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**The use of nudges and other behavioural
approaches in education**

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Prepared for the European Commission

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Executive Summary (English)

Globalisation and rapid technological progress have increased the focus on efficient investment in high-quality skills across the EU countries.

One issue that is high on the political agenda is the persistent underachievement among youths in many European countries meaning that approximately 20 percent of Europe's 15 year olds perform poorly on the OECD PISA survey in each of the assessment areas: mathematics, reading and science (e.g. European Commission, 2016). In fact, the most recent PISA results show that the share of low performers is increasing rather than decreasing in most European countries, implying that the 2020 target of less than 15 percent low performers in each of the assessment areas appears less achievable than a few years ago. Another issue on the agenda is the need for a stronger focus on non-cognitive (or socio-emotional) skills from early life throughout the educational career (e.g. Kautz et al. 2014). These two issues point at a need for more knowledge about how to gently push youths in the desired direction towards more skill attainment or how to teach them to make better decisions when it comes to their educational pathways.

From an academic point of view, these observations underline the importance of understanding the extent of behavioural barriers influencing decision making. Such barriers include self-control problems (i.e. the inability to control emotions and behaviour when facing temptations and impulses), loss aversion, social preferences, biased beliefs, default bias (i.e. the tendency for people to stick to the default or status-quo option) as well as cognitive and attentional limitations. Research suggests that these barriers may be particularly relevant for educational decisions.⁴ For instance, self-control problems may be especially pronounced for children and adolescents and thus explain why some students do not study adequately or drop out of education too soon.

When decision making is influenced by behavioural barriers, it raises the question of whether behaviourally motivated interventions such as nudges can be used to reduce short-sighted educational decisions drop-and out rates. Recently, there has been a growing interest in nudging policies among both practitioners and academics, in part because nudges often involve low implementation costs. However, some have argued that nudges may influence people to make decisions that are not in their best interest and that the long run effects may not be positive. This paper reviews the use of nudges and other behaviourally motivated interventions in education.

Our review reveals that extremely few field interventions in education have used pure nudge interventions such as defaults, deadlines, social nudges, priming, reminders and framing. Therefore, it would be premature to make a general assessment of their effectiveness at this stage. For some types of nudges, in particular social nudges or priming, it appears to matter greatly how they are being applied and effects may even be counterproductive.

Our review suggests that positive results are typically found for interventions providing reminders, easy access to information, boosting of decision-making capabilities and assistance, coaching or mentoring.

⁴ See Lavecchia, et. al (2016) for a review.

Common for these interventions is that they target attentional and cognitive limitations (sometimes in addition to other behavioural biases) and often have the potential to improve decision making.

Generally, we find that the interventions seem most effective at changing the behaviour of individuals who are at the margin of behaving as desired. There is also some evidence that many of the interventions are most effective for students with low Socio-Economic Status (SES), but many studies are targeted only at low SES students and do not allow for an assessment of differential effects for high and low SES students.

In conclusion, nudges and other behaviourally motivated policy tools show some promise in terms of triggering positive behavioural changes, although evidence so far is modest. However, the reviewed evidence does not provide a clear roadmap for how to introduce nudges in the education sector in the EU countries because: 1) for some nudges there is a general lack of research testing the type of nudge and therefore firm conclusions cannot be achieved, 2) as always there are potential issues of external validity in relation to randomised control trials and 3) with most evidence coming from the US, relatively little is known about the effects in a European context. The review nevertheless yields valuable specific insights about how to intervene in complex educational decisions. The substantial variation in the structure of education systems and in costs and benefits of education across the European Union warrants further high-quality research on the effectiveness of nudging and other behaviourally motivated interventions in different contexts.

Executive Summary (German)

Die Globalisierung und der schnelle technologische Fortschritt haben den Fokus auf effiziente Investitionen in hoch qualitative Fähigkeiten in allen EU-Ländern verstärkt.

Die anhaltend niedrigen schulischen Leistungen von Jugendlichen in vielen europäischen Ländern dominieren die politische Agenda. Die wird gemessen an den etwa 20 Prozent der 15-Jährigen in Europa, bei den PISA Erhebungen der OECD in den Bewertungsbereichen Mathematik, Lesen und Naturwissenschaften schlecht abschneiden (z.B. European Commission, 2016). Tatsächlich zeigen die neusten PISA-Ergebnisse, dass der Anteil der Leistungsschwachen in den meisten europäischen Ländern eher zunimmt als abnimmt, was das Ziel des Jahres 2020 weniger als 15 Prozent Leistungsschwache in den einzelnen Bewertungsbereichen zu haben weniger erreichbar erscheinen lässt als noch vor ein paar Jahren. Ein anderes Thema der politischen Agenda ist die Notwendigkeit eines stärkeren Fokus' auf nicht-kognitive (oder sozio-emotionale) Fähigkeiten im frühen Kindesalter durch die Bildungslaufbahn (z.B. Kautz et al. 2014). Diese beiden Themen zeigen die Notwendigkeit herauszufinden wie junge Menschen junge Menschen achtsam in die gewünschte Richtung höheren Kompetenzerwerbs bewegt werden könnten oder wie ihnen das Treffen besserer Bildungsentscheidungen vermittelt werden könnte.

Von einem akademischen Blickpunkt, ist es wichtig zu verstehen in wieweit Verhaltensbarrieren Entscheidungen beeinflussen. Diese Barrieren umfassen Probleme bei der Selbstkontrolle (z.B. die Unfähigkeit Emotionen und Verhalten zu kontrollieren, wenn man mit Versuchungen und Reizen konfrontiert wird), Verlustaversionen, soziale Präferenzen, verzerrte Überzeugungen, Unterlassensneigungen (z.B. die Tendenz der Menschen bei der Standard- oder Status-quo-Option zu bleiben), sowie kognitive und Aufmerksamkeitseinschränkungen. Manche Studien suggerieren, dass diese Barrieren vor allem bei Bildungsentscheidungen relevant sind.⁵ Zum Beispiel könnten Probleme bei der Selbstkontrolle besonders bei Kindern und Jugendlichen ausgeprägt sein und damit erklären warum Schüler nicht ausreichend lernen oder häufig zu früh die Schule abbrechen.

Wenn die Entscheidungsfindung von Verhaltensbarrieren beeinflusst wird, stellt sich die Frage ob verhaltenstheoretisch motivierte Interventionen wie Anreize dazu genutzt werden können die kurzsichtigen Bildungsentscheidungen hinsichtlich eines Schulabbruchs zu mindern. Unlängst wächst das Interesse an Anreizstrategien bei Praktikern und Wissenschaftlern, teilweise weil Anreizstrategien niedrige Implementierungskosten haben. Jedoch wird auch argumentiert, dass Anreize Menschen dazu bewegen könnten nicht in ihrem bestmöglichen Interesse zu handeln und langfristige Effekte negativ sein könnten. Dieser Bericht umfasst den Einsatz von Anreizen und anderen verhaltensökonomischen Interventionen in der Bildungsökonomik.

Unser Überblick zeigt, dass sehr wenige Feldexperimente in der Bildungsökonomik reine Anreizinterventionen wie Ausfälle, Tödlichkeit, soziale Anreize, Priming, Erinnerungen oder Framing

⁵ Überblick siehe Lavecchia et al. (2016).

benutzen. Deshalb wäre es verfrüht um eine generelle Bewertung über deren Wirksamkeit abzugeben. Für einige Arten von Anreizen, vor allem bei sozialen Anreizen oder Priming, scheint es entscheidend zu sein wie diese eingesetzt werden und die Auswirkungen können sogar kontraproduktiv sein.

Unsere Zusammenfassung deutet darauf hin, dass positive Ergebnisse typischerweise bei Interventionen mit Erinnerungen leicht zugänglichen Informationen, Unterstützung von Entscheidungsfähigkeit und Hilfestellung, Training und Mentoring auftreten.

All diese Interventionen zielen auf Einschränkung bei der Aufmerksamkeit und kognitive Einschränkungen ab (manchmal zusammen mit anderen Verhaltensverzerrungen) und haben häufig das Potenzial die Entscheidungsfähigkeit zu verbessern.

Im Allgemeinen scheinen Interventionen am effektivsten die Verhaltensweisen von Individuen verändern, wenn sich diese an der Schwelle zum gewünschten Verhalten befinden. Außerdem gibt es Hinweise darauf, dass die Interventionen am wirksamsten bei Schülern mit niedrigem sozio-ökonomischem Hintergrund sind. Jedoch zielen viele Studien nur auf Schüler mit niedrigem sozio-ökonomischem Status ab und erlauben somit nicht den Vergleich von heterogenen Effekten von Schülern mit hohem und niedrigem sozio-ökonomischem Status.

