Altruism, Cooperativeness and Academic Achievement: A Lab in the Field Experiment in French Middle Schools

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December 2024

Abstract

In this exploratory study, we investigate how altruism and cooperativeness are related to educational achievement. We run a lab in the field experiment with pupils from Middle Schools in Brittany, France, to study whether altruism and cooperativeness are correlated with educational success. Contrary to expectation, we find no significant relationship between cooperativeness and educational performance. In contrast, altruism is negatively related with academic achievement, but this relationship is gender-driven, as it is only significant for boys.

Keywords: lab-in the field; education; altruism; cooperativeness; teenagers

JEL Codes :C70;A13;C92

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This research was funded by the PIA (Programme d'Investissement d'Avenir e-Fran), and the Region of Brittany. We have benefited from valuable comments by Roberto Brunetti, Grazia Cecere, Seda Ertac, Marc Gurgand, Fabien Moizeau, Angela Sutan, Lucile Henry and seminar participants at LESSAC, CREM, and PROJECT. We are grateful to Elven Priour for helping to program the experiment, Valentin Journé for his R program, and Clémence Dedinger, Matthieu Pourieux, Madeg Le Guernic and Lila Le Trividic Harrache for helping to run the experiments. We also thank the School Headmasters for accepting to host these experiments, and the pupils and their parents for their participation. All remaining mistakes are our own.

1. Introduction

Deciding how much to invest in education is probably one of the most important economic decisions that people make in their life. Education determines many individual lifetime outcomes, such as earnings (e.g. Psacharopoulos and Patrinos 2004; Heckman et al., 2006a), employment opportunities (Rephann, 2002), and many socioeconomic outcomes like health, delinquency and voting (e.g. Lochner, 2011; Grossmann 2006). Understanding the factors that shape school performance is therefore of great importance.

Until recently, the economics of education literature mainly emphasized the role of intellectual skills in educational attainment (e.g., Cunha and Heckman, 2007; Spence, 1973). Over the past two decades, however, researchers have increasingly focused on the relationship between socio-emotional skills and academic achievement. These skills encompass a range of abilities and personality traits, such as self-control, perseverance, and conscientiousness, which are now widely acknowledged as essential for educational success (e.g., Shoda et al. 1990; Heckman et al., 2006b; Heckman and Rubinstein, 2001; Duckworth and Seligman, 2005; O'Connor and Paunonen, 2007; Burks et al., 2009; Oreopoulos,2007; Castillo et al., 2011; Moffitt et al., 2011; Almlund et al., 2011; Komarraju et al. 2011; Rosander et al., 2011; De Feyter et al. 2012; Sutter et al., 2013; Benjamin et al., 2013; Golsteyn et al., 2014; Vedel et al. 2015; Lavecchia et al., 2016; Levitt et al., 2016; Koch et al., 2015; Algan & Huillery, forthcoming)).

Recent studies have gone beyond simple correlations to provide causal evidence of the effects of intellectual and socio-emotional skills on educational performance. In particular, a growing body of literature has examined the impact of classroom-based interventions targeting intellectual skills (e.g. Berger et al., 2020; Brown et al., 2022; Schunk et al., 2022)[4] or socio-emotional development (e.g. Heller et al. 2017; Alan and Erta, 2018; 2019; Bettinger et al., 2018; Alan, Bonva, and Ertac, 2019; Yeager et al., 2019; Hart et al., 2020; Alan et al. 2021; Algan et al., 2022; Cipriano et al., 2023; Alan and Mumcu, 2024 ; Huillery et al., 2024; Sorrenti et al., 2024)[5] on educational achievement, showing

[4] For instance, Berger et al. (2020) report that an intervention targeting working memory improves both intellectual and socio-emotional skills, with effects lasting up to four years. Brown et al. (2022) find that cognitive endurance training enhances student performance. Similarly, programs targeting working memory and cognitive endurance have been found to positively impact academic achievement (Schunk et al., 2022).

[5] Classroom-based interventions aimed at fostering traits such as grit, perseverance, curiosity and self-control have shown significant improvements in academic achievement (e.g., Alan and Ertac, 2018, 2019; Alan, Bonva, and Ertac, 2019; Algan et al., 2022; Bettinger et al., 2018; Alan and Mumcu (2024) ; Huillery et al., 2024). Interventions promoting a growth mindset—encouraging students to believe that intellectual abilities can be developed—have been proven to enhance academic outcomes (Yeager et al., 2019). Broader socio-emotional learning programs, which include skills such as emotional regulation, perspective taking, and interpersonal competence, also yield measurable gains in academic outcomes (Cipriano et al., 2023; Sorrenti et al., 2024; Hart et al., 2020, Heller et al. 2017). Cipriano et al. (2023) conducted a meta-analysis of

a positive effect of such programs. These findings highlight the growing recognition of socio-emotional skills as critical determinants of educational success and underscore their potential for shaping effective educational policies and interventions.

While the link between several socio-emotional skills such as self-control, perseverance or conscientiousness and academic success is well-documented, less is known about the relationship between socioemotional skills related to social interactions such as altruism or cooperativeness and academic performance.[6] Accurately measuring these skills poses significant challenges, due to biases in self-reported measures. Social desirability bias often leads respondents to provide answers they perceive as socially acceptable, while the lack of cost for reporting prosocial behaviors may encourage overreporting. Furthermore, the reliability of these measures depends on respondents' ability to engage in complex reasoning and accurately evaluate their own cognitive traits—a task that can be particularly challenging for children and teenagers.

The aim of this exploratory study is to attempt to address the issues mentioned above by investigating to what extent altruism and cooperativeness are related to academic achievement through a lab-in-the-field experiment with 432 middle school students in Brittany, France. A specific contribution of our study is the use of behavioral tasks that expose teenagers to incentivized choices, making the revealing of prosocial behaviors costly and minimizing biases in the assessment of their cognitive traits. Specifically, the experiment consists of three different games: i) a repeated Voluntary Contribution Mechanism (VCM hereafter) to measure cooperativeness[7]; ii) a Modified Dictator Game to get a measure of altruism[8]; and iii) a two-stage real-effort game where participants choose their preferred remuneration scheme between a tournament and a flat-wage scheme before exerting a real

school-based SEL programs, concluding that these programs are generally effective. Sorrenti et al. (2024) find that a randomized intervention targeting eight-year-old children's socio-emotional skills in Switzerland has long term effects on high school completion and university enrollment. Other studies have nuanced these results by showing that the effects diminish over time (e.g. Hart et al., 2020).

[6] Altruism and cooperativeness can be considered as both social preferences and socioemotional skills. As social preferences, they represent individuals' values and choices, such as prioritizing others' welfare or acting fairly, often measured through behavioral experiments (e.g., dictator games, public good games, ...). They also operate as socioemotional skills, viewed as abilities that enable individuals to manage their social interactions effectively. As we are focusing on academic achievement in our study, the reference to socioemotional skills is more relevant and helpful to examine the relation between altruism and cooperation and academic performance.

[7] The public goods game is a popular experimental method in economics used to study cooperation and social dilemmas. In this game, individuals decide how much of their private endowment to contribute to a shared public account. Contributions benefit all participants, but individuals face a tension between maximizing personal gain (free-riding) and contributing to the collective good. The game provides insights into cooperative behavior, group dynamics, and the impact of incentives or punishment mechanisms. Without incentives, contributions often decline over time as participants observe free-riders benefiting without contributing. Many participants are conditional cooperators, contributing more when others do so (e.g. Ledyard, 1995; Chaudhuri, 2011).

[8] The dictator game is a widely used experimental tool in behavioral economics to study altruism and prosocial behavior. In this game, one participant (the "dictator") is given a certain amount of money or resources and must decide how much,

decoding task[9]. These measures are complemented by administrative school achievement data, ensuring robust and objective performance metrics.

There are only a few other papers which examine the relationship between altruism or cooperativeness and educational performance and this literature provides rather mixed findings. Regarding the relationship between altruism and educational achievement, some studies have found a negative correlation between generosity in a dictator game and performance on cognitive tests (Brandstatter and Guth, 2002; Ben-Ner et al., 2004; Ponti and Rodriguez-Lara, 2015; Benjamin et al., 2013). In contrast, other studies have found a positive relationship between altruism and performance or intellectual skills (Millet and Dewitte,2007; Houser and Schunk, 2009). Finally, some studies find no clear-cut evidence (Benjamin et al., 2013). Regarding the relationship between cooperativeness and academic results, the existing literature seems to be more consensual showing that cooperativeness is positively correlated with school performance (e.g. Jones, 2008; Englmaier and Gebhardt, 2016; Galizzi and Navarro-Martinez, 2015; Horn and Kiss, 2018).

