Le rôle des préférences et interactions sociales dans la performance scolaire

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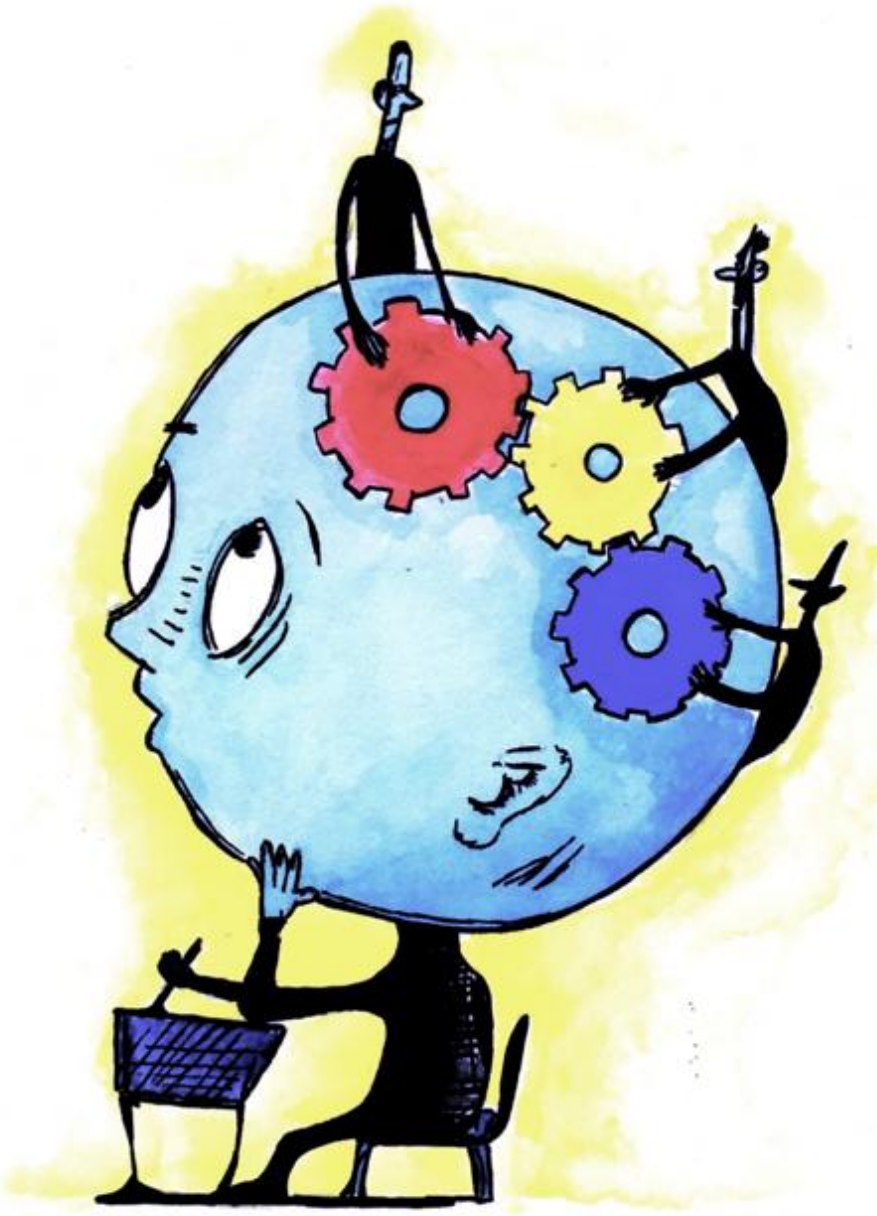

Introduction

La pandémie de COVID-19 rappelle l'importance des dispositifs d'apprentissage chez les enfants et adolescents. Selon l'UNESCO, une agence des Nations unies, 1,5 milliard d'apprenants n'ont pas pu se rendre à l'école lors de l'année 2020, forçant le passage de l'apprentissage à l'école vers le domicile tout en soulevant de fortes inquiétudes quant à l'augmentation potentielle des inégalités éducatives.[1] Sur la base de 31 études spécifiques à chaque pays, représentant 62,7% de la population mondiale, Bozkurt et al. (2020) montrent une accentuation des inégalités éducatives pendant les différents confinements. A l'inverse du domicile, l'école propose aux élèves un accès homogène aux ressources pédagogiques. La transition du présentiel au distanciel met en exergue le rôle des parents, des ressources éducatives disponibles et des comportements individuels mais également le rôle joué par les interactions avec les autres élèves.

Cette thèse propose une approche économique de la performance scolaire avec une attention particulière portée aux rôles des interactions entre adolescents et avec leurs parents. Plus précisément, nous considérons trois types de déterminants de la réussite scolaire : *i*) les comportements individuels et ceux envers autrui (Koch et al., 2015, Lavecchia et al., 2016, Levitt et al., 2016), *ii*) la pression par les pairs et l'émergence de comportements coopératifs (*i.e.* interactions horizontales) (Ledyard, 1995, Chaudhuri, 2011), et *iii*) les ressources mises à disposition par les parents pour étudier (*i.e.* interactions verticales) (Dang and Rogers, 2008, Eren and Henderson, 2011, Paredes, 2014).

Premièrement, nous analysons le rôle des préférences sociales, définies comme des mesures retraçant la capacité individuelle à considérer autrui, sur la performance scolaire. L'enjeu est d'affiner notre compréhension de la relation entre ces mesures comportementales,

[1] The Economist: Closing schools for covid-19 does lifelong harm and widen inequality - VoxEu :Schools, skills, and learning: The impact of COVID-19 on education

relatives à l'altruisme et le goût pour la compétition notamment, et la réussite scolaire des adolescents. L'apport de ce travail est de mettre en avant le rôle des préférences sociales - *e.g.* altruisme, coopération et goût pour la compétition - alors que les précédentes études se focalisent sur les préférences individuelles - *e.g.* préférences temporelles et vis-à-vis du risque. Dans un second temps, nous analysons les interactions sociales horizontales pour mieux saisir l'impact de la pression par les pairs sur la coopération entre adolescents. Ces mesures sont réalisées à l'aide un environnement contrôlé nous permettant d'identifier les mécanismes sous-jacents traditionnellement inobservables. Enfin, nous considérons une troisième forme d'interactions, celles avec les parents, à travers les ressources mises à disposition de leurs enfants pour étudier - telles que le soutien scolaire, l'aide aux devoirs et les ressources numériques - pour étudier. Les formes d'interactions considérées dans cette thèse nous permettent d'obtenir un large panorama des relations sociales et leurs liens avec la performance scolaire.

L'analyse des déterminants de la performance scolaire est intrinsèquement liée à la perception de l'éducation et son évolution. Elle était auparavant appréhendée comme un bien standard : comme les autres biens de consommation, les individus les plus favorisés en consomment davantage. Elle pouvait aussi être représentée comme un bien de «statut», permettant de signaler son statut social aux autres individus (Machin, 2008). Becker (1964) initie la réflexion des choix éducatifs en les présentant comme une décision d'investissement, optimisable selon ses rendements économiques.[2] Ce cadre met en évidence la notion de «*productivité de l'éducation*» dans la décision de poursuivre (ou d'abandonner) la scolarité à travers une analyse coûts-bénéfices pour chaque année supplémentaire d'éducation. Ainsi, la contribution de Becker (1964) est de démontrer que les choix éducatifs se font, entre autres, selon une rationalité économique et non purement sociale. Mincer (1970, 1974) démontre empiriquement la relation entre capital humain et performance sur le marché du travail en analysant la corrélation entre éducation et salaire perçu. Les chercheurs ont par la suite largement mis en avant l'influence du capital humain sur l'intégration sur le marché du travail (voir Card (1999)).[3]

[2]Voir Schultz (1961) pour une transcription de sa déclaration lors du congrès de l'*American Economic Association* sur l'importance de l'éducation en économie. Comme le retrace Kiker (1968), les antécédents de l'analyse du capital humain remontent bien plus loin, notamment Petty and Graunt (1899) et Smith (1791).

[3]Plusieurs nouvelles idées ont été développées dans le domaine, notamment des travaux théoriques

L'approche beckerienne se base sur l'idée que l'éducation favorise l'accumulation de compétences renforçant la productivité individuelle et, de fait, son employabilité sur le marché du travail. Contrairement aux travaux de Becker, les travaux de Spence et al. (1973) suggèrent que l'éducation n'augmente pas nécessairement la productivité des individus mais qu'elle la signale au marché. Les entreprises faisant face à de fortes asymétries d'information, les diplômes obtenus permettent aux candidats de signaler leur productivité. La distinction entre ces deux phénomènes est ardue puisqu'ils sont intimement liés (Lang and Kropp (1986), Kroch and Sjoblom (1994), Clark and Martorell (2014) pour les enjeux relatifs à la mesure de cette théorie).

Les approches précédemment mentionnées réduisent l'éducation aux rendements économiques (*i.e.* privés) sans considérer ses rendements sociaux, pourtant importants. Au niveau d'un pays, les citoyens ayant une meilleure éducation sont plus productifs (voir Krueger and Lindahl (2001) et Hanushek and Woessmann (2010) pour davantage de discussions). Sur le plan individuel, trois effets non-monétaires de l'éducation sont mis en avant : la santé, la criminalité et les comportements politiques (Lochner, 2011). Grossman (2000, 2006) montre que l'éducation est plus corrélée à la santé que le revenu.[4] Par ailleurs, une hausse du stock d'éducation réduit considérablement la criminalité à la fin de l'adolescence et au début de l'âge adulte (Cullen et al., 2006, Deming, 2011), favorise les échanges sur les idées politiques, la volonté de persuader les autres (Milligan et al., 2004), et influence les comportements de vote (Dee, 2004).

Au vu des implications individuelles et collectives de l'éducation, il convient de questionner les déterminants de la réussite scolaire. La famille apparaît comme la composante la plus intuitive. Les sociologues soulignent le rôle de l'intégration des normes, comme l' «*habitus*» (Bourdieu, 1973), tandis que les économistes se concentrent sur les décisions parentales d'accès à une meilleure école/environnement (Card, 1999,

ayant discuté l'approche originelle du capital humain : les travaux sur le signal et le «*screening*» de Spence et al. (1973) et Stiglitz (1975)) et des travaux empiriques détaillés sur des questions telles que la sur-éducation (Freeman, 1976) ou sur les rendement privés et sociaux de l'éducation (Layard and Psacharopoulos, 1974, Psacharopoulos and Hinchliffe, 1973). Voir Machin (2008, 2014a,b), Dearden et al. (2009) pour une discussion sur la tendance des recherches en économie de l'éducation et une revue de ses déterminants.

[4]Trois canaux sont discutés dans la littérature : *i)* l'éducation pourrait augmenter la productivité marginale de la santé ; *ii)* elle pourrait être corrolée à une meilleure connaissances sur la santé ; *iii)* les soins sont plus abordables pour les personnes ayant une éducation supérieure en raison de leurs revenus plus élevés.

Chetty et al., 2011). Une deuxième approche consiste à comprendre le rôle des ressources éducatives mises à disposition au sein de l'école (Hanushek, 2006), et des enseignants (Hanushek and Rivkin, 2006, Brodaty and Gurgand, 2016).

Outre le rôle joué par la famille (influence verticale), par les pairs (influence horizontale), ou par l'école, il convient de tenir compte des «*hard skills*», les capacités cognitives intrinsèques de l'individu, et des «*soft-skills*», les capacité non-techniques (Borghans et al., 2008, Heckman and Kautz, 2012). Le signal véhiculé par l'éducation peut traduire certaines compétences cognitives individuelles (capacité de concentration, autonomie, *etc.*) utilisable au sein de l'entreprise. Heckman and Kautz (2012) définissent les capacité non-cognitives comme étant des traits de personnalité, des objectifs, des motivations et des préférences. Une récente attention a été portée par l'économie expérimentale sur leur malléabilité, leur évolution avec l'âge des participants et leur impact sur les performance scolaires (Alan and Ertac, 2019, Behaghel et al., 2017, Sutter and Glätzle-Rützler, 2015, Kosse et al., 2020).

Heckman and Rubinstein (2001) présentent les premiers résultats attestant de l'importance des compétences non cognitives dans les trajectoires éducatives. Ils démontrent que les étudiants peuvent disposer des capacités cognitives nécessaires pour terminer leurs études secondaires, mais manquer des compétences non cognitives pour achever une éducation secondaire classique.[5] D'autres travaux montrent la relation entre les compétences non cognitives et l'éducation : Eckstein and Wolpin (1999) discutent du manque de motivation et Oreopoulos (2007) de la maîtrise de soi comme raisons du décrochage scolaire. Divers protocoles expérimentaux décrivent une relation positive entre la maîtrise de soi, les préférences temporelles et la réussite scolaire (Borghans et al., 2008, Gagne, 2017, Castillo et al., 2011, Sutter et al., 2013).

Dans cette thèse nous nous intéressons au rôle joué par les interactions sociales sur la performance scolaire. Cette perspective permet de revisiter les travaux antérieurs, majoritairement porté sur le rôle des préférences individuelles dans l'éducation. Plus précisément, nous focalisons notre attention sur le rôle joué par l'altruisme, le goût pour

[5] Heckman and Rubinstein (2001) utilisent l'examen GED ('*General Educational Development*'), examen de la deuxième chance aux États-Unis équivalent à la fin du lycée en France, pour déterminer si les décrocheurs sont équivalents aux diplômés de l'école secondaire sur le plan scolaire. Les personnes réussissant l'examen GED devraient être égales à leurs homologues qui réussissent à obtenir leur diplôme sur le plan scolaire, mais différentes en termes d'autres compétences.

la compétition et le degré de coopération sur la performance scolaire. Nous étudions également l'influence des normes sociales et des mécanismes de pression par les pairs. Enfin, nous considérons les interactions avec les parents à travers la mise à disposition de ressources pour étudier.

Les deux premiers chapitres de cette thèse utilisent la méthode expérimentale pour mesurer les préférences des adolescents ; l'expérimentation en laboratoire présentant de nombreux avantages pour aborder ce sujet. Premièrement, elle permet de mettre en place un environnement contrôlé offrant la possibilité de distinguer l'effet du contexte des comportements. Deuxièmement, elle mesure des préférences révélées (*i.e.* incitées monétairement), difficilement mesurables à partir d'enquêtes classiques.[6]

Les expérimentations présentées dans cette thèse sont issues d'un «*lab-in-the-field*» auprès d'une population d'adolescents. Au regard de Harrison and List (2004), ce type d'expérience se distingue de celles réalisées en laboratoire du fait de : l'identité des participants, l'information détenue par les participants lors de l'expérience, la nature de la gratification et l'environnement dans lequel le sujet évolue. Des participants issus d'une même classe, se connaissant entre-eux au sein de l'école, ont ainsi pris part à nos expériences. Cette approche originale permet de mesurer des comportements difficilement mesurables à l'aide de collectes de données traditionnelles.

List et al. (2021) avancent deux arguments majeurs : *i*) une meilleure compréhension des préférences des enfants permet de mieux saisir le processus d'accumulation du capital humain et les différents moyens de promouvoir la formation des compétences ; *ii*) les expériences économiques menées avec des enfants peuvent se concentrer sur les décisions et les préférences des enfants préfigurant potentiellement le comportement des adultes.

Une critique standard de l'économie expérimentale est l'omission des facteurs externes à l'expérimentation. On ne peut, par exemple, démontrer les déterminants des comportements observés en dehors des préférences mesurées lors des expériences, notamment la manière dont les parents consacrent du temps à leur enfant. Chaque enfant grandissant dans un environnement particulier, largement influencé par les parents, nous utilisons dans le troisième chapitre une enquête axée sur les caractéristiques parentales, permettant d'approcher un autre facteur de la réussite scolaire : les ressources mises à disposition

[6]Nous ne considérons ni les «*hard skills*», ni les traits de personnalité des adolescents dans la détermination de la performance éducative.

pour étudier au sein du ménage.

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L'investissement en capital humain est décidé avant de percevoir ces bénéfices : l'investissement est donc inter-temporel et risqué. Ces mesures sont d'autant plus pertinentes à réaliser auprès d'enfants et d'adolescents puisque la performance scolaire est cumulative : les résultats sont indexés au socle de connaissances antérieures. La littérature a dans un premier temps analysé la relation entre préférences individuelles, telles que le risque et la préférence pour le présent, et accumulation de capital humain.

Quelles sont nos connaissances des préférences vis-à-vis du risque auprès d'une population jeune ? Les enfants plus jeunes ont un goût pour le risque plus prononcé (Heinrich and Shachat, 2018), alors que la tendance à sous-estimer les petites probabilités et à surestimer les grandes probabilités diminue avec l'âge (Harbaugh et al., 2007). Les adolescents sont plus enclins à prendre des décisions en situation d'ambiguïté que les adultes (Tymula et al., 2012).

D'autres travaux ont étudié les différences de genre en termes d'aversion au risque des enfants et des adolescents. La plupart montre que les filles sont davantage averses au risque que les garçons (Borghans et al., 2009, Cárdenas et al., 2012, Dreber et al., 2014, Sutter et al., 2013, Khachatryan et al., 2015). L'environnement de l'enfant influence lui aussi le développement du goût pour le risque, par exemple en termes de structures du milieu éducatif (*e.g.* taille de classe, pairs) côtoyées par l'enfant (Eckel et al., 2012).

De récentes études mettent en avant les préférences pour le risque et la performance éducative. Hanushek et al. (2020) montrent un lien négatif entre goût pour le risque et performance à l'enquête PISA. Castillo et al. (2019) observent une relation négative entre prise de risque et obtention d'un diplôme d'études secondaires.

La deuxième préférence individuelle assimilée au capital humain sont les préférences temporelles, mesurées avec le taux d'escompte d'une gratification semblant hyperbolique auprès d'enfants et d'adolescents. Une forte hétérogénéité subsiste : par exemple, les garçons semblent plus impatients que les filles (Castillo et al., 2011, Bettinger and Slonim, 2006). La validité externe de ces mesures est présente puisque l'impatience des adolescents est fortement corrélée aux comportements des adolescents (Sutter et al., 2013).

L'intégralité des études analysant la relation entre préférences temporelles et accumulation de capital humain montrent une relation positive. Golsteyn et al. (2014) reportent les préférences temporelles d'adolescents de 13 ans en utilisant des données administratives et observent une très forte corrélation entre la préférence pour le présent des élèves et les performances scolaires, la santé et le revenus des parents. Sutter et al. (2013) observent que le niveau de patience est fortement corrélé avec la performance éducative à travers une expérience menée auprès d'enfants et d'adolescents de 10 à 18 ans. Hanushek et al. (2020) utilisent les données issues de l'enquête PISA et des préférences individuelles mesurées dans plusieurs dizaines de pays et observent eux-aussi une relation positive entre patience et performance éducative. Enfin, Angerer et al. (2021) mettent en lien les choix d'orientation avec des préférences mesurées à l'aide d'un environnement contrôlé. Les auteurs observent que les préférences temporelles, mesurées trois ans auparavant, sont positivement corrélées avec l'orientation vers des filières académiques.

Vers une approche comportementale de l'éducation

Les comportements des enfants et des adolescents ont été récemment étudiés à travers les mesures expérimentales traditionnelles (Sutter et al., 2019, List et al., 2021). Cet intérêt a conduit à une meilleure compréhension de leur évolution selon l'âge des participants et, plus particulièrement, de leurs rôles dans la réussite scolaire (Levitt et al., 2016, Lavecchia et al., 2016, Koch et al., 2015). Deux approches sont considérées pour analyser l'économie comportementale de l'éducation : *i*) l'architecture décisionnelle ; *ii*) les préférences individuelles et sociales.

Lavecchia et al. (2016) dressent un état de l'art sur l'approche comportementale en éducation en se focalisant sur une approche neuro-cognitive pour appréhender le processus décisionnel. Ce schéma décisionnel est largement fondé sur l'approche de Kahneman (2003, 2011) présentant un système décisionnel binaire composé d'un système 1 impulsif et d'un système 2 réflexif. Ils concluent leur article en classant les obstacles comportementaux à la réussite scolaire en quatre composantes : *i)* des décisions largement axées sur le présent : le système 1 se basant majoritairement sur le présent, les étudiants ont tendance à sur-pondérer les bénéfices présents au dépend des bénéfices futurs ; *ii)* un recours trop important à la routine : les étudiants prennent des décisions biaisées

et n'ont pas nécessairement conscience de la nécessité de réfléchir sur leurs choix ; *iii)* des identités : les étudiants se soucient de l'impact d'une déviation par rapport à leur groupe social de référence (Akerlof and Kranton, 2002) ; *iv)* des informations de mauvaise qualité ou trop nombreuses sur les choix scolaires.

Koch et al. (2015) attirent l'attention sur le rôle des compétences non cognitives (*i.e. soft-skils*) dans la réussite scolaire. Du point de vue des préférences individuelles, ils s'intéressent au contrôle de soi et à la motivation extrinsèque ainsi qu'aux potentiels mécanismes sous-jacents. Concernant les incitations, les auteurs montrent qu'elles *i*) donnent de bons résultats lorsqu'elles sont appliquées pour lutter contre l'absentéisme, *ii*) engendrent des résultats mixtes sur les efforts et la performance à l'école , *iii*) fonctionnent pour certains sous-groupes.

Ces approches des compétences non cognitives omettent largement le rôle des *comportements sociaux* au sein de l'éducation. À titre d'exemple, Niederle and Vesterlund (2010) discutent la validité externe du goût pour la compétition en termes d'éducation et d'intégration sur le marché du travail. Deux effets sont notifiés : *i*) la réaction des individus par rapport à un environnement compétitif tel que des examens sélectifs (Ors et al., 2008, Jurajda and Münich, 2011, Schlosser et al., 2019) ; *ii*) les choix d'orientation où les individus ayant un goût plus marqué pour la compétition sont plus enclins à sélectionner des filières sélectives (Kamas and Preston, 2012, Buser et al., 2014, 2017). Cette littérature suggère que la compétition représente un potentiel amplificateur des inégalités éducatives.

