	Coaching	College persistency	Positive
Angrist et al. (2009)	US. University students	Mentoring	Grades	No
Cook et al. (2014)	US. Low-SES, male secondary school students (age 14–15)	Coaching	Maths test scores	Positive
			Grades	Positive

3.10 Extrinsic motivation

Interventions using extrinsic motivation explicitly tie rewards to the desired behaviour (e.g. attendance, test performance, college enrolment). The use of extrinsic motivation is not exclusive to behavioural approaches. Traditional policy tools based on economic incentives (e.g. taxes, subsidies) also provide extrinsic motivation to behave in a certain way, but extrinsic motivation may be ‘behavioural’, for example by relying on immediate (monetary or non-monetary) rewards to offset immediate costs, thereby aiming to tackle self-control problems. In the context of education, the benefits of education occurring much later than the costs could render this particularly important.

As nudges *do not significantly change economic incentives*, some of the interventions considered in this section cannot be classified as nudging, whereas others can (e.g. interventions using feedback, other non-monetary rewards). We begin by discussing interventions that do not change economic incentives and then gradually move towards interventions with a substantial effect on economic incentives.

3.10.1 Non-monetary incentives

Schools, teachers and parents often use feedback and grades as a motivating tool. How such feedback is provided may matter greatly for how students respond to it. A Swedish intervention has found variations in the effects on test scores of different grading schemes and other non-financial incentives (Jalava, et al., 2015). The authors conduct a randomised trial on more than 1,000 sixth graders in Swedish primary schools, finding that student performance can be significantly higher with relative grading and non-monetary rewards (e.g. certificates or material rewards) than with standard absolute grading (on an A–F scale).¹² Boys seem to be motivated more by relative grading and girls more by non-monetary rewards. The study also finds that the effects are smaller for students for whom the questions are harder because they are tested early in the school year. This suggests that relative grading and non-monetary rewards may crowd-out intrinsic motivation when obtaining the reward or a high rank is more difficult.¹³ In contrast to these findings, a Dutch study among bachelor students finds no difference in effort provision (homework handed in, homework grades, attendance, preparation time) or exam grades under relative and absolute grading (Czibor, et al., 2015). The choice only seems to matter for marginal students who are close to the pass/fail cut-off. In that case, the exam performance of male students is greater with relative grading. These results are consistent with the findings from a US study that grade incentives do not matter for university student performance (Grove & Wasserman, 2006). The US study exploited a natural field experiment to analyse the effect of whether grades on problem sets counted towards the final grade. The study only found positive effects on exam performance for first-year university students.

A natural experiment in Spain also provides evidence on the motivating effect of feedback (Azmat & Iriberry, 2010). In one school year, secondary students were provided with relative performance feedback (average student grade point average – GPA) in addition to absolute performance feedback (own GPA). The study found that this information led to a 5% increase in grades, and the effect was significant for high and for low-performing students alike. The effect did not persist, however, disappearing as soon as the information was

¹² Absolute grading is also sometimes referred to as criterion-based grading because grades are determined by comparing the student’s performance with an objective criterion. Relative grading is also sometimes referred to as ranked based grading or norm-referenced grading.

¹³ These effects are in line with the non-experimental results reported by Murphy & Weinhardt (2016). Besides effects on student performance within subjects, the results from this English study suggest that, conditional on ability, a high-rank position in primary school in a particular subject has long-term effects on test scores and subject choice, particularly for boys. This might suggest that a high rank boosts confidence in the subject, which makes the student improve in the subject and choose to specialise in it.

removed. Very similar effects have been found in the UK, where some university departments provided feedback on tests in one semester before students started exerting effort towards their next semester test score, while other departments did not (Bandiera, et al., 2015). Again, grades were positively affected by feedback provision and the effects were significant for almost all students. Only the grades of the worst-performing students did not improve, but there were no signs of any discouragement effect. We note that in both the Spanish and British studies, feedback may have had both motivational and informational effects. In fact, both studies find the largest effects among new students who were likely to be less informed about their own performance and their returns to effort.

The effectiveness of feedback possibly also depends on how it is worded. Positive effects arose from an intervention in a widely used online educational game targeting primary school children (O'Rourke, et al., 2014). The intervention changed the language used in the programme from praise of performance outcomes to praise of provided effort. This means that the feedback focused on skills as malleable and worked to encourage students to exert self-control. The intervention led to an increase in the average amount of time children engaged with the tool, particularly for low-performing children.