Our paper attempts to complement these studies by resorting to young adolescents aged between 12 and 13 whereas most of studies mentioned above involved university students (see Sutter et al., 2019 for an overview of economic experiments with children and adolescents). The focus on younger participants is justified by the fact that socio-emotional skills evolve significantly during childhood. Using a lab-in-the-field approach provides a unique method for assessing socio-emotional skills in young individuals by directly observing their behavior in controlled naturalistic settings. This approach enables the collection of objective data while minimizing the biases often associated with self-reported or third-party evaluations. Another originality of our paper is that we consider a wide range of school subjects or disciplines such as Mathematics, English (as foreign language) and History-Geography whereas most of previous studies focus on GPA or on a single school subject. Examining grades by subject allows for a more nuanced analysis of how socioemotional skills correlate with academic performance across various domains. Indeed, we may reasonably argue that achievement in Mathematics, English or History- Geography does not necessarily require the same skills and may not correlate in the same way with cooperativeness and altruism. For instance, we may conjecture that problem-solving in mathematics is probably more suited to individual efforts where students

if any, to share with another participant (the recipient). The recipient has no power to influence the outcome. Since the dictator's decision is entirely voluntary, the amount given is interpreted as a measure of their altruistic tendencies (e.g. Forsythe et al., 1994; Berg et al., 1995; Andreoni & Miller, 2002; Engel, 2011).

[9] The two-stage real-task effort game is an experimental design often used to measure competitiveness and preferences for performance-based versus equal-pay remuneration schemes (Niederle and Vesterlund, 2007; Charness et al. 2014).

work independently to solve logical problems. Conversely, studies in English, which involve communication, as well as in history and geography, are probably better suited to collective work, where tendencies to cooperate or help others can be more valued.

To anticipate our results, contrary to expectations, we find no evidence of any significant relationship between cooperativeness and school achievement. In contrast, we observe that altruism is negatively correlated with pupils' success in most of the disciplines. This is consistent with several previous studies (Brandstätter and Güth, 2002; Benner et al. 2004; Ponti and Rodrigez-Lara, 2015). Moreover, the negative relationship between altruism and school achievement is stronger in Mathematics and is gender-driven. Indeed, altruism and academic success are negatively correlated only for boys. We also observe that, on average, girls exhibit more prosocial behaviors than boys and after controlling for altruism and cooperativeness, they tend to outperform boys slightly in terms of grades. All these findings suggest that socioemotional skills are correlated with academic success, but with differences across disciplines and gender.

The remainder of the paper is organized as follows. Section 2 sets out the experimental design, and Section 3 the behavioral predictions. Section 4 presents our results. Finally, section 5 discusses our main findings and concludes.

2. Experimental Design

This section begins by discussing the various approaches to measuring socioemotional skills in young individuals, then provides an overview of our experimental setup, and concludes with a detailed description of the behavioral tasks.

2.1 Measuring socioemotional skills

Socioemotional skills are challenging to observe directly, requiring the use of alternative methods for their measurement. The three main widely-used methods rely on student-reported questionnaires, teacher-reported questionnaires, and behavioral tasks. Self-reported measures, such as those used in PISA, are practical for collecting data from large and diverse samples and have proven effective in assessing socio-emotional skills (e.g., Falk et al., 2023; Murtin et al., 2018). But they are prone to biases such as social desirability—where individuals exaggerate prosocial tendencies to conform to social norms—and self-perception errors which can be shaped by individual reference points, intellectual abilities, and cultural context. (Chen et al., 2020; Laajaj *et al., 2019,* Laajaj et al., 2021). Moreover, these self-report methodologies were primarily developed and validated for adult populations, where

they tend to be more reliable. Adults generally possess greater introspective capacity, a clearer understanding of with social expectations, and better comprehension of hypothetical scenarios or abstract survey questions, leading to a closer alignment between their responses and actual behaviors. In contrast, these factors often diminish the reliability of self-reports among younger populations.

In comparison, behavioral tasks offer an alternative to self-reports by directly observing decision-making under incentivized conditions. This approach involves tasks where participants make trade-offs, requiring them to incur a tangible cost to reveal prosocial behaviors, while ensuring the task content is unrelated to the measured outcome. Such methods have proven effective in assessing behavioral traits among children and teenagers and have shown predictive power in explaining real-world behaviors (see Sutter et al., 2019).

While this study employs behavioral games to measure altruism and cooperativeness, we acknowledge their limitations and the context-specific nature of these methods compared to large-scale surveys like PISA. Boon-Falleur et al. (2022) found that self-reported questionnaires often outperform teacher-reported and behavioral tasks in measuring self-oriented traits, such as conscientiousness and impulsivity. Nevertheless, assessing socio-emotional skills related to others, such as cooperativeness and altruism, is more challenging due to increased risks of social desirability bias and differences in reference point. Behavioral games capture socio-emotional skills within specific, incentivized experimental conditions. In contrast, self-reported measures, such as those used in PISA reflect broader perceptions and attitudes, often influenced by social norms and individual self-assessments. These methodological differences imply that results from behavioral games and PISA surveys cannot be directly compared, as they capture distinct dimensions of socio-emotional skills. However, behavioral games allow for a closer observation of decision-making processes in concrete, real-life scenarios. While these methods are not without limitations—such as their dependence on task design and challenges related to scalability—they offer a valuable complement to surveys, enriching our understanding of how prosocial behaviors emerge and interact with educational environments.

2.2 Procedures

In this section we provide information on how the schools were selected and to what extent they are representative of French schools. Our experiment took place in five Middle Schools in Brittany, France, in October 2018. 432 adolescents aged between 12 and 13 from 22 7^{th}-grade classes participated in the experiment. Schools participating to the experiment were all part of a broader research program about the role of digital practices on education funded by the Ministry of Education (*Programme d'Investissement d'Avenir e-Fran*) and the Region of Brittany. As a pilot region for this

program, the regional Board of Education selected five schools intended to ensure some representativeness in Brittany in terms of location (rural vs urban middle schools), status (private versus public school) and social status of the family. Precisely, we have two schools located in a large urban area of 460,000 inhabitants and three schools located in rural areas Four out of five schools involved in the program are public schools.

In France, each middle school is characterized by its index of social positioning (ISP) that measures the average social status of the family attending this school.[10] The five schools in the sample have an index ranging from 96 to 127. Thus, there exists some diversity among our schools, in terms of parental social economic status although we have neither elite schools nor segregated schools. Table 1a shows the main characteristics of each school of the sample.

[Table 1a: about here]

Participation in the experiment was conditional on parental acceptance. 27 parents refused to let their child participate. Thus, 543 out of 570 students were allowed to participate, representing an attrition rate of only 4 percent. Note that neither parents nor students were informed about the details of the experiment, except for the way the pupils would be rewarded.

We ran the experiment using a mobile laboratory with 20 tablets, which allowed us to apply conditions very similar to those found in a traditional laboratory (see Appendix A.1). We emphasized the strict anonymity of decisions, and that there were no 'right answers'. Participants were forbidden to chat to each other during the experiment. At the beginning of the experiment, we carefully explained each game's rules and ran comprehension tests to ensure that the students fully understood the rules. Since our mobile laboratory was limited to 20 computers, students in each class were randomly chosen to participate in the experiment. The remaining students were asked to fill out a survey. A total of 432 participants was randomly selected to participate in the program.

In May 2019, we returned to our five schools to obtain pupils' grades in English, Mathematics, History

[10] The index of social position is a composite index created in 2016 by the French Ministry of National Education for measuring the social situation of students with regard to family context in French schools. The index is determined from the parents' professions, socio-professional categories and diploma. The ISP index ranges from 38 to 179. The higher this index, the more favorable the family context of the student is for his/her academic success. In 2019, the average social position index of the French middle-schools was 103. The ISP is less than 81 in the 10% most disadvantaged middle schools and above 124 in the Top 10% of middle-schools. In practice, the value of ISP associated with each parent's occupation is determined by the weighted average of characteristics such as diplomas, cultural practices, material conditions, cultural capital, and parental involvement in schooling and education success. Therefore, once the parents' occupations have been collected, the reference values of the IPS is applied. The social index of a school is assessed by calculating the average IPS of all the students who attend it.

and Geography, and their GPA for the first semester of the current academic year. The collection of individual grades via the school administration produces a reliable school-achievement measure for the pupils who participated in the experiment. In this way, we avoid any measurement bias that might occur if educational outcomes were assessed during experimental sessions. Of the 432 initial participants, 3 were excluded from the sample as they did not provide all of the information in the post-experiment survey. Furthermore, in the time between the experiment and our second visit, seven pupils changed school without having any grades for the Spring semester. Our final sample thus covers 422 pupils. Table 1b shows the number of participants in the experiment per school and per class. A session corresponds to a class, which gives a total of 22 sessions ranging from 15 to 20 students.

[Table 1b: about here]

Although it is a standard procedure in experimental economics to use monetary incentives to elicit meaningful responses from participants, it is often difficult or even impossible to use these incentives with children. Paying children in cash may not be allowed by all of the parties involved, including parents and School Headmasters. Furthermore, teachers may prohibit children from bringing cash to school. Last, it can also be reasonably argued that children do not have a precise value of money. To circumvent these difficulties, most experimenters do not use cash payments as incentives, and prefer using gift certificates (e.g. Harbaughet al. (2002); Bettinger and Slonim (2007); Castillo et al. (2011)).[11] We here awarded children tokens according to their choices that could be converted at the end of the experiment into vouchers, gifts (for example, mugs and pencils) or candies. That provided durable and immediate rewards to incentivize participants similarly independent of their preferences for a given gratification. The average value of gifts was around 8 Euros. This is consistent with Fehr et al. (2008), who assess weekly pocket money at 4.7 Euros for 10-11 year-olds and 6.5 Euros for 12-13 year-olds. The feedback from children and teachers indicated that the remuneration scheme did incentivize participants.