Les préférences concernant autrui, telles que la coopération ou l'altruisme, peuvent être assimilées à l'intelligence sociale (Millet and Dewitte, 2007), et influencer la performance scolaire. L'altruisme peut représenter tant une déviation de la maximisation du profit individuel, traduisant un manque de rationalité, qu'une forme d'intelligence sociale. Sa mesure primaire, issue du jeu du dictateur, dépeint une relation négative avec les capacités cognitives (Benjamin et al., 2013, Chen et al., 2013), tandis que des mesures plus complexes, telles que le «*Social Values Orientation*», nuancent ce constat (Millet and Dewitte, 2007). Au-delà de l'altruisme, le lien entre coopération et réussite scolaire est peu étudié alors que les comportements coopératifs s'associent à une meilleure rémunération dans les dilemmes sociaux (Ledyard, 1995). La capacité individuelle à réaliser une action collective peut refléter une forme d'intelligence sociale se traduisant par une plus haute

performance scolaire. L'économie de l'éducation abordée à travers les préférences sociales permet d'enrichir notre approche des aspects comportementaux de la réussite scolaire.

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Cette thèse analyse la performance éducative des adolescents à travers deux sources de données : de façon expérimentale (*i.e. lab-in-the-field*) et à partir d'enquêtes. La méthode expérimentale appliquée avec un *lab-in-the-field* offre de multiples avantages : *i*) un environnement décontextualisé permettant de distinguer les effets de contexte des préférences, *ii*) une gratification monétaire pour inciter les participants à réveler leurs préférences, et *iii*) des conditions proches des expériences réalisées au sein du laboratoire. Chaque chapitre fournit un ensemble de résultats originaux en se concentrant sur un facteur spécifique de la réussite scolaire.

Premièrement, nous analysons les déterminants comportementaux de la réussite scolaire chez les adolescents. Les préférences jouent-elles un rôle dans la réussite scolaire ? Nous mesurons diverses préférences, telles que le goût pour la compétition, l'altruisme et la coopération, pour ensuite les mettre en perspective avec la réussite scolaire, mesurée par les notes. Nos résultats montrent que le goût pour la compétition et l'altruisme sont de fortes composantes de la performance scolaire.

Deuxièmement, nous étudions l'influence des pairs sur les comportements coopératifs des adolescents à travers un environnement contrôlé où l'influence des pairs est approximée par la disponibilité de sanctions et de récompenses non-monétaires. Nous constatons que ces mécanismes entraînent des niveaux de coopération plus élevés alors que l'effet direct de recevoir une (dés)approbation n'influence pas la coopération.

Troisièmement, nous nous concentrons sur la mise à disposition de ressources éducatives par les parents de collégiens. Quelles sont les caractéristiques des parents associées à la fourniture de ressources supplémentaires pour favoriser l'apprentissage à domicile ? Nous constatons que les parents fournissent de multiples formes de soutien aux devoirs. Le niveau d'éducation ou la situation financière influencent peu ces décisions alors que les compétences numériques des parents est un facteur déterminant.

La section suivante présente le contenu des trois chapitres de cette thèse.

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Le rôle des préférences sociales dans la performance scolaire

Dans le **premier chapitre**, nous étudions le rôle des préférences sociales sur la réussite scolaire auprès d'une population de 5^{eme}. Nous avons recours à une expérience incitative de type «*lab-in-the-field*» pour mesurer les préférences des adolescents, plus particulièrement la coopération, le goût pour la compétition et l'altruisme. Nous analysons les comportements associés à la réussite scolaire au collège.

Le goût pour la compétition est traditionnellement considéré comme un déterminant important de la réussite individuelle. Par exemple, il est l'une des explications possibles des inégalités entre les sexes sur le marché du travail (Croson and Gneezy, 2009), des choix d'orientation universitaire (Reuben et al., 2017) et de carrière (Buser et al., 2014) . Un nombre croissant de publications souligne la pertinence de l'approche comportementale pour appréhender les questions éducatives (Koch et al., 2015, Lavecchia et al., 2016, Levitt et al., 2016).

Diverses expériences s'intéressent aux goût pour la compétition durant l'enfance et l'adolescence. La plupart de ces études concluent à l'existence d'une préférence plus forte pour la compétition pour les garçons que pour les filles (Gneezy and Rustichini, 2004, Khachatryan et al., 2015), et ce même à très jeune âge (Sutter and Glätzle-Rützler, 2014). Les origines de cette différence en termes de structure sociétale n'est pas claire (Gneezy et al., 2009, Cárdenas et al., 2012, Andersen et al., 2013), alors que le goût pour la compétition est corrélé au contexte familial dans lequel l'enfant a grandi (Almås et al., 2015).[7] Similairement aux participants standards, la nature de l'effort et les croyances par rapport aux performances influencent cette différence en termes de genre (Günther et al., 2010).

Concernant l'altruisme, les expériences en économie montrent que les comportements altruistes augmentent avec l'âge (Peters et al., 1997, Benenson et al., 2007, Harbaugh and Krause, 2000, Harbaugh et al., 2003, Fehr et al., 2008, Angerer et al., 2015).[8] Ces

[7]Il existe toutefois quelques exceptions. Ainsi à l'inverse, Samak (2013) trouve que le genre n'explique pas le goût pour la compétition des enfants de 3 à 5 ans. Dreber et al. (2011) ont réalisé une étude afin de mesurer le goût pour la compétition entre genres en Suède, à partir de 3 jeux non stéréotypés au niveau du genre. Les auteurs observent que les garçons et les filles choisissent de la même manière la compétition pour l'ensemble des tâches.

[8]Une exception est Almås et al. (2010) qui observent, à partir d'une expérience réalisée sur 486 personnes âgées de 10 à 19 ans, que les plus jeunes enfants sont plus égalitaires. Les auteurs n'observent par ailleurs aucun changement d'attitude en termes d'égoïsme entre les différentes catégories d'âge.

résultats peuvent partiellement s'expliquer par l'augmentation de l'aversion à l'inégalité avec l'âge (Martinsson et al., 2011), ou par le fait que les enfants les plus jeunes se concentrent davantage sur leurs propres désirs alors que les plus âgés mettent en avant la notion d'équité (Smith et al., 2013)

D'autres études intègrent la perspective du genre dans l'évolution des comportements altruistes et montrent que les filles seraient davantage altruistes que les garçons (Angerer et al., 2015, Harbaugh et al., 2003, Markovits et al., 2003, Benenson et al., 2007).

Notre étude est très proche de Alan and Ertac (2019) qui évaluent un programme visant à réduire l'écart entre les sexes en termes de goût pour la compétition pour stimuler la performance scolaire des femmes. Afin de couvrir un spectre plus large des préférences, nous mesurons le goût pour la compétition, la coopération et l'altruisme pour mieux comprendre leurs relations avec la performance scolaire.

Nos résultats indiquent que le goût pour la compétition - mesuré comme étant la décision de choisir le tournoi comme rémunération dans la tâche d'effort réel - s'associe avec une moyenne générale plus élevée. L'ampleur de cette relation est similaire entre les différentes disciplines considérées (Histoire-Géographie, Mathématiques, Anglais). Nous constatons également que l'altruisme est négativement associé à la réussite scolaire ; ainsi, les individus plus altruistes tendent à avoir de moins bonnes notes. Nos résultats suggèrent enfin que les préférences sociales sont corrélées avec la réussite scolaire.

Coopération et pression par les pairs auprès d'adolescents

Dans le **deuxième chapitre**, nous analysons les déterminants de la coopération et l'influence des pairs chez les adolescents. Pour cela, nous utilisons le «*lab-in-the-field*» présenté dans le chapitre précédent. Cette approche originale nous permet d'aborder les mécanismes de l'influence des pairs à travers une expérience de «laboratoire». Premièrement, nous abordons la question des déterminants de la coopération et de l'influence de la pression des pairs sur la coopération individuelle. Deuxièmement, nous étudions la motivation du recours à l'influence des pairs (*i.e.* récompenses ou sanctions non monétaires). Enfin, nous évaluons l'impact de la pression exercée sur le niveau individuel de coopération.

Olson and Spelke (2008) suggèrent que l'émergence de la coopération dépend de trois facteurs : *i)* agir pour le bénéfice de nos relations proches, *ii)* récompenser les personnes dont nous avons profité des actions passées et *iii)* récompenser les personnes faisant preuve de générosité. Brownell et al. (2006) observent la présence de comportements coopératifs dès l'âge de 2 à 3 ans lorsque les enfants interagissent avec leurs pairs, en particulier dans des jeux simples.

Deux mesures sont traditionnellement utilisées pour mesurer les comportements coopératifs : le dilemme du prisonnier et le bien public. Les résultats sont similaires entre ces deux mesures puisque le niveau de coopération semble constant (Fan, 2000), si ce n'est plus important (Harbaugh and Krause, 2000, Angerer et al., 2016), au gré des interactions. Les enfants plus âgés semblent développer des comportements similaires à ceux observés avec des participants «standards». Ces comportements sont sujets à la taille du groupe : plus le groupe est important, plus l'incitation à coopérer est diluée (Kollock, 1998, Suzuki and Akiyama, 2005). Alencar et al. (2008) observent que la taille du groupe réduit la coopération auprès des enfants mais ni le genre, ni l'information sur la durée de l'expérience n'influencent les comportements des participants.

Le rôle des interactions entre élèves est fondamental puisque l'approbation et la désapprobation du groupe de référence influencent fortement l'éducation (Akerlof and Kranton, 2002). Le rapport Coleman (1966) est une des premières études de grande ampleur sur le rôle des pairs dans la réussite scolaire.[9] Les pairs influencent effectivement

[9]Le rapport Coleman ou *Equality of Educational Opportunity* vise à comprendre si les mauvais résultats scolaires sont dus à des contraintes financières ou à la mauvaise qualité des écoles. La collecte de données porte sur plus de 1 000 écoles et 600 000 élèves. Les conclusions du rapport montrent que le milieu familial est plus important que les ressources disponibles pour expliquer la réussite des élèves.

la réussite (ou l'échec) scolaire, mais ont des répercussions plus larges sur les comportements sociaux (Sacerdote, 2011).

L'identification des comportements sociaux est difficilement saisissable à l'aide d'un processus standard de collecte de données. Manski (1993) et Brock and Durlauf (2001) présentent le défi de l'identification pour comprendre l'ampleur de l'effet observé. Diverses stratégies empiriques permettent d'outre-passer ces différents biais : affectation aléatoire des pairs, effet fixe divers et variance des résultats moyens entre les groupes pour détecter la présence d'interactions sociales (Sacerdote, 2011).

Les stratégies d'identification mentionnées ci-dessus ne permettent pas de comprendre les mécanismes sous-jacents de la pression par les pairs contrairement à la méthode expérimentale (voir Ledyard (1995) et Chaudhuri (2011)). Plus précisément, les expériences abordent la pression des pairs par le biais de sanctions monétaires (Fehr and Gachter, 2000, Andreoni et al., 2003, Sefton et al., 2007, Balliet et al., 2011), de récompenses et sanctions symboliques (*i.e.* non monétaires) (Masclet et al., 2003, Dugar, 2010, 2013) dans un environnement contrôlé. L'utilisation de la procédure expérimentale permet de construire un environnement neutre dans lequel il est possible de distinguer les motivations de la pression par les pairs et leurs impacts.

Seules quelques études ont abordé la coopération et ses leviers chez les jeunes participants. McAuliffe et al. (2015) étudient l'importance de la punition par un tiers. Leurs résultats sont similaires aux comportements observés auprès des participants traditionnels. A six ans, les enfants punissent déjà les choix injustes malgré une sensibilité au coût des punitions. Lergetporer et al. (2014) analysent l'efficacité de la punition par un tiers sur la coopération des enfants dans un jeu de coopération. Ils constatent que la menace de punition fait plus que doubler les taux de coopération. Ces études sont principalement basées sur des punitions verticales (*i.e.* celles reçues par les enseignants ou les parents) représentant une unique forme de sanction rencontrée par l'enfant. A l'école, les pairs influencent pourtant significativement les comportements individuels à travers des (dés)approbations envers leurs camarades prenant des formes et des impacts distincts des sanctions verticales. Nous contribuons à cette littérature en abordant la pression horizontale des pairs par le biais de sanctions et de récompenses non monétaires entre des participants se connaissant au sein de l'école.

L'influence des pairs est un déterminant important de la coopération. Nos résultats

indiquent que la (dés)approbation sociale conduit à des contributions plus élevées. Ce résultat est robuste à l'intégration de divers contrôles tels que le sexe, le milieu social et diverses préférences individuelles. Nous étudions ensuite les déterminants du recours aux récompenses et aux sanctions non monétaires dans un jeu du bien public. Les participants sont plus (moins) enclins à recourir aux récompenses (sanctions) si l'individu s'écarte de la norme de coopération du groupe. En revanche, le nombre de (dés)approbations reçues ne semble pas avoir d'effet sur les contributions individuelles. Nos résultats corroborent ainsi ceux d'études antérieures en suggérant que la menace de recevoir une (dés)approbation est suffisante à elle seule pour soutenir la coopération.

Ce deuxième chapitre montre que les adolescents adoptent des comportements plus coopératifs lorsque la pression par les pairs est présente. Nous observons que les comportements coopératifs ne diminuent pas avec le temps et que le nombre de (dés)approbations reçues a peu d'impact sur les contribution individuelles.

Ressources éducatives à la maison

Dans le **troisième chapitre**, nous étudions dans quelle mesure les parents fournissent des ressources supplémentaires pour la réalisation des devoirs, avec une attention particulière portée aux pratiques numériques. Nous utilisons une base de données collectée par un institut de sondage, CODHA, en octobre 2018 et représentative de la population française par la méthode des quotas. Nous abordons dans un premier temps les aides aux devoirs fournies par les parents pour ensuite préciser les différents usages d'Internet des adolescents lorsqu'ils réalisent leurs devoirs.

Les devoirs à la maison sont traditionnellement présentés comme formant des habitudes de travail, offrant aux élèves une occasion de revoir les contenus dispensés en classe (Cooper et al., 2006). L'aide parentale fournie lors des devoirs est étroitement liée à la relation parents-enfants et à son impact sur les résultats scolaires (Avvisati et al., 2010). Une telle implication développe les capacités des enfants et offre une certaine flexibilité : les parents peuvent compenser l'apprentissage à l'école. Ces résultats sont d'autant plus intéressants lorsque l'on considère que des programmes simples impliquant les parents dans l'apprentissage augmentent leur implication à l'école et à la maison (Avvisati et al., 2014). La question centrale est alors d'identifier si l'aide à la maison est uniformément répartie au regard des caractéristiques parentales. Boonk et al. (2018) montrent que les parents s'impliquant dans le travail scolaire ont généralement des enfants présentant des scores cognitifs plus élevés, se traduisant par une meilleure réussite scolaire. Le niveau d'éducation des familles influence les perspectives des enfants par deux canaux : *i)* un niveau d'éducation plus élevé favorise l'acquisition de compétences pour aider les enfants à faire leurs devoirs (Lee and Bowen, 2006); *ii)* les parents peuvent être plus concernés par la réussite de leurs enfants (Calarco, 2018, Lareau, 2011).

Les parents disposent d'un large éventail de choix pour fournir des ressources éducatives extrascolaires. Elles peuvent être matérielles (par exemple un lieu d'étude approprié), ou immatérielles (implication des parents, mentorat numérique) (Park et al., 2016). Le soutien scolaire formel, payé par les parents à des intervenants extérieurs, est une pratique associée aux ménages favorisés (voir Dang and Rogers (2008), Jung and Lee (2010), ou Safarzyńska (2013)).

La manière dont les élèves apprennent a évolué et la disponibilité des ressources

pour étudier a structurellement changé. La majorité, si ce n'est l'intégralité, des pays occidentaux a connu une augmentation rapide de la disponibilité des équipements numériques à la maison (Bulman and Fairlie, 2016). Selon l'enquête PISA 2012 aux États-Unis, 86% des répondants ont accès à un ordinateur et 83% à Internet à la maison. Ces ressources pourraient constituer de puissants outils pour les étudiants en distanciel : la plupart d'entre eux disposent d'un accès aux ressources numériques et savent les utiliser. Cependant, il est communément admis que les bénéfices de ces équipements sont nuancés par une combinaison d'usages productifs (*i.e.* éducatifs) et de loisirs (*i.e.* récréatifs) (Barrera-Osorio and Linden, 2009, Belo et al., 2014, Comi et al., 2017, Falck et al., 2018).La plupart de ces études évalue l'impact de la mise à disposition de ressources numériques sur la performance scolaire alors que les usages sont largement ignorés. L'impact positif de la possession d'un ordinateur pourrait être dû à des caractéristiques parentales non observées (Schmitt and Wadsworth, 2006, Fairlie et al., 2010, Malamud and Pop-Eleches, 2011, Vigdor et al., 2014). Ce chapitre fait le lien entre ces deux littératures en étudiant les déterminants de la provision de ressources éducatives au sein du ménage avec une attention particulière portée sur les pratiques numériques des parents.

Nous constatons que l'aide aux devoirs est principalement attribuée aux élèves qui en ont besoin. La famille fournit de multiples ressources pour aider l'enfant à étudier s'il rencontre des difficultés à l'école. Nous observons une corrélation significative et positive entre chaque type d'aide (ressources en ligne, tutorat privé et informel). En opposition à la littérature, nous ne trouvons pas de lien entre revenus, éducation du ménage et la décision d'allouer ces ressources. Les usages numériques partagés entre parents et enfants sont le principal déterminant de l'aide aux devoirs : les parents consacrant du temps avec leurs enfants pour utiliser des ressources numériques sont plus susceptibles de fournir des aides aux devoirs.

Ce dernier chapitre montre que l'aide aux devoirs est principalement déterminée par la socialisation numérique au sein du ménage. Plus particulièrement, nos résultats suggèrent que les parents fournissent de multiples ressources pour aider leur enfant lorsqu'il rencontre des difficultés. Enfin, notre étude suggère que lla simple mise à disposition d'une ressource numérique dissimule de nombreux usages.

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Étudier l'éducation à partir de l'économie expérimentale et de sondage représentatif des pratiques des parents permet d'analyser des composantes de la performance éducative de différentes natures. Bien que les méthodes expérimentales menées sur le terrain avec des enfants suivent un protocole similaire aux expériences traditionnelles, elles peuvent présenter certains biais. Par exemple, nous ne pouvons pas garantir le strict anonymat des participants, laissant supposer que l'expérimentateur connaît le gain du participant pouvant entraîner un «*experimentalist effect*» (Zizzo, 2010). Une conséquence directe serait que les participants se comporteraient de la manière souhaitée par l'expérimentateur. De tels phénomènes ne devraient pas avoir lieu dans notre collecte de données puisque les expérimentalistes ne sont venus qu'une seule fois pour mener les expériences et ont garanti l'anonymat des choix. Nous discutons plus en détail de cet aspect au chapitre 1.

Par ailleurs, nos mesures comportementales ne font qu'approximer la richesse des comportements observés en dehors du laboratoire. Par exemple, le goût pour la compétition n'est abordé ici que par un choix binaire, alors qu'il peut prendre de multiples formes en dehors du laboratoire. Ainsi, notre mesure n'indique qu'un aspect de ces comportements.

Une troisième limite pouvant se rapporter au troisième chapitre est le processus de récolte des données de l'enquête. Les parents ont été interrogés sur les résultats scolaires de leurs enfants et sur leurs pratiques numériques. Une relation plus proche avec son enfant peut signifier une meilleure connaissance des pratiques numériques et de ses résultats scolaires. Ceux ayant fait des études supérieures ont une meilleure connaissance des usages numériques de leur enfant. Néanmoins, l'offre d'aide aux devoirs est abordée comme une décision parentale. Ainsi, notre mesure représente correctement les choix parentaux puisque nous sommes intéressés par les croyances (exactes ou non) des parents.

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Chapter 1

On the Behavioral Determinants of School Achievement[1]

Abstract

Non-cognitive skills play a crucial role in human capital formation. In this paper, we investigate how soft skills are related to school achievement. We use a lab in the field experiment with pupils in middle school to analyze the relationship between social preferences, such as altruism, degree of cooperation or willingness to compete, and grades. We find that willingness to compete is a strong predictor of individual educational achievement, while selfishness is associated with lower grades.

Key words: lab-in-the-field experiment; education; preferences; cooperation; competition; teenagers

JEL code: C70, A13, C92

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1.1 Introduction

The economic literature on the determinants of student achievement focuses mainly on the possible benefits of new educational resources and the family and school's socioeconomic context.[2] However, the influence of children's personality traits or their social preferences on academic achievement is less documented. It is mainly due to the difficulty to get precise measures of such factors. Existing evidence relies on subjective self-report measures through standard databases. According to several authors, it might be relevant to investigate them in an educational setting considering how significant are their influences on labor market outcomes (Heckman et al., 2006, Heineck and Anger, 2010).

A recently growing literature emphasizes the benefits of experimental tools to investigate the determinants of school achievement (Koch et al., 2015, Levitt et al., 2016, Lavecchia et al., 2016). For instance, Koch et al. (2015) present how individual and social preferences might be related to education.[3] More specifically, they open the so-called black box of individual '*soft skills*'[4] through experimental measures, such as a taste for competition, self-control and extrinsic and intrinsic motivation. Thus, this novel approach allows grasping individual behaviors through incentivized measures using widely replicated experimental procedures. We cover in this chapter three of them: individual willingness to compete, altruism, and cooperation.

Individual willingness to compete seems to be a significant behavioral component of school achievement. Individuals exhibiting high competitiveness might be more likely to put higher effort into school (Niederle and Vesterlund, 2007, 2011). Grades also represent students' status - a strong motivation in decision making (Frank, 1985) - who might take individual ranking in the grades distribution. Hence, we conjecture that willingness to compete may foster pupils' effort to obtain a higher ranking than a classmate.