Zusammenfassend bieten Anreize und andere verhaltensökonomisch motivierte politische Instrumente die Aussicht positive Verhaltensänderungen auszulösen, obwohl Beweise dafür bisher dürftig ausfallen. Die betrachteten Studien halten jedoch noch keine klaren Anhaltspunkte dafür bereit wie Anreize im Bildungswesen der EU-Länder implementiert werden können, weil: 1) für einige Anreize ein allgemeiner Forschungs-mangel der den Anreiztyp testet und damit fundierte Schlussfolgerungen nicht erzielt werden können 2) wie immer potenzielle Probleme bei der externen Validität in Bezug auf randomisierte kontrollierte Studien auftreten und 3) die meisten Studien aus den Vereinigten Staaten kommen und relativ wenig über die Effekte im europäischen Kontext bekannt ist. Trotzdem bietet der Bericht wertvolle, spezifische Einblicke in komplexe Investitionsentscheidungen in der Bildungsökonomik. Die beträchtlichen Unterschiede in der Struktur des Bildungssystems und bei deren Kosten und Nutzen von Bildung innerhalb der Europäischen Union wird mehr hochwertige Forschungsarbeit zur Effektivität von Anreizen und anderen verhaltensökonomisch motivierten Interventionen in unterschiedlichen Kontexten benötigt.

Executive Summary (French)

La mondialisation et un progrès technologique rapide ont accru l'accent placé sur un investissement efficace dans des compétences de qualité au sein des pays de l'UE.

Une des questions prioritaires sur l'agenda politique concerne les mauvaises performances persistantes des jeunes de nombreux Etats européens, 20% des européens de 15 ans obtenant de mauvais résultats aux tests PISA de l'OCDE dans toutes les matières évaluées : mathématiques, lecture et sciences (cf. Commission Européenne, 2016). Les résultats de la dernière étude PISA montrent même que la part d'élèves obtenant de mauvais résultats, loin de reculer, s'accroît dans la plupart des pays européens. Ceci implique que l'objectif pour 2020 d'atteindre un ratio de moins de 15% de mauvais résultats dans chaque matière apparaît aujourd'hui plus difficile à atteindre qu'il y a quelques années. Une autre problématique réside dans le besoin d'une attention accrue portée aux compétences non-cognitives (ou socioémotionnelles) dès la petite-enfance et tout au long du cursus scolaire (cf. Kautz et al., 2014). Ces deux thématiques montrent le besoin de mieux comprendre comment aiguiller les jeunes vers davantage d'accumulation de compétences et de leur apprendre à prendre les bonnes décisions concernant leurs études.

D'un point de vue plus académique, ces observations soulignent qu'il est important de prendre la mesure des barrières comportementales qui influencent la prise de décision. Ces barrières incluent les problèmes de maîtrise de soi (c'est-à-dire l'inaptitude à contrôler ses émotions et son comportement face à des tentations et des pulsions), la peur d'échouer, les préférences sociales, les jugements biaisés, la tendance à s'en tenir à l'option par défaut ou au statu quo, les limites cognitives et les troubles de l'attention. Des études sur le sujet suggèrent que ces phénomènes pourraient être particulièrement présents dans les décisions éducatives.⁶ Par exemple, les problèmes de maîtrise de soi pourraient s'avérer aigus pour les enfants et les adolescents et expliqueraient ainsi pourquoi certains élèves n'étudient pas suffisamment ou arrêtent leurs études trop tôt.

L'existence de barrières comportementales influençant la prise de décision soulève la question du recours à des mesures à visée comportementale telles que les incitations (*nudges* en anglais) pour diminuer le nombre de décisions précipitées de sortie du système scolaire. Depuis peu, les politiques incitatives font l'objet d'un intérêt croissant parmi les praticiens et les chercheurs, en partie parce que les incitations sont en général peu coûteuses à mettre en œuvre. Cependant certains avancent que les incitations peuvent ne pas aboutir aux bonnes décisions et que les effets de long terme peuvent même être négatifs. Ce rapport passe en revue l'utilisation en matière d'éducation d'incitations et autres politiques à visée comportementale.

Notre étude montre que très peu de politiques dans le domaine de l'éducation ont eu recours à des mécanismes purement incitatifs tels que les options par défaut, les dates butoirs, les incitations sociales, la mise en condition (*priming* en anglais), les rappels et le cadrage (*framing en anglais*). Par conséquent, il est trop tôt pour porter un jugement général sur leur efficacité à ce stade. Pour certains types d'incitations, en particulier les incitations sociales ou la mise en condition, il semble que les modalités d'application soient d'une grande importance, si bien que les effets peuvent même s'avérer contre-productifs.

⁶ Voir Lavecchia et al. (2016) pour une revue de ces questions.

Notre étude suggère que les politiques mêlant rappels, accès facile à l'information, amélioration des capacités de prise de décision et assistance, encadrement ou mentorat ont souvent des résultats positifs. Ces politiques ont en commun de viser les limitations cognitives et les troubles de l'attention (parfois superposés à d'autres biais comportementaux) et ont souvent le potentiel d'améliorer la prise de décision.

Plus généralement, nous mettons en évidence que les politiques incitatives semblent être plus efficaces pour changer le comportement des individus qui sont les plus susceptibles d'adopter le comportement désiré. Certains résultats montrent également que ces mesures sont plus efficaces sur les élèves issus des catégories socio-économiques les moins favorisées. Beaucoup d'études ciblent toutefois uniquement ce type d'élèves ce qui ne permet pas d'apprécier le différentiel avec les élèves plus favorisés.

En conclusion, les incitations et autres politiques publiques à visée comportementale sont prometteuses pour permettre des changements de comportement, bien que les résultats actuels le confirmant demeurent modestes. Cependant, les études passées ici en revue ne fournissent pas de ligne directrice claire quant aux modalités d'introduction des politiques incitatives dans l'éducation. En effet : 1) un travail recherche fait défaut pour apprécier l'efficacité de certains types d'incitations, ce qui empêche de tirer des conclusions définitives, 2) comme toujours se posent les questions de validité externe en lien avec les études randomisées et 3) dans la mesure où la plupart des études ont été réalisées aux Etats-Unis, on en sait peu sur leurs effets dans un contexte européen. Cette revue apporte néanmoins des éclairages utiles sur la manière de mieux influencer sur les décisions complexes que sont les choix éducatifs. Les variations substantielles dans la structure des systèmes éducatifs ainsi que dans les coûts et les bénéfices de l'éducation au sein de l'UE requièrent maintenant de mener une recherche de qualité sur l'efficacité des mesures incitatives et autres politiques à visée comportementale dans ces différents contextes.

1. Introduction

Behavioural economics integrates insights from neuroscience, psychology and sociology into economics to better understand individual behaviour and outcomes. This field of research has been successfully applied to many areas, such as finance and consumption, but only more recently to the area of education. This is surprising because economics of education traditionally has relied heavily on the human capital model, which emphasises the long-term investment aspects of schooling decisions. Accounting for the fact that most educational decisions are taken at young ages when the brain is not fully developed, there is scope for many behavioural biases, and the field lends itself to approaches from behavioural economics. Understanding these behavioural biases can motivate interventions that mitigate their detrimental effects by de-biasing or nudging.

A small literature has recently emerged that investigates behavioural economics of education. Much of this literature is synthesised in two recent papers: Lavecchia, Liu and Oreopoulos (2016) focus on field interventions that help parents and youths take full advantage of educational opportunities by addressing a set of specific behavioural challenges, whereas Koch, Nafziger and Nielsen (2015) discuss how approaches from behavioural economics can assist in understanding the complexity of educational investments and outcomes.

In contrast to the mentioned research, the contribution of this paper is to review the emerging research which employs field interventions that work through *nudging*. This means that the relevant interventions alter people's behaviours in a predictable way without forbidding any options or significantly changing their economic incentives. Nudging has become a hot topic across fields among practitioners and academics, partly because the cost involved is low by definition. Our goal is to provide an overview of the frequency of use of different nudging interventions and their effectiveness in the education sector. As a consequence of our delimitation, we do not fully review the vast literature on interventions that explicitly aim at offsetting immediate costs with immediate benefits nor do we include interventions that impose mandatory requirements or in other ways restrict the choice sets. However, there is some leeway for interpretation, and we choose to put most weight on field interventions in the education sector that strictly adhere to the definition of nudging and put less weight on other interventions that are motivated by behavioural economics or can be interpreted that way. When possible, we discuss differential effects of the different types of interventions for students with high and low SES.

The remainder of the paper is organised as follows. Section 2 discusses benefits of education and introduces the main behavioural barriers to educational attainment. Section 3 defines nudging and discusses critiques of nudging as well as arguments for nudging. Section 4 is the core of the paper and presents applications of nudges as used in the field of education. We start out with the field interventions that most strictly adhere to the definition of a nudge and gradually move towards field interventions that change economic incentives to a higher extent. Section 5 concludes our review with a summary of the frequency of use and the effectiveness of the interventions in affecting educational attainment.