[11] For instance, Harbaugh et al. (2002); Bettinger and Slonim (2007), and Castillo et al. (2011) used vouchers or small gifts as rewards to elicit risk aversion. Harbaugh et al. (2007) gave subjects an endowment of five white poker chips before each round instead of cash. Subjects knew that they could use these tokens to purchase goods such as fancy pencils, small stuffed animals, superballs and toy airplanes from a store that they set up at the end of the experiment. Fan (2000) used coupons for the school store. Children could then use these coupons to purchase stationery, milk, juice or snacks. Gummerum et al. (2010) and Benenson et al. (2007) used stickers in a dictator game as young children value stickers. Payoffs in toys, stickers or candy represent significant changes in children's budget constraints and are generally enough to make them think carefully about their decisions.

2.3 The experimental games

Our experiment consists of three different games: *i*) a repeated Voluntary Contribution Mechanism (VCM hereafter) to capture a measure of cooperativeness; *ii*) a Modified Dictator Game to measure altruism; and *iii)* a two-stage real-effort game where participants chose their preferred remuneration scheme between a tournament and a flat-wage scheme before exerting a real task.[12] This latter game provides us a proxy of individual ability or skills that will be included as control variables in our regressions. All pupils played the three games above. We kept the same order of games: the public-good game was played first, then the modified dictator game, and last the real-effort task (see the instructions of the games in Appendix A.2).[13]

The first game is a repeated voluntary contribution mechanism (VCM) played during six periods. The VCM is a commonly used game to measure cooperativeness and to study the conflict between individual and group incentives. At the beginning of the game, players are matched in groups of four. The composition of the group remains the same for the entire game (*partner* matching protocol). At each period, each participant is endowed with 20 tokens and has the opportunity to allocate a part of her endowment to a group account. Participants simultaneously choose the portion of their endowment to contribute to the group account. They make this contribution decision by entering the number of tokens they wish to contribute in an appropriate field on their screens and clicking on another field to confirm their decision. At the end of each period, participants are informed about the total number of tokens invested in the group account. Each token contributed to the group account yields a payoff of 0.5 tokens to each of the four members of the group. Each token not contributed to the group account remains in the participant's private account. Therefore, the payoffs, in tokens, for each individual i in a given period equal[14] :

[12] A fourth game was played between the VCM game and the dictator game. This was a VCM game with the possibility for the participants to assign non-monetary rewards and sanction to their group members. This game was played during six periods. The decisions of this game are not presented here as it is beyond the scope of this study. Since the outcome of this game was not revealed to the children, we believe it should have had little to no influence on their decisions in the dictator game and real-task effort game. All of the games were programmed using Z-tree (Fischbacher, 2007).

[13] We acknowledge that there could be order effects. However, to limit this possible bias, participants were informed about their payoffs only at the end of the experiment. Furthermore, participants' partners were separately randomly assigned in each of the three games and this was common knowledge.

[14] An alternative design might have been to elicit conditional cooperativeness using the strategy method (e.g., Selten, 1967; Fischbacher et al., 2001; Fischbacher and Gächter, 2010) used it to measure individuals' preferences for conditional cooperation. Specifically, with the strategy method, participants are asked to indicate for each possible average contribution of other group members how much they would contribute to the public good. However, using this method also has drawbacks, particularly when applied to children. Indeed, it may be complex because the strategy method requires employing a contribution schedule (i.e., a vector of contributions), which is not an easy task. Additionally, calculating the payoffs resulting from players' contribution choices in the public goods game (PGG) using the strategy method is very demanding, even for adults (see Hermes et al., 2020 for a discussion). Furthermore, using the strategy method may be longer than the hot method, and we were constrained by the need to conduct the experiments within class time. For these reasons, we opted for the standard hot VCM game. It is important to note, however, that our VCM was repeated over six periods with partner matching which introduces a certain conditionality to our game.

$$E = 20 - c_i + 0.5\sum_{k=1}^{4} c_k \quad (1)$$

where c_i corresponds to player *i*'s contribution. It is easily seen from (1) that individual *i*'s earnings are maximized at $c_i = 0$. Therefore, if the game is played once, there is a dominant strategy to contribute zero. If the game is finitely repeated, the only subgame perfect equilibrium of the game is still for all players to contribute zero in each period.

The second game of the experiment is a modified dictator game based on Berg et al. (1995). In this game, each participant *i* is endowed with 50 tokens and has the opportunity to give a share of this amount to another randomly chosen participant *j* in the classroom. At the same time, another participant *k* has the opportunity to share her endowment with participant *i*. The participants take their decisions simultaneously and therefore are not informed of others' decisions when making their own choice.[15] The payoff function of this game for each player *i* is

$$\pi_i = 50 - S_{ij} + S_{ki}, \quad (2)$$

where S_{ij} is the number of tokens sent by player *i* to player *j* and S_{ki} the number of tokens received by player *i* from player *k*.

The third game is a two-stages real-effort game (Charness *et al.*, 2014). Participants are asked to decode sets of numbers into letters from a grid of letters displayed on their tablet during three minutes (see Appendix A.2 for details). We chose a simple task that does not require any specific skills and is sufficiently fastidious to induce disutility for participants. Participants can solve as many problems as they like and are free to not decode any letter as long as they do not communicate with other participants.[16] Participants are continuously informed of their current number of correct answers. If a submitted answer is wrong, the participant has to decode the same letter until the correct answer is provided. Before the decoding tasks, participants are asked to choose their preferred remuneration scheme between a flat wage and a tournament scheme, being informed that their preferred scheme will be the one implemented.

If the participant chooses the flat wage, her payoff is 50 tokens irrespective of the numbers of letters

[15] One may argue that the pairing of each player with another and the simultaneous decision-making process may give rise to anticipated (or pre-emptive) reciprocity. In this case, players who would give money in the dictator game might be motivated by a form of "pre-emptive reciprocity". In other words, they may expect their partner to give money and may reciprocate accordingly. This possibility could result in an upward bias in the perceived level of altruism. However, we doubt that this effect, if present, is substantial given the precautions taken to explain the game. Moreover, we argue that this should not undermine the correlation between altruism and academic success. More importantly, the significant advantage of this experimental design lies in its ability to provide a measure of altruism for each participant.

[16] Experimenters usually provide participants with alternative uses of time in traditional laboratory settings. Our design did not offer these kinds of leisure activities. This might lead to participants exerting effort to avoid boredom. To mitigate this effect, we made clear to participants that they were free not to decode any letters and take a nap or do whatever they wanted as long as they were quiet.

decoded. If the participant chooses the tournament, the player who decodes more tasks correctly is awarded 80 tokens, while the counterpart receives 20 ECU. Ties are broken by a random draw. Once the three minutes have elapsed, the computer displays a summary screen of the two counterparts' respective performance.

These measures of effort in the decoding task and remuneration choice will be used as proxy of ability and will be considered as controlled variables in our data analysis. Indeed, although the decoding task does not require any specific skills, it may provide a proxy of some form of individual ability such as speed or ability to concentrate. In the same vein, the remuneration choice may potentially correlate with educational achievement by capturing some abilities that may correlate with academic success. For instance, one may reasonably argue that students who have a good academic level are more confident and more likely to choose the tournament. [17]

3. Theoretical Predictions and Behavioral Assumptions

We begin by considering the relationship between cooperativeness (captured by the contribution to the public good) and educational achievement. The empirical literature on the relationship between cooperativeness and performance is relatively scarce but tends to report a positive relationship between cooperativeness and performance. Using data from a meta-analysis from1959-2003 based on experiments run in various universities, Jones (2008) finds a positive relationship between university average SAT score and cooperation in prisoner's dilemma experiments. Other studies have shown that behavior in the public-good game is generally positively correlated with effort and school performance (see for instance Horn and Kiss, 2018; Englmaier and Gebhardt, 2016).[18] Using non-experimental data, Caprara et al. (2000) find that prosocial attitudes measured at age 8 are strong predictor of educational achievement. The literature also provides compelling evidence of a relationship between IQ, and more broadly cognitive abilities, and cooperation (Burks et al., 2009; Lohse, 2016; Al-Ubaydli et al., 2016; Benito-Ostolaza et al., 2016; Baghestanian and Frey, 2016). Burks et al. (2009) observe a positive relationship between participant IQ and cooperation in a sequential Prisoners' Dilemma. In

[17] We thank an anonymous reviewer for this comment.