We also investigate whether social preferences such as altruism and degree of cooperation

[2] See for instance Krueger (1999) and Hanushek (2006).

[3] Levitt et al. (2016) discuss how simple interventions inspired by behavioral economics, based on the endowment effect or effort provision, do not enhance individual effort devoted to education. Lavecchia et al. (2016) review the literature on behavioral intervention in school and discuss the possibility proposed by behavioral economics to foster school achievement.

[4] The notion of soft skills has been popularized by Heckman et al. (2006) which define them as '*personal preference and personality traits.* This discussion echoed the traditional distinction between *savoir-faire* ('know-how') and *savoir-être* ("interpersonal skills') used in sociology.

may affect educational achievement. Indeed one may reasonably argue that both generosity and the degree of cooperation in social dilemmas may reflect a form of social intelligence related to school achievement.

Regarding the ability to cooperate, we know from the experimental literature that it is an influential factor to improve overall payoffs in social dilemmas (See Ledyard (1995) for a survey). The literature provides compelling evidence between IQ, or more broadly, cognitive abilities, and cooperation (Lohse, 2016, Al-Ubaydli et al., 2016, Benito-Ostolaza et al., 2016, Baghestanian and Frey, 2016). One may reasonably assume that willingness to cooperate benefits educational achievement.

Regarding altruism, whether it should improve or not educational achievement is not clear-cut. Indeed, on the one hand, altruism may simply reflect deviations from rational decisions (e.g., Chen et al. (2013)). On the other hand, one may argue that, to some extent, altruism may reflect some form of social intelligence. Whether altruism should improve or decrease educational achievement is therefore left to empirical evidence. Frey and Detterman (2004) find a positive relationship between SAT scores[5] and scores on the Armed Services Vocational Aptitude Battery, a U.S. army administered test to measure abilities and academic success in the army. The literature also finds a close relationship between SAT scores and subsequent GPA in college.[6] Thus, self-centered or introverted pupils might not grasp all benefits from interactions with school stack-holders. Millet and Dewitte (2007) document that unconditional altruism might be a form of signal for social ability or, more broadly, intelligence. It traces then an ability to deal with social interactions. Therefore, altruism might be associated with higher school achievement through the ability to handle various social exchanges.

To investigate the relationship between behavioral factors mentioned above and educational achievement, we ran a lab in the field experiment. Indeed it is difficult

[5]SAT is a score retracing individual ability at university entrance. Evidence-Based Reading and Writing (ERW) score, the Math score, and the composite, or total score, represent the student's performance in the given subject.

[6]GPA is a conversion of grades into a numerical scale. This study aims to document the relationship between IQ and SAT using the National Longitudinal Survey of Youth 1979 and undergraduate participants. Beaujean et al. (2006) find similar results using a similar design with an alternative pool of participants. SAT correlates with grades/achievement at school. See Coyle and Pillow (2008) and Coyle et al. (2011). The first study documents the predictive power of SAT and ACT[7]. They found that both components strongly relate to IQ and have a sizable role in predicting grades. The second shows that SAT score correlations with GPA are higher for high than low ability subjects.

to infer the role of such behavioral factors from classical survey data.[8] Precisely, we conducted a lab-in-the-field experiment in October 2018 in five middle schools in Brittany, France. 22 classes, representing 432 pupils, participated in our study. Participants are between 12 and 13 years old. Since class repetition is really rare in our sample, pupils have merely the same age. More specifically, we are looking to identify whether particulars soft skills measured using widely replicated experimental procedures are associated with teenagers' educational achievement. The basic underlying idea is that preferences elicited using the experimental method have external validity, reflecting field educational behaviors.

The experiment consists of three distinct games: *i)* a real effort task where pupils can choose their remuneration scheme between a flat wage and a tournament to get a measure of competitiveness, *ii*) a modified dictator game to get an estimate of altruism and *iii*) a Voluntary Contribution Mechanism to capture a degree of cooperation. Each session lasted on average one hour.

Our paper closely relates to Horn and Kiss (2018) which investigate the relationship between individual and social preferences and school achievement among Hungarian university students. In their article, authors measure school achievement using GPA and grades at an econ exam. Our paper differs from this existing study on two main dimensions: *i)* participants of our study are much younger, allowing us to test whether their findings are robust among younger pupils; *ii*) school achievement measures with scores in multiple disciplines taught at school. Most related literature mainly focuses on GPA or Mathematics grades. We integrate other disciplines to account for a richer aspect of educational achievement. For instance, Mathematics represents a given way of reasoning - obtaining the right results and calculating - which might not reflect the school's entire content.

To preview our findings, we show that several behavioral factors matter for educational performance. More specifically, willingness to compete is positively correlated with

[8] A core motivation of experimental economics is to incentive participants to reveal their '*true*' preferences. It remains unclear to what extent self-reported behaviors are biased regarding children in an educational setting. They might over or under-declare their preferences. Besides, the experiment being run with widely replicated games allows comparing the effect's magnitude with other studies using a similar design.

grades, while altruism is negatively associated with pupils' success. Interestingly, the effect of competition strongly differs regarding the disciplines considered: those considered scientific (such as Mathematics) are those where its impact is more salient than in other fields. Altruism is negatively correlated with educational success in most of the disciplines studied: selfish teenagers tend to have higher grades. Finally, we do not observe any correlation between cooperative behaviors and school achievement.

The rest of the paper is organized as follows: Section 1.2 presents our behavioral predictions, Section 1.3 details the experimental design. Section 1.3 shows our findings. Section 1.4 presents our main results and Section 1.5 discusses them. Section 1.6 concludes.

1.2 Predictions and Behavioural Assumptions

Let us begin first by conjecturing the influence of competition on grades. In experimental settings, the methodology commonly used to elicit individual willingness to compete is a real effort task where individuals choose between a flat remuneration or a payoff depending on their performance (Niederle and Vesterlund, 2007). Competition stimulates individual productivity with a more sizable effect observed among men (Gneezy et al., 2003, Niederle and Vesterlund, 2007, 2011, Masclet et al., 2015). These differences have considerable implications outside the experimental setting, mainly in terms of education and labor market outcomes (Niederle and Vesterlund, 2011). The impact of competition is multidimensional in education. First, environment competitiveness at a school or class level might stimulate pupils to achieve higher educational outcomes. Second, willingness to compete at an individual level might influence the ranking within a class. We are interested here in the second.

Another attempt to document the interaction between competitiveness and education is an achievement for competitive exam entrance. This natural setting allows measuring how individuals react toward a competitive environment in an educational setting. Studies based on admission tests suggest that the entrance exam differences result from a differential response toward a competitive environment. Ors et al. (2008) use performance on HEC entry exam, where 13% of candidatures are accepted. The authors compare them to the grades of applicants at the national high school exam. Despite

girls having initially higher grades, boys perform better than girls in a more competitive environment. In a similar spirit, Jurajda and Münich (2011) examine applicants' performance for tuition-free universities with variation in the selectivity of programs as an instrument for environment competitiveness. Authors observe that men over-perform girls when the program is more selective. Schlosser et al. (2019) find similar pattern using GRE exam.

Competitiveness also influences school achievement through education and career choices. Willingness to compete increases the likelihood of pursuing and being accepted in competitive academic tracks. Kamas and Preston (2012) use a 'winner takes all' experiment to elicit various measures of confidence, to analyze whether they are related to career choice. They found that overconfidence relates to career choice. There are no differences between men and girls within STEM students, while differences in confidence among students in humanities and social sciences explain gender differences in willingness to compete. Buser et al. (2014) and Buser et al. (2017) elicit willingness to compete before school orientations. They found that pupils with higher willingness to compete are more likely to go to selective/STEM studies.

Furthermore, evidence suggests that individual willingness to compete tends to be associated with higher achievement at school. Horn and Kiss (2018) investigate the relationship between risk, time, social and competitive preferences, and cognitive abilities of university students and observe that future-oriented and competitive participants tend to have higher GPA. Alan and Ertac (2019) evaluate a program to reduce the gender gap in terms of willingness to compete to foster educational achievement. They found that simple intervention reduces such gap without 'harming' the boys' competitiveness. Based on these results, we conjecture that the choice to undertake the tournament will be positively correlated with grades. It is stated precisely in H1 :

H_1: Willingness to compete increases the likelihood of being a high-achieving student.

Our second conjecture deals with the relationship between altruism and educational outcome. Whether individuals paying attention to others will be more successful in their studies is not clear-cut. On the one hand, one may argue that giving decisions in a dictator game may simply reflect deviations from rational choices. Indeed entirely rational agents should attempt to maximize their payoffs. Previous studies have shown that participants with higher cognitive abilities are more likely to behave rationally in

dictator games. Brandstatter and Guth (2002) approach altruism via dictator game, the ultimatum game, and a combination of the former two and put choices in these games in the perspective of individual personality. Authors observe that participants having warm personalities tend to favor equity, while intelligence does not influence bargaining behaviors. Ben-Ner et al. (2004) measure cognitive abilities with the participant's performance on the Wonderlic test, a so-called 'intelligence test' to assess an employee's job readiness to learn and problem-solving ability. Their results suggest that giving in the behavior game for women is correlated with personality and cognition measures. Chen et al. (2013) report a positive relationship between the amount kept in the dictator games, GPA, and Math SAT. They do not observe any effect of verbal SAT. Benjamin et al. (2013) measure cognitive abilities with math grades and GPA and found a negative relationship between school achievement in Mathematics and altruism. Lastly, Ponti and Rodriguez-Lara (2015) play different forms of dictator games and sort participants into groups regarding their CRT scores.[9] Authors observe that impulsive participants, those considered having lower cognitive abilities, are more inequity adverse. At the same time, reflective dictators (*i.e.* those with the highest score) show lower distributional concerns than impulsive participants. This first set of literature indicates that altruist participants tend to have lower cognitive abilities.

Deviating from standard predictions in the dictator game may not merely reflect a lack of rationality but social preferences, which may, in turn, reflect some kind of social intelligence. If this is the case, one may reasonably argue that the more altruist individuals would also be those with higher grades. The before mentioned literature grasps altruism through a dictator game. Alternative measures lead to substantial differences, in terms of its sign and magnitude, regarding this relationship. Seminal work of Millet and Dewitte (2007) emphasizes that high scores in an IQ-test are positively correlated with altruistic behavior in a Social-Value Orientation (SVO) task and cooperation in a public good game.[10] altruism may hence be a costly signal used by intelligent

[9] Frederick (2005) introduces the Cognitive Reflection Test (hereafter CRT) which measures the individual predominant cognitive system (*i.e.* System 1 & System 2, (Kahneman, 2011)) at work. For example, respondents ask, '*If it takes five machines 5 minutes to make five widgets, how long would it take 100 machines to make 100 widgets?*' - '*A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost?*'. The CRT score represents the number of correct answers. Besides, it provides a measure of impulsiveness: the number of correct answers is associated with educational outcomes and psychological measures.

[10] Millet and Dewitte (2007) resort to The Raven Progressive Matrices Test introduced by Frederick (2005). Social Values Orientation gathers various measures of people's concern toward others (Murphy

participants to signal cognitive abilities for others. Chen et al. (2013) and Benjamin et al. (2013) observe a positive relationship between cognitive skills measurement and pro-sociality. The former observe a positive correlation between SAT score and altruism measure through a dictator game and SVO, while the second finds a positive relationship between verbal attitude and altruism. Lastly, using a feature of the German educational system splitting students into two tracks, John and Thomsen (2015) find that those in the selective one are more likely to behave selfishly in the dictator game. Authors suggest that being in a competitive educational environment might develop selfish behavior.

The literature does not draw clear evidence regarding the relationship between altruism and educational achievement. It suggests that two channels oppose within the literature : altruism *i)* reflects a lack of rationality or *ii)* a form of social intelligence. We are then not able to state a conjecture.

The last conjecture deals with cooperative behaviors and academic achievement. Seminal work of Caprara et al. (2000) finds that pro-social attitude measured at age 8 predicted educational performance and peer acceptance five years later using Italian survey data regarding the degree of cooperation. Jones (2008) observes a positive relationship between university average SAT score and cooperation in prisoner's dilemma experiments using a large meta-analysis from 1959-2003 with experiments ran in various universities. His data does not allow him to observe this relationship at an individual level. In contrast to this study, our data will enable us to investigate the relationship between cooperation and educational achievement at the student level.

A more standard experimental literature also investigates the relationship between cognitive abilities and cooperation. Burks et al. (2009) observe a positive relationship between participant IQ and cooperation in a sequential Prisoner Dilemma. In three one-shot public good games, Lohse (2016) finds a positive relationship between cognitive abilities, measured through CRT-scores, and cooperation. To extend this study to a finitely repeated prisoner's dilemma game, Al-Ubaydli et al. (2016) test the relationship between cognitive ability and cooperation and do not find a direct connection between them. Their results suggest that high-ability might be associated with higher cooperation if all group members have the higher cognitive ability.

et al., 2011).

Lastly, John and Thomsen (2015) show that pupils in selective tracks have poorer cooperative behaviors than those not present in this track.

Thus, we conjecture that:

H_3: Higher cooperation in the public good game is associated with higher educational achievement.

1.3 Experimental Design

1.3.1 Procedures

Our experiment took place in five middle schools in Brittany, France, in October 2018. 432 students of 22 classes of 6^{th} grade participate in the study. They were between 12 and 13 years old, nearly all born in the same year since class repetition were rare in our sample.

Among each class, from 16 to 20 students were randomly chosen to participate in the experiment.[11] Appendix 1.A shows those selected to participate are not different from those who answer a survey in most of the characteristics considered. The project was approved by the rectorate of Brittany and by every school headmaster. We sent an authorization to participate to parents. They were free to refuse. Parents were not informed about the details of the experiment except for gratification. Among all parents, 27 parents refused to let their child participate, consisting of a rate of 4.7%.

We ran the experiment using a lab mobile of 20 tablets, which allowed us to provide conditions very similar to that one would obtain with a traditional lab (cf. Appendix 1.B). We emphasize the strict respect for decisions anonymity and the fact that there are no 'right answers'. Participants were forbidden to chat during the experiment. At the beginning of the experiment, we carefully explained each game's rules and ran comprehension questionnaires to understand the rules fully. Table 1.1 presents the different sessions per school and per classroom.

Experiments with non-standard participants are more likely to be subject to an '*experimenter effect*' (Zizzo, 2010): the subject understands which behaviors we are measuring and the underlying hypothesis of the study. Various reasons suggest that

[11] The other students answered a survey.

Table 1.1: Participants by class-school

School	Class						Total
	1	2	3	4	5	6	
1	20	16	20	20	20	0	95
2	20	20	20	16	20	0	96
3	20	20	0	0	0	0	40
4	20	20	20	20	0	0	80
5	20	20	20	18	20	20	118
Total	100	96	80	76	60	20	432

We have not been able to collect demographics and grades for 11.

participants have not been subject to an experimenter effect. First, they were not aware that we put in perspective their behaviors with their grades which does not make it possible to adopt a particular expected behavior. Second, we particularly emphasize the dissociation between experiments and the school environment. Third, we notably underline that their peers, teachers, and parents will not know their choices.

In May 2018, we returned to schools to collect pupils' grades in English, Mathematics, History & Geography and their GPA. The collection of individual grades via school administration allows for commensurable school achievement measures for all pupils who participate in the study. The French grades system is explained in Section 1.4.1. In the time-lapse between the experiment and our second visit, eight pupils changed school without having any grades for the semester. Hence, on the 432 participants in total, 3 of them did not fill pieces of information in the post-experiment survey, making it impossible to link their behaviors to administrative data (*i.e.* gender and SES). We collect additional control variables regarding participants' social environment and their digital practices on the overall sample except for the two first sessions. Our final sample consists of 421 pupils who participate in the initial study.

A standard procedure in experimental economics is to use monetary incentives to elicit meaningful responses from participants. However, it is often difficult or even impossible to use monetary rewards with children. Indeed paying children by cash maybe not be allowed by all involved parties, including parents and school principals. Furthermore, teachers may prohibit small children from bringing cash to school. Also, we may reasonably argue that children may not have a precise value of money. For

all these reasons, most experimenters do not use cash payment as an incentive. They prefer to use gift certificates (*i.e.* Harbaugh et al. (2002), Bettinger and Slonim (2007), Castillo et al. (2011)).[12] In our current study, we awarded children tokens according to their choices. They converted them at the end of the experiment into vouchers, gifts (mug, pencil, among other things), or candies. The remuneration scheme covers durable and immediate rewards to incentivized participants in a similar manner regardless of their preferences for a given gratification. The average value of gifts was around 8 euros. Appendix 1.C gives the pay-off in tokens. Fehr et al. (2008) define weekly pocket money for 10-11 years at 4.7 and 6.5 euros for 12-13-year-old students. Considering the difference in living standards between France and Switzerland, we incentivized children at their opportunity cost.

Considering feedback provided by children and teachers, it seems that our remuneration scheme incentivized participants.

1.3.2 The experimental games

Our experiment consists of three different games : *i*) a VCM game, *ii*) a modified dictator game and *iii*) a real effort task where they had to choose their preferred remuneration scheme between a tournament or a flat wage scheme. A fourth game has been played. Results for this given game are presented in the following chapter. All games have been programmed using Z-tree (Fischbacher, 2007). Matching with others player in all games were random.[13] We kept the same order across games.

The real effort task inspires from Charness et al. (2014). In this task, participants

[12]We acknowledge, however, that using gifts may cause more uncertainty and therefore are less good predictors of preferences. For instance, Harbaugh et al. (2002), Bettinger and Slonim (2007), and Castillo et al. (2011) use vouchers or small gifts as rewards to elicit risk aversion. Harbaugh et al. (2007) give 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 we 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) use stickers in a dictator game since young children valued stickers. Conducting children's experiments is also cheap: payoffs in candy represent significant changes in their budget constraints and are generally enough to make them think carefully about their decisions.

[13]Appendix 1.D displays the instructions. For the real effort task, participants have to select their remuneration scheme between flat wage and tournament. If the number of players choosing the tournament was not an even number, one of the participants already paired would randomly match with the last participant without knowing it.

had to decode one-digit numbers into letters from a grid of letters displayed on the tablet for two minutes (see 1.D for details). The task is simple, does not require any particular skills, and was particularly meticulous, inducing participants' disutility. Such a task required neither memory nor specific ability. Participants were entirely free not to decode any letter.

Before decoding tasks, participants were asked to choose a remuneration scheme: either a flat wage or a tournament scheme. The game only lasts one period. Participants were continuously informed of their correct answers but did not have any information regarding others' performance. If they submitted a wrong answer, they had to decode the same letter until the answer was correct. Once the two minutes have elapsed, the tablet displays a screen with their productivity and their counterpart if they have chosen the tournament scheme.

Experimentalists usually provide alternative occupations to participants in a traditional lab setting. Our design did not offer such leisure activities. Hence, it might imply that participants select the tournament scheme to spend time until the end of the experiment. To mitigate this bias, we emphasize to participants that they were free not to decode any letter if the flat wage remuneration scheme was chosen and were free to take a nap or do whatever they wanted if they were quiet.

If the participant chooses the flat wage, the payment is 50 ECU (experimental currency units) irrespective of the numbers of letters decoded. If he selects the tournament framework, he receives $\pi_i = 80$ if he wins or $\pi_i = 20$ otherwise. In the tournament setting, a random draw brokes ties. Appendix 1.E shows the individual performance under both remuneration scheme and appendix 1.F the gratification chosen by gender. We observe that girls are less likely to enter the tournament than men.

Altruism is measured using a dictator game based on Berg et al. (1995). Each participant i was endowed with 50 tokens and had the opportunity to give a share of this amount to another participant j randomly chosen in the classroom. At the same time, another participant k had the opportunity to share his endowment with participant i. Thus, the participant did not have any information about other decisions when they proceed with their choice. The profit function for each player i was defined as $\pi_i = 50 - S_{ij} + S_{ki}$ where S_{ki} is the number of tokens received by the player i from

the player k, S_{ij} is the number of tokens send from i to j. We ensure that participants i and k did not play together during both VCM games to alleviate a possible reciprocity effect. However, we acknowledge that our altruism measure cannot disentangle between inequality aversion, altruism, trust (*i.e.* someone also sent something for me).

In the public good games, groups consisted of four participants in partner setting (*i.e.* group composition constant over periods). The game last six periods. In the public good game, the payoff function is given by :

$$\pi_i = 20 - C_i + 0.5.\Sigma_{i=0}^{4} C_i$$

Where C_i is the individual contribution of the individual i. In the classic public good game, participants have only the group total participation as information. Appendix 1.H shows the distribution of the average contribution in the VCM by gender.

1.4 Results

1.4.1 Variables of interest

We present here the main variables of interest.

School achievement. We measure school achievement through individual administrative grades. The French grades' system has a mark going from 0 (the worst) to 20 (the best). We obtain grades for 421 students in GPA, Mathematics, and History & Geography. The GPA represents the '*Moyenne Générale*', which is the average of the weighted grades for all disciplines taught. Its scale is similar to standard grades (*i.e.* between 0 and 20).

We lost eight pupils who changed school between the experiments and the initial sample's administrative data collection. We obtained English grades for 303 pupils. We use standardized grades at the class level, which allows us to analyze the pupils' relative achievement compared to the class instead of an absolute grade.[14] This identification allows comparing the individual position within the class distribution instead of the simple raw grades. Appendix 1.I reports the distribution of grades for each discipline

[14]Standardized grades are defined as $G_{ij} = \frac{G_{ij} - \bar{G_{kj}}}{\sigma_{kj}}$ with G_{ij} is the standardized grades for individual i in the j^{th} discipline, G_{ij} is the raw grade of individual i in the j^{th} discipline $\bar{G_{kj}}$ is the class,k average in the discipline j, σ_{kj} is the standard deviation of the raw mark for the class k in the discipline j.

with the two specifications (distance to the average and standardized).

Behavioral measures. Our experimental design allows us to measure three behavioral factors: cooperation, altruism, and willingness to compete.