2. Benefits of educational attainment and behavioural barriers

This section briefly presents the benefits of educational attainment as known from the literature on economics of education. Then it introduces 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 costs of education against benefits and decides whether to attain further education. 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 that extend 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 high school completion in the US, i.e. completion of upper secondary education. In a more recent study, Bhuller, Mogstad and Salvanes (forthcoming) find that the internal rate of return to schooling is around 10 percent even in a country like Norway with its progressive tax and pension system. Lochner (2011) studies the non-production benefits of education and he reports the most striking beneficial effects when it comes to crime reduction, in particular around the final years of high school. The main reasons why education reduces contemporaneous crime are the so-called incapacitation effect, which means that youths do not have time to commit crime while in school, and the human capital effect, which raises the opportunity cost of crime while in school. The social network effect, on the other hand, means that many young people susceptible to crime are gathered at school and this effect works in the opposite direction, thus increasing crime. Some of the candidates explanations why education reduces subsequent crime are that 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 show only modest improvements of health and small reductions in mortality as a consequence of more years of education. Similarly, he reports substantial effects for the US but only modest effects for other countries with regard to good citizenship as measured for instance by voting behaviour and political participation.

Based on the above literature, it remains puzzling why individuals drop out or perform poorly in education in light of its high estimated financial and non-financial returns. The remainder of this paper points at some potential explanations that are relevant at various points of the educational career from pre-school through university.

2.2 Behavioural barriers to educational attainment

Although most people have clear economic benefits to obtain education at all levels, human capital accumulation may be hindered by a number of behavioural barriers. In this subsection we briefly discuss some of the most important barriers and introduce key concepts from behavioural economics highlighting their relevance for educational decisions.⁷

Self-control

Educational decisions as well as other investment decisions have long-term consequences and involve the potential of higher future earnings. Investing time and effort in studying therefore 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 so-called present-biased or time-inconsistent preferences meaning that an additional discount factor is applied to costs and benefits that occur in the future such that discounting between the present and the next period is higher than discounting between two consecutive future periods (Laibson, 1997).⁸ This implies that students and their parents may be more impatient when making choices that concern current costs and benefits than when making choices that also involve future costs and benefits. This impatience may in turn lead to self-control problems where students do not properly regulate their own behaviour in order to achieve long-term goals. For example, a student who starts high school may clearly prefer to graduate rather than to drop out, but may nevertheless every day fail to resist the temptation of doing something more enjoyable than studying. Hence, students with self-control problems tend to procrastinate doing tasks such as homework and studying for exams as well as taking important decisions such as what university to apply to. In addition, students with self-control problems may be lacking non-cognitive skills such as grit and perseverance.

In the context of educational decisions, it is worth noting that children and adolescents are particularly likely to be influenced by self-control problems (Bettinger & Slonim, 2007; Green, et al., 1994), because their brain and in particular their executive function is less developed.⁹ There is also some evidence that boys are more impatient than girls (Duckworth & Seligman, 2006) and therefore are 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 to schooling, and they are more likely to express regret at middle age and on average earn significantly less than their patient counterparts (Cadena & Keys, 2015). Parents, who are an important influence for early-life educational decisions, could potentially compensate for their children's poor self-control. However, self-control problems are correlated with poor socio-economic characteristics (Golsteyn, et al., 2014; Mischel, et al., 1989), meaning that both children

⁷ 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).

⁸ Time-inconsistency can be captured by hyperbolic or quasi-hyperbolic discounting rather than exponential discounting. Often, present bias is modelled using so-called $\beta\delta$ -preferences, where given the per-period utility u_t overall utility at time t is given by $U_t = u_t + \beta \sum_{s=t+1}^T \delta^{s-t} u_s$. Here δ is the standard exponential discount factor and β captures present bias.

⁹ See for example Lavecchia et al. (2016) for a review of the literature on brain development.

and parents with low SES tend to lack self-control. Hence, low SES parents may be less able to compensate for their children's lack of self-control.

Limited attention and cognitive ability

Standard economic theory assumes that individuals take all relevant alternatives and all available and cost-free information into account when making decisions. For example, when choosing whether and which college or field to apply for, in theory, prospective students consider all possible alternatives, seek out all information about those alternatives including the specific costs and benefits associated with each degree and each institution and then make an informed choice about where to go and what to study. In practice, decisions are, however, likely to be influenced by both cognitive and attentional limitations. In behavioural economics attention is often viewed as a scarce resource (DellaVigna, 2009). The implications are 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 such as complete homework and prospective college students may not consider all alternatives.

Cognitive and attentional limitations may be particularly important for complex choices such as education decisions and may therefore be an important barrier to good decision making. There is for example evidence that students lack accurate information about the returns to education (McGuigan, et al., 2014; Oreopoulos & Dunn, 2013). The evidence also suggests that the (as with self-control problems) effects of limited attention and limited cognitive ability are greater for students from low income families (Avery & Kane, 2004).

In order to cope with large amounts of information and choice, people may adopt a number of heuristics to simplify the choice (DellaVigna, 2009). First, people may avoid making choices if the choices 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). In an education context that would for instance suggest that people may fail to apply to university because they have too many alternatives to choose from. However, we do not know of any studies which explore this in an education context.

A second coping mechanism is to put excessive weight on the most salient information or the most salient option. For example, the costs of attending university may be more salient than the benefits because tuition costs and housing costs are paid up-front and are featured in material provided by the university. Similarly, the nearest primary school may be more salient to parents and children than alternative schools because they pass by it more often and because children in their neighbourhood attend it. However, other schools may perform better and may be better suited to the needs of some parents and children. The overemphasis on salient information also implies that decisions may be sensitive to how information is framed i.e. how the information is presented. In addition, 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.

Loss aversion

Experimental studies have consistently shown that people evaluate outcomes relative to their reference point. For example, suppose that someone applies for financial aid and get a grant covering half their tuition fee. If they had expected to get two thirds of the costs covered then the grant would feel like a

disappointing loss. However, if they had only expected to get a third of the 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. Referent dependent theories build on this and other observations about decision making (Kahneman & Tversky, 1979; Köszegi & Rabin, 2006; Köszegi & Rabin, 2007).

An implication of the common finding of loss aversion is that people have a strong aversion to risk and that they react more strongly to losses than to gains. Investing in education involves some uncertainty with respect to the possible gains and as a result people may underinvest in education to avoid possible losses.

Default bias

A common finding in behavioural economics is that people have a strong tendency to stick to the default or their status-quo. This is what is often known as default bias, status-quo bias or the endowment effect. Default bias is related to several of the concepts discussed 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 will tend to try to avoid losses compared to that reference point, thus sticking to the status-quo. Finally, present bias and the fact that costs associated with moving away from the default often are immediate imply that people often focus too much on the costs of choosing an alternative.

In an educational context, the default bias may for example imply that parents do not make use of a possibility to freely choose which primary school their child will attend and instead simply choose the default. 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.

Social preferences

Laboratory experiments and field data suggest that most people are influenced by social preferences (DellaVigna, 2009). Social preferences may include several different, but related concepts and capture concern for others as well as concern about belonging to a group. For example, concepts such as fairness, reciprocity, inequality aversion, altruism, social norms and self- and social-image concerns are all related to social preferences.

In the context of education, two of these concepts seem particularly relevant: social norms and self- and social image concerns. First, educational choices may have important effects for how people perceive themselves and are perceived by others. Typically, people care about how they are perceived and they may go to some length to preserve a favourable social image and self-image. This can be captured by social image and self-image concerns (Benabou & Tirole, 2006; Benabou & Tirole, 2002). Interestingly, this might explain why some people make so-called self-handicapping choices (i.e. choices that conflict with what is in their own interest). For example, going out drinking the night before an important exam could be caused by a desire to maintain a favourable self-image because it allows the student to explain poor performance on the exam by being hungover rather than having to see it as a signal of low ability.

Social identity is closely related to (self- and) social-image concerns. People like having a feeling of social belonging and a way of achieving that is by using one's actions to reveal information to other people (Austen-Smith & Fryer, 2005). Hence, actions may be motivated by the reputational effects one's actions

have in terms of shaping one's (self- and) social-image and social identity. This may in turn lead to a preference for following social norms in the social comparison group (Benabou & Tirole, 2006; Akerlof & Kranton, 2002). In an educational context, it is worth noting that the prevailing social norm in the social comparison group may be detrimental to educational 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 high school. In other cases, the social norm may be conducive to educational attainment e.g. if the norm is to get a university degree. Hence, from the perspective of the individual, social norms may lead to underinvestment or in other circumstances even to overinvestment in education.

Biased beliefs

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

The way in which self-confidence (with respect to ability) is likely to influence educational decisions depends on whether effort is best considered complementary or supplementary to ability (Benabou & Tirole, 2002). In some educational situations, effort and ability are complementary. For example, high effort combined with high ability will lead to higher grades. In such cases, overconfidence tends to have a motivational effect and an overconfident student is likely to exert more effort and more perseverance at a task. In other situations, for example when applying to a particular university or in the context of “fail-or-pass” exams, effort and ability can be characterised as substitutes at least close to the fail/pass threshold. In these situations, overconfidence may have negative effects on effort provision because students (wrongly) believe that their high ability level can substitute for study effort.