[18] For instance, Horn and Kiss (2018) find that cooperative preferences measured by the amount of money offered in a public-good game are also strongly correlated with GPA. However, the authors point out that the relationship is non-linear: students who offered around half of the possible amount had significantly higher GPAs as compared to those who offered none or all of their money.

three one-shot public-good games, Lohse (2016) finds a positive relationship between cognitive abilities, measured via CRT (Cognition reflection test) scores, and cooperation.[19]

A possible reason for explaining this positive relationship between cooperativeness and academic success is that cooperativeness could reflect a form of social intelligence as well as an ability to anticipate future gains associated with long term cooperation (e.g. Alexrod, 1984). This may be particularly the case when social dilemma is repeated under a partner matching protocol as shown by experimental evidence from repeated public good games (e.g. Fischbacher et al. 2001; Keser and Van Winden, 2000). This is also consistent with the idea that classroom education could be considered as a public good (Lazear, 2001) where cooperativeness may improve the in-class performance of students, which may not only benefit others but also oneself.

Altogether, based on this literature, we conjecture that greater cooperation in the public-good game is associated with better educational performance:

Hypothesis 1 *(Cooperativeness): More cooperative teenagers have greater academic achievement.*

Our second conjecture concerns the relationship between altruism measured by the amount given in the dictator game and educational achievement. Although altruism and cooperativeness are related concepts, they have distinct meanings. Indeed, pure altruism as captured by decisions in a dictator game is unconditional and involves one-sided acts of kindness or generosity without any expectation of any personal benefit in return. In contrast, cooperativeness typically involves mutual benefit or reciprocity, where individuals cooperate with others with the expectation of receiving benefits in return. This distinction can have consequences regarding the sign of the relationship between altruism and academic achievement. Indeed, since there are *a priori* no long-term gains to be expected from giving in the dictator game, unlike cooperation in the repeated public good game, we might expect a less clear relationship between altruism and academic achievement, or even a negative one. Indeed, several conflicting viewpoints are clearly put forward in the debate.

On one hand, some research suggests a potential negative relationship between altruism and academic achievement. Precisely, some authors posit that altruistic decisions may simply reflect a lack of rationality, as altruistic actions are often viewed as resulting in pure loss for oneself without any

[19] A notable exception is Al-Ubaydli et al. (2016) who tested the relationship between cognitive ability and cooperation in a finitely repeated prisoner's dilemma game, and found no direct correlation between the two measures. Interestingly, their results suggest that high ability might be associated with greater cooperation only if all group members have higher cognitive ability.

benefit in return. Consequently, such irrational decisions would be less likely to be made by individuals with strong intellectual abilities (e.g. Ben Ner et al. 2004). Ben Ner et al. (2004) summarize this as follow: "*perhaps Machiavellians are right that only fools are kind when there is nothing in it for them*." Another potential explanation for expecting a negative relationship between altruism and academic achievement could be that the time and effort spent helping others may come at the expense of dedicating sufficient time and effort to one's own achievement. This is consistent with Holmström and Milgrom (1991)'s multitask theory in which the performance in one task may affect the performance in other tasks. So there would be a trade-off between altruistic behavior and educational attainment. Altruistic individuals may allocate a significant amount of their time and resources towards helping others, leaving them with less time and energy to focus on their own academic pursuits.

In sharp contrast, other authors have argued that the relationship between altruism and educational achievement may be positive as altruism may reflect a form of social intelligence ("too smart to be selfish"). Indeed, altruism can demonstrate an individual's ability to understand and empathize with the needs and feelings of others, which are key components of social intelligence. It may reflect a higher level of social awareness and a better understanding of social norms and expectations. For instance, Millet and Dewitte (2007) show that unconditionalaltruism behavior is related to general intelligence. Altruism may foster positive relationships with peers, but also potentially with teachers. For instance, Brañas-Garza et al., (2010) explored the relationship between social integration and altruistic behavior and found that more altruistic subjects are also more socially integrated.

Empirical research on the relationship between altruism and educational achievement is sparse and provides rather mixed findings. Some previous work has shown that participants with intellectual ability are more likely to be self-interested and maximize their payoffs in dictator games (Brandstätter and Güth, 2002; Ben-ner et al. 2004; Ponti and Rodrigez-Lara,2015). For instance, Brandstätter and Güth (2002) find a negative relationship between giving in a dictator game and performance on cognitive tests. Ben-Ner et al. (2004) also underline a negative relationship between giving in a dictator game and performance on a cognitive-ability test. Ponti and Rodriguez-Lara (2015) ran different forms of dictator games and sorted participants into groups by their CRT scores. They find that reflective participants, characterized by higher cognitive ability, are more selfish in standard dictator game.[20] In sharp contrast, other studies have come to the opposite conclusion or reported mixed evidence. For instance, Millet and Dewitte (2007) observe a positive relationship between the Raven Progressive Matrix test of cognitive ability and altruistic behavior, suggesting that altruism may be a

[20] Although indirectly related to educational achievement, Piff et al. (2010) found that individuals from upper class background levels (which is often highly correlated with higher education) are less altruistic in economic games, keeping significantly more laboratory credits—than did lower-class participants who shared more of their credits with a stranger.

costly signal used by intelligent participants to signal cognitive abilities to others. Based on an experiment involving schoolchildren, Houser and Schunk (2009) find that children who are very good at mathematics tend to be more generous than those with relatively lower math grades. Finally, some studies find no clear-cut evidence (Benjamin et al., 2013; Chen et al., 2013).[21]

Altogether, empirical evidence is mixed and there are arguments both for a positive or a negative relationship between altruism and educational achievement. This suggests that this relationship is complex and could be potentially context dependent. Since there are arguments both for a positive and a negative relationship, we cannot therefore formulate a clear *ex-ante* hypothesis regarding the relationship between altruism and educational achievement. We can only state the following exploratory hypothesis:

Hypothesis 2 (altruism). *More altruistic teenagers have lower academic achievement if altruism primarily involves going against one's own interests.*

Our third conjecture concerns differences across school subjects. In our data, we collected grades for Mathematics, History and Geography, and English. One may reasonably argue that the relationship between cooperativeness or altruism and educational achievement may vary across subjects. The reason is that each academic subject requires specific intellectual abilities and that teachers may also value different socioemotional skills based on their teaching field. For instance, mathematics may demand stronger analytical, logical reasoning and problem-solving skills compared to other subjects such as English or History and geography. Furthermore, the nature of problem-solving in mathematics often leans towards individual efforts, where students work independently to solve problems. Altogether this may suggest that the positive relationship between either cooperativeness or altruism and educational achievement, if any, may be less pronounced for Math than for other subjects. This is consistent with some previous studies that have shown that agreeableness, which is a tendency to be friendly, cooperative, generous and prepared to compromise is negatively correlated with grades in mathematics (Levpuscek et al., 2013).

In contrast, one may reasonably argue that altruism and cooperativeness may be more valued

[21] Benjamin et al., (2013) found no clear evidence of any relationship between selfishness and cognitive ability. Chen et al., (2013) found that subjects with higher Grade Point Average (GPA) outcomes are more selfish in dictator decisions. However, by contrast, they also observe that subjects who perform better in the SAT are more generous in both the Dictator Game. The authors explain these different findings by the fact that although both the SAT and GPA outcomes provide a measure of cognitive ability, these two measures seem to be affected by factors other than cognitive ability.

in English. Indeed, in English class, communication with others and cooperativeness is promoted in activities such as group discussions and collaborative projects. Furthermore, some authors have shown that achievement in English as a second language can be indicative of an individual's ability to adjust to multicultural contexts and may reflect openness and agreeableness (Cao and Meng, 2020, Burke et al. 2009).[22] Concerning history and geography, the relationship with socio-emotional skills is less clear cut. Nevertheless, one may also reasonably argue that altruism and cooperativeness may be emphasized more in history and geography than in mathematics, as these subjects often explore human societies, social interactions, and the impact of collective actions. Moreover, History and Geography are subjects that are suitable for group work. This is consistent with Guchait (2021) who reports that academic achievement in geography was significantly positive correlated with Extraversion, Agreeableness, Conscientiousness and Openness. Based on this previous empirical evidence our conjecture is as follow:

Hypothesis 3. *We expect a stronger positive relationship between cooperativeness or altruism and grades in English or in History and Geography than in Mathematics.*

4. Results

4.1 Variables of interest

In this section we present our variables of interest.

School achievement. School achievement is measured by pupils' grades. In the French system, grades go from 0 (the worst) to 20 (the best) and are released in quarterly transcripts. We obtained the average grades in Mathematics and History & Geography grades for 422 students, and English grades for 303 pupils, for the first semester of the academic year 2018-2019 (the semester during which the experiments were conducted).[23] The Grade Point Average (GPA) is calculated as the average of the weighted grades taught including not only Mathematics, English and History & geography but all the school disciplines. Appendix A.3 displays the descriptive statistics for these educational-achievement measurements.

Cooperativeness and altruism. Cooperation is measured by the average number of tokens given over the six periods of the repeated public good game. Altruism is captured by the number of tokens

[22] Using the Big Five Personality test (conscientiousness, neuroticism, extraversion, openness, and agreeableness), Cao and Meng (2020) investigated the relationship between personality traits and academic performance in learning English as a second language from 555 Chinese university students. The authors found that conscientiousness, agreeableness, openness and extraversion positively predicted English achievement. Burke et al. (2009) focused on international students in Latin America and identified openness and agreeableness as positive predictors of adjustment to the multi-cultural contexts.
[23] One school did not provide us with the grades in English.

sent in the modified dictator game. The latter provides a pure measure of altruism while the number of tokens allocated to the group account in the repeated VCM mainly capture conditional cooperation.

