Edukacja 2020, 3(154), 102–122
DOI 10.24131/3724.200308
ISSN 0239-6858

Impact of Information Provision on Investments in Human Capital. Review of Experimental Studies[1]

Aneta Sobotka

Directorate General for Employment, Social Affairs and Inclusion,
European Commission, Brussels, Belgium

The classical approach of economics to education assumes that individuals regard education as an investment and have perfect information on the costs and benefits of their educational choices. This review investigates the burgeoning literature on information interventions in education and attempts to discover whether such interventions can be effective tools for education policies to increase the time spent in school and modify educational choices and preferences. The findings of 19 experimental studies were analysed. The results of this review show that some groups of students made educational choices using very inaccurate information and information interventions led them to update their beliefs. Despite existing informational constraints, raising students' knowledge on the profitability of education had mixed results on educational behaviour. The most promising effects of information interventions were raising student learning efforts and changing student preferences.

KEYWORDS: decision-making, educational choices, experimental studies, human capital, information.

Introduction

According to Gary Becker's (1975) theory of human capital, individuals regard education as an investment and analyse the costs and benefits of a longer period of learning when deciding whether to continue attending school. The assumption is that students are fully informed and decide to invest in education when it is beneficial. However, despite the high premium of a longer time spent in education, in many countries some high-ability students decide to discontinue their school education and enter the labour market. One possible explanation for this is that students make such decisions based on the perceived expectations of profitability from the educational investment (Manski, 1993), which may be biased. Thus, an overestimation of the costs of education and an underestimation of future wages may

[1] This work was supported by the National Science Centre in Poland (Narodowe Centrum Nauki) under Grant 2015/17/N/HS4/00886.

*E-mail: Aneta.Sobotka@ec.europa.eu
ORCID: 0000-0002-0119-4981

© Instytut Badań Edukacyjnych

deter investments in education. Equally, an overestimation of the returns on an investment in education, or a misjudgement about the heterogeneity of returns across disciplines or institutions may lead to suboptimal choices and yield additional costs, both from global and personal perspectives. Errors in evaluating the profitability of an educational investment may lead to the ineffective use of human capital, inequalities, skills mismatch, skills shortages and increased public costs.

The hypothesis is that providing accurate information on the costs and benefits of education would allow individuals to make better choices. When provided with new information, students should adjust the effort placed into their learning and educational choices to optimise their educational investment. Examples from behavioural economics show that providing information can influence individual choices, e.g. changing retirement behaviour (Duflo and Saez, 2003), sexual behaviour (Dupas, 2011) or labour market participation (Liebman and Luttmer, 2010). This review investigates the burgeoning literature on informational experiments in education and attempts to discover whether such interventions can be effective tools for education policy to raise the time spent in education as well as to modify educational choices and preferences to increase investments in human capital. To this aim, the findings of 19 experimental studies showing the causal effects of information on the costs and benefits of education were analysed. The results of this review show that some groups of students made educational choices using very inaccurate information and the provision of accurate information led them to update their beliefs. However, updating knowledge not always led to a change of behaviour, as students had already made certain educational choices keeping them on their chosen pathway, or they lacked assistance in the decision-making process. The most promising effects of information interventions are in raising students' learning efforts and changing students' preferences. The results of information interventions tend to be more marked in developing countries, where information constraints are broader. The timing of the intervention seems critical to its effectiveness, revealing that information which could influence educational behaviour should be provided several years prior to making educational choices.

Section 2 of this article describes the role information plays in educational investments, section 3 – the methodology of this review, and section 4 – the design of the interventions. In section 5, the effects of the intervention on school attendance, completion of secondary education, school results, college enrolment, financial aid uptake and educational preferences are presented. Table 1 summarises the main effects found and Table 2 presents the main characteristics of the interventions.

The Role of Information in Educational Investment

The assumption that individuals base their choices on perfect information is very strongly embedded in economics, but at the same time many authors have questioned it. Herbert Simon (1957) emphasised that according to neoclassical economic thinking, the rationality of a decision requires complete information about all alternatives and characteristics, but this is rarely satisfied in reality. Lack of complete information has significant impact on behaviour and decisions and even small changes in access to full information or non-zero costs incurred in obtaining it result in market imbalances (Stiglitz, 1975; Akerlof, 1970; Spence, 1973). Accurate information can protect against suboptimal decisions, motivate individuals to apply more effort to learning and lead to better use of their skills, but an important question concerns

whether students and their parents have sufficient knowledge to make rational economic decisions (Dill and Soo, 2004).

Information constraints exist in every education system, but their scope and character vary significantly depending on a country's level of economic development, complexity of the education system and availability of high quality information policy and counselling systems. Three types of information constraints are described in the literature. In first place is the low awareness of the financial and non-pecuniary benefits of education. This type of information constraint is especially serious in developing countries, where some communities live in isolation resulting from poor quality infrastructure or the onset of mass-scale social mobility (Nguyen, 2008; Jensen, 2010). A lack of school counselling and limited access to public statistics lead many students to underestimate the returns from education and consequently to lower motivation towards learning. It is hypothesised that when students more precisely understand the profitability of investing in education, they decide to stay in learning longer.

The second type of information constraint is informational asymmetry between students of different socio-economic status (SES). This information gap is often interpreted as being behind the low enrolment of high-achieving low-SES students in higher education (HE). When low-income students perceive study costs as high and/or do not know how to finance further education, they resign from educational investments without benefitting from dedicated funds for this purpose, even if they are eligible for them (Kane and Avery, 2004; Bettinger, Long, Oreopoulos, Sanbonmatsu, 2012; Dinkelman and Martínez, 2014). The assumption is that informing students of the real costs of education and the means to finance it encourages young people to enrol in postsecondary education.

The third type of information constraint results from the growing complexity of the HE market in developed countries. The premium from HE varies dramatically by discipline and institution and not all students know how to benefit from the culture of choice (Ball and Vincent, 1998). Providing students with detailed information on the returns from specific disciplines can induce them to invest in learning programmes with higher expected earnings. This could be helpful in reducing the gender gap and social inequalities in educational choices in higher education.

Methodology

For the purpose of this article, an information intervention is understood as an intervention in which students are provided with information about either the costs of education, the benefits of education or both. The benefits of education are understood as financial (e.g. mean/median of earnings, education premium and return rate from education) and non-pecuniary benefits. The costs of schooling are understood as direct and indirect costs, as well as the possibilities of funding education.