Cooperation is the average number of tokens given in the first six periods in the VCM. We acknowledge that this cooperation measure is somehow biased due to other group members' behaviors. We further discuss this issue in section 1.5.[15]

Altruism is the number of tokens sent in the modified dictator game standardized at the class level. This specification allows us to approach '*relative*' instead of '*absolute*' altruism.[16] Hence, we can identify whether pupils are altruist *compared* to their peers.

Willingness to compete is a dummy equal to 1 if the participant chose the tournament as a remuneration scheme.[17] Appendix 1.4 summarizes relationships between behavior, gender and sociodemographic variables. Altruism is strongly correlated with cooperation, while the willingness to compete is not associated with those measures.

Socio-demographic characteristics. We collected additional control variables via the school administration and a post-experiment survey. Administrative data are gender and SocioEconomic Status (henceforth SES). SES encompasses two categories: high and low SES. Appendix 1.L details the creation of the variable. Appendix 1.4 shows that girls tend to exhibit slightly less willingness to compete ($p < 0.1$). Pupils from the higher socioeconomic background are less altruist and cooperative ($p < 0.05$). Besides, we measure their digital practices via a survey at the end of the experiments.

[15] As presented in the following chapter, altruism is a strong motivation to contribute to the VCM. Our analysis might therefore be bias due to this correlation. To test for this bias, we incrementally add behavioral measures to test for collinearity in Appendix 1.J. The relationship between altruism and school achievement does not differ whether cooperation is added or not.

[16] An experiment taking place in school within traditional class time allows to compare individual behaviors compared to classmates' behaviors. The basic idea is to account for altruism distribution within the class instead of absolute individual altruism. Moreover, it gives a commensurable measure of individual altruism relative to his classmates' behaviors. Standardized altruism is defined as $A_{ij} = \frac{A_i - \bar{A}_{kj}}{\sigma_{kj}}$ A_i represents tokens sent in the MDG for individual i belonging to class k. $\bar{A}_{kj}$ is the class k average amount of tokens sent and σ_{kj} its standard deviation.

[17] We acknowledge that several papers document the role of risk preferences to elicit individual willingness to compete (Niederle and Vesterlund, 2007). They influence the choice through the payoff difference: tournament offers a higher uncertain payoff. Moreover, Hanushek et al. (2020) show a negative relationship between these risk-taking behaviors and school achievement using PISA and the Global Preference Survey (see Benzoni and Chyruk (2015) for an extensive review on that matter). Risk-aversion is negatively associated with willingness to compete and positively correlated with school achievement. Hence, the relationship between competitiveness and grades might be downward biased due to risk preferences.

1.4.2 Determinants of educational achievement

This section aims to investigate the determinants of grades in various disciplines. Experimental literature highlights that willingness to compete depends on the nature of the task realized (Günther et al., 2010, Große and Riener, 2010), even for adolescents (Dreber et al., 2014). For instance, Mathematics is not representative of disciplines taught in schools; due to its stereotypes, over-representation of men, and the exercise's nature. We run similar specifications over various fields (GPA, Mathematics, English, and History & Geography). Our various measures of grades allow us to test if individual preferences have the same impact between disciplines. The following estimations displayed in Table 1.2 are based on standardized grades at the class level and based on the below equation :

$$Y_{ij} = \beta_0 + \beta_1.\text{competitiveness} + \beta_2.\text{altruism} + \beta_3.\text{cooperation} + X_i + \mu_{ij}$$

Where Y_{ij} represents the standardized grades in discipline j for individual i. Competitiveness is a dummy equal to one if the i chooses the tournament as a remuneration scheme for the real effort task. Altruism is the number of tokens sent in the MDG standardized at the class level. Cooperation is the average number of tokens sent in the VCM. X_i is a vector of individual characteristics, such as gender, SES, birth month, and school dummies. μ_{ij} is the error term for individual i in discipline j clustered at the class level. It allows controlling for serial correlation within each class. Columns 1-3, 4-6, 7-9, 10-12 of Table 1.2 display the estimations for the GPA, Mathematics, English and History & Geography, respectively.

Model 1 - 4 - 7 - 10 shows that individual behaviors are positively and highly associated with grades. All else equal, the choice to undertake the tournament as a remuneration scheme raise the GPA of 0.188 standard deviations ($p < 0.01$), 0.259 standard deviations ($p < 0.01$) in Mathematics. This pattern is not observed among grades in English and History & Geography. This first set of results echoes Niederle and Vesterlund (2010) explanation on the role of the willingness to compete as a determinant of school achievement among STEM disciplines. The competitiveness coefficient is more salient for Mathematics grades than English, but its coefficient is not significant. It appears that individual competitiveness is more associated with STEM disciplines grades.

Table 1.2: Determinants of grades in various discplines

	Average		Mathematics		English		History	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Competitiveness	0.188**	0.210**	0.256***	0.259***	0.226	0.269*	0.077	0.092
	(0.086)	(0.092)	(0.080)	(0.084)	(0.137)	(0.133)	(0.103)	(0.109)
Normalized altruism	-0.151**	-0.150**	-0.155***	-0.150**	-0.070	-0.065	-0.171***	-0.167***
	(0.055)	(0.055)	(0.054)	(0.055)	(0.059)	(0.059)	(0.048)	(0.047)
Individual average cooperation	0.004	0.004	-0.005	-0.004	0.016	0.013	-0.001	-0.000
	(0.012)	(0.011)	(0.012)	(0.011)	(0.010)	(0.010)	(0.012)	(0.011)
Girl		0.187		0.036		0.241		0.124
		(0.129)		(0.119)		(0.140)		(0.145)
SES		0.573***		0.461***		0.435**		0.588***
		(0.119)		(0.103)		(0.155)		(0.118)
Constant	-0.093	-0.259	-0.191	-0.269	-0.204	-0.345	-0.005	-0.145
	(0.278)	(0.296)	(0.312)	(0.316)	(0.269)	(0.294)	(0.289)	(0.318)
N	421	421	421	421	303	303	420	420
R^2	0.058	0.122	0.063	0.101	0.081	0.123	0.069	0.132

Significance levels: ***0.01 **0.05 *0.10 School and birth month dummies included. Robust standard errors clustered at the class level. Estimations based on OLS. Digital leisure is defined as the number of social networks used, daily times of TV, smartphones using and video games. Playing in a normal school day. See Appendix 1.M for estimations with additional control variables.

As presented in section 1.2, the literature emphasizes the association between willingness to compete and various educational achievement dimensions. First, pupils exhibiting competitiveness might be more ranking-oriented than their classmates, resulting in higher grades. Second, competitive environment heterogeneously impacts students (Ors et al., 2008, Jurajda and Münich, 2011). Educational environments having this feature are more likely to benefit pupils exhibiting such taste.

Result 1: Competitiveness is positively correlated with achievement.

A second result pined out from those estimations is the negative relationship between altruism and school achievement in GPA ($p < 0.05$), Mathematics ($p < 0.01$), and History & Geography ($p < 0.01$). Thus, pupils sending is the MDG is negatively associated with grades. For instance, one standard deviation of altruism decreases the GPA of 0.151 standard deviations.

This result is surprising for several reasons. First, coefficients are stable over disciplines. It suggests that the relationship magnitude is somehow constant on three out of four fields considered, regardless of its contents and characteristics. Thus, it goes along the way of the first stand of the literature suggesting that altruism is associated with poorer cognitive abilities. Second, the coefficient magnitude is considerable. It is similar to competitiveness regarding GPA (-0.151 compared to 0.188) and accounts for half of the competitiveness impact in Mathematics (0.256 and -0.155).

Being selfishly in a dictator game somehow reflects individual rationality—payoff maximization by being selfishly associates with '*homo oeconomicus*' principles. We propose two possible explanations for this result. First, selfish pupils might be more likely to efficiently proceed to the trade-off between individual and social activities to promote their school achievement. Second, altruism reflects others' concern, reflecting a lower willingness to obtain a higher ranking than their classmates.

Result 2: Altruism is negatively associated with achievement in all the disciplines considered here.

Model 2 - 5 - 8 - 11 reports qualitatively similar results after controlling for demographics (gender and socioeconomic background). We also observe a strong relationship between pupil's socioeconomic background and school achievement. For instance, all else equal, belonging to the higher SES is associated with a rise of the GPA of 0.573 standard deviations. The magnitude is not important *per se* but provides an order of the extent

of behavioral coefficients. As an example, individual willingness to compete accounts for half of the importance of a pupil's socioeconomic background in the model (2), altruism around 25%. Our results suggest little impact of gender on school achievement.

The predictive power of those various characteristics on grades is somehow pretty low. In the first set of models, 1-4-7-10, which only included behavioral measures, explain between 5.8%, for GPA, to 8.1%, in English, of the total variance of standardized grades in the discipline. Our results strongly differ to Borghans et al. (2016) which observe that IQ explains nearly 20% of the variance of grades while their measures of soft skills (*i.e.* self-esteem and locus of control) account for less than 10%. Our results depict lower predictive power than Borghans et al. (2016)'s results. Socio-demographic characteristics inclusion leads to a similar increase in the predictive power of the model. In other words, three behavioral measures explain as much as individual core characteristics.

The estimations displayed in this section underline the core role of preferences in school achievement. Competitiveness and altruism are shaping school achievement across disciplines. The choice to undertake the tournament is correlated with higher grades in a couple of fields. We also observe a negative correlation between altruism and grades across disciplines (global GPA, Mathematics, and History & Geography). The magnitude of both results is far from being negligible: competitiveness accounts for half of the influence of SES and altruism for a third. Lastly, we do not find any relationship between individual ability to cooperate and grades.

1.4.3 Alternative specification of grades

Estimations displayed in the previous section are based on standardized grades, which account for the within-class variation. This identification expresses individual grades in terms of standard deviations compared to the mean achievement within the class. It implicitly considers that all classes have the same average grades while having a different level of achievement. A relative grade homogeneity might drive the relationship between competitiveness and grades within classes. For instance, competitive pupils will provide additional efforts to have higher grades when they are close to their classmates.

To overpass those potential biases, we run an alternative specification by using the

difference between the individual grades and the class average in a given discipline. It allows us to grasp the absolute performance regarding the overall class achievement. Appendix 1.N displays those estimations. This new set of estimations aims to test whether the absolute distance to the class achievement matters. These specifications are identical to those present in Table 1.2 except that explicative variables are the distance to the mean instead of the standardized grades. Results are qualitatively similar.

Result 3: Alternative specification of grades leads to similar results.

1.5 Discussion

This section briefly discusses this paper's main findings.

On Competition. Previous works on competition and education emphasize a strengthened relationship in STEM disciplines (Niederle and Vesterlund, 2010). The authors suggest that various disciplines' characteristics lead to this issue. For instance, the nature of the task used to elicit competitiveness influences a gender gap in willingness to compete and its magnitude (Große and Riener, 2010, Günther et al., 2010). Thus, STEM disciplines by its evaluation procedure- a unique and given possible answer, an analytical task - might be more favorable to pupils exhibiting a higher taste for competition. Our results do not provide compelling evidence regarding this issue. Willingness to compete is positively associated with Mathematics grades, which is larger than those observed for GPA but weaker than English grades. This last discipline being far from belonging to STEM, we cannot infer a stronger and causal relationship between achievement within scientific disciplines and competitiveness.

On Altruism. A '*naive*' experimentalist may, based on our result, suggest policies to enforce selfishness to foster school achievement. One may reasonably argue that selfish individuals do not bear opportunity costs associated with helping others. They dispose of longer time to work on their achievement and be more oriented toward their futures. It is our first explanation. We can also suggest that omitted variables bias this relationship. For instance, Ben-Ner et al. (2004) depict a positive relationship between personality measures and behaviors in a dictator game. Hence, pupils lacking self-confidence are more altruist. They might also be less confident regarding their ability to be successful students. This negative relationship might reflect an aspect of child personality positively

correlated with altruism and negatively with educational achievement.

On Cooperation. Our results suggest a weak, if not null, relationship between cooperation and school achievement. However, its measure based on a VCM does not represent its '*pure*' aspect since it takes place within a group and is theretofore strongly correlated with other members' cooperative behaviors. Hence, the cooperation measure previously presented is '*conditional*' and does not reflect strictly individual cooperative preference. Our findings show a null impact of conditional cooperation on educational achievement. In our view, it remains unclear whether a '*pure*' measure would observe a relationship or not. Nevertheless, it could clarify this relationship.

On their roles on educational inequalities. The experimental literature shows extensive evidence of demographic characteristics' role on preferences development among young participants (see Sutter et al. (2019) for a review). More specifically, children from higher socioeconomic backgrounds tend to exhibit higher competitiveness and higher pro-social behaviors (see Section 1.2 for a review). Our results show that both preferences are strongly associated with school achievement. More specifically, Almås et al. (2016) document the relationship between children and teenagers SES and their competitiveness development. Additionally, studies documenting children socioeconomic background and pro-social behaviors tend to show a positive relationship (Bauer et al., 2014, Deckers et al., 2017, Kosse et al., 2020). Higher parental background associate with more developed pro-social behaviors. Both measures might represent an important root of educational inequalities, hardly measurable using standard non-experimental procedures. A growing number of studies show behavior malleability at a young age promotes individual educational achievement. Thus, it appears as promising research agenda to reduce educational inequalities.

What are we measuring ? This last issue relates to our study's causality. The one-shot experiment does not allow to infer a causal relationship between preferences and school achievement for several reasons discussed hereafter.

First, we cannot distinguish whether those preferences cause school achievement or are caused by it. This chapter conjectures that experimental measures illustrate field behaviors, which influence then pupils' schooling performance. A participant displaying a higher taste for competition is more likely to pursue a greater effort to obtain a higher rank than his classmates. This explanation has been largely discussed within

the literature (see, for instance, Horn and Kiss (2018) and Alan and Ertac (2019)). We can also reasonably argue that higher-performing pupils are more likely to develop such taste. Being educationally competitive might develop competitiveness. Unfortunately, this study design does not allow to cover this aspect.

Second, the extent to which school values impact our results remains unclear. The behavioral economics of education literature discusses relationships between behaviors and educational achievement for a given educative system. Studies conducted in a given country and using standard measurements - such as grades or GPA - encompass values and behaviors promoted by the educative system. For instance, an educational system promoting collaborative works might have cooperative pupils as high achievers. Students exhibiting a higher taste for competition might obtain higher achievement in an educational system that emphasizes competition. Our results might then only represent the importance of competitiveness and selfishness in education in France.[18]

1.6 Conclusion

The relationship between traditional experimental measures and schoolchildren's educational achievement receives growing attention. Seminal works show that time preferences influence pupils' achievement (Castillo et al., 2011, Sutter et al., 2013). Furthermore, a growing literature regarding behavioral economics of education has recently emerged (Lavecchia et al., 2016, Levitt et al., 2016, Koch et al., 2015). While most of this literature focus on habits, information, and beliefs, we pin out the importance of individual and social preferences in the human capital formation process. We have investigated what extend willingness to compete, cooperation, and altruism shape educational success in middle school.

Using a lab-in-the-field with 22 classes of 7^{th} grade, we study the relationship between individual preferences and school achievement in various disciplines taught. We measure the willingness to compete, altruism, and cooperation using widely replicated games in experimental economics. We find a significant correlation between those behaviors and

[18] We need to put in perspective this discussion to the related literature which observe an important role of competitiveness in children and teenagers educational achievement. Results are robust over countries with different school system (*i.e.* Hungary (Horn and Kiss, 2018) and Turkey (Alan and Ertac, 2019)). The small number of studies covering this issue does not draw a clear conclusion on a global aspect.

our various measures of school achievement.

We first show that willingness to compete is a significant determinant of school achievement in most of the disciplines studied here: pupils exhibiting a higher degree of competitiveness are more likely to have higher grades. Our study's second key result is to show a robust negative relationship between altruism and school achievement. This finding echoes previous research suggesting a positive relationship between cognitive abilities and selfishness: well-performing pupils at school tend to share less in a dictator game.

Growing evidence documents the malleability of preferences and behavioral traits. It provides a meaningful avenue in terms of policies' implementation (Sutter and Glätzle-Rützler, 2015, Alan and Ertac, 2018, 2019, Kosse et al., 2020, Cappelen et al., 2020). As highlighted by Levitt et al. (2016), educational policies inspired by behavioral and experimental economics might represent powerful costless leverage to foster the pupils' achievement. Hence, our results contribute to economists and policymakers' growing discussion on interventions to promote individual preferences to enhance lifelong trajectories. In this spirit, Cappelen et al. (2020) evaluate the causal impact of early education on social behaviors and found sizable effects. Based on our results and this growing literature, policymakers might find some policies to develop child behaviors at a young age.

We hope that our results provide further evidence of the relevance of studying social preferences in an educational setting. A first natural extension of this study might be to observe whether our findings are still associated with future individual outcomes (such as integration into the labor market, the field of study). The possible leverage to foster individual competitiveness, documented by Sutter and Glätzle-Rützler (2015) and Alan and Ertac (2019), is a second possible extension of our study and provides meaningful avenues for policy implementation. An interesting feature would be to design experiments to causally explore the role of the behavioral traits considered in this study. A third natural extension might be to analyze whether our results hold if we had a personality or alternative school achievement measures. These possible extensions might shed light on the three-way relationship between character, social preferences, and educational achievement.

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Appendix

1.A Randomization

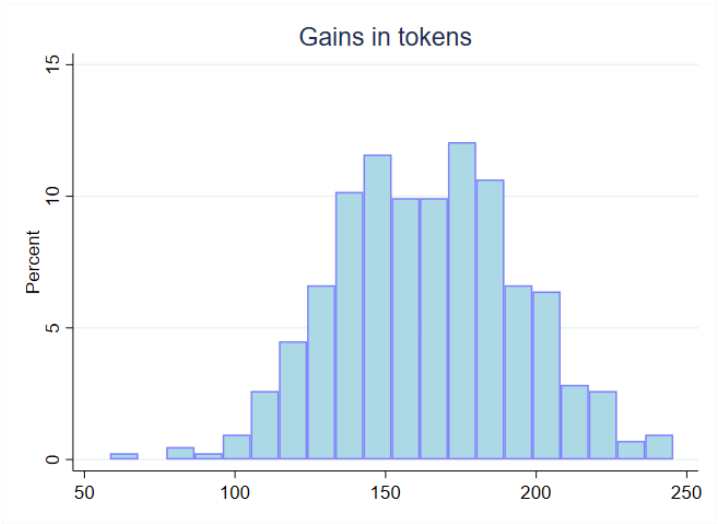
The size of our lab disallows the entire class to participate in the experiment. To conserve the representatives of our study, we randomize the participation at a class level. The current appendix displays the distribution of some individual characteristics to ensure that the randomization works.

Descriptive statistics of participants and non-participants

	(1)	(2)	(3)
Variable	Non-participants	Participants	Difference in means
Gender	0.366	0.586	0.220***
	(0.483)	(0.493)	(0.045)
Receiving scholarship	0.171	0.000	-0.171***
	(0.377)	(0.000)	(0.018)
Farmers, Craftsmen, traders, and business leaders	0.034	0.040	0.005
	(0.183)	(0.195)	(0.019)
Executives and higher intellectual professions	0.110	0.143	0.033
	(0.314)	(0.351)	(0.033)
Intermediate professions	0.145	0.141	-0.004
	(0.353)	(0.348)	(0.034)
Employees	0.297	0.267	-0.030
	(0.458)	(0.443)	(0.043)
Workers	0.262	0.291	0.029
	(0.441)	(0.455)	(0.044)
Retired	0.000	0.002	0.002
	(0.000)	(0.050)	(0.004)
Unemployement	0.152	0.116	-0.036
	(0.360)	(0.321)	(0.032)
Observations	164	423	

1.B Lab-in-the field

1.C Gains in tokens



1.D Instructions

You are participating in an economy experiment where the goal is to win as many tokens as possible, and these tokens will give you gifts. The tokens you win will depend on your choices and those of other players. During the experiment, you must not talk to any of your classmates. If you speak to them, you will not be able to play, and you will not receive any tokens. If you have any questions, raise your hand, and we will come and answer them.

There are four different games in this experiment: the first two last six games each, two final games are one game each.

You will use a number pad throughout the experiment. Use the C key to erase what you have entered.

The number of tokens receiving is :

- We give you 20 tokens for your participation.
- To find out how many tokens you won in the first two games, we will draw a random number of 6 tokens for each of them. For the last two games, all of your choices matter for the payment.

First game: 6 periods

You are part of a group of 4 players, but you do not know with whom you are playing. You can choose to participate in a group project, *i.e.*, to put tokens in a pot. The tokens given in the communal pool are equally shared among the group members.

Rules of the game :

- At the beginning of each game, you receive 20 tokens.
- You are part of a group of 4 players (A, B, C, D). You do not know who the others are.
- The game consists of participating in a joint project in which everyone decides how many tokens they want to put in the common pot without knowing what the others will give.
- You have the choice to give from 0 to 20 tokens.

Two things influence what you will win:

- When everyone has made their choice, the screen displays the number of tokens in the community pot and the number of tokens you have won.

- Each player receives half of all the tokens that have been placed in the community pot.

Your win depends on two things:

- The tokens you kept (20 tokens - your stake).
- Tokens given to the pot. Each player receives half of the total amount of tokens pooling.

The number of tokens you win at the end of the game is equal to the number of tokens you kept plus half of the tokens in the pot.

For example, if each of the four players puts 20 tokens in the community pot, it will be 80 tokens in the pot ($20 \times 4 = 80$). Each player gets half of the given tokens in the pot ($40 = 80 \div 2$) plus the tokens they have kept (in this game, 0 tokens). Everyone will have won 40 tokens in this game.

Conversely, if each of the four players puts 0 tokens in the pot, each player will have won half of the tokens in the pot (*i.e.*, 0) plus the number of tokens they have kept (*i.e.*., 20 tokens). So everyone has won 20 tokens in this game.