A US field experiment also finds positive effects of another type of non-monetary incentive (Levitt et al., 2016a). The results suggest that non-monetary incentives announced immediately before a test may offer a very cost-effective way of increasing test performance (although general study effort leading up to the test is unaffected by construction), because the possibility of winning a \$3 trophy had greater effects on test scores than a \$10 cash reward. The study also suggests that non-monetary incentives are most effective for primary school children, particularly when combined with a loss frame (i.e. if the student is given the reward before a test and then told to return it if test scores do not improve). Positive effects of non-monetary incentives were also found in a US study providing primary school children with incentives to read books over the summer holiday (Guryan, et al., 2016). By reading books students could earn points to “spend” on items such as art sets, board games or sports equipment. The study found positive effects on the number of books read and on vocabulary test results. There were no effects on comprehension or English language test scores.

Interestingly, a recent German study provides more mixed results on the effects of non-monetary incentives (Wagner & Riener, 2015). The study uses a randomised field experiment to test the effect of three different types of non-monetary incentives on more than 2,000 students in grades 5–6. A control group received no incentives to improve their test scores, the first treatment group were given a medal in front of their classmates if they improved test scores, parents of students in the second treatment group received a letter if students improved their test scores, and students in the last treatment group were offered a choice between the medal and the letter. The study found positive but insignificant effects of all treatments for students attending *Hauptschule*, *Realschule* (non-academic secondary school) or *Gesamtschule* (comprehensive secondary school). In contrast, the medal and letter treatments on average led to negative and significant effects on test scores for students attending *Gymnasium* (academic-track secondary school), suggesting either the crowding out of incentives or that students do not like performance information to be provided to their peers and/or parents. Interestingly, however, the effects turn positive but insignificant in the choice treatment, possibly because students who do not like information to be provided to parents can select peer recognition instead and vice versa. The study also finds that low performers in both types of secondary school are more likely to choose the letter than high performers. This is particularly the case for low performers in *Gymnasiums*.

3.10.2 Monetary incentives

Monetary incentives could also be used to create more immediate benefits of education, thereby tackling problems related to present-bias and lack of self-control. Such immediate monetary incentives may be particularly effective in institutional settings where the return to skills is low and/or only occurs in the distant future. Numerous interventions provide monetary rewards for academic achievement (e.g. measured by grades or test scores). We do not include all of the papers in this category, trying instead to provide an overview of some of the emerging conclusions. The effects are somewhat mixed and suggest that the incentives may need to be quite substantial to induce behavioural change (see Table 10).

A Dutch intervention that introduced financial incentives of €227–681 to students for completing all first-year requirements by the start of the next academic year had no significant effects on pass rates or credit accumulation (Leuven, et al., 2010). Positive effects were found only for already high-achieving students, whereas low-ability students displayed negative effects. These results resemble the effects of a similar Italian intervention, where university students were assigned to a high reward (€700), low reward (€250) or no reward treatment (De Paola, et al., 2012): The study only found positive effects of monetary incentives on performance for high-ability students. In contrast to Leuven et al. (2010), however, the effects were strong enough for high-ability students to produce an overall positive effect. The positive effects persisted to subsequent years when financial incentives were no longer in place and the effects did not depend on the size of the reward. A number of US interventions have resulted in small, if any, effects on performance outcomes for which students were directly incentivised (Fryer, 2011; Bettinger, 2012; Angrist, et al., 2014). Even if positive effects arise in the courses in which students are incentivised, however, they may not be large enough to impact overall GPAs (Angrist, et al., 2014), and negative effects may result in courses for which no incentives are provided (Fryer & Holden, 2012). Similarly, some students may experience *negative* effects. For example, Fryer & Holden (2012) find that financial performance incentives have persistent, negative effects on low-ability students. This naturally raises the question of whether students should be able to self-select in or out of incentive schemes. A recent study suggests that positive results can also be obtained when students are allowed to self-select into the achievement incentive scheme and set their own achievement targets as seen in a recent Spanish study (Herranz-Zarzoso & Sabater-Grande, 2016). However, this requires that students are motivated to participate in the incentive scheme.