To select the relevant articles and reports for this literature review, three inclusion criteria for were set. First was the topic of the study, which must describe a policy intervention providing students with information on the costs and/or benefits of education. Studies were excluded in which information was part of a larger intervention, such as tutoring on receiving financial support, or it was not possible to evaluate the effect of information provision without applying additional measures. Similarly, studies were excluded in which the intervention was focused on providing information on other characteristics, e.g. the quality or social composition of the school.

Second, the study had to use an experimental design to avoid biased estimates of the effects. Thus, all selected studies were randomized controlled trials. Experimental design has been applied to educational research for many years to validate policy interventions, e.g. testing how preschool education affects school outcomes (the High/Scope Perry Preschool study – Schweinhart et al., 2005) or testing the effects of class size on school results (STAR experiment – Word, Johnston, Bain, 1990). The results of experimental studies often show how education works better than is explained by a theoretical framework of an educational production function, e.g. improving access to textbooks does not affect average test scores in developing countries (Glewwe, Kremer, Moulin, 2009), but deworming treatment reduces school absenteeism by 25% (Miguel and Kremer, 2004). The greatest advantage of experiments is the strength of the inferential evidence of causation. Randomized controlled trials (RCTs), if run properly, provide a reliable, robust and precise estimate of the intervention (Bouguen and Gourgand, 2012) because they resolve selection bias, which is often a problem in methods such as regression, matching or discontinuity design (Duflo, Glennerster and Kremer, 2007). The experimental sample is drawn from the population or a targeted sub-population with particular characteristics (e.g. rural schools), and individuals (schools in this case) are randomly allocated to treatment and control (comparison) groups. Both groups are expected to have the same initial characteristics that can be correlated with the expected result, e.g. distribution of students' SES or distribution of students' ethnicity. Then in both treatment and control groups, different characteristics are measured, e.g. students' knowledge about the costs and benefits of education, educational preferences, etc. The next step is an intervention in the experimental group – in the analysed articles and reports, this is the information intervention. The last stage is measuring the particular characteristics again as in the first phase. The difference in the outcome of interest between the treatment and control group is the treatment effect. Experimental studies have some limitations – the main drawback is the external validity of results. Interventions are implemented in specific economic, social and institutional contexts and the success of the intervention implemented in one context does not guarantee similar effects in different systems or countries (Bouguen and Gourgand, 2012). However, the analysis of different experimental studies allows predictions to be made of what type of intervention may work (Duflo et al., 2007).

The third criterion was the language of the report, which had to be English. No criteria were set for the stage of schooling when the information is provided. The narrow criteria for the topic and requirements for the experimental design excluded older studies (the oldest is from 2008).

To find relevant studies, the following electronic databases were reviewed: JSTOR, ERIC, Web of Science, RePEc and National Bureau of Economic Research. To be certain that no articles were omitted, the references of selected articles and policy papers were reviewed. After reviewing the titles and abstracts of the articles and policy papers, 19 interventions were found.

Design of the Information Intervention

Even though they tested how the provision of information on benefits or costs influenced student behaviour, the interventions were designed differently and conducted in diverse socio-economic contexts and with various information constraints, which also influenced the effect. The analysed interventions represented various levels of economic development, diverse systems of education and heterogeneous rates of participation at each level of education. Many elements of the design also varied, e.g. target group, how information was presented

and timing of the intervention in the context of educational choice. Conclusions about the effect of the provision of information required very careful consideration, as differences in the design and contexts of the various studies had to be accommodated.

In many interventions, information on the benefits of education was presented as average earnings (mean or median, distribution of earnings), employment rates and by education level (e.g. Nguyen, 2008, Jensen, 2010, Barone, Schizzerotto, Abbiati and Argentin, 2017). In some studies, the information was more precise and the heterogeneity of returns from education was presented by gender (e.g. Avitabile and de Hoyos, 2015; Kerr, Pekkarinen, Sarvimäki and Uusitalo, 2015) or by discipline (e.g. McGuigan, McNally and Wyness, 2016; Wiswall and Zafar, 2015). In some studies, participants were also informed about other benefits gained by extending schooling, e.g. the probability of imprisonment being inversely proportional to level of education (Fryer, 2016) or life expectancy (e.g. Avitabile and de Hoyos, 2015). In some RCTs, the intervention was focused on education costs, mainly on demonstrating how students could overcome the financial constraints associated with remaining in education longer by using loans, financial aid programmes and scholarships (e.g. Booij, Leuven and Oosterbeek, 2012; Loyalka, Song and Wei, 2013). In some studies, both types of information were provided (e.g. Kerr et al., 2015; Bonilla, Bottan, Ham, 2016). In most interventions, information was provided on the costs and benefits pertinent to higher education, as it was not compulsory and full participation at lower levels had already been achieved. Only the interventions of Madagascar (Nguyen, 2008) and the Dominican Republic (Jensen, 2010) focussed on encouraging students' investment in secondary education.

In some studies, the information intervention was targeted to students potentially suffering the most acute information constraints, e.g. from rural areas (Nguyen, 2008), from low-income families (Bettinger et al., 2012; Dinkelman and Martínez, 2014; Bonilla et al., 2016; Hoxby and Turner, 2015) or at the margins of acceptability for college enrolment (Carell and Sacerdote, 2017). Accordingly, greater effects from these interventions could be expected.

In most studies, information was provided to individuals only once, over a short period (15–45 minutes). Only the Italian and American interventions were longer (Barone et al., 2017; Fryer, 2016), delivered during 3 sessions over several months and 183 messages sent throughout the entire school year. In some studies, participants in the experiment could take materials home (information cards, leaflets), so one could estimate a longer exposure time. Information was mainly presented as statistics. The means by which the information was provided were highly variable, e.g. Avitabile and de Hoyos (2015) as well as Wiswall and Zafar (2015) provided information as part of a baseline survey. An innovative method was adopted by Fryer (2016) – 6th grade students were given pre-loaded cell phones for their personal use, in which they received text messages for 183 days containing information about the importance of education for future life outcomes. In Chile (Dinkelman and Martínez, 2014) and Great Britain (McGuigan et al., 2016), students obtained information by watching a video, while in China (Loyalka et al., 2013) students were given a 30-page booklet containing user-friendly information about college costs and financial aid, accompanied by a presentation. Carell and Sacerdote (2017) sent students a letter about financial and other benefits of college education. In an experiment by Hastings, Neilson and Zimmerman, (2015), information was presented on an interactive internet page where students could search for specific information regarding their study preferences. In the intervention by Kerr et al. (2015), school guidance counsellors presented information, and in Columbia (Bonilla et al., 2016), students were given a talk by a recent college graduate presenting statistics on earnings and HE funding possibilities.