Opposite effects are likely for underconfident students. If effort and ability are complements, underconfident students might fail to invest sufficiently in education because they overestimate the probability that they will fail. Hence, low confidence may be detrimental for the motivation to study hard. On the other hand, if study effort and ability are substitutes, underconfident students may exert more effort than if their beliefs were unbiased because they (wrongly) overestimate the amount of effort required to reach their goal.

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

3. The purpose of nudges and other behavioural approaches

The existence of behavioural barriers that influence decision making may motivate interventions that target these barriers and potentially try to remove them. For example, an intervention that recognises self-control

problems might use interim deadlines to get students to increase total study effort, or teach students to exercise more self-control.

Behaviourally motivated interventions are often associated with nudging. However, the behavioural barriers may also motivate the use of more traditional policy tools such as regulation, economic incentives and bans. In this report, we focus mainly on nudging interventions but we also discuss other types of behaviourally motivated interventions. Some of the interventions discussed also contain more traditional policy tools like monetary incentives and mandatory requirements to participate e.g. in tutoring sessions.

3.1. What is a nudge?

The concept of "nudging" was introduced by Richard Thaler and Cass Sunstein who defined *a nudge* as "*any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives*" (Thaler & Sunstein, 2008). The choice architecture is the context in which people make decisions. It includes, for example, the order in which options are presented, how information is provided and how default options are chosen.

Thaler and Sunstein exemplify their definition of nudges by discussing a number of field interventions which in their view involve nudges:

- **Defaults:** For example, changing the default enrolment method for retirement savings plans to automatic enrolment significantly increases enrolment.
- **Commitment devices:** To alleviate self-control problems, it may be effective to get people to commit to a specific action or choice ahead of time. A plan that increases contributions to retirement savings when people get pay raises can, for example, increase contribution rates. Another example is gambling self-bans whereby people can put themselves on a list that bans them for entering a casino.
- **Information provision:** Information may be made more accessible by being simplified, standardised or easily comparable and by reducing cognitive requirements. As an example, Thaler and Sunstein propose a system called RECCAP that would provide people with an electronic record of data about their personal consumption behaviour that could easily be uploaded to e.g. websites comparing different credit card plans, in order to enable consumers to make better comparisons and ultimately better decisions.
- **Social nudges:** Examples include the use of role models to reduce littering in Texas in the "Don't mess with Texas" campaign where famous sports personalities featured in a campaign against littering. Another example of social nudges is to improve tax compliance by appealing to social norms, e.g. by telling people that 90% of people already complied with their obligations under the tax law.
- **Extrinsic motivation:** Low-value monetary or non-monetary incentives or rewards can be designed in new ways using behavioural insights. For example, the "Dollar-a-day" programme targeted teenage pregnancies by offering teenage mothers a dollar per day they were not pregnant again.

However, not all scholars agree on the definition of nudging. Some argue that only so-called "non-educational" nudges that do not teach people to make decisions are true nudges because these policies instead exploit systematic biases in behaviour to achieve behavioural changes without promoting *active* decision making. Examples of non-educational nudges are defaults and framing. In contrast, so-called "educational" nudges such as information provision (e.g. disclosure requirements and warnings) and

reminders potentially induce better active decision making. Policies that deliberately aim to improve decision making capabilities e.g. by targeting *“the individual’s skills, knowledge, the available set of decision tools, or the environment in which decisions are made”* (Grüne-Yanoff & Hertwig, 2015) are sometimes referred to as “boost” (Grüne-Yanoff & Hertwig, 2015) or “educate” (Katsikopoulos, 2014) policies.

This review considers both interventions such as priming and framing that can be classified as non-boost policies in the sense that they do not intend to improve decision-making capabilities as well as policies that intentionally or non-intentionally contain boost elements.

3.2. To nudge or not to nudge?

Part of the appeal of nudges is that they are so-called “soft” interventions that do not involve coercion because no restrictions are placed on the choice set (Thaler & Sunstein, 2003). Despite the soft approach, many nudges are effective at changing behaviour and at the same time involve relatively low implementation costs.

Thaler & Sunstein (2008) argue that a “neutral” choice architecture does not exist. For example, it is often necessary to have defined default options for everything from the choice of electricity provider to retirement contribution rates for mandatory retirement saving schemes. Thaler and Sunstein therefore argue that, as it is impossible *not* to influence decision making, choice architects should do so in a way that is beneficial.

However, the definition of nudging given by Thaler and Sunstein does not require that the nudge aligns the behaviour and preferences of the individual being nudged, or even that it benefits the person being nudged. This opens the door to nudges that benefit the choice architect instead (Hausman & Welch, 2010). Thaler and Sunstein recognise this critique but elsewhere argue that the policies should have *“the goal of influencing the choices of affected parties in a way that will make those parties better off”* (Thaler & Sunstein, 2003). In addition, they propose that nudges (in the public sector) should only be adopted if they *can* be defended publicly (Thaler & Sunstein, 2008). However, since transparency is not *required*, they may be considered more intrusive and more open to abuse than “hard” interventions such as regulation or bans (Hausman & Welch, 2010). Furthermore, transparency is even less likely to be implemented in the private sector and concerns about whether they harm the people being nudged seem mostly relevant for private nudges (Thaler & Sunstein, 2008).

Even if the choice architect has good intentions and wants to design policies that improve outcomes for the affected individuals, this requires a good understanding of people’s preferences and how they would evaluate their own welfare. However, people may not always have well-established preferences (Grüne-Yanoff & Hertwig, 2015) and even if they do, it is not straightforward to infer how they would evaluate their welfare in case of time-inconsistent preferences where today’s preferences for tomorrow are different from tomorrow’s preferences for tomorrow (Bernheim & Rangel, 2005). An additional possible complication is that preferences may be heterogeneous and that a particular nudge may not benefit everyone. To address this problem, one possibility is using a so-called asymmetric paternalistic (nudging) policy that *“creates large benefits for those who make errors, while imposing little or no harm on those who are fully rational”* (Camerer, et al., 2003) .

Nudging is also criticised for diminishing the autonomy of people who are being nudged (Hausman & Welch, 2010). By exploiting psychological barriers, nudges do not necessarily enable individuals to make better informed decisions and as people are often not aware that they are being nudged, they can be said to have less control over their own decisions (Bovens, 2009). A concern has also been raised that nudging may diminish decision-making capabilities in the longer run and hence may not have sustainable effects on behaviour (Hausman & Welch, 2010). Therefore, boost policies may be preferred (Grüne-Yanoff & Hertwig, 2015). Another argument for using boost policies is that they can be designed without knowledge of preferences. However, boosting is only effective if individuals are motivated to learn to make better decisions for themselves (Grüne-Yanoff & Hertwig, 2015). This may not always be the case.

4. Applications of nudges and other behavioural approaches in education

This section discusses international experience using nudges and behavioural approaches in education. The discussion is organised according to the type of intervention, for each of which we discuss what behavioural barrier the intervention targets and give examples of applications and the effects in terms of, for instance, grades, dropout, homework completion, early school leaving and inequality.

4.1 Commitment devices: 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 of quasi-hyperbolic present-biased preferences (Laibson, 1997; O'Donoghue & Rabin, 1999b) predict that students benefit from such commitment devices, and that so-called sophisticated individuals (who are aware that they have self-control problems) will actively choose to use deadlines as a commitment device if they are given the choice.

The empirical evidence on the effectiveness of deadlines on student behaviour is mixed.¹⁰ Ariely & Wertenbroch (2002) test the effect on student performance in an educational field setting. Ninety-nine executive students at MIT who have to write three term papers as part of a course were assigned to one of two deadline treatments. In the first treatment, participants were given evenly spread deadlines, and in the second, students set their own deadlines which may be in the last week of the course. In both treatments, there is a 1% grade penalty for each day of delay beyond the deadline. Ariely & Wertenbroch (2002) find that students exposed to evenly spread deadlines achieve better grades than students who do not set intermediate deadlines. In addition, they find that, when given the choice, more than two thirds of the students do set intermediate deadlines. However, grades are lower with self-imposed deadlines than with externally imposed deadlines, suggesting that students do not set deadlines optimally. Notably, all students completed the three papers regardless of the treatment meaning that the deadlines had no effect on the completion rate.

¹⁰ Studies of non-field interventions with students also give 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 is better with deadlines than without, but Bisin & Hyndman (2014) find the opposite effect.

While these results are supportive of a positive effect of deadlines, they were obtained for a very specific sample of highly motivated students with strong incentives to complete the course (fees are non-refundable). Therefore, task completion was not an issue. In contrast, Burger et al. (2011) study 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 week period, and in the second, they were given intermediate deadlines by being required to study 12 hours per week or no payment is made. Burger et al. (2011) find lower completion rates in the treatment with intermediate deadlines suggesting that deadlines are not always beneficial.