In contrast, a study in Kenya incentivising 6th grade girls and their families for performance on exams led to substantially improved exam scores (Kremer, et al., 2009). The programme awarded two-year scholarships to the highest scoring 15% of grade 6 girls together with public recognition. The success of the programme may relate to the programme being conducted in a less developed country, the value of the prize being relatively large (5% of GDP per capita). In comparison, in Fryer (2011), students earned on average between \$14–700 in the three interventions studied. This amounts to less than 2% of GDP per capita in the US. Across the interventions, primary school children had the opportunity to earn less than older students. In Bettinger (2012), primary school children could earn a maximum of \$100. Some US studies have implemented larger financial incentives. For example, one intervention offered university students up to \$5000 (roughly a year's tuition) for improving their GPA (Angrist, et al., 2009). The intervention resulted in significantly better grades, particularly for women and particularly if the incentives were combined with a mentoring intervention. A few studies test the effect of changing the size of the financial incentives offered for academic performance, and some studies suggest that large financial incentives lead to larger improvements in performance than small incentives, at least for the students who are most responsive to the incentives (Levitt et al., 2016a; Leuven et al., 2010), whereas others find little effect of incentive size (De Paola et al., 2012).

Another possible reason why results have not been entirely positive could be that although the interventions discussed above have introduced benefits of studying at an earlier point in time, the incentives have still not been made immediate. Typically, some weeks or months pass between when effort is exerted and when payment is made (see, e.g., Leuven et al., 2010; Fryer, 2011; Angrist et al., 2014). A US field experiment tested the effect of immediate \$10–\$20 rewards vs. delayed rewards of the same size by rewarding students for improved performance on a test (Levitt et al., 2016a). Students were told about the financial incentives immediately before the test and in the immediate treatment students received their rewards as soon as testing was over. In the delayed treatment, there was a one-month lag between the test and payment of the reward.

Another possible explanation for the mixed results and the heterogeneous effects for low and high-ability students found by e.g. Leuven et al. (2010) and De Paola et al. (2012) is the potential crowding-out of intrinsic motivation. Several studies using incentives in education have tried to assess the effect on intrinsic motivation, most concluding that there is no crowding-out (Kremer, et al., 2009; Barrera-Osorio, et al., 2011; Bettinger, 2012; De Paola, et al., 2012). However, Levitt et al. (2016a) produce evidence that very small financial incentives may crowd out intrinsic motivation and lead to worse future academic performance.

The performance measures to which incentives are tied might also matter for the effects. The studies above have all tied incentives to academic performance reflected by grades, test scores or passing exams. Other studies, particularly in less developed countries, have tied incentives to attendance and enrolment and the effects of such interventions have generally been positive. In Mexico, the Progreso intervention provided financial incentives to the parents of children attending at least 85% of all school days in the past two months. The average total payment to parents was \$55 per month, which is estimated to lead to an increase in schooling of about 0.7 years and a 21% higher secondary school enrolment rate (Schultz, 2004; Behrman, et al., 2005). Evidence from Colombia suggests that the effect on attendance can also be achieved when parts of the rewards are paid into a savings account and paid out at graduation rather than immediately. This also increases enrolment into further education, particularly if the pay-out is made contingent on graduation or enrolment in further education (Barrera-Osorio, et al., 2011). This appears to contradict the results reported by Levitt et al. (2016a).

In contrast to these positive results for monetary incentives tied to attendance and enrolment, an American intervention providing financial incentives to enrol in and attend in-state colleges only led to minor increases in overall 4-year-college attendance among recent secondary school graduates (Cornwell, et al., 2006). However, enrolment at in-state colleges increased in response to the incentives, which is hardly surprising given that incentives were tied to in-state colleges.¹⁴ This suggests that rather than increasing overall attendance, the intervention merely led to a shift in applications towards in-state colleges.

Incentives could also be based on multiple performance measures including attendance and academic performance measures as well as behavioural measures. One example of such an intervention is Levitt et al. (2016b), who conducted a randomised experiment in a low-performing American high school with incentives tied to multiple measures. They only found modest effects on average but large effects for students assessed to be on the threshold of meeting the target. The effects persisted even a year after the intervention but then faded. The study also tested if it mattered for the effectiveness whether incentives were given to students or to

¹⁴ There is a large literature analysing the effect of financial aid composition (e.g. loans, grants) on enrolment decisions at individual institutions and more generally. This literature is outside the scope of this review. See Monks (2009) for a review of the effect of merit-based financial aid on enrolment.

parents and whether they were provided as a lottery (giving students who met the achievement target a 10% chance of winning \$500) or as fixed rewards (with the same expected value of \$50). They found no differences in the effectiveness in either case.

Finally, desirable parent behaviour could also be incentivised. Fryer et al. (2015) provide incentives to parents for attending a parent education programme including homework assignments with their children and reward them for their children's performance on child assessments. The intervention was tested in Chicago and found positive effects on test scores for Hispanics and Whites but no effects for African-Americans. High-ability children were found to benefit the most.