Information interventions are generally highly cost effective. As described by Hoxby and Turner (2015), intervention cost was estimated at $6 per student. Dinkelman and Martínez (2014) estimated $13.1 per person and $11.20 per family. Some authors did not mention the exact cost of the intervention per student but described it as low (e.g. Avitabile and de Hoyos 2015; Kerr et al., 2015; Hastings et al., 2015). Only Fryer's (2016) intervention was more expensive – 250 dollars per student, since providing the information required cell phones and incentives (telephone credit).

Review of Empirical Studies Using the RCT Design

Are Students Misinformed?

The fundamental hypothesis for each information intervention is that students' knowledge on the profitability of education is biased. However, measuring misinformation is complex. It is important to distinguish the perception of earnings for the whole population from forecasted individual earnings, since even if students have accurate information on average graduate earnings, they may remain uncertain about their position in the earnings distribution.

Uncertainty about one's own return originates from two sources: imperfect knowledge of the average return and the relationship between individual characteristics and individual return (Avitabile and de Hoyos 2015; Nguyen, 2008). Wiswall and Zafar (2015) noted students' potential awareness of information about themselves that justified different earnings expectations (e.g. they knew their previous education scores), which they termed private information, as it is known only to the individual, compared with information about average earnings, considered public. An important issue is also how the term "expected earnings" is understood. Jensen (2010) remarks that it is not clear whether this refers to the mean, median or mode and which of these indicators is critical to students' decision-making.

Another fundamental issue concerns the assessment of the scope of students' imperfect information. The average estimation of earnings by a group of students might be very close to the observed mean but the distribution may be skewed, as some students overestimate earnings and some underestimate them (Wiswall and Zafar, 2015). For example, in the Madagascar experiment (Nguyen, 2008), one parent in three did not respond with reference to perceived earnings, and despite the match between perceived and average returns, there was disparity in perception, both in individual and average returns from education.

The analysed studies showed that students very often underestimate the benefits from longer schooling, which deters them from investments in human capital, but there are also countries and/or group of students who overestimate expected benefits. Jensen (2010) showed that 42% of 8th grade students (boys only) in the Dominican Republic reported no difference in their own expected earnings from primary and secondary education, which to some extent can explain the low interest in pursuing secondary education. However, some students were wrong in the other direction, and on average overestimated earnings for primary schooling by 11% and for secondary schooling by 14%. Despite different socio-economic and cultural contexts, McGuigan et al. (2016) similarly reported that one-fifth of students in the UK did not consider that employment opportunities were improved by continuing education up to the age of 18 (as opposed to leaving at age 16, which is the end of compulsory education) or going to university (as opposed to completing secondary school). Moreover, fewer than half of the prospective HE students were not aware of the heterogeneity of the returns from

education by discipline, and just over half by institution. In Mexico (Avitabile and de Hoyos, 2015), students underestimated average incomes after completion of secondary education, but were closer to the official data when assessing their future level of earnings and on average overestimated earnings for those with diplomas, no matter if they were asked for an average assessment or for themselves. Hastings et al. (2015) found a lack of awareness about average graduate earnings among half of the students. Students from low SES families were 6.3 percentage points less likely to report an awareness of tuition costs for their chosen discipline than those from high SES families. They were also 8.5 percentage points more likely to admit ignorance of expected earnings from their discipline compared to high SES students. Barone et al. (2017) showed a 30% upward bias on monthly earnings for bachelor's degree students. In the Columbian experiment (Bonilla et al., 2016), almost 90% had an inflated expectation of the college premium, but the overestimation was within one standard deviation of the true amount. However, low-income students more often underestimated the financial benefits of HE, while their colleagues from higher income families were more prone to overestimate them. Wiswall and Zafar (2015), despite analysing the beliefs of very high-ability students who were already enrolled at selective private universities, showed marked bias in students' beliefs about graduate earnings. Students underestimated annual average earnings for men with no college degree by $9,890 and overestimated male economics/business graduate income by $34,750. In the Finnish experiment, Kerr et al. (2015) did not assess perceived earnings, but after providing the treatment group with information, students were asked how much their beliefs varied from the data presented and nearly a third of the students declared that they were surprised about the actual earnings.

Misperceptions of schooling costs and the lack of knowledge on how to obtain financing are very common problems both in developed and developing countries. Information on higher education costs and possible sources of its financing is particularly important for less affluent students and first generation students (these groups often overlap). For example, in Germany, where the costs of higher education are rather low and there are many measures to support students who want to pursue higher education, more than 40% of students from low-educated families were concerned about financing their postsecondary education (Ehlert, Finger, Rusconi, Solga, 2017). In Mexico, Dinkelman and Martínez (2014) showed that students were aware of the financial returns from higher education and that many aspired to complete college, but 41% were unaware of how to finance this. In the UK, McGuigan, McNally and Wyness (2016) reported that almost 20% of the students believed that going to university was too expensive and financial constraints deterred them from applying. In the US experiment, Bettinger et al. (2012) showed that students overestimated the costs of college by more than 300%. Barone et al. (2017) reported that students overestimated university costs by 72% and Booij et al. (2012) showed that fewer than 30% of students were poorly informed about loan conditions. In an experiment by Hastings et al. (2015), students' estimates of tuition fees were close to the actual figures, but about 25% of the students underestimated the fee for their chosen discipline by at least 16.5%. In the Columbian experiment (Bonilla, 2016), only 18% of students were aware of the existence of one of several major funding programmes for higher education.

Updating Beliefs

All the experiments chosen showed that providing information improved the accuracy of students' knowledge. A detailed analysis of how students updated their earnings