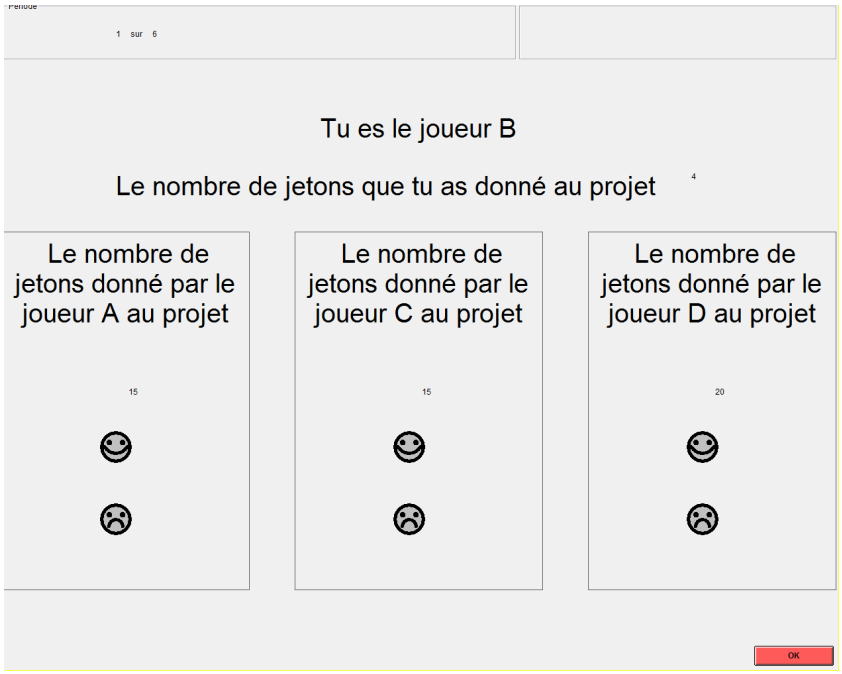
For example, if you put ten tokens in the community pot and the other three players put 20 tokens in the community pot, that makes 70 tokens in the community pot ($10 + 20 \times 3 = 70$). Each player gets half of the tokens in the pot ($35 = 70 \div 2$) plus the tokens they have kept. In your case, you have won 35 tokens from the community pot plus the ten tokens you kept. You have won 45 tokens in this game.

Before you start, you will answer a few comprehension questions.

The tokens you give to the pot increase the winnings of all players in the group. To calculate what you have won in this step, we will randomly draw one of the six games.

Second stage : 6 periods

You will replay 6 periods like in the first game. But now you can hand out smileys to the other players to show them if you are satisfied or not with the number of chips they gave to the pot. Receiving smiley faces does not affect the number of tokens you will win. The person receiving the smiley will not know that you gave it to them. Don't forget that you can also receive smileys from other players in the group.



We'll explain how this step works:

- You will play 6 periods like in the previous game. At the end of each game, you will know how many tokens each of the other 3 players has put in the common pot.
- You decide which smiley you want to give to each player in your group. You can choose between no smiley face, a positive smiley face or a negative smiley face. If you think the player has contributed enough chips to the pot, you can give them 1 positive smiley. If you feel that the player did not contribute enough tokens to the pot, you can give them a negative smiley face. But you can also decide not to give any smiley

Before you start, you will have to answer a few comprehension questions.

To calculate how many tokens you will keep to pick lots at the end of the experiment, we will randomly draw one of the six games.

****

Third stage: 1 period

You will make a decision that will allow you to win tokens. You are going to play with another player.

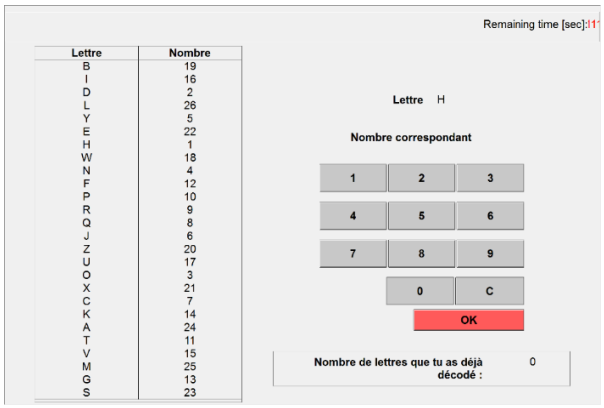
You receive 50 tokens. The other player gets 0 tokens. You can choose to increase that player's tokens by giving them some of your tokens (between 0 and 50 tokens).

At the same time, another player will play with you. He gets 50 tokens, and you get 0 tokens. He can choose to increase your tokens count by giving you some of his tokens. When you decide, you will not know how many tokens that player has chosen to provide you.

Your winnings will depend on: what you give the player + what the other player gives you.

Fourth stage

You will now participate in a new game where you will have to complete a task. You will see a table on the left side of your screen. The first column contains letters and the second column numbers. Each row shows the number corresponding to a letter. You will have to decode these letters into numbers.



A letter appears in the middle of your screen. You have to look at the number corresponding to the letter in the table. Then you type in the number. If you were wrong, you have to start over until you find the correct answer. You have three minutes to decode as many letters as you can.

You will choose your payment scheme. You can choose between a fixed number of tokens (your win does not depend on the number of letters you decode) or a tournament

(your success depends on your performance). You will then play the same task for three minutes.

If you choose a fixed payout, you win 50 tokens regardless of the number of letters you decode. If you decode 0, 5, 10, 20, or any number of letters, you will always win 50 tokens.

If you choose the tournament, you compete with another player in the room (you do not know his identity). At the end of the three minutes, letters decoded are compared to the number of letters made by the other player. The earning distribution is as follow:

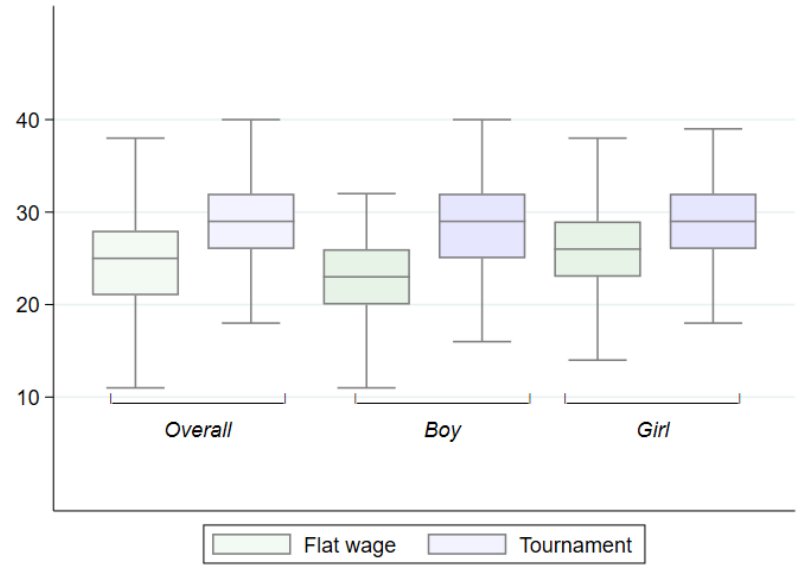
- You win 80 tokens if you have decoded more letters than the other player.
- You win 20 tokens if you have decoded fewer letters than the other player.

Before you start, you answer few comprehension questions.

You will now take a quiz. It only takes a few minutes.

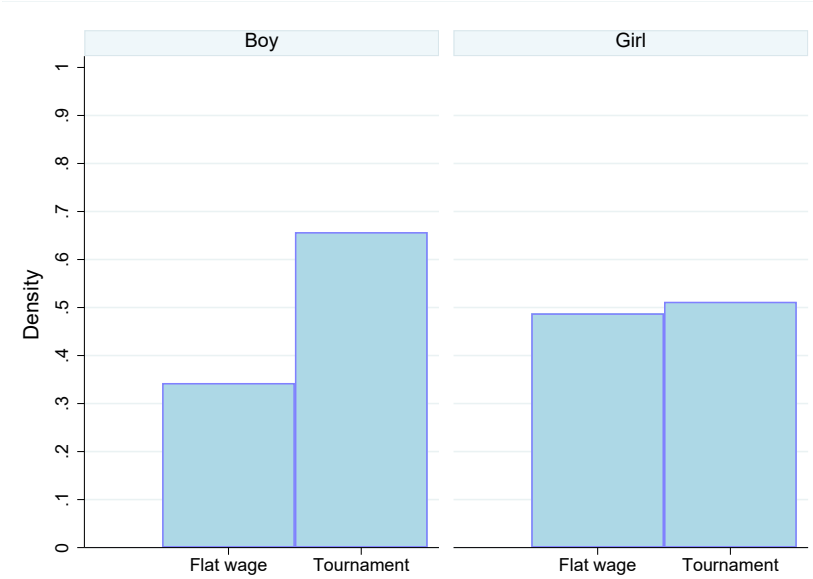
1.E Effort and remuneration scheme

Figure 1.2: Letters decoded by remuneration scheme and gender



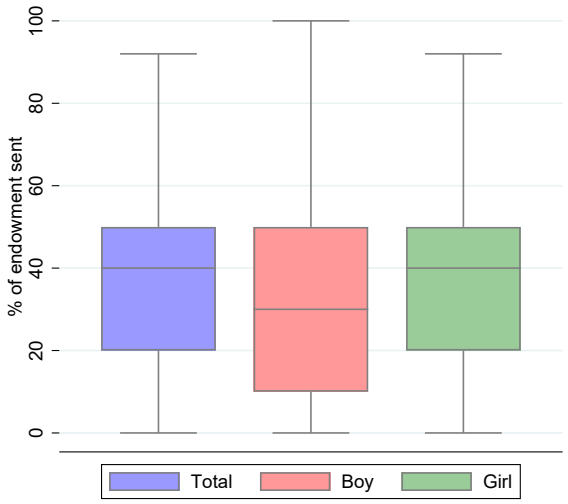
1.F Willingness to compete by gender

Figure 1.3: Remuneration scheme choice and gender



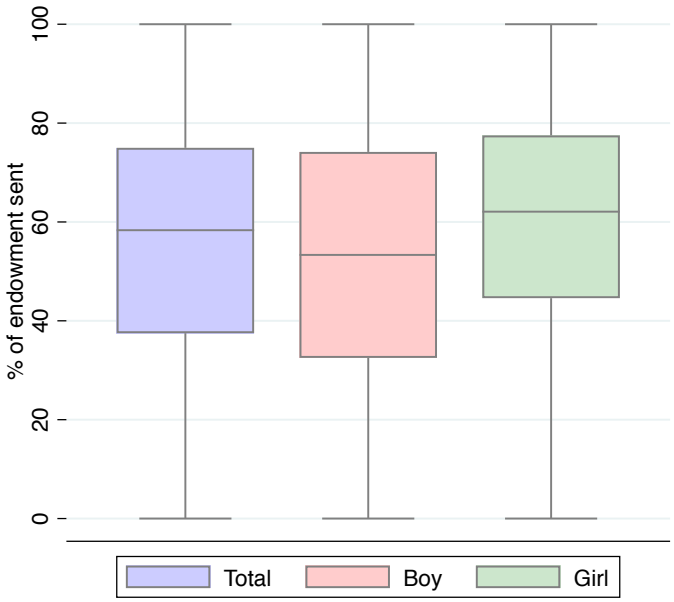
1.G Altruism over gender

Figure 1.4: Altruism by gender

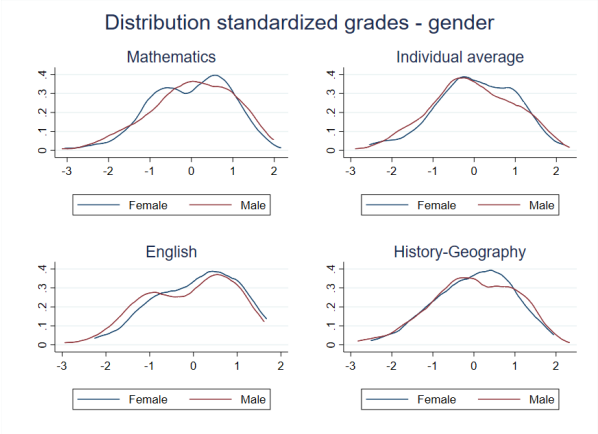


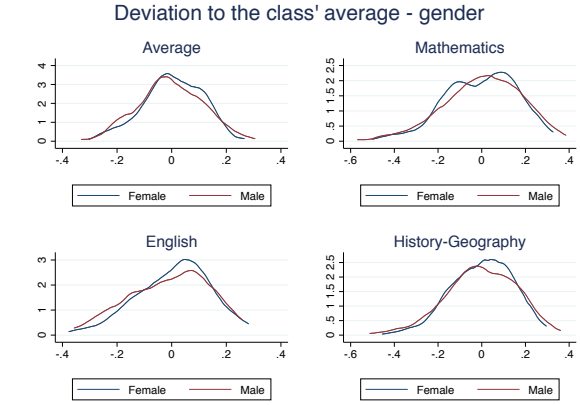
1.H Cooperation in the VCM

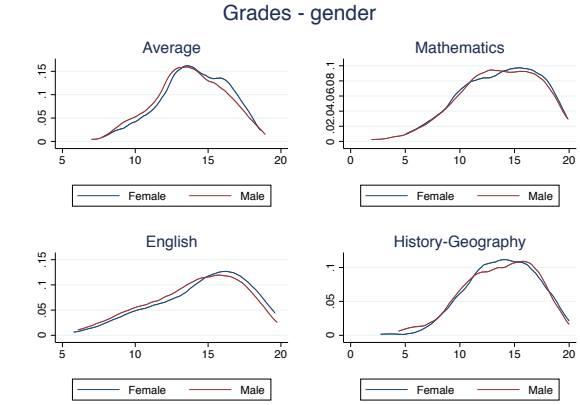
Figure 1.5: Percentage of endowment given in average in the VCM



1.I Grades Distribution







1.J Correlation between cooperation and altruism

Table 1.3: Determinants of grades in various discplines

	Average				Mathematics				English				History			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Competitiveness	0.188**	0.188**	0.210**	0.210**	0.256***	0.256***	0.259***	0.259***	0.217	0.226	0.264*	0.269*	0.077	0.077	0.092	0.092
	(0.086)	(0.086)	(0.093)	(0.092)	(0.080)	(0.080)	(0.084)	(0.084)	(0.134)	(0.137)	(0.131)	(0.133)	(0.102)	(0.103)	(0.109)	(0.109)
Normalized altruism	-0.144**	-0.151**	-0.144**	-0.150**	-0.163***	-0.155***	-0.155**	-0.150**	-0.042	-0.070	-0.044	-0.065	-0.173***	-0.171***	-0.168***	-0.167***
	(0.058)	(0.055)	(0.056)	(0.055)	(0.057)	(0.054)	(0.056)	(0.055)	(0.060)	(0.059)	(0.057)	(0.059)	(0.051)	(0.048)	(0.049)	(0.047)
Individual average cooperation		0.004		0.004		-0.005		-0.004		0.016		0.013		-0.001		-0.000
		(0.012)		(0.011)		(0.012)		(0.011)		(0.010)		(0.010)		(0.012)		(0.011)
Girl			0.193	0.187			0.031	0.036			0.256*	0.241			0.124	0.124
			(0.127)	(0.129)			(0.115)	(0.119)			(0.137)	(0.140)			(0.145)	(0.145)
SES			0.571***	0.573***			0.463***	0.461***			0.434**	0.435**			0.588***	0.588***
			(0.118)	(0.119)			(0.103)	(0.103)			(0.157)	(0.155)			(0.117)	(0.118)
Constant	-0.044	-0.093	-0.213	-0.259	-0.251	-0.191	-0.310	-0.269	-0.012	-0.204	-0.197	-0.345	-0.020	-0.005	-0.149	-0.145
	(0.233)	(0.278)	(0.259)	(0.296)	(0.263)	(0.312)	(0.272)	(0.316)	(0.234)	(0.269)	(0.263)	(0.294)	(0.241)	(0.289)	(0.280)	(0.318)
N	421	421	421	421	421	421	421	421	303	303	303	303	420	420	420	420
r2	0.058	0.058	0.122	0.122	0.062	0.063	0.101	0.101	0.075	0.081	0.119	0.123	0.069	0.069	0.132	0.132

Significance levels: ***0.01 **0.05 *0.10 School and birth month dummies included. Robust standard errors clustered at the class level. Estimations based on OLS.

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1.K Determinants of individual behaviors

Table 1.4: Determinants of individual behaviors

	Willingness to compete			Altruism				Cooperation			
	(1)	(2)	(3)	(4) OLS-Altruism	(5) Stand. Altruism	(6) Stand. Altruism	(7) Tobit	(8)	(9)	(10)	(11)
Girl	-0.282*	-0.270*	-0.275*	2.725*	0.140	0.077	2.445*	0.913	0.577	0.577	0.577
	(0.159)	(0.160)	(0.159)	(1.451)	(0.118)	(0.114)	(1.482)	(0.593)	(0.568)	(0.568)	(0.568)
SES +	0.206	0.189	0.181	-4.233**	-0.377**	-0.249	-3.824*	-2.158**	-1.626**	-1.626**	-1.626**
	(0.230)	(0.233)	(0.233)	(2.081)	(0.169)	(0.164)	(2.175)	(0.850)	(0.813)	(0.813)	(0.813)
Girl × SES+	-0.367	-0.340	-0.333	6.056**	0.490**	0.325	4.987*	2.704**	1.946*	1.946*	1.946*
	(0.291)	(0.295)	(0.296)	(2.674)	(0.217)	(0.211)	(2.769)	(1.092)	(1.047)	(1.047)	(1.047)
Altruism		-0.006							0.128***	0.128***	0.128***
		(0.006)							(0.019)	(0.019)	(0.019)
Individual average cooperation		0.004	0.005			0.055***	0.836***				
		(0.014)	(0.014)			(0.010)	(0.125)				
Normalized altruism			-0.096								
			(0.070)								
Competitiveness						-0.127	-1.503		0.138	0.138	0.138
						(0.096)	(1.250)		(0.479)	(0.479)	(0.479)
Constant	0.861***	0.930***	0.810**	17.850***	-0.038	-0.535**	9.334***	10.951***	8.546***	8.546***	8.546***
	(0.292)	(0.334)	(0.333)	(2.586)	(0.210)	(0.241)	(3.135)	(1.056)	(1.138)	(1.138)	(1.138)
Observations	421	421	421	421	421	421	421	421	421	421	421

Significance levels: ***0.01 **0.05 *0.10.

The first three columns aim to analyze the determinants of the willingness to compete based on a probit estimation. Column (4) to (7) document the determinants of altruism. The first three based on OLS, the last on a Tobit estimation with a censorship at zero. The last fourt columns present the determinants of individual cooperation. Cooperation is measured as the average number of tokens given for the six first periods of the VCM. School dummies and birth month dummies included.

1.L From CSP to SES

The French system gathers on eight different categories and itself divided into various subcategories. To distinguish a clearer pattern between high and low SES, we create a dummy from the rich information behind CSP. Teenagers having at least one parent having a position as '*Executives and higher intellectual professions*' and '*Intermediate professions*' are High SES. Low SES defines for the rest of the sample. The repartition of CSP into SES are described in Table 1.5.

Table 1.5: Socio Economic Status in France

	Catégories socioprofessionnelles	Groupes socioprofessionnels	CSP
Low SES	1	Farmer-operators	11 - Farmers on small farms 12 - Farmers on medium-sized farms 13 - Farmers on large farms
Low SES	2	Craftsmen, traders and business owners	21 - Craftmen 22 - traders 23 - Business owners - 10 or more employees
High SES	3	Executives and higher intellectual professions	31 Liberal professions 33 - Public Service Executives 34 - Professors, scientific professions 35 - Information, arts and entertainment professions 37 - Administrative and commercial executives of companies 38 - Engineers and technical managers of companies
High SES	4	Intermediate professions	42 - School teachers, teachers and similar 43 - Intermediate health and social work professions 44 - Clergy, religious 45 - Intermediate administrative professions in the public service 46 - Intermediate administrative and commercial professions of companies 47- Technicians 48 - Supervisors
Low SES	5	Employees	52 - Civilian employees and public service employees 53 - Police and military 54 - Corporate administrative employees 55 - Commercial employees 56 - Direct personal services to individuals
Low SES	6	Workers	62 - Industrial skilled workers 63 - Skilled craftsmen 64 - Drivers 65 - Skilled workers in handling, storage and transport 67 - Unskilled industrial workers 68 - Unskilled artisanal workers 69 - Agricultural workers
Low SES	7	Retired 71 - Former farmer-operators	72 - Former craftsmen, traders and business leaders 77 - Former employees 78 - Former workers
High SES			74 - Former executives 75 - Former intermediate professions
Low SES	8	Other persons without professional activity	81 - Unemployed who have never worked 83 - Military contingent members 84 - Students 85 - Miscellaneous persons without professional activity under 60 years of age (except retired) 86 - Miscellaneous persons without professional activity aged 60 and over (except retired)

1.M Regressions with additional controls

Table 1.6: Determinants of standardized grades in various discplines

	Average			Mathematics			English			History & Geography		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Competitiveness	0.188**	0.210**	0.292***	0.256***	0.259***	0.340***	0.226	0.269*	0.356**	0.077	0.092	0.154
	(0.086)	(0.092)	(0.102)	(0.080)	(0.084)	(0.091)	(0.137)	(0.133)	(0.133)	(0.103)	(0.109)	(0.117)
Normalized altruism	-0.151**	-0.150**	-0.140**	-0.155***	-0.150**	-0.148**	-0.070	-0.065	-0.072	-0.171***	-0.167***	-0.142**
	(0.055)	(0.055)	(0.054)	(0.054)	(0.055)	(0.062)	(0.059)	(0.059)	(0.056)	(0.048)	(0.047)	(0.052)
Individual average cooperation	0.004	0.004	-0.001	-0.005	-0.004	-0.006	0.016	0.013	0.011	-0.001	-0.000	-0.007
	(0.012)	(0.011)	(0.012)	(0.012)	(0.011)	(0.013)	(0.010)	(0.010)	(0.011)	(0.012)	(0.011)	(0.011)
Girl		0.187	0.134		0.036	-0.009		0.241	0.270*		0.124	0.076
		(0.129)	(0.134)		(0.119)	(0.114)		(0.140)	(0.144)		(0.145)	(0.142)
SES		0.573***	0.504***		0.461***	0.377***		0.435**	0.332**		0.588***	0.535***
		(0.119)	(0.119)		(0.103)	(0.097)		(0.155)	(0.155)		(0.118)	(0.118)
Constant	-0.093	-0.259	-0.023	-0.191	-0.269	-0.091	-0.204	-0.345	-0.214	-0.005	-0.145	0.075
	(0.278)	(0.296)	(0.359)	(0.312)	(0.316)	(0.357)	(0.269)	(0.294)	(0.364)	(0.289)	(0.318)	(0.366)
N	421	421	384	421	421	384	303	303	280	420	420	383
R^2	0.058	0.122	0.154	0.063	0.101	0.136	0.081	0.123	0.152	0.069	0.132	0.149
Digital leisure controls	NO	NO	YES	NO	NO	YES	NO	NO	YES	NO	NO	YES

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Each regression is based on OLS with standard errors clustered at the class level. School and birth month dummies included to account for different child development and school effect. Digital leisure controls are defined as the number of social networks used, daily times of TV, smartphones using and video games playing in a normal school day. This part of post-experiment survey has not been collected for the first three classes, leading to a loss of observations.