A related literature has investigated the effect of interventions changing the frequency of testing or examination. For instance, a study randomly assigned Italian university students to different frequencies of examinations (De Paola & Scoppa, 2011). Students in the control group had one exam at the end of the semester covering the full material of the course, while students in the treatment group had an intermediate exam in the middle of the semester covering half 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. Students in the treatment group achieved higher grades and were more likely to pass the exam. High ability students appear to benefit more from frequent examinations than low ability students and there is no negative (or positive) spillover on exams in subjects not included in the intervention. De Paola and Scoppa (2011) further provide some evidence suggesting that the positive effect of frequent examinations is not driven by additional feedback provision, but instead by a workload division or commitment effect because treatment differences are of similar magnitude for the exam questions relating only to the the first half of the course for which feedback effects can be excluded for both groups. Tuckman (1997) provides further evidence that heavy procrastinators may benefit from frequent testing, although this study does not attempt to disentangle the feedback effect from the commitment effect. The fact that Tuckman (1997) finds the largest effects for high procrastinators seems to contradict the finding in De Paola and Scoppa (2011) that high ability students (measured for example as students with high grades in high school) benefit most from the interim exam as one would expect procrastination to be associated with lower high school grades.

In addition to setting deadlines, a few US interventions have aimed to reduce procrastination leading up to deadlines because such behaviour can be associated with lower performance. Using an online exam environment, one study attempted to motivate more than one thousand students to complete an exam sooner, by setting up interim deadlines that if met meant that students would have more time to work on the exam (Levy & Ramim, 2013). The study found that this reduced procrastination with more people completing the exam earlier, but there was no effect on grades. 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). The study had a very small sample of only 10 students, but the results nevertheless 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.

Overall, relatively few interventions have used deadlines to nudge study effort. The initial positive effects found by Ariely & Wertenbroch (2002) are not always replicated¹¹ and in fact intermediate deadlines may harm task completion. It seems that positive effects of deadlines are most likely if students are already highly motivated to complete a task and that interventions to increase incentives to meet (interim) deadlines could be effective. Relatedly, positive effects of increasing exam frequency have been found. Exams may also be thought of as deadlines for which students often have a high motivation, but the literature provides conflicting results with respect to whether high or low procrastinators benefit more from an increased exam frequency. The results thus suggest that deadline effects may be highly context dependent and hence may also depend on the institutional setting. Most of the evidence on deadline effects comes from US studies and with the mixed results found so far, more research is needed before firm conclusions regarding the effectiveness of deadlines in educational contexts in the EU can be reached.

4.2 Social nudges

Social nudges have evolved from the observation that people like to act in ways that improve their self-image and their social image. In addition, people like to belong to a group and adhere to the social norms of that group. This means that it may be possible to use positive social norms to change behaviour in desired ways. However, a difficulty in nudging behaviour by appealing to social norms is that it can be difficult to identify the norms of a particular group.

Social norms

A German study illustrates the difficulties of using social norms to change behaviour (Wagner & Riener, 2015). The study found negative effects of an intervention that made academic performance information public to either parents or peers in the class room. Negative effects arose only for students attending *Gymnasium* (academic track high-school), which generally attracts students with a higher SES. No effects were found for students attending *Hauptschule*, *Realschule* (non-academic track high schools) or *Gesamtschule* (*comprehensive high school*). The negative effects were mitigated when students had the opportunity to select the type of public information provided, i.e. whether parents or class mates would learn that they had improved their performance. Similar effects were found in a US intervention where a performance-based leaderboard which announced the top three performers in the classroom, school and among all users was introduced in computer based high school courses (Bursztyn & Jensen, 2015). This led to a 24 percent decrease in performance primarily driven by a decline in effort provided by students who were top performers prior to the introduction of the leaderboard. This suggests that the students wanted to avoid being mentioned on the leaderboard. These results suggest that in some classrooms the social norm may be to put in relatively low study effort and in these settings it may be counterproductive to make effort choices public.

In another US intervention, high schools offered 11th grade 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

¹¹ In other (non-educational) field contexts, there limited support for deadline effects has been found (Bertrand, et al., 2010; Damgaard & Gravert, Forthcoming).

whether the enrolment decision was public, but in less advanced classes the enrolment rate was 11 percentage points lower when the decisions were made public. The response of students enrolled in *both* advanced and non-advanced courses appears 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.

Peer group interaction

Interaction with peers can help improve the feeling of social belonging and enforce or create social norms. Studies of peer effects among room- or dormitory mates have found mixed effects on academic performance (Carrell, et al., 2009). If peer effects arise, they may arise either because of 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 with the intention of helping the lowest ability students (Carrell, et al., 2013). Low ability students were placed with high ability students in an attempt to create 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, which the intervention intended to help. The performance of high ability students 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 these students may have been better able to create a sense of group belonging. The results also highlight that it can be very difficult to exogenously create a sense of group belonging.

A recent German intervention, however, finds that children can be influenced through the social environment (Kosse, et al., 2016). The intervention was targeted at children aged seven to nine with low SES. Children in the treatment sample interacted regularly with a mentor over roughly a one year period. The mentors were mostly university students. The study found that children in the treatment group behaved significantly more prosocial 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. However Kosse, et al. (2016) only focuses on the effect of mentoring on prosociality and not on academic achievement. Hence, it is not clear whether the change in attitudes also translates into changes in academic performance.

Several other coaching and mentoring interventions (discussed in more depth below) have also attempted to use peer influence by exposing high-school graduates to interactions with college students. For example Castleman and Page (2015) study a US intervention where college students provided outreach to high-school graduates intending to go to college. Peers had conversations with high-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.

Informational nudges to create group identity

Other studies have experimented with simpler informational nudges to create a sense of social belonging. As discussed below, informing students of peer performance can have positive effects on grades and

persistence (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).¹² A US intervention has also shown that providing teachers and students with information about similarities in their values, interests etc. led to an improvement in student 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 better when taught by teachers or instructors with similar ethnicity or race (Fairlie, et al., 2014; Lusher, et al., 2015).

Overall, social nudges in education have so far not been very successful. Interventions appealing to assumed social norms tend to backfire because students prefer not to signal high study efforts to others. This can be true both for high achieving students (who tend to have higher SES) and for low achieving students (who tend to have lower SES). More research is therefore required to uncover whether and under what circumstances positive effects of appealing to social norms as those found in various non-educational settings can also arise in educational contexts. Interventions influencing interaction with peers have also not been particularly effective. The reviewed studies highlight that it can be difficult to exogenously influence group identity, but there is a scarcity of studies in the area. The most promising social nudges are perhaps the simplest – namely nudges that provide information about peers in order to enhance a sense of group belonging. Although the evidence for the latter type of interventions comes only from the US, it seems plausible that similar positive effects could arise in the EU.

4.3 Priming

Priming may be used to bring certain information (and possibly seemingly irrelevant information) to students' minds with the aim to exploit their subconsciousness to influence their behaviour. Some US interventions have used priming to improve academic performance with mixed results. In one study, students were randomly assigned to a treatment or control group both of whom were given a 15 minute in-class written assignment (Cohen, et al., 2006). In the assignment, students in the treatment group focused on values important to them whereas students in the control group focused on values not particularly important to them. Teachers did not know which students were in the control group and which students were in the treatment group and as soon as the assignment was complete, teachers resumed their lesson plan. 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 arise because the reaffirmation of personal values in the treatment group worked to lessen effects of negative stereotypes.¹³ However, a replication study undertaken on a larger US sample failed to replicate these results 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 in these classrooms negative effects of the intervention were found for female students.

¹² We note, however, that the use of fictional descriptions in general could raise ethical concerns about the possibility of manipulation and in addition may harm the credibility of those providing the information.

¹³ This finding is complemented by lab experiments which show that priming students to think about negative student-athlete stereotypes can reduce performance on tests for athletes compared to non-athletes (Dee, 2014; Harrison, et al., 2009; Yopyk & Prentice, 2005).

In another study, low performing students in an undergraduate psychology class were sent a weekly review question and in addition students in the 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 something they can control with their effort rather than determined by external factors (Forsyth, et al., 2007). The study found no or negative effects on final exam graded of any of the treatments compared to the control group who received only the review question.

More evidence on the use of priming interventions in education are needed – particularly in EU countries – before conclusions regarding the effectiveness can be made. The results so far suggest that for the effectiveness of priming is greatly dependent on what students are being primed to think about.

4.4 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. By refocusing attention to important deadlines or tasks, reminders may also bring attention to the benefits and value of meeting deadlines and completing tasks. This further implies that reminders may mitigate self-control problems.