beliefs was performed by Wiswall and Zafar (2015), who classified students' updating behaviours into 5 groups: Bayesian (consistent with the Bayesian framework), alarmist (more exaggerated response than Bayesian), conservative (in the right direction but less than predicted by the Bayesian framework), contrary (inconsistent with the direction of Bayesian updating) and non-updating behaviour. The largest groups of respondents who updated their earnings belief were Bayesian and conservative updaters, but almost a fifth of the students did not revise their beliefs. Importantly, the revision of beliefs occurred in both directions – upward and downward – and this was differentiated by discipline, from an average downward revision of 8.5% for self-earnings in economics/business to an average upward revision of 27% in the no degree/non-graduate category. Nguyen (2008) showed that providing statistical information in Madagascar significantly reduced the gap between perceived and observed returns, both average and individual. However, statistics combined with role models (who provided the information as their success story) or role models alone did not influence beliefs. In Jensen's (2010) intervention, the treatment caused students to raise their expectations about earnings after completing secondary school and to lower their expectations following primary school. McGuigan et al. (2016) showed that after the information intervention, the proportion of students believing that there is no variation in earnings by subject of study or institution was reduced by about 5 percentage points. Students also updated their beliefs regarding perceived employment benefits from going to university by 2–3 percentage points and their knowledge on university fees and loans also improved by 5.8 and 7.6 percentage points, respectively. In Fryer's (2016) experiment, students in the treatment group were 5.4 percentage points more likely to correctly identify the wage gap between college graduates and college dropouts, and were 17.4 percentage points more likely to correctly identify the relationship between level of education and imprisonment, but surprisingly they did not improve their general understanding of investing in human capital. Kerr et al. (2015), while measuring the updating of beliefs, relied exclusively on students' opinions. Overall, 19% of students were negatively surprised and 15% positively surprised about the true level of earnings. The biggest share of negative surprise was among students planning to apply for education and psychology courses and the biggest share of positive surprise was for business, medicine and engineering. Barone et al. (2017) demonstrated that after the intervention, students from the treatment group were less concerned about financing their education and revised their perceived costs, but still tended to overestimate university graduate earnings. Avitabile and de Hoyos (2015) observed that after the intervention, the proportion of students reporting an expected income in the category close to the observed average earnings was higher. Bonilla et al. (2016) reported that treatment raised awareness of one of the possibilities for HE funding by 3.8 percentage points and did not influence knowledge about other funding possibilities or the HE premium, but over time, awareness developed independently of the intervention. In Germany (Ehlert et al., 2017), students from the treatment group substantially raised their knowledge about financial aid options as well as on the returns from higher education.

A stronger updating effect on beliefs was seen when more precise information was provided, i.e. level of earnings – by course, not general level of earnings (e.g. Wiswall and Zafar (2015) or by gender (e.g. Avitabile and de Hoyos) and for students with the least accurate information who were positively surprised by the information provided (Wiswall and Zafar, 2015).

Effect on School Attendance and Completion of Secondary Education

School attendance is an indicator showing students' motivation to invest in their human capital. The hypothesis is that when students perceive benefits from education as high, they will be more motivated to attend classes, so the probability of completing secondary education increases. The interventions analysed showed that providing information to students may increase school attendance, especially in developing countries, but it did not prove to be an effective tool to raise the completion of secondary education, since other factors beyond information on the profitability of investing in education are critical to the discontinuation of education.

This assumption was tested in six of the analysed studies, but the results were mixed. In Jensen's (2010) experiment in the Dominican Republic, students from the treatment group were 4 percentage points more likely to return to school the following year, but there was no difference in secondary school completion. In Madagascar (Nguyen, 2008), attendance in grade 4 measured five months after the intervention increased by 3.5 percentage points compared to the control group mean of 85.6%. The effect of the intervention was seen only when information was provided as statistics. A role model providing the information did not affect attendance. In the Chilean experiment by Dinkelman and Martínez (2014), despite no improvement in academic results, post-intervention absenteeism dropped by 8.8 percentage points, suggesting that students attempted to invest more in schooling. In Great Britain (McGuigan and McNally, 2012), the intervention stimulated a declared intent of the treatment group to continue full-time education after age 16 by 3 percentage points. In the Mexican RCT by Avitabile and de Hoyos (2015), the information provided did not influence the scheduled completion of upper secondary school three years later. Fryer's (2016) US intervention also showed no effect on secondary school attendance.

Effects on School Results

In five analysed experiments, the effect of the intervention on academic scores was measured. The assumption was that by updating information on the profitability of education, students would be motivated to optimise the effort put into study, potentially resulting in better outcomes as measured by standardized tests. Providing information may have a positive impact on students' educational results, but it seems that the effects may be greater in developing countries where information constraints are more severe than in countries with well-developed career services and counselling policy. Second, the effect is quite clear in the longer perspective – a few months seems to be too short of a period to improve results. It is important to note that adjusting the learning effort may go both ways – when students realise that the expected benefits are not as high as they were assuming, it lowers their motivation to learn.

In the Mexican RCT by Avitabile and de Hoyos (2015), three years after the intervention, the treatment group performed better by 0.29 standard deviation in mathematics and the effect on test scores in Spanish was also positive (0.1 standard deviation) but not statistically significant. Furthermore, students from the treatment group self-assessed their learning effort more favourably, by 0.24 standard deviation. The effects on school outcomes of providing information were also observed by Nguyen (2008). Notably, responsiveness occurred in both directions. Measured a few months after the intervention, students were found to

have adjusted their effort in line with the expected return from schooling – the outcomes increased for those who underestimated the return from the educational investment, but at the same time decreased for those who overestimated it. Providing information in the form of statistics raised test scores in the treatment group by 0.2 standard deviation at the end of the school year. The size of the effect was smaller in schools where role models were added to provide the information – the increase in scores was a little lower, by 0.1 standard deviation. It seems critical that students identify with the role model, as the effect was greater for students from low-income backgrounds who were informed by a role model who was also from a low-income background – test scores increased by 0.27 standard deviation. The greatest response to the intervention was for students who initially underestimated the returns from education – their scores increased by 0.37 standard deviation. The update of beliefs also had negative results, as the learning outcomes of students overestimating the results of schooling decreased by 0.22 standard deviation. In an experiment by Fryer (2016), the information provided neither impacted test scores nor the index of self-reported learning effort, measured less than one year after the intervention. However, at the end of secondary school (four years after the intervention), the treatment group had higher scores in English than students in the control group by 0.18 standard deviation. In the Chilean experiment by Dinkelman and Martínez (2014), providing information did not raise average test scores measured five months after the intervention. The study's authors suggested two possible explanations for the lack of an effect on test scores: first, the timing of the follow-up, which may have been too early to improve outcomes; and second, the lack of complementary input, such as quality teaching or textbooks. In the Columbian intervention (Bonilla 2016), there was no treatment effect on test results 5 months later.

Effects on College Enrolment

Increasing college enrolment and the proportion of the population with HE degrees is a strategic goal of developed countries. The US and European Union's goal for HE is 60% of 25- to 34-year-olds by 2020 with at least an associate degree (U.S. Department of Education Strategic Plan: Fiscal Years 2014–18) and at least 40% of people aged 30–34 having completed higher education (European Commission's Europe 2020 Strategy). Developing countries are also trying to catch up with building their human capital, as raising college completion rates is becoming a national priority. However, the results of the analysed studies show that providing information is not an effective policy tool to increase college entry. It seems that an information intervention is not enough to increase enrolment in HE, because even if they exist, information barriers are not the main constraints to continuing education.