1.N Alternative specification of grades

Table 1.7: Determinants of grades in various discplines

	Average			Mathematics			English			History & Geography		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Competitiveness	0.025**	0.027**	0.037***	0.045***	0.046***	0.061***	0.039**	0.044**	0.056***	0.011	0.013	0.023
	(0.011)	(0.011)	(0.012)	(0.015)	(0.015)	(0.017)	(0.018)	(0.018)	(0.018)	(0.015)	(0.016)	(0.017)
Normalized altruism	-0.016**	-0.016**	-0.014**	-0.027**	-0.026**	-0.024**	-0.010	-0.009	-0.009	-0.026***	-0.025***	-0.022**
	(0.006)	(0.006)	(0.006)	(0.010)	(0.010)	(0.010)	(0.008)	(0.008)	(0.007)	(0.007)	(0.007)	(0.008)
Individual average cooperation	0.001	0.001	0.001	-0.000	-0.000	-0.001	0.003*	0.002	0.002	0.000	0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Girl		0.019	0.014		0.007	0.000		0.023	0.025		0.019	0.012
		(0.016)	(0.016)		(0.021)	(0.020)		(0.019)	(0.018)		(0.022)	(0.023)
SES		0.066***	0.058***		0.079***	0.064***		0.057**	0.042**		0.092***	0.084***
		(0.014)	(0.014)		(0.018)	(0.017)		(0.019)	(0.020)		(0.020)	(0.020)
Constant	-0.011	-0.029	-0.000	-0.030	-0.044	-0.013	-0.031	-0.045	-0.026	-0.004	-0.026	0.009
	(0.030)	(0.031)	(0.036)	(0.052)	(0.054)	(0.060)	(0.039)	(0.043)	(0.042)	(0.045)	(0.048)	(0.054)
N	421	421	384	421	421	384	303	303	280	420	420	383
R^2	0.058	0.121	0.156	0.064	0.103	0.139	0.088	0.121	0.160	0.062	0.131	0.152

Significance levels: ***0.01 **0.05 *0.10. Distance represents $X_{ik} - \bar{X}_{jk}$ where X_{ik} is the individual grade of i the discipline k and $\bar{X}_{jk}$ the class j. average Errors are clustered at the class level

Chapter 2

Cooperation and Peer Influence among Teenagers: Evidence from a Lab in the Field[1]

Abstract

Peers largely influence teenagers in multiple dimensions. In this paper, we investigate cooperation and peers effects among teenagers. We ran a lab-in-the-field experiment with teenagers from middle schools in 7^{th} grades. Our experimental design allows us to analyze the evolution of cooperation over time and how teenagers resort to non-monetary incentives to sustain cooperation. Our findings indicate that cooperation does not decrease with interactions and that demographics are associated with the willingness to cooperate. Teenagers resort to sanctions and rewards to enforce cooperation, and that opportunity of assigning non-monetary sanctions and rewards improves cooperation significantly. Lastly, this effect is mainly driven by threats of rewards/punishments more than receiving it.

[1]This chapter is based on joint work with David Masclet and Thierry Penard. I am gratefull to Abhijit Ramalingam and to David Dickinson for their valuable comments on a previous version of this chapter.
We are thankful to participants of the ASFEE 2019, ESA 2019, the SMART-CREM Ph.D. seminar and Appalachian State seminar for their helpful comments. We are grateful to E. Priour for programming the experiment. We would like to thank Clémence Dedinger, Matthieu Pourieux, Madeg Le Guernic, and Lila Le Trividic Harrache for their incommensurable helps to run the experiments. We are thankful to the school headmasters for accepting to run the experiment. the Region of Brittany and the PIA (Programme d'Investissement d'Avenir), operated by Caisse des Dépots, funds this study. All remaining mistakes are my own.

Key words : Lab in the field experiment, Public good experiment, Non-monetary Rewards, Non-monetary punishment, Teenagers

2.1 Introduction

The first chapter of this thesis emphasizes the role of individual behaviors to promote school achievement. Limiting our analysis to individual components narrows the variety of determinants of educational attainment. In this chapter, we investigate the role of social (dis)approval to promote cooperation in an experimental setting among teenagers. This framework allows approaching hardly measurable peer pressure using a standard data collection process. This chapter aims to understand to what extend social (dis)approvals influence teenagers' behaviors.

Peers effects may have a crucial influence on children and teenagers' behaviors by inducing significant changes in their attitudes or behaviors to conform to the social norms of their reference group (Crane, 1991, Coleman, 1990). For instance, Riester and Zucker (1968) reported that the extent to which teenagers drink alcohol does depend heavily on the group of peers to which they belong. Clark and Loheac (2007) observe that American teenagers' risky behaviors are highly correlated with their peers' group composition.

Peers pressure among teenagers can result in either positive or negative outcomes (Sacerdote, 2011). On one hand, there may be positive outcomes when their peers pressure teenagers toward positive behavior, such as volunteering for a charity, contributing to public goods, or excelling in academics. For instance, children who deviate from the existing social norm in the peer group by either performing too much or poorly at school may be excluded from their peer group (Walton and Cohen, 2007, Hausmann et al., 2007). On the other hand, peer pressure may induce adverse outcomes (Riester and Zucker, 1968, Clark and Loheac, 2007), for instance, when peer pressure leads teenagers to use alcohol, illicit substance, etc., to confirm the peer group's social norm.

According to the 2018 PISA survey, French teenagers largely report bullying at school. This survey, conducted by the OECD on middle-school students (6,308 respondents of 7^{th} grades in France), shows that 12.91% of respondents declared that other students made fun of them more than once a month. 6.43% reported being threatened more than once a month by their peers; 9.92% said that other students spread rumors about them more than once a month. Then, a non-trivial share of teenagers experiences peer social disapproval.

In this current study, we resort to lab-in-the-field experiments with teenagers to investigate the determinants of cooperation and peer influence. The interest of resorting to such a design is the difficulty of identifying reference groups and peer pressure by using standard survey data. Indeed, both cooperation and peer effects are hardly measurable using declared behaviors.[2]

Our experiment consists of public good games with and without peer influence, allowing group members to assign non-monetary punishment or reward. The baseline game is a classic public good game. The second treatment is similar to the Baseline, except that a second stage is added where participants can signal social (dis)approval to each group member for each period. First, it allows us to evaluate the impact of the availability of peer pressure on individual contributions. Second, it provides a de-contextualized environment where we can investigate teenagers' sanctioning and rewarding behaviors. We run two additional games to account for altruism and willingness to compete and add several demographics to understand cooperative and (dis)approval behaviors. As shown in the previous chapter, these preferences have a key role in school achievement. Therefore, we set up a lab-in-the-field where pupils play these games within the school during traditional class time with their schoolmates.

This approach allows relevant features regarding the experimental and the peer effects literature. Experiments with a standard participants pool might lower peers' influence since it provides total anonymity: no one knows who they are - in the lab and in the field - and their choices. The subject might then give little importance to others' reactions regarding their preferences. Previous experiments might then be downward biased since they resort to a de-contextualized environment with unrelated participants. Let us develop more precisely these two features.

First, teenagers participating in this study know each other prior entering the lab. Peer effects are then already present in a field setting, taking the forms of friendship,

[2]Two reasons motivate this approach. First, a difference might appear between declared and revealed cooperation. Pupils might over-declare their cooperative behaviors for individual and social image concern. A controlled environment allows hence to incentivize individuals to show their cooperativeness. Second, individuals experiencing peer pressure might have some unobserved characteristics that surveys cannot grasp. For instance, teenagers' social networks do integrate ostracized pupils due to poor social skills. Alternatively, bullying behaviors are also associated with social behaviors, such as self-confidence, others-regarding behaviors, or social image concern. Standard data collection procedures hardly disentangle individual social history and why they behave that way.

bullying, or, more broadly, social (dis)-approvals. They care about others' attitudes regarding their '*rea*l' behaviors. Providing a de-contextualized environment allows isolating the effect of each variable of interest, controlling the environment, and incentivize decisions. We can then distinguish their field relationships to peer effects observed during the experiment. This feature is hardly graspable using other protocols.

Second, an experiment taking place in school reduces biases regarding lab-experiment selection with children. It echoes a rising discussion regarding the traditional participant's pool representativeness.[3] This selection bias is likely to be present if experiments with children taking place in a laboratory setting. Parents with greater concern for scientific research are more likely to encourage their children to participate. Hence, participants accepting to participate are likely to have different characteristics, observed or not, compared to those refusing. Experiments in school lower such bias. Lastly, children's behaviors are more likely to encompass a Hawthorne effect. They may change their actions by being watched and analyzed by experimentalists. A standard laboratory setting may reinforce this effect with a de-contextualized environment in an unknown place. Participants might then behave so that they think they are expected to (Zizzo, 2010). Both arguments suggest that having experiments taking place in school might lower this bias.

Our design aims to evaluate the impact of the availability of non-monetary sanctions and rewards on cooperation. These mechanisms and their consequences have been extensively studied among traditional participants pool (see Ledyard (1995), Gächter and Herrmann (2009), Chaudhuri (2011) for reviews).

Cooperation can then be sustained in the long run with the availability of punishment (Yamagishi, 1986, Fehr and Gachter, 2000, Gächter et al., 2008). Punishment is the most studied mechanism to foster cooperation.[4] The main finding pined out from this literature is that sanction is mainly driven toward those deviating from the norm of cooperation within the group, approached through deviation to the average contribution.

[3]The literature provides mixing results regarding this issue. See for instance Cleave et al. (2013), Falk et al. (2013) regarding that matter.

[4]This effect might be eradicated if participants using punishment as an antisocial behavior (see Herrmann et al. (2008), Gächter and Herrmann (2009, 2011) ; second-round punishment opportunities (Cinyabuguma et al., 2006, Denant-Boemont et al., 2007, Nikiforakis, 2008); its cost and effectiveness (Anderson and Putterman, 2006, Carpenter, 2007, Egas and Riedl, 2008, Nikiforakis and Normann, 2008)

This finding is consistent over various experimental protocols (Masclet et al., 2003, Bochet et al., 2006, Anderson and Putterman, 2006, Carpenter, 2007).

Rewards are the second leverage for cooperation cover in this study. Other studies have attempted to investigate the effectiveness of reward mechanisms to enforce the norm of cooperation (Dickinson, 2001, Andreoni et al., 2003, Sefton et al., 2007, Sutter et al., 2010, Dugar, 2013, Dickinson et al., 2015). They show that rewards improve cooperation less efficiently than punishments.

The contribution of this chapter is twofold. First, we propose an original method to evaluate whether non-monetary mechanisms' availability enhances cooperation among a participants' pool knowing each other and exhibiting peer pressure outside the laboratory. Second, we investigate demographics and behavioral determinants of cooperation among teenagers.

The first contribution is to analyze non-monetary sanctions and rewards on teenagers' cooperation in social dilemmas. The availability of both non-monetary mechanisms among teenagers is, to the best of our knowledge, undocumented within the literature. Our experimental design closely relates to Dugar (2013) who evaluate the provision of non-monetary mechanisms to enhance cooperation among traditional undergraduate students. We extend his analysis by applying a similar framework among teenagers who know each other, who are then more likely to exhibit peer influence outside the lab. Our study provides further evidence on how teenagers resort to horizontal influence to enhance cooperation in a controlled environment.

The second originality of this chapter is to investigate the individual determinants of cooperation among teenagers. Experiments with children receive recently growing attention (see Sutter et al. (2019) for a review) to understand how individual and social preferences evolve with age and how they are associated with basic demographics. We further document how basic demographic characteristics, such as gender or socioeconomic status, are correlated with cooperative behaviors in a public good game setting.

To anticipate our findings, we find that contribution is stable over periods but significantly rises with the *(dis)approval* treatment's implementation. We also observe that girls and pupils from lower socioeconomic backgrounds tend to be more cooperative.

The decision to resort to sanction and reward follows a similar pattern as those run with traditional participants: negative (positive) deviation is subject to sanction (reward). We find little evidence of demographics to explain those behaviors. Our results also suggest that the direct impact of receiving a sanction or a reward is insignificant; this finding echoes Lergetporer et al. (2014), implying that the threat is the primary channel through which sanctions rise cooperation.

The rest of the chapter is organized as followed. Section 2.2 presents our experimental procedure. Section 2.3 formulates our conjectures based on the literature. Section 2.4 depicts our results. Section 2.5 summarizes our results and concludes.

2.2 Experimental design

2.2.1 Games

Participants played two different games: a baseline Voluntary Contribution Mechanism (henceforth VCM) and a treatment where non-monetary sanctions and rewards, *(dis)approval* treatment, are available.[5] All games have been programmed using Z-tree (Fischbacher, 2007). In both games, each group was consisted of four players and last for both treatments (*i.e.* partner setting). The baseline treatment has only one stage (contribution stage). The *(dis)approval* treatment is similar to the Baseline but has an additional rewarding and sanctioning stage. We run two additional games: a real effort task where participants can choose their remuneration scheme and a modified dictator game. Participants matching with other players in the last two games is random.[6] Games order remains the same across sessions.

For both treatments, each participant receives an endowment of 20 tokens at the beginning of each period. The treatment *(dis)approval* (*i.e.* sanctions & rewards are available) is directly played after the baseline. Each period has two stages: first, the contribution stage, which is the same as in the Baseline, and, second, the punishment/reward stage. Both treatments last six periods each.

The contribution stage represents the period where individuals make their choices to

[5]Instructions can be found in appendix 1.D.

[6]For the real effort tasks, the participant has to select their remuneration scheme between flat wage and tournament. If the number of players choosing the tournament was unmatched, one of the participants already paired would randomly match with the last participant without knowing it.

contribute to the public good. They decide how much of their initial endowment they allocate. The difference between the endowment and the contribution to the public good is transferred into their private account. Public good revenue, *i.e.* marginal per capita return, is the sum of the contribution multiplied by 0.5 and is the same for all group members. At the end of this stage, the public good revenue and private account are privately disclosed to each group member.

The individual profit function is defined as :

$$\pi_{ij} = 20 - C_i + 0.5 \sum_{i=1}^{4} C_i \tag{2.1}$$

Where π_{ij} is the individual i payoff at period j,C_i the contribution of i.

For the *(dis)approval treatment*, participants play the contribution stage and then the *(dis)approval* stage. In this second stage, each member's contribution is available, and the player could give a unique non-monetary positive (reward) or negative (sanction) to each group member. We acknowledge that other studies allow for variation in the intensity (see for instance Dugar (2013) and Dickinson et al. (2015)). In our settings, participants have the choice to give a positive, negative, or any for each period to each group member. It provides a more comprehensive framework for children and helps them to understand the rules of the game. Social (dis)approvals do not influence the individual payoff. The individual profit function is the same as in the baseline treatment, *i.e.* equation (2.1). Rewards and punishments being non-monetary, public good revenue, and individual contributions determine individual profit.

Group member ID is shuffle for each period to avoid a possible reputation effect which might lead to counter-punishment (Fehr and Gachter, 2000, Denant-Boemont et al., 2007, Nikiforakis, 2008) or counter-rewarding (Stoop et al., 2013). We randomly select two periods at a group level for the payment, one in the baseline treatment and one in the *(dis)approval* treatment. Participants do not have any information about others group members' identity. Group composition remain the same for all periods. Experiments take place within the traditional classroom at its traditional school-time. Participants played with their classmates, knowing that they played with one of them, but they could not identify their group members' identity.

For all sessions, participants play first the *Baseline*, then the *(dis)approval* treatment, the MDG, and finally the real effort task.

2.2.2 Procedures

Our experiment took place in five middle schools in Brittany, France, in October 2018. 432 students of 22 classes of 7^{th} grade participate in the study. They are between 12 and 13 years old, nearly all born for the same year since class repetition is rare in our sample. Among each class, from 16 to 20 students were randomly chosen to participate in the experiment. We ran the experiment using a lab mobile of 20 tablets, which allowed us to provide conditions similar to that one would obtain with a traditional lab. The procedure has been extensively documented in the previous chapter, we display here only the participant distribution across session.

Table 2.1: Participants by class-school

School	Class						Total
	1	2	3	4	5	6	
1	20	11	20	20	20	0	96
2	20	20	20	16	20	0	96
3	20	20	0	0	0	0	40
4	20	20	20	20	0	0	80
5	20	20	20	18	20	20	118
Total	100	95	80	74	60	20	429

As previously mentioned, we have not been able to collect date of birth and pupils SES for eleven participants.

2.3 Theoretical predictions

2.3.1 Standard predictions

Our first set of predictions is based on a selfish maximizing individual payoff participant. In both the Baseline and the (dis)approval treatments, the only Sub-game Perfect Equilibrium is $C_i = 0$ for all individuals. Equation 2.1 shows that Individual maximize their own payoff by placing their initial endowment into their private account (*i.e.* $C_i = 0$). In the equilibrium, each subject earns 20 tokens, and the whole group earning is 80 tokens. In contrast with the Pareto optimal, individuals contribute their entire

endowment (*i.e.* $C_i = 20$) to the public good. The entire group earning is then 160 tokens, 40 tokens for each participant. Regarding (dis)approval, participants are incentivized to use them since they are free but do not have any interest in doing it.

The implementation of the (dis)approval treatment should not change individual strategies. Punishments and rewards are purely symbolic: they are free and do not influence payoff. Thus, the availability of those mechanisms should not affect individual contributions to the public good.

2.3.2 Behavioral Predictions

Our second set of conjectures deals with the contribution to the public good during the baseline treatment. It has been shown that other-regarding preferences matter ; such as advantageous inequity aversion (Fehr and Schmidt, 1999), fairness and efficiency (Charness and Rabin, 2002), or imperfect conditional cooperation (Fischbacher and Gachter, 2010). This theoretical finding is corroborated by lab experiments which show that trust (Kocher et al., 2015, Kim et al., 2019), or altruism (Lergetporer et al., 2014) are correlated with contributions in a public good game.

Cooperation tends to decrease with time in a public good game setting. Surprisingly, younger participants tend to have steady (if not rising) cooperation over interactions (Harbaugh and Krause, 2000, Fan, 2000, Lergetporer et al., 2014, John and Thomsen, 2015).

H_1: *a)* Other regarding preferences is positively associated with the contribution.

b) Cooperation does not decline over time.

Our second set of conjectures relates to *(dis)approval* treatment impacts. The implementation of various mechanisms leads to higher cooperation (Ledyard, 1995, Chaudhuri, 2011). Experiments with children shows that third-party (*i.e.* vertical) punishments promote cooperation by impacting other beliefs to cooperate and by the threat to be punished (Lergetporer et al., 2014, Jordan et al., 2014, McAuliffe et al., 2015, Bašić et al., 2019). However, this mechanism only represents one single type of sanction scheme that children faced. Horizontal monetary sanctions (Fehr and Gachter, 2000), non-monetary sanctions (Masclet et al., 2003) and, more recently, rewards (Sefton et al.,

2007) even when they are non-monetary (Dugar, 2010, 2013) are important leverages to foster cooperation in social dilemmas.

Sanctions and rewards being non-monetary, subjects face a significant incentive to give other group members social (dis)approval to enhance cooperation. The literature related to such mechanisms highlights that rewards are less efficient than sanctions to foster contribution in a VCM (Dickinson, 2001, Andreoni et al., 2003, Walker and Halloran, 2004, Sefton et al., 2007, Rand et al., 2009, Sutter et al., 2010, Dugar, 2013)

H_2: *a)* Non-monetary rewards and sanctions raise individual contribution in the public good.

*b)*Rewards are less efficient than sanctions to increase individual contribution.

2.4 Results

2.4.1 Variables of interest

We define here the main variables of interest.

Cooperation. Cooperation represents the number of tokens given in the public good game for a given period. In the rest of this chapter, the **Baseline** is the first six periods of the game where the participant could not give any smileys to group members. **(dis)approval Treatment** refers to the last six periods of the game, *i.e.* when non-monetary punishments and rewards were available.

Altruism. The number of tokens sent in a modified dictator game (henceforth MDG) measures altruism. The MDG is an upgrade version of Berg et al. (1995). Participants received 50 tokens. The player was then matched with a partner who did not belong to the same group in the VCM. They did not have any information regarding the other player's identity. While they were choosing the number of tokens they would give, another participant was doing the same. Hence, each player is at the same time giver and receiver. The profit function is $\pi_i = 50 - S_{ij} + S_{ki}$ where S_{ki} is the number of tokens received by the player i from the player k, S_{ij} is the number of tokens send from i to j. Appendix 1.G displays descriptive statistics regarding altruism: girls tend to be more altruist than boys.