Sometimes reminders may simply remind people of already known information, e.g. telling people that an application deadline is approaching. In other cases, reminders may provide easy access to new information, e.g. informing people that they can get assistance completing their task. Reminders typically have positive effects on behaviour and low implementation costs in the order of \$7 or less per contacted student or family in the US (Castleman & Page, 2015; Castleman, et al., 2016; York & Loeb, 2014).

Reminding students

Nudging students with reminders is relatively new in educational contexts, but the results are promising. For example, as part of a US intervention, text message reminders were sent to high 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 geographical areas 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.

A related study uses text message reminders to remind first-year US college students to apply for financial aid for their second year (Castleman, et al., 2016). Again the reminders contained information about upcoming deadlines and requirements as well as 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. However, there was little effect among students at four-year institutions, possibly because of already high enrolment rates.

Reminding parents

Parental involvement has been shown to improve children's skills (Andersen & Nielsen, 2016). However, like the students, parents are also potentially affected by behavioural barriers such as limited attention and

self-control problems and this 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 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 school class specific effects.

Another intervention combined text messages reminding parents to read to their child with goal setting, information provision, and extrinsic information (Mayer, et al., 2015). Every week, parents in the treatment group 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 achieve the goal and if they reached their goal they would get a congratulatory text message as a non-monetary reward. In addition, parents in the treatment group were provided with information about the importance and benefits of parental involvement. Goal setting was included to induce psychological costs of not reaching the target and hence make parents more likely to read. Furthermore, the non-monetary reward was 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, parents with low patience on average read 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. There is some 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.

Overall, nudging students and parents with reminders has mostly had positive short term effects on parental involvement as well as enrolment and persistency in college/university. There is some evidence that the effects are strongest for families with lower SES, as one study found persistency effects to be greatest among community college students, another study found enrolment effects to be greatest among students with less clearly formulated college plans, and a third study found parental involvement effects to be greatest among more impatient parents. All of these characteristics would tend to be correlated with lower SES.

However, it should be noted that studies so far have focused mostly on short term effects, and recent studies outside the area of education have questioned whether short term benefits of using reminders might come at the cost of adverse effects in the longer term (Damgaard & Gravert, 2016). In particular, the results suggest that reminders impose a cost on recipients and that the recipients therefore may disengage from repeated reminders implying that the effectiveness of reminders is reduced in the long run. In

evaluating reminders, it may therefore be appropriate also to consider longer term effects e.g. do students and parents begin to ignore the reminders after some time? 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.

Finally, we note that all of the surveyed studies using reminders have been undertaken in the US. The positive effects do not seem to be dependent on the specific institutional setting and it seems reasonable to conjecture that similar effects would arise if reminders were used in European countries. However, it would be relevant to get evidence from a European context too.

4.5 Information provision: Easy access to information

Attention limitations may also imply that students do not acquire all 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, when selecting what information to provide, choice architects can ensure that some information becomes more salient than other information. For example, if there is a concern that students and parents focus too little on future benefits of obtaining education and too much on immediate costs, then it might be effective to simply make the benefits more salient by mentioning them in information material. As a result, information provision may target both attention limitations and other behavioural barriers, e.g. self-control problems. In addition, information provision may help boosting decision making skills of students and parents.

Financial aid

Several studies investigate effects of providing information about financial aid. The results are mixed. A Dutch study randomly provided students with information about student loan conditions with the intention of exogenously increasing knowledge about 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 of the untreated group. This suggests that the take-up rate of student loans in the Netherlands is not constrained by lack of information. Similarly, a US study providing potential low-income students with information comparing estimates of financial aid with tuition costs of nearby colleges, found no effects on financial aid applications or college enrolment (Bettinger, et al., 2012).

Interestingly, in some cases, there may even be adverse effects of information provision on 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 students with low SES. It is still too soon to evaluate the effect on academic achievement and it is not obvious that lower borrowing would lead to better educational outcomes.

However, in some cases positive effects have been found. For example, an intervention in Chile found positive effects on college preparatory high school enrolment, primary 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). In addition, it led to higher admission, enrolment and progression.

Returns to schooling

Information may also be provided in an attempt to de-bias beliefs about the returns to schooling and different educational paths. British (McGuigan, et al., 2014) and Canadian (Oreopoulos & Dunn, 2013) studies show that information campaigns informing secondary school students about study costs and earnings potentials can influence beliefs about the net returns to education. But the change in beliefs does not necessarily translate into a change in behaviour. For example in a US intervention, high-school students identified as being on the margin of applying to college received letters highlighting financial and non-pecuniary benefits of attending college (Carrell & Sacerdote, Forthcoming). In some cases the information was combined with follow-up personalised 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 suggests that an intervention informing high school graduates about the earning distribution and employment rates for different post-secondary educations did, on average, not increase enrolment into post-secondary education or the type of educational programmes selected (Kerr, et al., 2015). However, there is some evidence that students are updating their beliefs about employment prospects and that a small group of students who are disappointed by the information they receive change 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 tend to switch to study programmes with a higher net value.

The positive effects for students from low SES can be backed up 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 shows that students significantly underestimate the returns to education and an intervention providing students at randomly selected schools accurate information about the returns to secondary schooling led to an increase in the number of completed years of schooling of about 0.2 years (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 could also be that (other) behavioural barriers are more important in poorer households. A similar intervention in Madagascar finds that parents update their beliefs in response to statistical information about earnings potential and that test scores and attendance subsequently improves (Nguyen, 2008). An alternative to providing statistical information about earnings potentials is to use role models. Nguyen (2008) tests a role model intervention where an actual person tells students and families about his/her family background, educational experience and current occupation. Importantly, the role models are moderately or highly successful and therefore share success stories. The study finds that role models from poor backgrounds have almost the same effect on test scores as statistical information whereas role models from rich backgrounds have no effect.

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. Furthermore, students with self-control problems may find plagiarism an appealing alternative to exerting effort. An 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.

University students may also lack information enabling them to judge whether they are likely to graduate given their current performance. As a result 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 could also influence social identity by strengthening the student's sense of belonging to the group of university students. The sample in the study was rather small (20 students in the control group and 20 students in the treatment group), but the study nevertheless suggests that information about the academic performance of peers positively influences grades and reduces drop-out.

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 their personal struggles and the control treatment provided students with information about their scientific achievement. The intervention led to an increase in science grades for students in both struggle treatments.

In France, a reform providing high school students in their last year with personalised assessments from their preferred university degree programme was intended to lead to a better match between student skills and degree programmes (Pistoiesi, 2015). Access to universities in France is non-restricted 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 a very high drop-out rate among first year students. Pistoiesi (2015) studied the effect of the information on enrolment into the Economics programme in Toulouse and found that a negative evaluation of the student reduced enrolment. A positive evaluation had no impact on enrolment. Similar results were found in a Mexican study which provided disadvantaged students with feedback on their performance on a mock version of an admission test before students had to apply for high schools and subsequently had to 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 update their beliefs upward responded to the new information by applying for and enrolling in more academically oriented high schools. The study found no effects on grades at the end of the first year of high 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.

Parental information

Information can also be targeted at parents (see above). 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 made more parents choose higher performing schools (Hastings & Weinstein, 2008). The effect was strongest if there were high performing schools close by. The evidence also suggests that the effects arise 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 relationship between child and parent. Children are better informed about the effort that they exert than their parents. The problem of asymmetric information is well-known even in classical economic theory and is not directly related to behavioural biases. However, some interventions to alleviate the problems are somewhat behavioural in the sense that they reduce informational barriers by providing parents with easy access to standardised information. For example, a Dutch intervention introduced a parental 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 for 7th and 8th grade students study efforts, 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 tests scores for language tests, 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 and Rogers (2015) also obtain positive effects of a similar but more light-touch intervention providing parents of high 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 emphasizing good performance.

Overall, the results of interventions providing easy access to information suggest that such interventions do not necessarily lead to positive results. While most studies successfully influence awareness and/or debias beliefs, this does not necessarily translate into behavioural change and better educational outcomes. There is some indication that information about financial aspects (aid and returns to schooling) has very limited effect on behaviour. For this type of information, positive effects seem most likely to arise for low SES students and in developing countries. Other types of information generally seem to lead to positive behavioural change. There is some indication that positive impact is more likely if transaction costs to acting on the information are low (e.g. if better alternatives are close by).

4.6 Information provision: Framing

The way information and choices are framed can influence the salience of different parts of the relevant information and hence influence the extent to which different behavioural biases are at play. In contrast to

the interventions providing easy access to information, framing interventions do not boost decision making skills because the interventions work through the subconsciousness.

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 which 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 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 students who are loss averse will try to avoid having to repay waivers that they feel entitled to. 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 if they can. In addition, the response is consistent with default bias and loss aversion because students behave to minimise losses relative to the status quo endowment.