Positive effects of information provision were noted by Loyalka, Song and Wei (2013), as college enrolment in low-income Chinese regions increased by 6.7 percentage points (12.7%). In the Chilean study by Dinkelman and Martínez (2014), enrolment in a college preparatory high school increased by 6.3 percentage points (10%) for students required to choose a new school in grade 9. In Germany, the effects of the intervention on college applications were substantial (in most colleges, students are accepted without selection) – an increase by 11.9 pp. (18.4%), but surprisingly, there was no effect on plans to pursue higher education, which shows that college intentions are not always a good predictor of actual behaviour (Ehlert et al., 2017). In the RCT by McGuigan et al. (2016) in the UK, there was no change in students' plans to apply for university, which the authors explained as the result of an announcement

about increasing college tuition fees coinciding with the intervention. Bettinger et al. (2012) in North Carolina (USA), found that providing information alone had no effect on enrolment, showing that interventions targeted to raise participation in HE should combine the provision of information with assistance in applying for financial aid (the information and counselling intervention increased enrolment by 7.7 percentage points). In Italy (Barone et al., 2017), Finland (Kerr et al., 2015), the USA (Fryer, 2016; Rosinger 2016; Carell and Sacerdote, 2014), Chile (Hastings et al., 2015) and Colombia (Bonilla et al., 2016), information interventions had no impact on enrolment in HE.

Effects on Using Financial Aid

In many countries where HE is financed from private sources, financial aid programmes or preferential loans support low-income, high-achieving students. However, eligible students often do not use these possibilities of securing financial aid and do not enrol (Hoxby and Turner 2015). The hypothesis put forward is that students are not aware that they qualify for financial aid for their education. The results from the interventions showed that despite many students being uninformed about the possibilities of financing their studies, providing information was not sufficient to induce students to apply for higher education, as other constraints were behind the non-uptake of financial aid. To achieve better effects, information interventions should be accompanied by some tutoring in the application process, because in addition to imperfect information, students often lack the skills of applying for financial aid, fail to complete aid forms or miss deadlines.

Loyalka et al. (2013) showed that after providing information, students in the treatment group were about 4 percentage points (30%) more likely to receive needs-based grants. In the RCT by Dinkelman and Martínez (2014), the frequency of students planning to use loans increased by 4.6 percentage points, but there was no effect on plans to apply for scholarships. The responsiveness to the information provided was linked to students' abilities (see the heterogeneity section below). In the experiment by Bettinger et al. (2012), students who received information and assistance in applying for funding were substantially more likely to submit the aid application, whereas providing information about financial aid without assistance had no effect on application rates, receipt of aid or financial award value. The information intervention did not influence financial aid uptake in the Hoxby and Turner (2015), Booij et al. (2012), Rosinger (2016), or Bird et al. (2019) studies.

Effects on Changing Educational Preferences

The HE market has become more complex and returns from courses and institutions differ substantially. Students do not always know which courses to choose to avoid a future skills mismatch or problems with finding a job. The analysed information experiments show that informing students about the labour market perspectives of different choices can encourage choices that are more profitable for individuals and society.

Hoxby and Turner (2015) showed that the information intervention had positively influenced university choices for high achieving students from low-income families. Treated students submitted 19% more applications to universities than students from the control group, were 27% more likely to submit at least five applications to better quality universities, and finally, they enrolled in better universities. In the intervention by Avitabile and de Hoyos

(2015), the provided information only changed the educational preferences of female students, who switched to upper secondary school subjects with greater expected labour market returns (see the treatment effect heterogeneity section below). In the experiment of Hastings et al. (2016), students who overestimated future earnings were more likely to change their preferences of courses, but not of HE institutions. The net value of chosen degrees increased after the intervention, especially for students from low SES families who tended to choose courses with lower expected earnings (increase of 3.4% in comparison to mean net value). The intervention had no impact on a move towards longer degree programmes, degree programmes with higher graduation or dropout rates. In the Italian intervention (Abbiati Argentin, Barone, Schizzerotto, 2018), students changed their preferences, resigned from investing in weak fields of study (-2.9%) and more often preferred vocational tertiary education (1.6%). Positive effects on changing preferences were also found in the intervention by Wiswall and Zafar (2015) – 12.3% of the students switched their intended course of study after being informed about average earnings by discipline; however, the revision of the preferences was both upwards and downwards. Kerr et al. (2015) reported that the information intervention did not increase the number of applications in students' portfolios and did not lead students to apply for courses with higher expected returns, which may have been due to the timing of the intervention, as it took place only 6 months before applying to HE institutions. However, those students who had been negatively surprised by the information provided were more likely to change their preferences than other treated students. Loyalka et al. (2013) showed that the information interventions did not influence students' preferences, understood as the intent to apply to military college or to different tiers of college.

Heterogeneity of the Treatment Effect

The average responsiveness to the intervention may be masked by substantial sub-group heterogeneity, such as gender, SES or ability level. Knowledge about which groups are likely to be the most affected by the intervention should help in the preparation of differently targeted measures.

Gender

A gender differentiated response to the intervention was frequently investigated in the various studies, but the results were mixed. In some studies, a higher responsiveness of female students was observed, which could be used to improve the labour market situation of women and to decrease the gender income gap. The mechanisms of the higher responsiveness of female students are not clear, but it seems that providing more gender specific information can yield positive results.

In Avitabile and de Hoyos' (2015) RCT, greater learning effort was reported for female students (female: 0.35 s.d.; male: 0.11 s.d.) and their average scores increased by 0.26 s.d. while no effect for males was manifested. Notably, although students did not receive specific information about course-related differences in returns from education, some girls from the treatment group moved from biology and chemistry courses (qualifying not only for enrolment to highly paid professions such as medicine, but also to low-paid nursing as an occupation) to economics, where expected returns were higher. Avitable and de Hoyos (2015) hypothesised that the intervention motivated girls to seek more detailed information about wages, which resulted in changing preferred courses to ones leading to higher expected earnings.

Despite this, gender differences were not found in the probability of the timely completion of secondary education. Wiswall and Zafar (2015) found that female students were more likely to update their beliefs about future earnings than male students. They were also more likely than males to update information in a Bayesian or alarmist way. A third study demonstrating the greater responsiveness of female students was reported by Loyalka et al. (2013). Providing information increased the likelihood of female students to attend college by 10.7 percentage points and had no significant impact on male students. Female students were also 9.9 percentage points more likely to obtain financial aid, especially needs-based grants. Nevertheless, the intervention did not change female preferences, understood here as choosing a military university or applying to a more selective type of institution. In contrast, Fryer (2016) showed that after the intervention, the level of valid beliefs about earnings was greater for male than for female students. Kerr et al. (2015) reported that boys from less-educated neighbourhoods increased their number of applications and were more likely to apply to courses for which average incomes were higher than they expected by 0.14 log points. The authors claimed that increasing the expected value of a portfolio was linked both to a higher probability of acceptance (information about the acceptance rate was also provided in the intervention) and higher average earnings. McGuigan et al. (2012) as well as Hoxby and Turner (2015) did not identify gender related differences in the responsiveness to information.