Effort task and remuneration choice. The real-effort game gives us two additional variables of interest: the number of decoded tasks and the decision to enter the tournament. These variables can serve as proxies for individual ability. Indeed, even though the effort task does not require any particular skill, it can still reflect response speed, memory capacity and a certain form of intellectual ability. Similarly, choosing a tournament as a compensation system can indicate a taste for competition. Indeed previous work has shown that those who are more competitive are more likely to exert higher effort and that there exist important gender differences in competitiveness (Gneezy et al., 2003; Niederle and Vesterlund, 2007, 2011). Other studies have found that competitiveness also influences career choices, as the willingness to compete increases the likelihood of pursuing and for being accepted in competitive academic tracks (Buser et al., 2014; 2017; Kamas and Preston, 2012).[24] Furthermore, previous empirical evidence suggests that a more competitive environment is associated with greater school achievement (Azmat and Iriberri, 2010; Horn and Kiss, 2018).[25]

However, the remuneration choice variable should be interpreted carefully. Indeed, the tournament choice may not solely reflect individuals' taste for competition but also some degree of overconfidence and risk aversion (e.g. Van Veldhuizen, 2022; Lozano and Reuben, 2022).[26] For these reasons above, we should interpret both the effort task and remuneration variables with caution and consider them as proxies of abilities and control variables only.[27]

Socio-demographic characteristics. We collected a number of socio-demographics variables via the school administration and the post-experimental survey. These variables include gender, school dummies and parent's socio-economic status (henceforth SES).[28] The SES variable is a dummy variable

[24] For instance, in the context of high school students in the Netherlands, Buser et al. (2014) observed that competitiveness predicts the choice of STEM specialization in high school. In the same vein, Buser et al. (2017) found that after controlling for grades and performance in the experiment, students who compete are significantly more likely to choose a STEM specialization in Swiss academic high schools.

[25] Using a natural experiment with students in a high school in Spain, Azmat and Iriberri (2010) examined the effect of providing relative performance feedback information that allowed students to know if they performed above or below the class average. The authors found that provision of this information increased students' grades by 5%. These findings suggest that social comparison matter and that students care about their social image; they dislike appearing less performant than others. Horn and Kiss (2018) investigated experimentally the relationship between educational attainment and competitive preferences of bachelor students. The authors found that the most competitive students have higher GPAs.

[26] Ideally, it would have been necessary to control for the degree of risk aversion and elicit beliefs. However, the time constraints for running experiments during class time restricted the number of games for each session, hence preventing us to have incentivized tasks to measure risk aversion, time preference and various cognitive and socioemotional skills. Isolating these different factors is beyond the scope of this current study.

[27] We thank an anonymous reviewer for this helpful comment.

[28] Due to the fact that there is little variation in terms of age, the variable age is not considered in our data analysis.

that equals 1 if the pupil has at least one parent whose profession belongs to 'Executives and higher intellectual professions' or 'Intermediate professions' and zero otherwise. The SES variable is used as a proxy for family income, as children were not necessarily informed of their parents' income level or had a very imprecise understanding of it. It is important however to interpret this variable with caution because it only provides a partial indication of parental income level or human and cultural capital. For these reasons, this variable is introduced as a control variable for the family background.

4.2. Empirical strategy and endogeneity issues

This study focuses on the relationship between altruism or cooperativeness and academic achievement. However, it is important to note that we have to be cautious in interpreting our results as our data analysis does not allow for identifying any causality. Indeed, even though it is reasonable to presume that those endowed with certain socio-emotional skills perform better, the reverse relationship is also plausible. For example, it is possible that those with better results have more time to help others and thus will be more likely to cooperate with their peers.[29] For these reasons, our analysis does not pretend to establish any causality but rather contributes to highlight the existence of a relationship between altruism or cooperativeness and academic achievement.

Moreover, an additional concern relates to potential omitted variable bias (OVB), which could affect our estimated relationship between socioemotional skills and academic achievement. Specifically, unmeasured individual characteristics, such as parenting practices, personality traits, or other socio-emotional factors, may affect both altruism, cooperativeness and academic outcomes. For example, parenting styles that foster prosocial behaviors like altruism and cooperativeness might also encourage better study habits or academic performance, independently of the child's socio-emotional skills. Although we control for observable socioeconomic factors, these unobserved variables could introduce bias in our estimates, as they are not perfectly captured by social status or other included covariates.

4.3 Altruism, cooperativeness and educational achievement

Figure 1 shows the correlation between our different indicators of school performance and social-preference measures. The part above the diagonal of Figure 1 shows the basic Pearson correlation

[29] In the same vein, the relationship between effort task and achievement should also be interpreted in both directions as smart students could solve tasks more easily. Similarly, while it is possible to imagine that the most competitive individuals are the most successful, the other relation is also plausible. Indeed, one may also reasonably argue that smart students may believe that they will decode more tasks, and hence are more likely to choose the tournament.

coefficients along with the corresponding statistical significance thresholds ($p < 0.10$, $p < 0.05$, $p < 0.01$). The diagonal represents the distribution of each variable, while the bottom part displays the bivariate distribution, with the red line indicating the smoothed conditional means along with their corresponding confidence intervals. Table A4.1 in Appendix 4 displays the Pearson correlation table including the effort task and remuneration choice variables.[30]

Unsurprisingly, grades correlate with each other. Our analysis also reveals a positive correlation between altruism and cooperativeness ($rho = 0.328$, $p < 0.01$). Pairwise correlations reveal a negative correlation between altruism and school achievement in three out of four disciplines: GPA, Mathematics, and History-Geography. Finally, no significant correlation is found between cooperativeness and grades, which is inconsistent with Hypothesis 1.

[Figure 1: about here]

We extend this data analysis by conducting non-parametric tests based on pupils' rankings in terms of school achievement. Precisely, we distinguish between students whose grade is above or below the median grade in a given discipline among our entire sample. Our data indicate that students with higher grades compared to the median tend to display lower levels of altruism. Specifically, students with higher GPA are less altruist than those below the median grade. A non-parametric Mann-Whitney test indicates that this difference is statistically significant ($z=2.129$, $p< 0.033$; two tailed). Similar findings are obtained for Mathematics ($z=4.066$, $p<0.001$; two tailed), History and Geography $z=2.166$, $p<0.026$; two tailed), and English ($z=2.086$, $p<0.037$; two tailed). Next, we refine this approach by considering within-classroom ranking in the distribution. Namely, we consider the distance from the median achievement within each subject and classroom at the student level. We find consistent results for GPA ($z=2.111p<0.035$; two tailed) and Mathematics ($z=2.930p<0.0035$; two tailed), while we do not detect a statistically significant relationship for History and Geography ($z=1.275$ $p<0.182$; two tailed) or English ($z=0.475p<0.526$; two tailed).

Regarding cooperativeness, our data indicate that pupils with Mathematics grades higher than the median exhibit more cooperativeness ($p<0.021$; two tailed). We do not observe any statistically significant differences for the other disciplines.[31] The result for Mathematics is not robust when considering within-classroom differences, and we do not detect any statistically significant relationship

[30] As expected, we observe a positive correlation between effort task and grades, as well as between tournament choice and grades, as the number of letters decoded and the choice of the more competitive remuneration scheme are both proxies of cognitive abilities that should translate into better grades.

[31] We do not report the specific p-value for each test conducted here as they did not approach any of the conventional statistical significance thresholds: the closest p-value from a significant threshold is about 0.335.

when adjusting cooperation at the class level.

To provide more formal evidence of the relationship between altruism, cooperativeness and grades, we ran OLS regressions on school performance. Standard errors are clustered at the class level to control for interdependence of observations within each class. The findings are displayed in Table 2 for GPA, Mathematics, English, and History and Geography grades, respectively. Columns (1) to (3) present estimates for GPA while the remaining columns show findings for Mathematics, History & Geography, and English, respectively. We proceed incrementally by introducing socioemotional variables (altruism, cooperativeness) one by one, then introducing them together, and including effort task and tournament variables as proxies for individual ability.

[Table 2: about here]

Table 2 indicates that the altruism variable (measured in tokens) has a negative and significant coefficient for almost all grades except English. Note however that the size of this effect is relatively small. For instance, giving 10 more tokens in the dictator game translates into 0.23 points less on GPA and reduces the Math grade by 0.39 points. Note that the altruism coefficient associated to mathematics is significantly lower than the coefficient on GPA ($p< 0.0561$). These results remain robust after controlling for effort task and remuneration choice. Our findings suggest that altruistic pupils have lower grades, and in particular in mathematics. In line with hypothesis 2, this negative relationship may reflect the fact that altruistic teenagers are going against their own interests.

In contrast, the cooperation variable is never statistically significant in all estimates whatever the school subjects, which invalidates our first hypothesis. Contrary to expectations, there are no evidence of positive relationship between cooperativeness and school performance.