Competitiveness. We define individual willingness to compete as the decision

to undertake the tournament in the real effort task. The task is based on Charness et al. (2013). Participants decode letters into numbers. Each letter has a corresponding number. They were informed about the effort's nature before choosing the remuneration scheme (flat wage or competition). The tournament winner would be the most productive (*i.e.* decoding the higher number of letters) between both players. The task was meticulous enough to imply disutility for participants.

Profit functions were defined as: $\pi_i = 50$ if the individual i choose the flat wage or $\pi_i = 80$ if winning or $\pi_i = 20$ if losing under the tournament. Appendix 1.E displays the real effort task realized and appendix 1.F the individual willingness to compete by gender. Girls are more likely to choose flat wage as a remuneration scheme and exhibit a higher effort under this framework.

Control variables. We collect pupils' social backgrounds and gender using administrative data provided by school administrations. Overall, the literature related to gender and cooperation at a young age provides little evidence on its impact on the likelihood to cooperate (Brocas et al., 2017, Cárdenas et al., 2014, Fan, 2000, Harbaugh and Krause, 2000, Hermes et al., 2019, John and Thomsen, 2015). Few studies found a significant difference regarding gender and cooperation. For instance, Angerer et al. (2017) observe girls between the ages of 6–11 be more cooperative than boys using an experiment run in a bilingual city in Switzerland. A second example might be found in Cárdenas et al. (2014) who observed that Columbian girls cooperate less than Swedish girls and Swedish girls to be more cooperative than Swedish boys. There is, however, a tendency for girls to cooperate more.

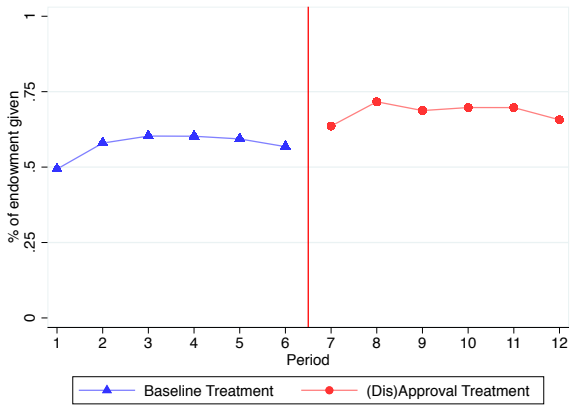
A second sociodemographic characteristic is Socioeconomic Status (henceforth SES). The literature provides little evidence on its relationship with cooperative behaviors. A notable exception is Cipriani et al. (2013) who do not observe any effect of parents SES on children behaviors.[7] French categorization distinguishes a large number of social categories. We summarize their parental job into two categories: high and low Socio-Economic Status. Teenagers having at least one parent having a position as '*Executives and higher intellectual professions*' and '*Intermediate professions*' are High SES. The rest of the sample is defined as Low SES. Appendix 1.5 details the French

[7]The results of this study have to be analyzed with cautions considering the small sample size (38). Most of the literature is based on parents' transmission of behaviors to children or how family members' behaviors differ if they play together (see Sutter et al. (2019) for a review).

nomenclature and the creation of the variable.

2.4.2 Determinants of cooperation

Figure 2.1: Contributions over periods



The figure displays the average contribution to the public good by periods. Period 1 to 6 is the Baseline, 7 to 12 the (dis)approval treatment.

Figure 2.1 displays the average level of contributions by periods. It seems that contribution does not decline with the number of interactions. The *(dis)approval* treatment implementation (*i.e.* period 7 to 12) depicts higher contribution compared to the Baseline treatment. This effect encompasses a possible learning effect since we do not randomize treatments order. Contributions arise due to a restarting or a learning effect. Participants contribute more to the VCM since they know how others cooperate. We run a ttest between both first periods to ensure that the contribution's rise is due to the *(dis)approval* treatment. The first periods for each treatment allow independence between observations - which is violated by taking periods 6 and 7. The ttest shows a significant difference in contributions between both periods. The *(dis)approval* treatment impact is not mainly due to a learning effect.[8]

For the first period, participants share 49.28% of their initial endowment (*i.e.* 20 tokens) while 63.47% in the *(dis)approval* treatment. The contribution significantly increases with the *(dis)approval* treatment's implementation ($z = 7.519$, $p < 0.000$). A ttest between the first period of the Baseline and the *(dis)approval* treatment indicates a significant rise of the contribution ($p < 0.000$). Both tests suggest that the availability

[8]In the following of the chapter, reported z-score are based on Wilcoxson signed-rank. The group's mean behavior by period is taken as one independent observation.

of non-monetary rewards and sanctions raise contributions in the VCM.

We then run Wilcoxon signed-rank test for a given period between treatment. These tests allow testing for a difference for the n period between the Baseline and *(dis)approval* treatment. The underlying motivation is to compare periods that are similar between both treatments. It allows to measures whether the *(dis)approval* treatment effects by controlling in some way for a learning effect. The second treatment raises the contribution for each period, $p < 0.000$, for every period.

Result 1 : Social (dis)approvals availability rise contribution.

We then compare the distribution between periods within each treatment to test whether contribution rises over periods or not. The difference between the first two periods is positive and highly significant ($Z = 7.404$; $p = 0.000$). We do not observe any significant difference between consecutive periods afterward. The notable exception is the difference between periods 5 and 6. It is barely significant ($p < 0.1$). This result suggests that cooperation rises for the first period and is then stable. The *(dis)approval* treatment implementation leads to a similar issue. We only observe a significant difference between the first and the second period ($z = 5.832$; $p < 0.000$) and for the last period ($z = 3.217$; $p < 0.00$). Both results suggest that participants tend to raise their contribution for the first period and then maintained it at the same level for the rest of the game. However, we do not have a clear explication behind this finding.

Result 2 : Contribution does not decline over time in the baseline and the (dis)approval treatment.

We appeal to parametric data analysis to further investigate determinants of cooperation across subjects. The estimations are summarized in Table 2.2 based on the following estimation:

$$y_{it} = \beta_0 + \beta_1.\text{period} + \beta_2.\text{treatment} + \beta_4.\gamma + \beta_5.\,\gamma \times \text{treatment} + X_i + \alpha_i + \epsilon_{it} \quad (2.2)$$

y_{ij} is the number of tokens given to the public good by participant i at period t. *(dis)approval* Treatment a dummy equals one if period included in the treatment—γ

behavioral measures (*i.e.* altruism and willingness to compete). X_i is a school dummy to account for within-school characteristics. α_i is a random effect at the individual level, and ϵ_{it} the error term.

Columns (1- 4) are based on GLS with random effects, while columns (5) to (8) present estimations from a panel Tobit regression with random effects. Tobit estimations allow us to account for censorship in our sample. Participants might be willing to give less than their initial endowment. This new set of estimations allows accounting for those behaviors. Random effect controls for the lack of independence of the contributions of a given participant over rounds, and the Tobit model accounts for censorship at 0 tokens. The left censured (*i.e.* 0 tokens) restricts 339 observations.

Model (1) and (5) include a time trend variable (period) and a dummy equal to 1 if the period is in the *(dis)approval* treatment. Model (2) to (5) and (7) to (10) add altruism and willingness to compete to investigate the relationships between individual and social preferences. Models (3) and (7) include basic socioeconomic characteristics: gender as a dummy equal to 1 if the participant is a girl; High SES a dummy equal to 1 if the participant is from a higher SES. Finally, models (4) and (8) include interactions between behavioral measures and *(dis)approval*treatment to test whether they influence the positive treatment effect.

Table 2.2 confirms first evidence on the periods' trend and the implementation of non-monetary rewards and sanctions on cooperation.[9] Both variables are highly statistically significant ($p < 0.01$) but provide weak evidences on the overall variance of contributions (Within $R^2 = 0.053$). Cooperation increases the implementation of the *(dis)approval* treatment.

The inclusion of behavioral measures does not influence *(dis)approval* treatment and time trend impacts ($p < 0.01$). Altruism is positively correlated to contributions to the VCM and highly significant ($p < 0.01$). Each additional token sent in the MDG increase of 0.149 tokens the contribution. Willingness to compete is not associated with individual contributions. Gender matters in the decision to cooperate. Girls give on average 1,784 ($p < 0.01$) more than boys. Lastly, the interactions between behavioral characteristics and the treatment show that altruistic participants increase their cooperation with the

[9]We acknowledge that it is unlikely that these three preferences are perfectly orthogonal. We might then expect a negative relationship between altruism and willingness to compete. Appendix 2.A shows that the correlation is not significant and weak.

Table 2.2: Determinants of contribution

	GLS				Tobit			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(dis)approval Treatment	1,370***	1,370***	1,388***	1,034**	1,498***	1,498***	1,520***	1,182***
	(0.315)	(0.315)	(0.316)	(0.503)	(0.293)	(0.293)	(0.297)	(0.410)
Period	0.134**	0.134**	0.132**	0.132**	0.118***	0.118***	0.116***	0.116***
	(0.055)	(0.055)	(0.056)	(0.056)	(0.042)	(0.042)	(0.043)	(0.043)
Altruism		0.147***	0.152***	0.134***		0.159***	0.165***	0.147***
		(0.015)	(0.014)	(0.016)		(0.018)	(0.018)	(0.019)
Willingness to compete		-0.220	-0.259	-0.007		-0.297	-0.338	-0.072
		(0.395)	(0.401)	(0.469)		(0.439)	(0.448)	(0.472)
Gender			-0.859**	-0.859**			-1,032**	-1,031**
			(0.406)	(0.406)			(0.449)	(0.449)
High SES			-0.735	-0.735			-0.715	-0.715
			(0.496)	(0.496)			(0.520)	(0.520)
(dis)approval Treatment × Willingness to compete				-0.505				-0.531*
				(0.444)				(0.297)
(dis)approval Treatment × Altruism				0.036**				0.036***
				(0.017)				(0.012)
Constant	11,212***	8,594***	9,013***	9,191***	11,085***	8,285***	8,862***	9,034***
	(0.485)	(0.541)	(1,016)	(1,074)	(0.525)	(0.662)	(1,074)	(1,083)
Observations	5184	5184	5052	5052	5184	5184	5052	5052
Number of id	432	432	421	421	432	432	421	421
Between R^2	0.002	0.158	0.213	0.213				
Within R^2	0.053	0.053	0.053	0.056				
Observations left censored					340	340	339	339
Log likelihood					-15,717.5	-15,680.5	-15,259.0	-15,252.8

Significance levels: ***0.01 **0.05 *0.10

The first four estimations are based on GLS with standard errors clustered at a group level, the last four on panel tobit estimations with robust standard errors. The total number of observations corresponds, 432, to the total number of subjects in the 12 periods. The missing observations, 11, represent those where we have not been able to obtain their date of birth and their socioeconomic background. School and birth month dummies included.

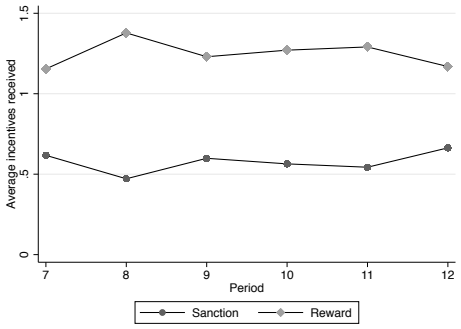
(dis)approval treatment implementation ($p < 0.05$).

As a robustness check, we run panel Tobit estimations with random effect with left censorship at 0 display column (5) - (9). We found reasonably similar results as with the GLS specification.

Result 3: Altruism is positively associated with the individual contribution to the VCM.

2.4.3 Sanctions and Rewards

Figure 2.2: Sanctions and Rewards over periods



The figure displays the average number of (dis)approval given for each public good game period during treatment periods. Each participant can give one single approval to every group member, making a total of three possible (dis)approval per period per participant.

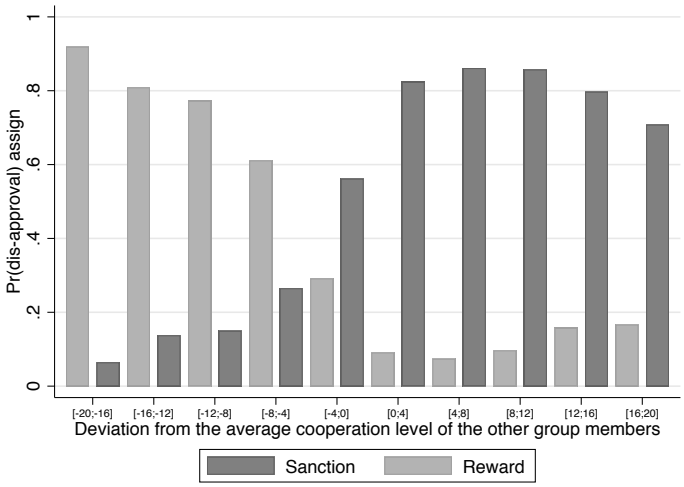
Figure 2.2 documents the distribution of non-monetary sanctions and rewards received. Each line represents the mean approval received for each period. In the first period of the *(dis)approval* treatment, 56.34% of the choices were devoted to rewards, 31.68% to sanctions, and 11.98% was doing nothing. The distribution is fairly consistent over time. This first result suggests that assigning smileys is not due to a time trend but to participants' behaviors or contributions. This finding is in line with previous result : individuals are more likely to use reward as an incentive (Dickinson, 2001, Sefton et al., 2007, Sutter et al., 2010, Dugar, 2013, Dickinson et al., 2015).

This first set of results suggests that peers are more likely to approve behaviors than to disapprove them. Social exclusion and ostracism are often presented as the main consequences of peer influence. Teenagers prefer rewards compared to sanctions in our setting, suggesting that most of the peers' effects occur through social approval.

Result 4: Rewards are more used than sanctions

Figure 2.3 draw the distribution of (dis)approval regarding the difference in contribution between the social(dis)approval receiver and the group average.

Figure 2.3: Sanctions - Rewards and individual deviation



Predictions based on probit estimation with a second order polynomial of individual difference to the group average to obtain a probability of assigning (dis)approval for each bin.

Figure 2.3 displays the (dis)approval type given to participants j regarding its distance to the group average. We divide the distance to the group average into bins of four units and assigns each of them an average probability of receiving a (dis)approval. The probability are calculated using probit estimations for each type of (dis)approval regarding individual distance to the group average.

We find strong evidence of the positive relationship between the probability of giving a reward and the group average deviation. Punishment is associated with a higher negative deviation. This finding corroborates previous findings: participants who violate the norm are more likely to be sanctioned (Masclet et al., 2003, Bochet et al., 2006, Anderson and Putterman, 2006, Carpenter, 2007).

We observe a non-negligible share of participants who are not punishing (rewarding) those below (above) the cooperation norm at both limits of the distribution. It shows the existence of goodwill rewards and antisocial punishments. The related literature mainly documents antisocial punishment (see Falk et al. (2005), Herrmann et al. (2008) and there following literature) but provides little evidence on prosocial rewards. Those behaviors are found in 10% to 20% of our observations.

Translating these findings to peer pressure among teenagers suggests that social

(dis)approvals are oriented toward those deviating from existing social norms. Hence, peers enforce norms with such mechanisms. Our results also suggest that teenagers resort to antisocial punishments and prosocial rewards. It implies that extreme behaviors (*i.e.* distant from existing norms) are likely to face spiteful or goodwill (dis)approval.

Result 5: Teenagers are punishing norm violators, and rewards are given to those who cooperate.

Result 6: Spiteful punishments are present in our study, so as goodwill rewards.

Decision to give a non-monetary reward-sanction

Table 2.3 documents the probability to give a non-monetary sanctions/rewards, columns 1 to 4 report rewards while 5 to 8 sanctions. We estimate various random-effect probit models.The equation below summarizes Table 2.3 estimations :

$$P_{it} = \beta_0 + \beta_1.\text{period}_t + \beta_2.\text{Abs.Dev}_{jt} + \beta_3.\text{Oth.Avg}_t + \beta_4.\gamma_i + \beta_5.X_i + \beta_6.X_k + \omega_i + \epsilon_{it} \quad (2.3)$$

The dependent variable, P_{it}, is a dummy equal to one if player i give (dis)approval (sanctions or reward) to j at period t in the group k. The random effect, α_i, accounts for the lack of individual independence over periods. We include negative and positive deviations from the group's average to test whether they are correlated with the decision to provide approval.[10] We then add individual preferences - such as willingness to compete and altruism to control for unobserved individual traits - and sociodemographic characteristics, gender and social background.

Table 2.3 indicates that the recipient's relative contribution level mainly determines the propensity to give (dis)approvals. The first four columns of table 2.3 show that the probability of being rewarded increases by 11.1% ($p < 0.01$) with a one-point positive deviation to the group's contribution. One point below the other's average decreased the likelihood to be rewarded by 17%. The group's contribution is positively correlated with the provision of rewards ($p < 0.01$). A point rise increases the probability to reward of 10.7%.

[10]We define the other's average as the group average minus the player's contribution. We compute the absolute deviation which is max $(C_j - (\sum_1^4 C_i - C_i)\ ,\ 0)$

Table 2.3: Probability to give a feedback

	Rewards				Sanctions			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Positive deviation from others average	0.111***	0.111***	0.111***	0.111***	-0.093***	-0.093***	-0.092***	-0.092***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)
Negative deviation from others average	-0.170***	-0.170***	-0.170***	-0.170***	0.179***	0.180***	0.180***	0.180***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Other's average	0.109***	0.107***	0.106***	0.106***	-0.103***	-0.100***	-0.099***	-0.099***
	(0.011)	(0.011)	(0.011)	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)
Altruism		0.004	0.004	0.003		-0.004	-0.004	-0.004
		(0.003)	(0.003)	(0.003)		(0.002)	(0.002)	(0.002)
Willingness to compete		0.068	0.082	0.077		0.115	0.099	0.102
		(0.075)	(0.075)	(0.075)		(0.063)	(0.068)	(0.069)
Girl			0.055	0.052			-0.059	-0.058
			(0.062)	(0.062)			(0.068)	(0.069)
High SES			-0.176*	-0.173*			0.161*	0.160*
			(0.080)	(0.079)			(0.073)	(0.072)
Rewards received in $t-1$				0.006				0.003
				(0.028)				(0.033)
Sanctions received in $t-1$				-0.062*				0.041
				(0.026)				(0.025)
Constant	-0.930***	-1,018***	-0.900***	-0.867***	0.414**	0.374*	0.276	0.238
	(0.169)	(0.184)	(0.209)	(0.223)	(0.139)	(0.157)	(0.196)	(0.208)
Observations	7776	7776	7578	7578	7776	7776	7578	7578
Log Likelihood	-3620.25	-3614.99	-3526.39	-3517.72	-3108.24	-3100.05	-3031.49	-3028.71
LR chi2	564.36	589.58	681.52	743.26	736.80	769.75	857.40	867.04
Prob > χ^2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Significance levels: ***0.01 **0.05 *0.10 . This table only reports marginal effects.Estimations are based on panel probit with random effect and robust standard errors cluster at the group level. The random effect account for lack of independence between observations. The 7776 observations represent the decision for 432 participants to give a non-monetary sanctions and rewards for the six treatment periods to each member of their group (3). Birth month dummies are included to control for individual unobserved cognitive abilities.

The last four columns of Table 2.3 show that the deviation raises the probability of being sanctioned. More significantly, individuals contributing less than the group are more likely to receive a sanction ($p < 0.01$). A contribution one point below the average increases the probability to be rewarded of 18.0%. Positive deviations also influence the provision of sanctions: one point above the other's average decreases the likelihood to be awarded of 9.2%. The more the group's contribution is, the less likely individuals will be sanctioned ($p < 0.01$). This result suggests that the higher is the standard of cooperation within the group, the higher the sensitivity to sanction will rise. The coefficients are relatively stable by adding behavioral traits and sociodemographic characteristics.

Both patterns follow the same dynamics. To assess our result's robustness, we add additional control variables (individual-social preferences and social background). Our findings draw little compelling evidence on a relationship between behavioral traits and social (dis)approval. Willingness to compete and altruism coefficients are not statically significant in all specifications. The inclusion of sociodemographic characteristics does not influence previous results. However, we observe that pupils with higher socioeconomic status are more (less) likely to resort to sanctions (rewards) ($p < 0.1$). It remains unclear why pupils' background matters in these decisions.

Lastly, we include the total number of sanctions and rewards received in the previous period. This inclusion aims to document how pupils react toward (dis)approvals. Our results show that sanctions received decrease the likelihood of giving a reward ($p < 0.1$). Since participant IDs were shuffled to avoid counter-punishment/reward, it thus suggests that receiving a negative signal is translated into a lower willingness to reward others.

2.4.4 Impact of Sanctions and Rewards

We focus here on the contribution variation between two consecutive periods regarding the numbers of non-monetary sanctions and rewards received. Estimations in Table 2.4 are based on GLS with random effects.[11] :

$$c_i^{t+1} - c_i^t = \beta_0 + \beta_1.(\sum_k R_{ki}) + \beta_2.(\sum_k S_{ki}) + \beta_3(c_i^t - \bar{c}^t) + \beta_4.\text{period}_{t+1} + X_i + \epsilon_{i,t+1} \quad (2.4)$$

[11] Table 2.4 displays rate of exchange between two periods. Alternative specifications using variation rates can be found in Appendix 2.B to test the robustness of these estimations. Results are similar over both specifications.

Where $c_i^{t+1} - c_i^t$ is the difference in contribution between t and $t+1$. β_1 measures the impact of receiving rewards, β_2 the impact of sanctions, β_3 accounts for the distance between i's contribution and the group average at period t. β_4 captures time effect, X_i school characteristics and $\epsilon_{i,t+1}$ the error terms for individual i at $t+1$. Robust standard errors are clustered at the group level. We first jointly estimate this specification on the overall sample before to separately estimate by considering the individual relative contribution to the group cooperation.