Social and Economic Background

Low SES students are often the most poorly informed and could be responsive to treatment if only other, mainly financial constraints did not have a dominant influences on their choices. As the target group in some interventions was already narrowed to low SES students, it is not easy to draw conclusions about responsiveness with respect to socio-economic background.

Jensen (2010) targeted students from relatively poor families, but the intervention had a large effect on the least poor students who increased their schooling by 0.33 years over the next 4 years, the likelihood of returning for the next school year by 7 pp. (11%), and their likelihood of completing school improved by 5 pp. (13%). Although students from the least poor and the poorest groups similarly increased their perceived returns, no effect on all three measures was later found. These differences showed that beyond information constraints, other constraints, mainly financial, also limited schooling. The Italian experiment showed an interesting heterogeneity of results, where students received more personal information, e.g. the costs of a preferred institution or the chances of graduating by SES (Abbiati et al., 2018). The strongest effect of the intervention was among students from the most educated families who shifted towards intermediate fields of studies (5.2%). Students from less educated families favoured vocational programmes (2%) more and often resigned from moderately rewarding fields (4.3%). The intervention deepened social inequalities, which the authors interpreted within the framework of the Breen and Goldthrope (1997) Rational Action Theory, explaining that students from less educated backgrounds chose the safer option of study, while students from more educated families wanted to enhance their investment in human capital to maintain their social position. Loyalka et al. (2013) showed that the information intervention increased the likelihood of low SES students to obtain financial aid by 4 percentage points, but the students' likelihood of attending college, the selectiveness of the college or the probability of obtaining needs-based grants were not differentiated by SES. Hastings et al. (2015) reported a substantial information gap between high and low SES students choosing courses in higher education. However, the information

intervention had a small but statistically significant effect on low SES students' educational preferences, as they changed to courses with higher expected earnings – the net value of their chosen degree (course + HE institution) increased by 3.4%. Although the Bonilla et al. (2016) intervention did not have an effect on overall exam results, treatment group students from middle-income families improved their scores in mathematics by 8.2% standard deviations and language by 7.1% standard deviations. In the Finnish experiment (Kerr et al., 2015), boys from less educated neighbourhoods changed their preferences and applied to courses with higher expected returns; however, no effect was observed on enrolment. Avitable and de Hoyos (2015) found that the difference between students coming from different backgrounds was insignificant.

Final remarks

The findings from 19 information interventions on the costs and benefits of an investment in education were reviewed. Some groups of students make educational choices possessing very inaccurate information – they often overestimate costs and underestimate the benefits of education. This is more characteristic for students from developing countries and students with a low SES background who are not familiar with the education system. In developed countries, students are more aware of the higher profitability of a longer learning period and often overestimate the benefits of education, but they do not see the heterogeneity of returns by fields of study or HE institution. The information interventions have some effect on updating beliefs regarding expected earnings or educational costs. It should not be implied that all students entirely change their beliefs, but rather that a greater number of students have more complete information about the educational investment. Despite existing information constraints, providing information on the profitability of education is a rather ineffective tool for improving secondary school completion, raising higher education enrolment or the uptake of loans and financial aid, since factors beyond a lack of knowledge dominate in the decision-making about these phenomena. The most promising strategy seems to recommend the information intervention for the purpose of raising the learning effort and shifting student preferences towards selective institutions and courses with higher expected returns. These could contribute to decreasing social inequalities in education, as students with a low SES tend to choose less selective HEIs and courses with lower expected earnings. The effects can be expected to be proportionately greater in developing countries where information constraints are a greater hurdle.

The timing of the intervention and providing more specific and targeted information seems critical to the effects. Interventions were more effective when information was provided several years before the moment of making a choice rather than a few months before this time (too late). Despite the fact that students immediately updated their beliefs, they still needed time to apply the new information. Also, choices regarding investments in education are often determined by earlier choices of education paths and a few months before the start of the recruitment process to a higher level of education is often not enough to change anything significantly. The same can be applied to the effect on school outcomes, which was only perceptible in a longer perspective. Information interventions can only be effective when the constraints are diagnosed correctly and knowledge is provided to respond to the main problems, such as biased beliefs about future earnings, lack of knowledge about how to finance education, or suboptimal choices in highly differentiated systems.

The effect size for the information interventions is rather small, but as such, the programmes are inexpensive and easy to conduct, they are suitable measures for application in education policies. Information interventions are generally highly cost effective. As described by Hoxby and Turner (2015), the intervention cost was estimated at $6 per student. Dinkelman and Martínez (2014) estimated the cost at $13.1 per person and $11.20 per family. Some authors did not mention the exact cost of the intervention per student but described it as low (e.g. Avitabile and de Hoyos 2015; Kerr et al., 2015; Hastings et al., 2015). Only Fryer's (2016) intervention was more expensive – $250 per student, since providing the information required cell phones and incentives (telephone credit).

Research on the effects of information provision is still a developing field. In the future, more emphasis should be placed on understanding how students develop their beliefs about educational investments and on establishing the best time for the intervention. Greater insight is needed about why many students still do not respond to the information provided, even if they update their beliefs.

References

Abbiati, G., Argentin, G., Barone, C., Schizzerotto, A. (2018). Information barriers and social stratification in higher education: evidence from a field experiment. *The British Journal of Sociology*, *69*(4), 1248–1270.

Akerlof, G. A. (1970). The market for "lemons": Quality uncertainty and the market mechanism. *The Quarterly Journal of Economics*, *84*(3), 488–500.

Avitabile, C., de Hoyos, R. (2015). The heterogeneous effect of information on student performance. Evidence from a randomized control trial in Mexico. Policy Research Working Paper No. 7422. Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/22845.

Ball, S. J., Vincent, C. (1998). 'I heard it on the grapevine': 'Hot' knowledge and school choice. *British Journal of Sociology of Education*, *19*(3), 377–400.

Barone, C., Schizzerotto, A., Abbiati, G., Argentin, G. (2017). Information barriers, social inequality, and plans for higher education: Evidence from a field experiment. *European Sociological Review*, *33*(1), 84–96.

Becker, G. S. (1975). *Human capital. A theoretical and empirical analysis, with special reference to education*. New York: National Bureau of Economic Research.