Concerning the control variables, we find that the effort task variable is associated to a positive and significant coefficient, which may reflect that those who are faster or have more memorization capacity perform better. The tournament variable also captures a positive and statistically significant coefficient in all estimates (except in history & geography). Table A5.1. in appendix A5 shows additional estimates with interaction variables ("effort task*remuneration scheme"). The intuition behind this interaction is that effort task under each remuneration scheme (tournament versus flat wage) may reflect different motivations. These estimates provide very similar findings.

The gender variable (girl) is positive and slightly significant in estimate (3), after controlling for altruism and cooperativeness, indicating that girls slightly outperform boys in term of GPA. This

variable is not significant in Mathematics and English. Finally, the SES variable captures a positive and significant coefficient (Haveman and Wolfe, 1995; Plug and Vijverberg, 2005; Langevin et al., 2017).

To control for the robustness of our findings, we standardized each variable of interest to facilitate comparison across classrooms, in order to express individual differences relative to the mean of the classroom's grade distribution.[32] This overcomes potential differences in teacher grading practices by ranking each pupil in terms of the class distribution. The results are presented in Table A5.2 in Appendix A.5, showing consistency with our initial analysis. Altogether, our main findings are summarized in Result 1.

Result 1. *a) Altruism is negatively correlated with most of grades, except for English. b) No significant relationship is found between cooperativeness and educational achievement*

4.4 Gender differences in educational achievement

Our findings above revealed some weak gender differences in educational achievement showing that after controlling for altruism and cooperativeness, girls slightly outperform boys in term of GPA. This is consistent with previous studies showing that girls outperform boys in many subjects (see OECD, 2022; Horn et al. 2022; Stoet and Geary, 2013; Else-Quest et al., 2010).[33] In this subsection, we analyze to which extent those differences may stem from the fact that males and females differ in terms of socioemotional skills. For this purpose, we proceed in two steps. We first test whether altruism or cooperativeness differ by gender (see sub-section 4.4.1). Then in sub-section 4.4.2., we analyze how these possible differences in socioemotional skills correlate differently with boys and girls' educational

[32]Precisely we z-score grades at the class level as follow: $\frac{X_{\{ik\}}-\overline{x\_\{jk\}}}{\sigma\_\{jk\}}$, where $X_{\{ik\}}$ is the grade of individual *i* in discipline *k*, $\overline{x\_\{jk\}}$ the class *j* average in discipline *k*, and $\sigma\_\{jk\}$ the grade distribution for class *j* in discipline *k*.

[33] According to the PISA 2022 survey (The OECD's Programme for International Student Assessment), girls score above boys in reading, in all but two countries (79 out of 81) (see also Horn et al. 2022; Stoet and Geary, 2013; Else-Quest et al., 2010). If we turn our attention to the French PISA data, girls outperform boys in reading by 20 score points in France (PISA report, 2022; see also Chabanon and Steinmetz, 2018). In foreign languages, especially in English, performance gaps between girls and boys are very pronounced at secondary school level in France, both in oral comprehension and reading comprehension. Girls achieve better results in English than boys (11 standard deviation points difference in oral comprehension; 18 points in written comprehension) (see Beuzon et daLiBard, 2017; Chabanon, and Steinmetz, 2018). In history-geography no gender difference is found between the average scores of girls and boys (Chabanon, Steinmetz, 2018). In contrast, boys outperform girls in mathematics by 10 score points (Pisa, 2022). Note however that some studies have shed light on the fact that girls perform now as well as boys in mathematics (e.g. Goldin et al. 2006; Hyde, 2008; Niederle and Vesterlund, 2010). For instance, using US data, Hyde et al. (2008) found no gender differences in math skills, which challenges the stereotype that males outperform females in mathematics.

attainment.

4.4.1. Gender differences in altruism and cooperativeness

Figure 2 displays the gender differences in socioemotional skills (cooperativeness and altruism). The part on the left side of the Figure 2 represents the average amount (over all six periods of the VCM) contributed to the group account by boys and girls, respectively. On average, girls allocate 59.5% of their initial endowment against 54.5% for boys. A Mann-Whitney test reveals that this difference is statistically significant, indicating that on average girls cooperate more than boys ($z = -2.10$, $p = 0.036$). This finding is consistent with previous studies that have shown that females are generally more co-operative than males (see Sutter et al. 2019 for an overview).[34] Note, however, that some studies show either an opposite relationship (Brown-Kruse and Hummels, 1993) or no difference between girls and boys (Harbaugh and Krause, 2000; Cipriani et al., 2013; Sutter et al., 2019).[35]

[Figure 2: about here]

The right-hand side of Figure 2 depicts the average number of tokens given in the dictator game. On average, pupils send 35.6% of their initial amount in the modified dictator game. Girls give 37.8% of their endowment against 32.9% for boys. A Mann-Whitney test shows that this gender difference is significant ($z = -1.94$, $p = 0.053$). This finding is consistent with previous studies showing that on average girls are more generous than boys (Bettinger and Slonim, 2006; Houser and Schunk, 2009; Horn et al. 2022; see also Sutter et al. 2019 for an overview).[36]

[34] For instance, Nowell and Tinkler, (1994) found that females are more cooperative than males in the context of public good experiment. Some studies also found gender differences in agreeableness, girls being more agreeable than boy (Bratko et al. 2006 Levpuscek et al., 2013).

[35] Based on a large literature review on experiments with children, Sutter et al. (2019) show that girls and boys do not differ noticeably in their likelihood and extent of cooperation but there is, nonetheless, a slight suggestive tendency for girls to cooperate more. For instance, Harbaugh and Krause (2000) examined the development of altruistic and free-riding behaviors in children aged 6 to 12 through public good and dictator experiments. They found that both boys and girls displayed similar patterns of contributions, with variations more closely tied to age and group attachment rather than gender. In the same vein, Cipriani et al. (2013) that examined whether prosocial values are transmitted from parents to their children found no gender differences in children's contributions to public goods games.

[36] Using experimental data with Hungarian high school students, Horn et al. 2022 find that females are significantly more altruistic than males. In the context of dictator games conducted in Ohio with children aged 6-14, Bettinger and Slonim (2006) found that girls give significantly more to their peers than boys do. Houser and Schunk (2009) found that gender differences in altruism (proxied by a dictator game) become stronger when the environment is more competitive. Using a sharing game, Decker et al (2015) found that girls of age 8 or 9 are significantly more likely than boys to choose the equal split allocation and hence are more altruistic. Other studies have shown that women are more altruistic than men (Eckel and Grossman, 1997; Dickinson and Tiefenthaler, 2002 and Selten and Ockenfels, 1998) and tend to prioritize fair and equal distributions more than men (Guth et al. 2001; 2007). In the context of ultimatum games, the female participants in Guth et al. (2001) are significantly more likely to propose an equal split. In Andreoni and Vesterlund (2001), women are

We also performed a similar analysis by documenting the gender differences in the likelihood to choose the tournament as a remuneration scheme and the corresponding effort. These findings are shown in Appendix 6. Our results are consistent with the literature, showing that males are more likely to choose the tournament while females are more productive than males in the flat wage setting.
We extent this descriptive approach in Table 3 by providing estimates on the determinants of amount sent in the dictator game (left part) and the average contribution to the group account in the public good experiment (right part).

[Table 3: about here]

Columns (1)-(3) of Table 3 confirm our previous findings indicating that girls give significantly more than boys in the modified dictator game. Columns (4)-(6) of Table 3 indicate that girls are on average more cooperative than boys. These findings are summarized in Result 2.

Result 2. *a) Girls are on average more likely to give positive amounts in the modified dictator game. b) Girls are more cooperative than boys in the VCM.*

We now analyze how altruism and cooperativeness are associated with academic achievement across genders. It is plausible that altruism and cooperativeness might have distinct associations with educational performance for girls compared to boys. For instance, cooperative and altruistic behavior may be valued differently by teachers based on students' gender. To test this, we replicate the estimates from Table 2 and incorporate interaction terms between gender and altruism or cooperativeness to account for gender differences. The findings are presented in Table 4.

[Table 4: about here]

Table 4 indicates that the coefficient for the interaction term "Altruism" and "Boy" is negative and significantly different from zero across all estimates, except for English. Conversely, the coefficient for the interaction term "Altruism" and "Girl" is not significant. This result suggests that the relationship between altruism and school achievement is primarily driven by male students. Additionally, the interaction term "Tournament" and "Boy" shows a positive and significant coefficient in all estimates, while the interaction term "Tournament x Girl" is insignificant, except in estimate (3) for English.

more altruistic when altruism is costly, while the opposite result holds when it is costless. Notables exceptions are Almas et al. (2017) who found no gender differences and Fehr et al (2013) who found that girls are significantly more likely to have egalitarian preferences than boys but that altruism is more frequent among males.

These findings are summarized in Result 3.

Result 3. a) *In most disciplines, there exists a negative relationship between altruism and educational achievement for boys. b) Altruism is not significantly correlated with educational achievement for girls.*

5. Conclusion and discussion

The relationship between socioemotional skills and children's educational achievement has received growing attention in recent decades (Lavecchia et al., 2016; Levitt et al., 2016; Koch et al., 2015). While most of this literature has focused on the role of time preferences, habits, information or beliefs (Castillo et al., 2011; Sutter et al., 2013), less is known about how socioemotional skills oriented toward others such as altruism or cooperativeness are related to educational attainment. In this current study, we attempt to contribute to the existing literature by conducting a lab-in-the field experiment in French middle schools to test the extent to which cooperativeness and altruism are correlated with children's educational attainment. We have three main findings.