Table 10: Studies using extrinsic motivation

Paper	Target group	Intervention	Outcome	Effect
Non-monetary incentives				
Jalava et al. (2015)	Sweden. Grade 6 (age 12–13)	Relative (vs. absolute) grading	Test scores	Positive (strongest effect for boys)
		Non-monetary rewards	Test scores	Positive (strongest effect for girls)
Czibor et al. (2015)	The Netherlands. University students	Relative (vs. absolute) grading	Study effort	No
			Grades	Positive (for male students on the margin of passing)
Grove & Wasserman (2006)	US. University students	Grade incentives for assignments	Grades	Positive (for first-year students)
Azmat & Iriberry (2010)	Spain. Secondary school students (age 14–17)	Relative performance feedback	Grades	Positive
Bandiera et al. (2015)	UK. University students	Feedback provision	Grades	Positive (smallest for low-performing students)
O'Rourke et al. (2014)	Users of educational computer game/tool	Praise of effort (vs. performance)	Study effort	Positive (especially for low-performing children)
Levitt et al. (2016a)	US. Primary, middle and secondary school students	Non-monetary rewards	Test scores	Positive (especially for primary school children and with loss framing)
Guryan et al. (2016)	US. Primary school children. Grades 3-5 (age 8-11)	Non-monetary rewards	Total books read	Positive
			Test scores	Positive (for vocabulary). No effects on overall language.
Wagner & Riener (2015)	Germany. Secondary school students. Grades 5-6 (age 10–11)	Non-monetary rewards	Test scores	No or negative
Monetary incentives				
Leuven et al. (2010)	The Netherlands. University students	Incentives for completing first-year requirements	Pass rate	Mixed: Positive for high-achieving students and negative for low-ability students
			Course credits	
De Paola et al. (2012)	Italy. University students	Incentives for course credits earned and grades	Grades	Positive (for high-ability students)
			Course credits	
Fryer & Holden (2012)	US. Teachers, parents and grade 6 students (age	Incentives for maths performance	Maths test scores	Mixed: positive for high-ability students. Negative for low-ability students

	12) at low-performing schools		Language test scores	Negative
Angrist et al. (2014)	Canada. University students	Incentives for grades in specific courses	Incentivised grades	Positive
			Overall grades	No
Fryer (2011)	US. Primary and secondary school children	Various incentives considered	Grades	No
			Incentivised outcomes	No
Bettinger (2012)	US. Primary school grades 3–6 (age 8–12)	Incentives for test scores in specific courses	Maths test scores	Positive
			Reading, social science, science test scores	No
Herranz-Zarzoso & Sabater-Grande (2016)	Spain. University students	Incentives for meeting self-selected grade target	Grades	Positive
Kremer et al. (2009)	Kenya. Grade 6 girls and families (age 11)	Incentives for test scores	Test scores	Positive
Angrist et al. (2009)	US. University students	Incentives for improvements in grades	Grades	Positive (especially for women and if combined with mentoring intervention)
Levitt et al. (2016a)	US. Primary, middle and secondary school students	Incentives for test scores	Test scores	Positive (if large and immediate)
Schultz (2004)	Mexico. Primary and secondary school children and families (age 9–15)	Incentives for attendance	Years of schooling completed	Positive (for older children who get large incentives)
Behrman et al. (2005)	Mexico. Primary and secondary school children and families (age 9–15)	Incentives for attendance	Drop-out	Reduced (for older children)
			Reentry	Positive
			Grade progression	Positive
Barrera-Osorio et al. (2011)	Columbia. Secondary school students. Grades 6–11 (age 10–16)	Incentives for attendance	Attendance	Positive (especially if also contingent on graduation or enrolment in further education)
			Enrolment in further education	

Cornwell et al. (2006)	US. Secondary school students	Incentives to enrol in in-state colleges	College attendance	Positive (but small)
Levitt et al. (2016b)	US. Secondary school students (age 14–15) at low performing school and their parents	Incentives tied to multiple measures	Grades	Positive (larger for students on the threshold of meeting the targets)
Fryer et al. (2015)	US. Parents of pre-school children (avg age 4) in low income area	Incentives for completing parent education and performance on child assessments	Cognitive and non-cognitive test scores	Positive for Hispanics and Whites

4. Conclusion and policy implications

There is a growing body of evidence from both the laboratory and the field that is consistent with the existence of a number of different behavioural barriers influencing decision-making. These barriers include self-control problems, loss aversion, social preferences, biased beliefs, default bias as well as cognitive and attentional limitations. Research suggests that some of these barriers may be particularly relevant for decisions regarding education. For instance self-control problems are particularly pronounced for children and adolescents (e.g. Green et al., 1994), and cognitive limitations make it particularly difficult to predict the returns to education (Oreopoulos & Dunn, 2013). This raises concerns that students and parents underinvest in education and that students may drop out of education.