Bettinger, E. P., Long, B. T., Oreopoulos, P., Sanbonmatsu, L. (2012). The role of application assistance and information in college decisions: Results from the HandR Block Fafsa Experiment. *Quarterly Journal of Economics*, *127*(3), 1205–1242.

Bird, K., Castleman, B., Denning, J., Goodman, J., Lamberton, C., Ochs Rosinger, K. (2019). Nudging at scale: Experimental evidence from Fafsa Completion Campaigns. NBER Working Paper No. w26158. https://ssrn.com/abstract=3439168.

Bonilla, L., Bottan, N., Ham, A. (2016). Information policies and higher education choices. Experimental evidence from Colombia. http://dx.doi.org/10.2139/ssrn.2546835.

Booij, A. S., Leuven, E., Oosterbeek, H. (2012). The role of information in the take up of student loans. *Economic of Education Review*, *31*(1), 33–44.

Bouguen, A., Gurgand, M. (2012). Randomized controlled experiments in education. *Analytical Report No. 11.* European Expert Network on Economics of Education (EENEE). http://www.eenee.de/dms/EENEE/Analytical_Reports/EENEE_AR11.pdf.

Breen, R., Goldthorpe, J. H. (1997). Explaining educational differentials: Towards a formal rational action theory. *Rationality and Society*, *9*(3), 275–305.

Carrell, S., Sacerdote, B. (2014). Late interventions matter too: The case of college coaching in New Hampshire. *NBER Working Paper 19031*. https://ies.ed.gov/ncee/wwc/Study/73500.

Dill, D. D., Soo, M. (2004). Transparency and quality in higher education markets. In A. Amaral, D. Dill, B. Jongbloed, and P. Teixeira (Eds.), *The rising strength of markets in higher education: The case of mature economies*. Dordrecht: Kluwer Academic Publishers.

Dinkelman, T., Martínez, A. C. (2014). Investing in schooling in Chile: The role of information about financial aid for higher education. *The Review of Economics and Statistics*, *96*(2), 244–257.
Duflo, E., Glennerster, R., Kremer, M. (2007). Using Randomization in Development Economics Research: A Toolkit. *Discussion Paper No. 6059*, Centre for Economic Policy Research. 10.3386/t0333.
Duflo, E., Saez, E. (2003). The role of information and social interactions in retirement plan decisions: Evidence from a randomized experiment. *The Quarterly Journal of Economics*, *118*(3), 815–842.
Dupas, P. (2011). Do teenagers respond to HIV risk information? Evidence from a field experiment in Kenya. *American Economic Journal: Applied Economics*, *3*, 1–34.
Ehlert, M., Finger, C., Rusconi, A., Solga, H. (2017). Applying to college: Do information deficits lower the likelihood of college-eligible students from less-privileged families to pursue their college intentions?: Evidence from a field experiment. *Social Science Research*, *67*, 193–212.
Fryer, R. G. (2016). Information, non-financial incentives, and student achievement: Evidence from a text messaging experiment. *Journal of Public Economics*, *144*, 109–121.
Glewwe, P., Kremer, M., Moulin, S. (2009). Many children left behind? Textbooks and test scores in Kenya. *American Economic Journal: Applied Economics*, *1*(1), 112–135.
Hastings, J., Neilson, C. A., Zimmerman, S. D. (2015). The effects of earnings disclosure on college enrollment decisions. *NBER Working Paper 21300*, 10.3386/w21300.
Hoxby, C. M., Turner, S. (2015). What high-achieving low-income students know about college. *American Economic Review*, *105*(5), 514–517.
Jensen, R. (2010). The perceived return to education and demand for schooling. *The Quarterly Journal of Economics*, *125*(2), 515–548.
Kane, T. J., Avery, C. (2004). Student perceptions of college opportunities: The Boston COACH Program. In C. M. Hoxby (Ed.), *College decisions: The new economics of choosing, attending and completing college*. Chicago: University of Chicago Press.
Kerr, P. S., Pekkarinen, T., Sarvimäki, M., Uusitalo, R. (2015). Post-secondary education and information on labor market prospects: A randomized field experiment. *IZA DP No. 9372*. http://ftp.iza.org/dp9372.pdf.
Liebman, J. B., Luttmer, E. F. P. (2015). Would people behave differently if they better understood social security? Evidence from a field experiment. *American Economic Journal: Economic Policy*, *7*(1), 275–299.
Loyalka, P., Song,Y., Wei, J., Zhong, W., Rozelle, S. (2013). Information, college decisions and financial aid: Evidence from a cluster-randomized controlled trial in China. *Economics of Education Review*, *36*, 26–40.
Manski, C. F. (1993). Adolescent econometricians: How do youth infer the returns to schooling? In C. T. Clotfelter, and M. Rothschild (Eds.), *Studies of supply and demand in higher education*. Chicago: University of Chicago Press.
McGuigan, M., McNally, S., Wyness, G. (2016). Student awareness of costs and benefits of educational decisions: Effects of an information campaign. *Journal of Human Capital*, *10*(4), 482–519.
Miguel, E., Kremer, M. (2004). Worms: Identifying impacts on education and health in the presence of treatment externalities. *Econometrica*, *72*(1), 159–217.
Nguyen, T. (2008). Information, role models and perceived returns to education: Experimental evidence from Madagascar. Job Market Paper, MIT. https://www.povertyactionlab.org/sites/default/files/documents/Nguyen %202008.pdf.
Simon, H. (1957). *Models of man, social and rational: Mathematical essays on rational human behavior in a social setting*. Wiley.
Schweinhart, L. J., Montie, J., Xiang, Z., Barnett, W. S., Belfield, C. R., Nores, M. (2005). *Lifetime effects: The High/Scope Perry Preschool study through age 40*. High/Scope Press.
Spence, M. (1973). Job market signaling. *The Quarterly Journal of Economics*, *87*(3), 355–374.
Stiglitz, J. E. (1975). The theory of "screening", education, and the distribution of income. *American Economic Review*, *65*(3), 283–300.
Wiswall, M., Zafar, B. (2015). How do college students respond to public information about earnings? *Journal of Human Capital, 9*(2), 117–169.
Word, E., Johnston, J., Bain, H. P. (1990). *Student Teacher Achievement Ratio (STR) Tennessee's K-3 Class Size Study, Final summary report 1985–1990.* Nashville: Department of Education.