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., Forthcoming). Some randomly selected students were told that they would get a reward if they improved their test scores. Another group of students were given the reward before the testing began and were told that they would have to return it if they did not improve their test scores. 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 they 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. The results indeed did go in that direction but the differences between the two frames were not statistically significant. It should be noted that incentives were provided just before students were tested and students therefore could not respond by increasing study effort. Instead students could only respond by increasing effort on the test. Hence the results do not provide predictions on the effects on overall study effort but they do suggest that students may perform better on testes if incentives are frames 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 (a bonus at the end of the year 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 of time and teachers therefore could respond by changing their teaching effort and/or strategy.

An additional framing intervention was carried out in Morocco where parents of school age children were given a modest transfer (Benhassine, et al., 2013). 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. The programme therefore did not provide new incentives

for children to be enrolled in school but the intervention nevertheless led to significant increases in enrolment with a reduction in 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.

Generally, framing interventions have shown positive results or at least results that tend to go in the desired direction. However, the surveyed interventions employ widely different framing manipulations and it remains to be seen whether the results of the studies can be replicated in other educational contexts and in different countries. Despite the promising results, it therefore seems too early to make firm conclusions regarding the general effectiveness of framing interventions.

4.7 Boost policies

As already mentioned, some nudges also contain boost elements. For example, the provision of easily accessible information can enable people to make better decisions but can also work subconsciously by making certain information more salient, e.g. the availability of financial assistance, which lowers immediate costs of attending college. Therefore, boost and nudging policies cannot always be distinguished. In this section, we consider policies which deliberately aim to boost decision-making capabilities by teaching people about possible behavioural barriers and skills to mitigate the effects. Students and parents then subsequently can use the skills independently when making decisions.

Some recent interventions fall into this category and show positive effects. 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). Educational 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.¹⁴ 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 among 3rd and 4th graders teaching students to be more forward-looking had positive effects on the pupils’ behaviour (Alan & Ertac, 2014). Similarly, an Italian study has found that encouragement to attend a learning programme, which among other things taught students how to organise their time and material and 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 positive effects on grades of intensive goal-setting learning programmes (Morisano, et al., 2010).

¹⁴ For a discussion of the motivational effect of believing that intelligence is malleable see among others Dweck (1986) and Dweck (1999).

Boost policies may also be targeted at 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 an improvement in classroom behaviour. However, there were no effects on test scores during the intervention (Avvisati, et al., 2014).

Overall, there are relatively few studies on boost interventions. However, the effects of teaching students and parents' skills like grit, forward-looking behaviour and goal-setting have shown positive effects. More research is needed to uncover whether and in what settings positive results can be replicated. In addition, it would be interesting to explore the long term effects, to assess whether the effects of boost policies are more persistent, which would suggest that students have actually learned new skills. One of the arguments for boost policies is indeed that people are taught to make better decisions for themselves rather than unconsciously being nudged towards specific choices. However, do policy makers know what decisions are good for people? And how much teaching is necessary to fundamentally improve decision making capabilities?

4.8 Assistance, coaching and mentoring

Reminders, informational letters etc. are easy and often cheap to provide. However, due to limited attention, there is no guarantee that recipients pay attention to this type of information and behavioural barriers such as self-control problems may be so severe that simple information provision is not enough to overcome them. In addition, even if people pay attention and want to act on the information, cognitive limitations may imply that they are unable to do so. Therefore one-on-one assistance, coaching or mentoring may be required to overcome behavioural barriers.

The type of interventions discussed in this section vary in their intensity and cost from basic assistance provided at very low cost to comprehensive mentoring programmes involving considerable costs (for example Cook et al. (2014) report average costs per 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 have much less predictable outcomes because there is a much deeper and more elaborate personal interaction between the mentor and the mentee. The higher costs, more comprehensive intervention approach, and the lower predictability of impacts are not characteristics normally associated with nudges. Instead coaching and mentoring programmes have clear boost elements, as the aim often is to boost decision making competencies.

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 return were provided with personal assistance to complete an application for financial aid (Bettinger, et al., 2012). In addition, individuals were given personalised aid estimates that were compared to tuition fees at local colleges. The intervention potentially targeted several behavioural barriers including limited attention, cognitive limitations, procrastination stemming from self-control problems, etc. The intervention led to an increase in financial aid applications and college enrolment in the treated families. The effect was coming from both

high school seniors whose parents were treated and for adults out of high school with no prior college experience.

Coaching and mentoring programmes

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

A US intervention randomised approximately 1800 high school students who were identified as being on the margin of wanting to apply for college into a treatment or control group (Carrell & Sacerdote, Forthcoming). 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 led to a large increase in college enrolment 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. In addition, the mentoring programme had a positive effect on persistency in college.

Other coaching interventions have had similar positive effects (Acker & Rowen, 2013; Avery, 2013; Bos, et al., 2012). For example, the Canadian *Pathways to Education* programme is a very comprehensive programme which combines academic tutoring, group mentoring, career mentoring, financial incentives, scholarships, and meetings with student/parent support workers. The programme lowered the high 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 is targeted at low income high 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 high school students with an advisor to support the college and financial aid application process through advice, encouragement, reminders, meetings, etc. (Bos, et al., 2012). The programme also increased enrolment to four year colleges but not overall college enrolment. The effects were particularly strong for Hispanic students and students with low SES. There were also positive effects on applications for financial aid and persistency in college.

Coaching programmes may also target students once they have been admitted to university. New students who have been accepted at a university must complete a number of tasks such as registering, finding housing, etc., before they can begin their studies. Field interventions in the US 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 background (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 may also have positive effects for students enrolled in education. A one-year US coaching programme tested across eight higher education institutions aimed to encourage 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 one year later persistency for the treatment group remained about 3 percentage points higher than that of the control group. 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 both academic and non-academic issues. In addition, mentees were offered courses to improve their study habits. However, when combined with financial incentives there was a large positive effect on grades.

At the high 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.

The results from assistance, coaching and mentoring interventions are overwhelmingly positive. Some of the studies are targeted directly at low SES students and therefore do not allow for an assessment of possible differential effects among high and low SES students and families. However, a few studies do provide some evidence that the effects are amplified among low SES students who face the greatest barriers to educational attainment. Finally, we note that the evidence is only coming from North American studies and it remains an open question whether similar results could be obtained in Europe.

4.9 Extrinsic motivation

Interventions using extrinsic motivation explicitly tie rewards to the desired behaviour, e.g. attendance, performance on tests or college enrolment. The use of extrinsic motivation is not exclusive to behavioural approaches. Traditional policy tools based on economic incentives such as taxes and subsidies also provide extrinsic motivation to behave in a certain way. In behavioural economics, there is a focus on the tension between extrinsic motivation and intrinsic motivation with some studies suggesting that extrinsic motivation can crowd out intrinsic motivation to behave in desired ways. Consequently, there might not be overall positive effects of introducing extrinsic motivation. Secondly, behavioural economists have focused on making the design of extrinsic motivation behaviourally motivated. This could for example be by designing more immediate (monetary or non-monetary) rewards to offset immediate costs and thus tackle self-control problems. In an education context this could be particularly important because the benefits of education occur much later than the costs.

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

Non-monetary incentives

Schools, teachers and parents also often use feedback and grades as a motivating tool. How such feedback is provided may matter greatly for how students respond to it. For example, a Swedish intervention finds 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 a thousand sixth graders in Swedish primary schools and find that student performance can be significantly higher with relative grading and non-monetary rewards (such as certificates or a material reward) than with standard absolute grading (on an A-F scale).¹⁵ 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. In contrast to these findings, a Dutch study among bachelor students finds no difference in effort provision (homework handed in, homework grades, attendance and 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 found positive effects on exam performance only for university students in their first year.

A natural experiment in Spain also provides evidence on the motivating effect of feedback (Azmat & Ghazzla, 2010). In one school year, high school students were provided with relative performance feedback (the average student grade point average) in addition to absolute performance feedback (own grade point average). The study found that this information led to a 5% increase in grades and the effect was significant both for high and for low performing students. However, the effects did not persist as the effect disappeared as soon as the information was 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 are positive affected with feedback provision and the effects are significant for almost all students. Only the grades of the worst performing students do not improve but there are also not signs of a discouragement effect. We note that both in the Spanish and in the British study feedback may both have a motivational effect and an informational effect. In fact, both studies find the largest effects among new students who are likely to be less informed about their own performance and their return to effort.

The effectiveness of feedback may also depend on how the feedback is worded. Positive effects arose from an intervention in a widely used online educational game targeted at 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 effort provided. 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.

¹⁵ 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.

A US field experiment also finds positive effects of another type of non-monetary incentives (Levitt, et al., Forthcoming). The results suggests that non-monetary incentives announced immediately before a test may be very cost-effective way of increasing performance on the test (although general study effort leading up to the test is unaffected by construction) because the possibility of winning a \$3 trophy had larger effects on test-scores than a \$10 cash reward. The study also suggests that non-monetary incentives are most effective for primary school children and particularly if combined with a loss frame (that is if the student is given the reward before a test and then told to return it in case test scores do not improve).