When decision-making is influenced by behavioural barriers, it raises the question of whether behaviourally motivated interventions, such as nudges, can be used to influence behaviour, mitigate problems of underinvestment in education and increase welfare. Recently, there has been growing interest in nudging policies among practitioners and academics alike, partly because nudging often involves low implementation costs. This paper provides an overview of studies of nudging and other behaviourally motivated interventions in education.

A number of conclusions emerge. First, the studied interventions often provide diverging results and, for some types of nudging, it seems to matter greatly how and in what setting they are applied. Nudging therefore does not always lead to desired effects and might even be counterproductive under certain circumstances. For example, positive effects of interim deadlines seem to be contingent on a sufficient level of motivation for doing the task among the students being nudged. Furthermore, there is evidence that nudging might have adverse effects when choice architects lack proper understanding of the decision-making process and the preferences of students and their parents. For example, the evidence of the impact of nudging that appeals to social norms is very mixed. The studies suggest that one must be extremely careful that social norms do not end up working against desired behavioural change. Similarly, when using priming, the type of information with which people are being primed matters for the effectiveness of the nudge.

Second, interventions providing commitment devices to reduce procrastination of study effort (e.g. through interim deadlines, higher exam frequency or goal-setting) have generally produced positive results. This suggests that self-control problems are present but may be reduced. While the testing of commitment devices has focused on university students thus far, testing the effect on children and adolescents remains a topic for future research.

Third, positive results are typically found for interventions providing reminders, easy access to information, boost policies and assistance, coaching and mentoring. This holds across all age groups and for parents. Common for these interventions is that they target attentional and cognitive limitations (sometimes in addition to other behavioural biases). Many of these interventions also have boost components and the potential to improve decision-making capabilities. This lends support to the argument for focusing on boost policies and suggests that students and their parents are motivated to make better education choices but sometimes lack the appropriate decision-making capabilities. Moreover, the evidence suggests that simply providing easy access to information may successfully influence awareness and/or de-bias beliefs without necessarily leading to better decisions regarding education. However, positive effects seem more likely when information is focused on enhancing the view of ability as malleable rather than fixed or when it is focused on reminding people about specific tasks that may otherwise be forgotten or procrastinated.

Fourth, the large number of interventions using non-monetary, extrinsic motivation has mostly produced positive effects. The results suggest that differential grading systems may benefit different students and that providing additional feedback in terms of grades and relative performance can affect academic achievement significantly. However, there is also indication of heterogeneous effects (e.g. males respond better to relative grading than females, and high-ability students may respond negatively to non-monetary performance rewards being provided in public). In contrast to these mostly positive results for non-monetary incentives, the evidence on monetary incentives is very mixed. Monetary incentives generally tend to have a positive impact on enrolment and attendance, but the effects on student achievement are less predictable and may have to be sizable to deliver effects.

Finally, interventions seem most effective in terms of changing the behaviour of individuals who are at the margin of behaving as desired. This means that there are often few improvements in behaviour for individuals already performing well, and effects are sometimes limited for students with very poor performance. There is also evidence that many of the interventions are most effective for low-SES students, but several studies are targeted only at low-SES students and can therefore not be used to evaluate whether the policies are most effective for high or low-SES students.

We conclude by noting that most of the studies on education focus on short-term effects, and recent studies outside the area of education have questioned whether the short-term benefits of using reminders might come at the cost of adverse effects in the longer term (Damgaard & Gravert, 2016). In particular, reminders may impose a cost on recipients who might therefore disengage from repeated reminders, implying that the effectiveness of reminders wanes in the long run. In evaluating reminders, it may therefore also be appropriate to consider longer term effects (e.g. do students and parents gradually ignore the reminders? Or do students become less self-reliant once they get used to receiving reminders?). It also seems relevant to consider long-term effects on grades and drop-out rates. Similarly, it would be interesting to explore whether the effects of boost policies are more persistent, which would suggest that students have actually learned new skills. One of the arguments for using boost policies instead of nudging is, indeed, that people are taught to make better decisions for themselves rather than unconsciously being nudged towards specific choices (Bovens, 2009;

Hausman & Welch, 2010; Grüne-Yanoff & Hertwig, 2015). However, how much teaching is necessary to improve decision-making capabilities fundamentally?

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