Table 1.
Main effects of information interventions

Type of effect	Study	Magnitude of the effect of the intervention
School results		
	Nguyen (2008)	School results – 0.2 sd
	Dinkelman, Martínez (2014)	School results – no effect
	Avitabile, de Hoyos (2015)	Mathematics – 0.29 sd Spanish – no effect Self-assessed level of effort put into learning – 0.24 sd
	Fryer (2016)	School results 4 years later – 0.17 sd School results in short time perspective – no effect Self-reported effort in short time perspective – no effect
	Bonilla (2016)	School tests – no effect
School attendance and completing secondary education		
	Nguyen (2008)	School attendance – 3.5 pp. Return to school the following year – 4 pp. 0.20 more years of schooling over the next four years Completing secondary school – no effect
	Jensen (2010)	Attendance (information in form of statistics) – 3.5 pp. Attendance (information provided by role model) – no effect
	McGuigan, McNally and Wyness (2016)	Intentions to stay in fulltime education – 3 pp.
	Dinkelman, Martínez (2014)	Attendance – 8 pp.
	Avitabile, de Hoyos (2015)	Completing upper secondary school on time – no effect
	Fryer (2016)	Attendance – no effect

Type of effect	Study	Magnitude of the effect of the intervention
College enrolment		
	Bettinger, Long et al. (2012)	Enrolment – no effect
	McGuigan, McNally, Wyness (2016)	Plans to enrol in college – no effect
	Loyalka, Song, Wei (2013)	Enrolment – 6.7 pp
	Dinkelman, Martínez (2014)	Enrolment in college preparatory high school – 6.3 pp. Plans to enrol in college – no effect
	Kerr et al. (2015)	Enrolment – no effect
	Fryer (2016)	Enrolment – no effect
	Bonilla (2016)	Enrolment – no effect
	Hastings et al. (2015)	Enrolment – no effect
	Rosinger (2016)	Enrolment – no effect
	Bird et al. (2019)	Enrolment – no effect
	Ehlert et al. (2017)	College application – 11.9 pp.
	Carell, Sacerdote (2014)	Enrolment – no effect
Using financial aid		
	Bettinger, Long et al. (2012)	Completing financial aid form – no effect Aid receipt – no effect Financial aid amount – no effect
	Booji, Leuven, Osterbeek (2012)	Loan take-up – no effect
	Loyalka et al. (2013)	Probability of receiving needs-based grants – 4 pp.
	Hoxby, Turner (2015)	Probability of applying for financial aid – no effect
	Dinkelman, Martínez (2014)	Plans to use loans – 4.6 pp. Plans to use scholarships – no effect
	Rosinger (2016)	Using financial aid – no effect Amount of borrowed aid – no effect
	Bird et al. (2019)	Using financial aid – no effect

Type of effect	Study	Magnitude of the effect of the intervention
Changing educational preferences		
	Loyalka, Song, Wei (2013)	Preferences to apply to military college – no effect Preferences to apply to different tiers of colleges – no effect
	Avitabile, de Hoyos (2015)	Changing sub-tracks – no effect
	Hoxby, Turner (2015)	Number of submitted applications – 19% At least 5 submitted applications – 27% Applying to better quality universities – 34 points in SAT scores, 7% higher graduation rate, 22% higher instructional spending and 21% higher student-related spending Accepted at more selective universities – 10% higher graduation rate, 14% higher instructional spending and 14% higher student-related spending Enrolled in better universities – 6% higher graduation rates, 8.6% higher instructional spending and 10.4% higher student-related spending
	Kerr et al. (2015)	Number of applications – no effect Applying to courses with greater expected returns – no effect
	Bonilla (2016)	Probability of enrolling to top 10 colleges – 0.4–0.6 pp.
	Hastings et al. (2015)	Change in preferences for majors with higher net value – 3.4% Change in preferences for HE institutions – no effect Moving towards longer degree programmes – no effect Moving towards degree programmes with higher graduation rates – no effect Moving towards degree programmes with higher dropout rate – no effect
	Abbiati et al. (2018)	Choosing vocational tertiary education – 1.6% Choosing weak fields of studies – 2.9%

Table 2.
Main characteristics of interventions

	Article	Size of the treatment and control group	Country	Year of intervention
1.	Abbiati, Argentin, Barone, Schizzerotto (2018); Barone, Schizzerotto, Abbiati, Argentin (2017)	31 high schools in the treatment group, 31 high schools in the control group	Italy	2013–2014
2.	Avitabile, de Hoyos (2015)	26 high schools in the treatment group, 28 high schools in the control group	Mexico	2009
3.	Bettinger, Long, Oreopoulos, Sanbonmatsu (2009)	7 864 individuals in the FAFSA assistance and aid interpretation group, 1 319 individuals in the information-only group, 7 557 individuals in the control group	USA (North Caroline)	2008
4.	Bird et al. (2019)	800 000 students	USA	
5.	Bonilla (2016)	120 school – 60 in the treatment group and 60 in the control group	Colombia	2013
6.	Booij, Leuven, Oosterbeek (2011)	1 914 students in the treatment group, 1 898 students in the control groups	Holland	2007
7.	Carell, Sacerdote (2014)	120 students in the treatment group, 902 students in the control group	USA	2013–2014
8.	Dinkelman, Martínez (2014)	56 schools in students treatment group, 56 schools in family treatment group, 114 schools in the control group	Chile	2009
9.	Ehlert, Finger, Rusconi, Solga (2017)	27 schools – 8 schools in the treatment group, 19 schools in the control group	Germany	2013–2014
10.	Fryer (2016)	3 treatment groups, each of 490 students and one control group of 437 students	USA (Oklahoma)	2010–2011
11.	Hastings, Neilson, Zimmerman (2015)	24 162 students in the treatment group, 25 004 students in the control group	Chile	2012
12.	Hoxby, Turner (2015)	31 928 students in the treatment group, 7 749 students in the control group	USA	2010

	Article	Size of the treatment and control group	Country	Year of intervention
13.	Jensen (2010)	2 250 students in both groups (treatment and control)	Dominican Republic	2001
14.	Loyalka, Song, Wei, Rozelle (2013)	20 high schools in the treatment group, 21 in the control group	China	2008
15.	McGuigan, McNally (2012)	27 schools in the treatment group, 27 in the control group	Great Britain	2010–2011
16.	Nguyen (2008)	7 treatment groups and 1 control group – 80 primary schools in each group	Madagascar	2001
17.	Kerr, Pekkarinen, Sarvimäki, Uusitalo (2015)	97 schools in the treatment group, 266 schools in the control group	Finland	2011
18.	Rosinger (2016)	1 100 students in the treatment group, 1 555 students in the control group	USA	2013
19.	Wiswall, Zafar (2013)	501 students in the treatment group, 115 students in the control group	USA	2010