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 two thousand students in grades 5 and 6. A control group received no incentives to improve their test scores, the first treatment group were given a medal in front of their class mates 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 high schools) or *Gesamtschule* (comprehensive high school). In contrast, the medal and letter treatments on average led to negative and significant effects on test scores for students attending *Gymnasium* (academic high schools) suggesting either crowding out of incentives or that students do not like performance information to be provided to their peers or parents. However, interestingly, 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 high-school are more likely to choose the letter than high performers. This is particularly the case for low performers in *Gymnasiums*.

Monetary incentives

Monetary incentives could also be used to create more immediate benefits of education and thus tackle 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 very far into the future.

A large number of interventions provide monetary rewards for academic achievement e.g. measured by grades or test scores. We do not provide a full review of all the papers in this category but try to give an overview of some of the conclusions that emerge. The effects are somewhat mixed and suggest that the incentives may need to be quite substantial to induce behavioural change.

A Dutch intervention which introduced financial incentives of €227-681 to students for completion of all first-year requirements by the start of the next academic year, led to no significant effects on pass rates or accumulation of credits (Leuven, et al., 2010). Positive effects were found only for already high-achieving students while effects were negative for low ability students. These results are similar to 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 found positive effects on performance of monetary incentives only for high ability students. However, in contrast to Leuven et al. (2010), the effects

for high ability students were strong enough to lead to 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 also tied incentives to achievement. For example, a US intervention tied incentives to grades in individual courses and found positive effects on grades in these courses but not large enough effects to impact the overall GPA (Angrist, et al., 2014). Other US interventions have resulted in small, if any, effects on outcomes for which students were directly incentivised (Fryer, 2011; Bettinger, 2012).

In contrast, a study in Kenya incentivising 6th grade girls and their families for performance on exams led to substantial improvements in exam scores (Kremer, et al., 2009). The programme awarded two-year scholarships to the highest scoring 15% of grade 6 girls as well as public recognition. The success of the programme may be due to the fact that because the programme was done in a less developed country, the value of the prize was relatively large at 5% of GDP per capita. In comparison, in Fryer (2011) students on average earned between \$14 and \$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 an improvement in the student's grade point average (Angrist, et al., 2009). The intervention resulted in significant improvements in 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 generally the results seem to 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., Forthcoming; Leuven, et al., 2010). Levitt et al. (Forthcoming) provide the cleanest results and replicate the findings across three different schools.

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 the payment is made (see for example Fryer (2011), Leuven et al. (2010) and 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., Forthcoming). 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 for the heterogeneous effects for low and high ability students found by e.g. Leuven et al. (2010) and De Paola et al. (2012) is crowding-out of intrinsic motivation. Several studies using incentives in education, have tried to assess the effect on intrinsic motivation and most have concluded that there is no crowding-out (Bettinger, 2012; Barrera-Osorio, et al., 2011; Kremer, et al., 2009; De Paola, et al., 2012). However, Levitt et al. (Forthcoming) find some evidence that very small financial incentives may crowd-out intrinsic motivation and lead to worse future academic performance.

It may also matter for the effects what performance measures the incentives are tied to. 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 Progresa intervention provided financial incentives to 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 and this is estimated to lead to an increase in schooling of about 0.7 years and a 21% higher enrolment rate in secondary school grades (Schultz, 2004; Behrman, et al., 2005). Evidence from Colombia suggests that the effect on attendance also can be achieved when part of the rewards are paid into a savings account and paid out at the time of graduation rather than immediately. This also has the effect of increasing enrolment into further education, particularly if pay-out is made contingent on graduation or enrolment in further education (Barrera-Osorio, et al., 2011). This seems somewhat contradictory to the results reported by Levitt et al. (Forthcoming).

In contrast to these positive results for monetary incentives tied to attendance and enrolment, an intervention in the US providing financial incentives to enrol in and attend in-state colleges only led to minor increases in overall 4-year-college attendance among recent high school graduates (Cornwell, et al., 2006). However, enrolment at in-state colleges increased in response to the incentives which is not surprising given that incentives were tied to in-state colleges.¹⁶ This suggests that rather than increasing overall attendance the intervention just 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. (2016). They conduct a randomised experiment in a US low performing high school and let incentives be tied to multiple measures. They only find modest effects on average but large effects for students assessed to be on the threshold of meeting the target. The effects persist even a year after the intervention but then fade out. The study also tests whether it matters for the effectiveness whether incentives are given to students or parents or whether they are provided as a lottery (giving students who meet the achievement target a chance to win a large prize of \$500 with a probability of 10%) or as fixed rewards (with the same expected value of \$50). They find no differences in the effectiveness in either case.

A large number of interventions have altered extrinsic motivation with the intention to provide incentives for students to perform better on exams, increase study effort, enrol and attend school, etc. Most studies using non-monetary incentives have found 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 have significant effects on academic achievement. However, some studies find heterogeneous effects of non-monetary incentives e.g. males respond better to relative grading than females and there is some evidence that high ability students may respond negatively to non-monetary performance rewards being provided in public.

¹⁶ There is a large literature which analyses the effect of financial aid composition (loans, grants, etc.) 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 enrollment.

The evidence on monetary incentives is very mixed. Generally, monetary incentives tend to have a positive impact on enrolment and attendance but the effects on student achievement are less predictable. The results seem to suggest that monetary incentives targeting achievement must be sizable to have an effect, it may be more effective to provide rewards sooner rather than later, and effects are greater if combined with other types of interventions e.g. coaching. There is also a tendency that studies in less developed countries are more likely to give positive effects. This may be both due to differences in income and hence the relative size of the incentives provided and due to contextual differences.

5. Conclusion and policy implications

There is a growing body of evidence from both the laboratory and the field which 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. Some research suggests that some of these barriers may be particularly relevant for educational decisions, e.g. self-control problems are particularly pronounced for children and adolescents (e.g. Green, Fry & Myerson, 1994). This raises concerns that students and parents underinvest in education and that students may drop out of education too soon.

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 a growing interest in nudging policies among both practitioners and academics, in part because nudges often involve low implementation costs. This paper provides a review of the use of nudges and other behaviourally motivated interventions in education.

Table 1 provides an overview of the types of interventions discussed in this review, their properties (nudge, boost or more traditional policy tool), costs, the extent to which they have been applied in education policy, and their effect. A number of conclusions emerge. First, to date there are relatively few field interventions in education that have used pure nudge interventions such as defaults, deadlines, social nudges, priming, reminders and framing. Instead, most interventions involve what can be thought of as traditional tools such as coaching and mentoring programmes, information campaigns and economic incentives with modifications to contain nudge or boost elements. This is despite the fact that pure nudging interventions typically have very low implementation costs.

Second, since there are relatively few nudging interventions such as defaults, deadlines, social nudges, priming and framing, it is too early to make a general assessment of whether this policy tool can be used to change behaviour. For example, only four studies have used deadlines to tackle self-control problems and the results from these studies are diverging. Hence, more evidence is needed to make firm conclusions on whether and under what circumstances deadlines can be used to address self-control problems in students. As another example, studies using framing have so far uniformly provided indications of positive behavioural change, but only four studies in this category have been reviewed and the specific framing manipulation used in those studies are widely different. Two use a gain vs. loss manipulation of extrinsic motivation and a third tests different framings of financial aid and loans for college students.

Third, for some types of nudges, it seems to matter greatly how they are being applied. For example, the evidence on the effects of social nudges that appeal to social norms and attempt to create a feeling of group identity have produced very mixed results. The studies suggest that one must be extremely careful that social norms do not end up working against desired behavioural change. In some cases making performance information public has led to worse performance because the social norm appears to have been not to study. Similarly, when using priming, the type of information people are being primed with matters for the effectiveness of the nudge.

Fourth, positive results are typically found for interventions providing reminders, easy access to information, boost policies and assistance, coaching and mentoring. 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.

Table 1: Use of nudges and other behaviourally motivated interventions in education

Policy tool	Nudge, boost or traditional tool	Cost	Frequency of use in education	Effect
Defaults	Nudge	Low	None	?
Deadlines	Nudge	Low	Few	Mixed evidence
Social nudges	Nudge	Low	Few	Mostly negative
Priming	Nudge	Low	Few	Mixed evidence
Reminders	Nudge	Low	Medium	Positive
Easy access to information	Traditional with nudge and boost elements	Low to medium	Many	Mostly positive
Framing	Nudge	Low	Few	Mostly positive
Boosting decision-making capability	Boost	Medium	Few	Positive
Assistance, mentoring and coaching	Traditional with boost and nudge elements	Medium to large	Many	Mostly positive
Extrinsic motivation	Traditional with nudge elements	Medium to large	Many	Mixed evidence

Fifth, generally interventions seem most effective at changing the behaviour of individuals who are at the margin of behaving as desired. This means that there are often only few improvements in behaviour for individuals already performing well and sometimes effects are also limited for students with very poor performance. There is also some evidence that many of the interventions are most effective for students with low SES 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.

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