First, we find a robust negative relationship between altruism and school achievement for most school disciplines. This is consistent with previous studies that have shown that participants with greater intellectual ability are more likely to be self-interested in dictator games (Brandstätter and Güth, 2002; Ben-ner et al. 2004; Ponti and Rodrigez-Lara,2015). This negative relationship seems to be particularly strong in mathematics, which may possibly be explained by the nature of problem-solving in mathematics that more often leans towards individual efforts compared to other subjects.

Second, we find no significant relationship between cooperativeness captured by the number of tokens allocated in the public good experiment and academic achievement. These findings differ from Horn and Kiss (2018) who found in their experiment that the amount of money offered in a public good game was associated strongly with GPA but in a non-linear way. Precisely, the authors reported that students who offered around half of their possible amounts had significantly higher GPAs than those, who offered none or all their money. A possible explanation for these differences relies on the fact that our experiment was run with younger individuals instead of university students.

Third, consistent with previous other studies, our data reveal gender differences in altruism and cooperativeness. On average girls send more tokens in the dictator game than boys and are more cooperative. Interestingly, we also find that the negative relationship between altruism and educational achievement is only significant for boys. While this result provides evidence of a relationship

between altruism and school achievement for boys, the limited sample size of girls leaves us uncertain whether this relationship is inexistent or of lower magnitude for girls.

This study is however not without a few limitations, which may offer additional avenues to extend this research. One can question the external validity of the study given the small number of participants. However, this study should be viewed as a preliminary investigation that calls for replications with a larger sample size. A second limitation concerns a possible selection bias in our sample of teenagers and external validity of our study. Indeed, one can argue that our sample was not randomly selected, but picked among middle schools that were voluntary to participate to a national research program. However, we took several precautions to avoid such selection bias. First, schools participating to the experiment were all part of a broader research program about the role of digital practices on education funded by the Ministry of Education. In this context, the regional Board of Education selected five schools in Brittany that were sufficiently representative in terms of location (rural vs urban middle schools), school status (private versus public school) and social status of the family captured by the ISP (Index of Social Position). A second precaution taken is that, for all the selected schools, we did not let the principals choose which class would participate to our experiments. Instead, we asked that all 7th grades classes, without exception, in each selected school were involved in the experiment.

A third limitation of this current study is that we are examining a rather narrow measure of altruism and cooperativeness. Indeed, we overlook other dimensions, such as the possibility that altruism and cooperativeness may correlate with a stronger friend network (e.g., Branas-Garza et al., 2010), which could enhance students' in-class performance through mutual support in homework and work in class.[37] Unfortunately, we do not have information on students' friendship networks, but this could be an interesting avenue for future research.

Another potential limitation of our study is that we focused our attention on altruism and cooperativeness leaving aside other factors likely to influence school success such as risk aversion, self-control or personality traits. We acknowledge that all these factors can explain individual differences in school achievement. Unfortunately, our experimental design was limited by practical and logistical constraints, which made impossible to run several additional games with the children. Due to the fact that our participants were teenagers with relative short attention spans coupled with the time constraints imposed by school time, we had to select a limited number of experimental tasks and our strategy was to focus on altruism and cooperativeness only. For this reason, we decided not to collect a complete set of preferences such as risk attitude or time preferences. In the same vein, we have only a limited

[37] We thank an anonymous reviewer for this comment.

information about the family background, in particular the family income, that is often considered as a key determinant of educational achievement. Indeed, we did not ask children about their parents' income as they may have no clue or a biased perception about their income. Such a question would contain too many measurement errors. Thus, we only have the SES variable as a proxy of the parental economic and cultural capital. A natural extension of this work would consist in collecting more detailed information about students' socioeconomic background and extensive intellectual and socio-emotional measures among a larger participants pool to conduct comprehensive heterogeneity analysis with sufficient statistical power.

Last, one might also argue that some choices of teenagers in the experiment may simply derive from the fact that participants felt committed to behave in a given direction in order to please the experimenter perceived as an 'authority' (see Zizzo, 2010 for an analysis of experimenter demand effects). Although we acknowledge that such effects may exist, we think that this interpretation is unlikely to account for our results for several reasons. First, we were careful to avoid excessive interactions with the pupils during the experiment. Second, a demand effect cannot explain the differences observed across games, such as differences in effort task under flat wage and tournament.

A number of topics for future research remain. A potential methodological extension could involve comparing comprehensive self-reported measures of socio-emotional skills with outcomes from behavioral tasks among children and teenagers following Boon-Falleur's et al. (2022)'s approach. This comparison could deepen our understanding of the nature of socio-emotional skills and identify the most effective methods for measuring them. Such an extension would combine the strong internal validity of lab experiments with the practicality and scalability of survey-based implementation.

An interesting extension may also consist in testing to what extent intergenerational persistence of altruism or cooperativeness may explain a part of the intergenerational correlation in educational achievement, as earlier evidence show that parents transfer to a certain extent their behavioral traits, ranging from personality to risk preferences (e.g. Chowdhury et al; 2022; Colombier and Masclet;2008)[38] Another natural extension of this study would consist in investigating in more details the observed differences across disciplines that were found in this current study. A third extension would consist in testing whether our results hold when considering alternative school-achievement measures.

[38] Using a large-scale experiment with 542 families from rural Bangladesh, Chowdhury et al, (2022) found significant evidence of intergenerational persistence of economic preferences. In particular both mothers' and fathers' risk, time, and social preferences are significantly positively correlated with their children's economic preferences, even when controlling for personality traits and socioeconomic background. Using French data from the European Community Household Panel Survey, Colombier and Masclet (2008) investigated the intergenerational correlation among the self-employed. Their findings suggest that self-employed workers transfer not only financial capital and career-specific skills but also managerial and more broadly preferences for autonomy and risk to their children.

Last, it would be of interest to consider the long-term relationship between altruism or cooperativeness and labor market outcomes.

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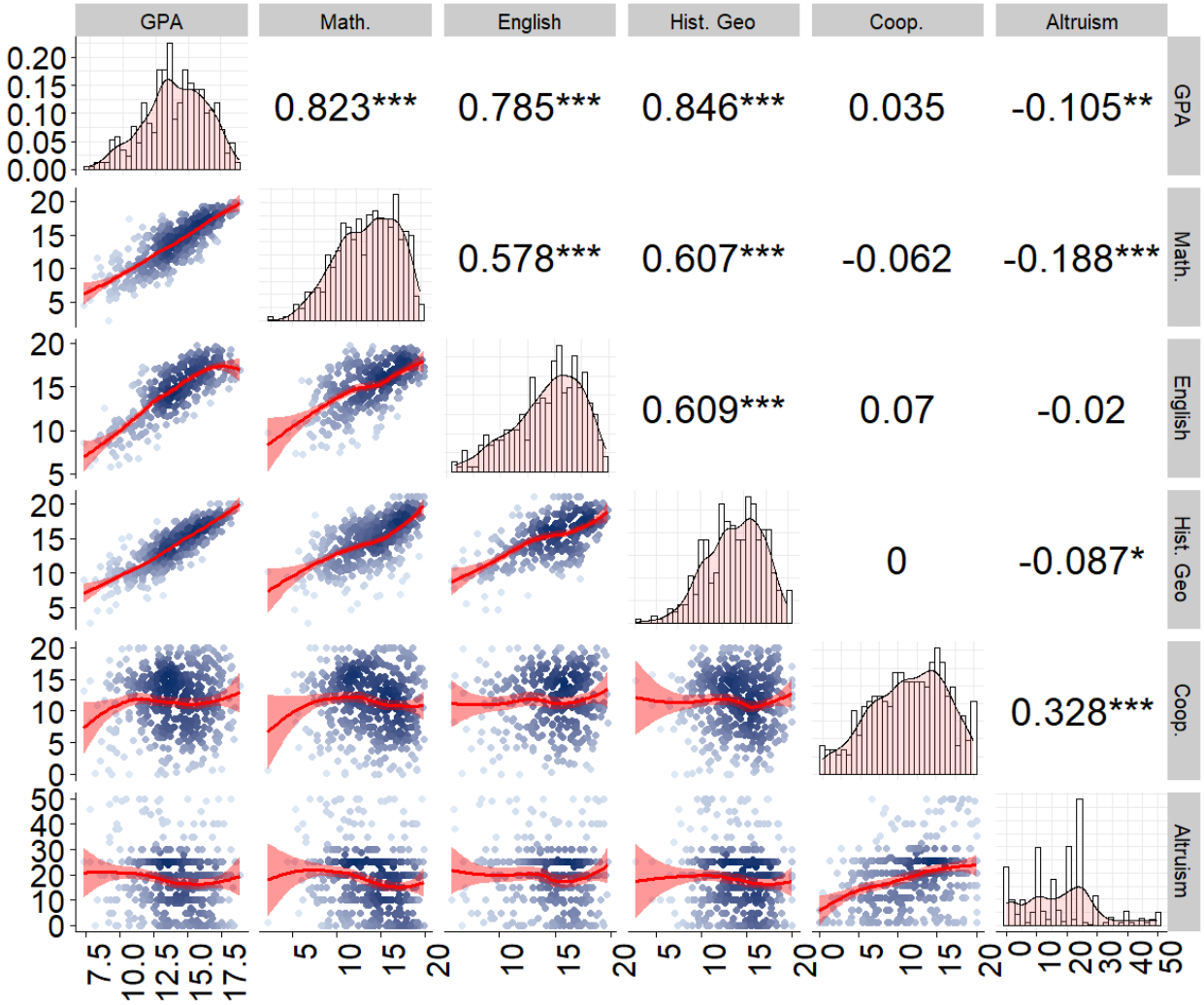
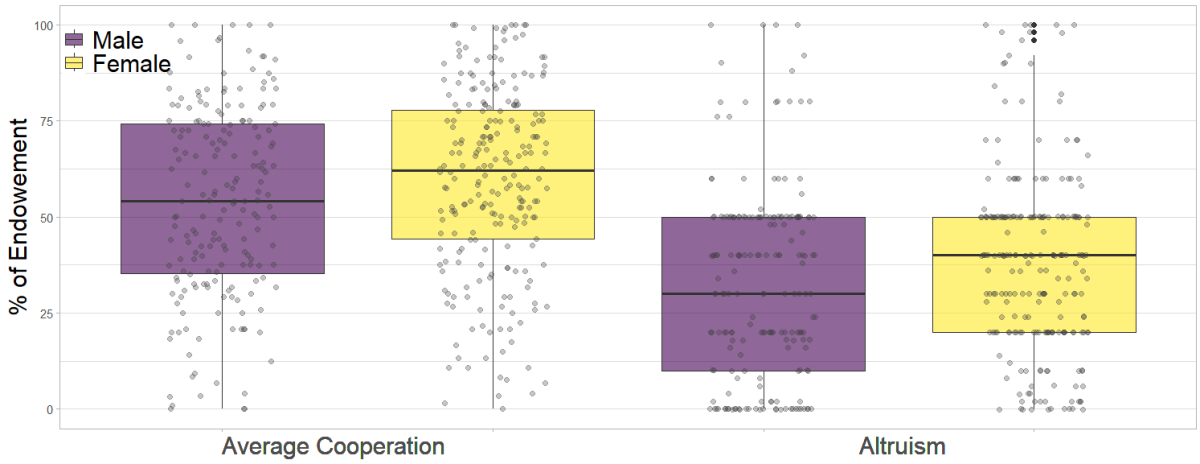
Figure **1.** Social preferences and academic achievement



Note : The figure illustrates the relationship between our main variables of interest. The upper right part shows the Pearson correlation index and its corresponding statistical significance using conventional thresholds (***0.01 **0.05 *0.10). The diagonal represents the distribution of the variable of interest. In the left bottom part of the figure, the bivariate distribution is shown, with a red line indicating smoothed conditional means along with their corresponding confidence intervals.

Figure 2. The amount sent in the modified dictator game by gender



Note: Figure 2 presents the share of endowment given for each game by gender. The share of endowment for cooperation represents the average given for all six periods of the VCM. The left-hand side of each measure correspond to male behaviors, and right-hand side the female counterpart. The box represents the inter-quartile range (IQR), with the line inside indicating the median, while the "whiskers" extend to the smallest and largest values within 1.5 times the IQR from the quartiles; points outside this range are considered outliers.

Table 1a. Characteristics of the schools selected for the program

School	Urban or rural area	Private or public school	Index of social position	Size
1	Rural	Public	96.6	122 (436)
2	Urban	Public	127	136 (557)
3	Rural	Private	100	40 (295)
4	Rural	Public	96	96 (395)
5	Urban	Public	115	176 (469)
Total				570 (2152)

Note: Size is the total number of students from 7th grade in this school and in brackets the total number of students in the school. *Source rectorate of Brittany*.

Table 1b. Participants per school and per class

School	Class						Total sample
1	19	15	20	19	20	-	93
2	20	20	19	16	20	-	95
3	18	20	-	-	-	-	38
4	20	18	20	20	-	-	78
5	19	20	20	19	20	20	118
Total	96	93	79	74	60	20	422

Table 2: Altruism, cooperativeness and School achievement

	(1) GPA	(2) GPA	(3) GPA	(4) Math	(5) Math	(6) Math	(7) Hist. Geo.	(8) Hist. Geo.	(9) Hist. Geo.	(10) English	(11) English	(12) English
Altruism	-0.021**		-0.023**	-0.043**		-0.039**	-0.031***		-0.032**	-0.004		-0.009
	(0.010)		(0.010)	(0.016)		(0.015)	(0.011)		(0.011)	(0.011)		(0.012)
Cooperation		0.017	0.031		-0.035	-0.011		-0.005	0.016		0.038	0.043
		(0.025)	(0.027)		(0.038)	(0.039)		(0.036)	(0.038)		(0.028)	(0.027)
Tournament			0.426*			0.572*			0.299			0.764**
			(0.229)			(0.326)			(0.321)			(0.339)
Effort task			0.067***			0.110***			0.056**			0.088**
			(0.019)			(0.023)			(0.025)			(0.036)
Girl	0.512*	0.437	0.481*	0.328	0.248	0.306	0.704*	0.625	0.677*	0.527	0.453	0.507
	(0.284)	(0.295)	(0.270)	(0.387)	(0.412)	(0.357)	(0.391)	(0.398)	(0.381)	(0.304)	(0.325)	(0.321)
SES	1.553***	1.581***	1.558***	1.683***	1.706***	1.670***	2.146***	2.173***	2.147***	1.402***	1.416***	1.355***
	(0.304)	(0.312)	(0.294)	(0.375)	(0.381)	(0.339)	(0.475)	(0.489)	(0.479)	(0.379)	(0.372)	(0.370)
Constant	14.389***	13.800***	11.717***	12.848***	12.406***	9.187***	14.676***	14.135***	12.606***	15.891** *	15.400** *	12.088** *
	(0.303)	(0.366)	(0.593)	(0.479)	(0.504)	(0.843)	(0.650)	(0.782)	(0.914)	(0.361)	(0.388)	(1.037)
School dummies	yes	yes	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes
N	422	422	422	422	422	422	422	422	422	303	303	303
r2	0.116	0.107	0.176	0.128	0.109	0.191	0.143	0.129	0.164	0.246	0.249	0.314

Note : All estimates include school dummies. Standard errors are clustered at the class level. Significance levels: ***0.01 **0.05 *0.10.

Table 3. Determinants of amount allocated in the dictator game/contributed in the VCM

	Altruism			Cooperation		
	OLS	OLS	Tobit	OLS	OLS	OLS
Girl	2.788**	2.745**	3.538***	1.120**		1.099**
	(1.192)	(1.195)	(1.294)	(0.483)		(0.481)
SES		-0.928	-1.602		-0.538	-0.465
		(1.384)	(1.545)		(0.586)	(0.578)
Observations	422	422	422	422	422	422
R2	0.042	0.043		0.015	0.005	0.017
Log Likelihood	-1645.683	-1645.463	-1564.625	-1267.453	-1269.725	-1267.121
Observations censored			41			

Note * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the number of tokens given in the modified dictator game in column (1) to (3). In Columns (4) to (6), the dependent variable is the number of tokens contributed to the group account averaged on the six periods of the VCM. All standard errors are robust. All estimates include school dummies.

Table 4. Determinants of grades (OLS models)

	(1)	(2)	(3)	(4)
Dep. Var.	GPA	Math	English	Hist-Geo
Altruism x Boy	-0.034**	-0.064**	-0.010	-0.047**
	(0.014)	(0.024)	(0.019)	(0.017)
Altruism x Girl	-0.013	-0.06	-0.007	-0.017
	(0.013)	(0.018)	(0.019)	(0.016)
Coop x Boy	0.056	0.055	0.061	0.047
	(0.039)	(0.062)	(0.037)	(0.0611)
Coop. x Girl	0.018	-0.054	0.044	-0.004
	(0.036)	(0.042)	(0.033)	(0.047)
Tournament. x Boy	0.985**	1.469**	1.433**	0.642
	(0.356)	(0.545)	(0.580)	(0.408)
Tournament x Girl	0.478	0.686	0.958**	0.440
	(0.285)	(0.409)	(0.345)	(0.379)
Girl	1.424	2.077	1.553	1.129
	(0.972)	(1.547)	(1.180)	(1.281)
SES	1.546***	1.662***	1.430***	2.136***
	(0.293)	(0.373)	(0.322)	(0.474)
Constant	12.385***	10.189***	13.004***	13.384***
	(0.879)	(1.353)	(1.223)	(1.260)
N	422	422	303	422
R2	0.147	0.159	0.284	0.154

Note : All estimates include school dummies. Standard errors are clustered at the class level. Significance levels: ***0.01 **0.05 *0.10.