Disentangling the impact of (dis)approval through individual contributions might shed light on the importance of peers' influence across pools of subjects. High contributor are those where $C_i^t \geq \bar{C}^t$ - Low contributors when $C_i^t < \bar{C}^t$. Column 1 of Table 2.4 displays the linear impact of *(dis)approval* treatment on the overall sample. Columns (2) and (3) disentangle these estimations over each sub-sample. Columns (4) to (6) allow us to test for non-linear effect.

Direct sanctioning and rewarding do not influence the individual contribution to the overall sample. Both identifications of sanctions and rewards show little effect of both mechanisms. This finding suggests that the intensity of peer (dis)approval has little impact on contribution change. It echoes results of Lergetporer et al. (2014): the threat of being sanctioned or rewarded influence more than actually receiving it. The authors discuss the role of beliefs in other decisions to cooperate in explaining this finding. Despite eliciting beliefs, our results suggest that the impact of *(dis)approval* treatment is not due to the direct assignment of smileys.

Our results also show that the time trend is negative and highly significant ($p < 0.01$). It might be explained by the rise of individual contributions over periods: the difference between the two periods tends to be lower because the contribution at period t is higher. The group's average is positive and highly significant, suggesting that the individual changes their behaviors if the group does: an increase of the group contribution of one point raises the i 's contribution of 0.113.

We then divide our sample according to individual's contribution at period t. Our results suggest that nor sanctions nor rewards influence cooperative behaviors for both profiles. We find that low contributors mainly drive the previous effect of others' average: an increase of cooperation at the group level tends to reduce low contributors

Table 2.4: Determinants of changes in contributions between t and $t+1$

	Linear			Non-linear		
	(1) Overall	(2) High contrib.	(3) Low Contrib.	(4) Overall	(5) High contrib.	(6) Low Contrib.
Sanctions received t	0.212	-0.249	0.222			
	(0.223)	(0.289)	(0.333)			
Rewards received$t$	-0.234	-0.251	-0.250			
	(0.203)	(0.279)	(0.302)			
Other's average$_t$	0.113***	0.039	-0.279***	0.113***	0.038	-0.279***
	(0.030)	(0.048)	(0.076)	(0.030)	(0.047)	(0.076)
Period	-0.614***	-0.518***	-0.597***	-0.767	-0.439	-1,349*
	(0.105)	(0.118)	(0.137)	(0.520)	(0.496)	(0.707)
Any sanction received in t (Sanction = 0)				ref.	ref.	ref.
1				-0.353	-0.638	-0.758
				(0.446)	(0.641)	(0.698)
2				-0.432	-1,230	-0.634
				(0.611)	(0.950)	(0.894)
3				0.214	-0.964	0.040
				(0.760)	(1,082)	(1,069)
Any reward received in t (Reward = 0)				ref.	ref.	ref.
1				-0.802	-0.322	-1,349**
				(0.524)	(0.784)	(0.652)
2				-1,557**	-1,322	-1,246
				(0.686)	(1,088)	(0.848)
3				-1,425**	-1,204	-1,823*
				(0.668)	(1,050)	(1,008)
Constant	1,561**	-0.470	9,823***	3,438	-0.283	15,593***
	(0.775)	(1,056)	(1,529)	(3,127)	(2,856)	(4,583)
Observations	2160	1153	1007	2160	1153	1007
Number of id	432	368	345	432	368	345
Between R^2	0.021	0.010	0.067	0.021	0.015	0.090
Within R^2	0.032	0.032	0.066	0.036	0.034	0.066

Significance levels: ***0.01 **0.05 *0.10 School and period dummies included.Estimations are based on GLS with robust standard errors clustered at the group level with random individual effects. Each individual (432) is observed over 5 periods, the first one being excluded due to lag variables. High contributors are those who contribute more than the other average (*i.e.* $C_{it} \geq (\sum_i^4 C_{it} - C_{it})/3$), low contributors are those contributing less than other's average. Those status are calculated for each period (*i.e.* an individual can change category between period). The first four columns test for linear effect of incentives while the last four investigate for non-linear impacts. Appendix 2.B provides evidence on the consistency of those results by adding birth month controls and changing the absolute deviation between two periods in the variation rate.

contributions for the next period. This first result indicates that two channels drive the *(dis)approval* treatment's impact in section 2.4.2 : the threat to be sanctioned/rewarded itself and its actual effect. However, it is based on the underlying assumption that sanctioning and rewarding follow a linear pattern.

The last three columns of Table 2.4 investigate the non-linear effect of peer pressure. As in previous estimations, we do not observe any direct impact of sanctions on the overall sample. We then divide our analysis according to the individual's contribution at period t. Being rewards decrease their contribution in the next period for low contributors (1,349 points if receiving one, 1,823 ($p < 0.1$) for three rewards - ($p < 0.05$)). We do not observe any compelling evidence on the impact of sanctions and rewards on high contributors' behaviors.

To summarize, the sanctioning and rewarding pattern on the overall sample is not straightforward. While sanctions do not directly influence contributions, rewards seem not to incentivize participants to raise their contribution for the next period.

2.5 Conclusion

This chapter provides evidence on the role of peer pressure to promote cooperation. Using a lab-in-the-field experiment in 22 classes of 6^{th} grades in five middle schools, we attempt to investigate the individual determinants of cooperation and peer influence among teenagers. Adolescence is an age where people are mainly subject to non-monetary sanctions and rewards from their peers. Their use is assimilated to a signal to peers whether they are deviating from a norm. Our experimental design allows us to understand cooperation within a teenagers' group and how they resort to peer pressure.

Cooperation arises with the availability of social (dis)approvals. In opposition to experiments with 'standard' participants, the contribution level is relatively stable over periods. Individual characteristics matter in the decision to cooperate. More notably, altruism seems to be the primary driver of cooperation, while SES and willingness to compete are not related to cooperative behaviors.

The availability of non-monetary sanctions and rewards raises cooperation on the overall sample. Participants resort to punishments or rewards toward those deviating

from the individual or the group's contribution. Moreover, we observe weak evidence on the direct impact of sanctions and rewards on individual behaviors. This result is in line with Lergetporer et al. (2014) findings: the threat of receiving a (dis)approval matters more than receiving it among children and teenagers.

Our experimental setting could be extended. Firstly, we cannot fully disentangle the effectiveness of punishments effectiveness compared to rewards. It would be possible by implementing an experimental design similar to Sefton et al. (2007) and Dugar (2010) where a single mechanism is available. Secondly, our measure of the willingness to compete is imprecise: we cannot distinguish between confidence and risk aversion. Integrating those measures would offer the possibility to get a more exact measurement of the relationship between cooperation and competition. Thirdly, our study is based on single participation. As Sutter et al. (2019) suggest, it is now necessary to follow-up participants to understand whether these behaviors are stable over ages.

More research needs to be done to understand how the pupils' environment influences their behaviors and how it evolves with age and, more fundamentally, to disentangle the innate from the acquired behaviors causally.

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Appendix

2.A Relations between altruism and individual competitivene

Figure 2.4: Altruism and willingness to compete over gender

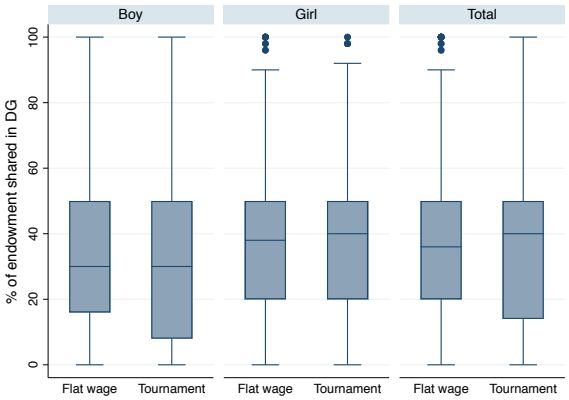

Table 2.5: Determinants of altruism

	OLS			Tobit		
	(1)	(2)	(3)	(4)	(5)	(6)
Willingness to compete	-1,375	-1,287	-1,521	-1,375	-1,287	-1,521
	(1,201)	(1,936)	(1,958)	(1,199)	(1,927)	(1,911)
Girl		2,820	4,101**		2,820	4,101**
		(1,919)	(1,963)		(1,910)	(1,916)
Willingness to compete × Girl		0.604	0.220		0.604	0.220
		(2,476)	(2,498)		(2,464)	(2,438)
High SES			-0.787			-0.787
			(1,432)			(1,398)
Constant	18,685***	16,800***	18,505***	18,685***	16,800***	18,505***
	(0.909)	(1,569)	(2,973)	(0.907)	(1,562)	(2,902)
Observations	423	423	421	423	423	421
R^2	0.003	0.019	0.085			
Log likelihood	-1,658,223	-1,654,744	-1,633,221	-1,658,223	-1,654,744	-1,633,221
Wald χ^2				1,314	8,271	37,258
Prob > χ^2	0.253	0.042	0.010	0.252	0.041	0.007

2.B Robustness impact of punishments and rewards

Table 2.6: Determinants of variation rate in contributions between two peridos

	Linear				Non-linear			
	(1) Overall	(2) High contrib.	(3) Low Contrib.	(4) Contri. Average	(5) Overall	(6) High contrib.	(7) Low Contrib.	(8) Contri. Average
Sanctions received in $t-1$	0.140**	0.0538	0.281**	-0.0142				
	(2.46)	(0.97)	(2.22)	(-0.37)				
Rewards received in $t-1$	0.0749	-0.0326	0.208	0.0159				
	(1.49)	(-0.76)	(1.61)	(0.39)				
Other's average_$t-1$	0.000988	0.00126	-0.146***	-0.0295**	0.00132	0.00128	-0.143***	-0.0323**
	(0.10)	(0.38)	(-3.48)	(-2.02)	(0.13)	(0.39)	(-3.40)	(-2.27)
Period	-0.0688**	-0.0301***	-0.0306	-0.0237	-0.189	0.0367	-0.195	0.0457
	(-2.39)	(-3.61)	(-0.57)	(-0.63)	(-1.11)	(1.18)	(-0.60)	(1.04)
Altruism		0.00265				0.00250		
		(0.55)				(0.50)		
Remuneration scheme		0.00842				-0.0118		
		(0.07)				(-0.10)		
Sanctions × Altruism		-0.00106				-0.000906		
		(-0.56)				(-0.46)		
Sanctions × Willingness to compete		-0.0579				-0.0526		
		(-1.16)				(-1.05)		
Rewards × Willingness to compete		-0.00478				-0.00123		
		(-0.12)				(-0.03)		
Rewards × Altruism		0.00131				0.00147		
		(0.79)				(0.84)		
Any sanction received in $t-1$ (Sanction = 0)					ref.	ref.	ref.	ref.
1.Sanctions received in $t-1$					-0.0382	0.00294	-0.221	-0.0672
					(-0.50)	(0.04)	(-1.10)	(-0.82)
2.Sanctions received in $t-1$					0.134	0.0678	0.184	-0.186
					(0.81)	(0.60)	(0.60)	(-1.39)
3.Sanctions received in $t-1$					0.308	0.151	0.579	-0.0448
					(1.54)	(0.85)	(1.39)	(-0.31)
Any reward received in $t-1$ (Reward = 0)					ref.	ref.	ref.	ref.
1.Rewards received in $t-1$					0.0205	-0.0112	0.143	-0.0872
					(0.13)	(-0.18)	(0.43)	(-0.65)
2.Rewards received in $t-1$					-0.116	-0.0870	-0.00484	-0.0224
					(-0.84)	(-0.87)	(-0.01)	(-0.22)
3.Rewards received in $t-1$					0.0814	-0.123	0.292	-0.0446
					(0.53)	(-0.89)	(0.78)	(-0.30)
Last period					0.120	-0.0726	-0.0995	-0.123*
					(0.46)	(-1.25)	(-0.19)	(-1.92)
Constant	0.343	-0.0555	2.639***	0.439	1.148	-0.299	4.125*	0.262
	(1.63)	(-0.44)	(3.23)	(1.25)	(1.31)	(-1.59)	(1.95)	(0.67)
Observations	1973	1153	856	102	1973	1117	856	102
Number of id	419	368	320	80	419	357	320	80
Between R^2	0.026	0.087	0.093	0.453	0.027	0.131	0.103	0.473
Within R^2	0.010	0.044	0.033	0.400	0.013	0.041	0.036	0.472

Significance levels: ***0.01 **0.05 *0.10 . Estimations are based on GLS with robust standard errors clustered at the group level with random individual effects. The dependent variable is the variation of contribution between two periods : $C\_it - C\_it-1/C\_it-1$. School, birth month and periods dummies included. Each individuals (432) are observed over 5 periods, the first one being excluded due to lag variables. Missing observations are due to lack of administrative data (date of birth) for 11 pupils. There is also missing variable when C_{it-1} is equal to zero. High contributors are those who contribute more than the other average (*i.e.* $C\_i \geq (\sum\_i^4 C\_i - C\_i)/3$) at period t, low contributors are those contributing less than other's average. Contrib. Average represent participant who contribute at the group average for the past period.Those status are calculated for each period (*i.e.* an individual can change category between period). The first four columns test for linear effect of incentives while the last four investigate for non-linear impacts.

Chapter 3

Homework Supports: Digital practices and Familial Background[1]

Abstract

This chapter investigates the determinants of homework support provision—namely extra and intra-household help and digital resources —through a national survey representative of the French population. We show that poor grades are the main reason to give additional help. Moreover, parents provide various extracurricular help when their child has poor school achievement. We also find that digital mentoring matters to develop efficient use of online resources.

Key words : Education—Homework support—digital practices

JEL code : I25, I21, D12

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3.1 Introduction

More than 1.5 billion pupils from half of the world faced school closure with the COVID-19 outbreak.[2] This event highlights that parental abilities and motivations, as well as intra-household educational resources, represent critical determinants of an efficient learning process beyond school walls (Park et al., 2016, Bol, 2020). The literature investigating homework practices provides few pieces of evidence regarding that matter. Homework benefits to high-performing pupils and might be more productive when parents support learning (Cooper et al., 2006). More specifically, parents with upper education can easily understand homework contents (Lee and Bowen, 2006, Boonk et al., 2018), and are more concerned about their child's success (Calarco, 2018, Lareau, 2011). Parental involvement in homework might then widen schooling inequalities.

How do children study from home and, more fundamentally, which resources are provided by parents to promote their achievement? Since the school setting offers homogeneous studying resources, educational inequalities might result from parental implication into the learning process beyond the school walls.[3] Parents face several ways to support their children with their homework.

The first intuitive way for parents to help their child is to resort to private tuition (*i.e.* private tutoring), where they have to pay an external stakeholder to help their child. This feature is relevant since it allows parents to resort to a knowledgeable tutor, even more, if they lack abilities regarding homework educational content. However, by being costly, this support might benefit to privileged households. It might not be available to all pupils (Dang and Rogers, 2008), which brings parents to invest in alternative homework supports if they cannot afford such support. The basic intuition to distinguish between private tutoring and support for the family is that parental characteristics - more precisely, their ability to deal with their child's educational content and digital practices - might influence the supports provided.

[2] Bozkurt et al. (2020) summarize 31 country-specified studies, representing 62.7% of the world population, to document how the COVID-19 influences school achievement. They found that home learning exacerbates inequities in educational opportunities and the digital divide. See also The Economist—Closing schools for covid-19 does lifelong harm and widens inequality - VoxEu: Schools, skills, and learning: The impact of COVID-19 on education.

[3] The literature provides little evidence of this phenomena *per se*. An enlightening example might be found in the impact of the summer break on pupils' achievement since it impacts educational inequalities (see for instance Alexander et al. (2001), Gershenson (2013)). Pupils from privileged socioeconomic background tend to pursue learning during the summer break while disadvantaged pupils' gains are weak.

The second form of homework support is familial help, representing a cheaper way for parents to help their children. We distinguish informal help between two components: *i*) parental time to help their child and *ii*) digital resources available at home. Why should we consider those as alternative forms of homework supports? First, parents unable to pay for extra-household help might provide free educational support to their children. Second, they face an inherent tradeoff between their time availability and financial resources and promote their child's independent learning. Digital parenting, defined as the parent's intention to promote their child to use digital resources, represents critical leverage to stimulate pupils' autonomy.

In this chapter, we attempt to contribute to the existing literature by investigating the determinants of homework support provision using a survey representative of the french population having at least one child in middle school. The work presented here closely echoes the growing interest in extracurricular educational activities (Park et al., 2016). More precisely, our aim is twofold.

First, we investigate the provision of homework supports by considering three of them: informal help from the family, extra-household tutoring, and internet access. A typical result from the literature related to extra-household tutoring is to highlight that wealthiest and more educated parents are more likely to engage in this practice (Dang and Rogers, 2008, Jung and Lee, 2010, Safarzyńska, 2013, Park et al., 2016).[4] The key questions are then to understand either if supports are complementary and if similar household characteristics determine them. This feature allows identifying the quantity of homework supports provided and to whom, shedding light on the channels through homework provision might deepen educational inequalities. Since previous studies focus on a single form, our data allow measuring complementarity between multiple forms of them and to whom they are provided.

Second, we document Internet usages while proceeding to homework as a form of homework support. This feature motivates itself by the growing availability of digital resources within households and to a theoretical free and unlimited acess to educational

[4]Most of the studies are country-cases in developing countries that differ in terms of the educational system of western countries. For instance, '*shadow education*' refers to formal tutoring representing an alternative learning way besides the traditional school system. Parental characteristics are the core determinant of formal tutoring in developing countries.

resources. According to PISA 2012,[5] pupils primarily benefit from those resources in the U.S.: 86% have access to a computer home and 83% to the Internet. This increase is not specific to the U.S. since other large countries also experienced it (Bulman and Fairlie, 2016). The availability of digital resources provides free educational resources for parents lacking abilities and financial resources to pay for private tutoring to their children. There is a growing body of evidence showing that the availability of digital resources might be associated with unobserved parental characteristics (Schmitt and Wadsworth, 2006, Fairlie et al., 2010, Malamud and Pop-Eleches, 2011, Vigdor et al., 2014), and lead to a mix of educational and recreational usages (Barrera-Osorio and Linden, 2009, Belo et al., 2014, Comi et al., 2017, Falck et al., 2018). Therefore, we break the availability of the Internet while studying down into several usages. We resort to this approach to understand whether or not parental characteristics influence those usages, and more precisely, to analyze the influence of digital parenting on teenagers' digital usages. Previous literature mainly documents how access to a computer and the Internet improve pupils' achievement (Bulman and Fairlie, 2016), we build upon this literature to open the black box of 'digital practices' in an educational setting.

Our analysis resorts to an original database gathering 1,000 French parents having at least one child in middle school, collected online in October 2018 via a polling institute and representative of the French population. It was administrated via an online platform where participants are used to answering surveys. We acknowledge that it might bias our analysis. This measurement error still provides parents beliefs, accurate or not, on their child's time-use.

The survey includes four parts: homework practices, parents and children's digital practices, socio-demographic characteristics, and the way parents get informed. Our analysis accounts for standard household demographics, such as education and income, and parents' and children's digital practices. We acknowledge that the study design does not allow to claim causation nor on *i*) which homework support promotes achievement, or on *ii*) which characteristics cause to resort to a given support. This study only depicts correlations between parental characteristics, homework supports, and Internet usages while studying.

[5]PISA 2012 is the fifth wave of PISA, an international survey aiming to understand what 15-years-old know and what they can do with what is known. The wave reported here gathers 65 countries representing 510 000 students.

To preview our results, we show that *i)* poor school achievement increases the likelihood to benefit from homework supports. *ii)* parents offer various forms of help when pupils need it. *iii)* digital mentoring is positively and strongly associated with these tools provision, disregarding its type. *iv)* we do not find any evidence regarding parental's education and income on the provision of homework support.

The paper is organized as follows. Section 3.2 displays the literature review to formulate our conjectures. Section 3.3 presents the survey and shows basic statistics. Section 3.4 analyzes the multiple determinants of each type of tutoring and their efficiency. The section 3.5 summarizes our main findings and concludes our study.

3.2 Literature Review—Conjectures

Literature Review

Homework usually represents an extension of learning from the classroom to the home environment. Its purposes are to build up studying habits and improving pupils' educational achievement. The literature largely nuances this belief regarding homework effectiveness (see Sharp et al. (2001) for a review). Based on a large set of empirical studies, Cooper (1989a,b) depict negligible effects on achievement with a grade dependency of homework effect and a heterogeneous impact.[6] Overall, it tends to benefit to high achieving students (Rønning, 2011).

Homework represents a possible inequalities widener since such exercises benefit high-achieving students with parents with higher education. This issue intrinsically relates to the parents-children relationship and its implications for school achievement (see Avvisati et al. (2010) for a review). Parents having privileged socioeconomic backgrounds are more concerned about their child's success (Calarco, 2018, Lareau, 2011), and have more accurate beliefs regarding their schooling performance (Yamamoto and Holloway, 2010, Dizon-Ross, 2019). Thus, those concerns crystallize into parental involvement in the homework proceeding.[7] It suggests that parental attention toward

[6]Previous studies show a larger effect for younger (*i.e.* primary) pupils. Homework seems to be positively associated with school achievement among older participants, as shown by Aksoy and Link (2000) and Grove and Wasserman (2006) with undergraduates students in the U.S.

[7]The literature also aims to understand whether parental involvement in the learning process promotes learning (Avvisati et al., 2014, Maldonado et al., 2019, Islam, 2019, Bergman, 2021). Despite the significant effect of such policies, the analysis presented here aims to understand what parental characteristics associate with homework support, not its efficiency.

their child's homework is heterogeneously distributed regarding socioeconomic status.

Parental involvement in the learning process largely benefits to pupils. McNeal Jr (2001) documents how parental attention promote non-cognitive skills and educational outcomes. More precisely, his findings suggest that parental involvement promotes more behavioral than cognitive outcomes. The magnitude of this implication is larger than those due to school resources (Houtenville and Conway, 2008), and allows to account for variation in school inputs quality.[8] Therefore, pupils from the privileged socioeconomic background are more likely to be supported by their parents at school, ending in higher school achievement.

A natural way to overcome these disparities is to resort to extra-household educational facilities. The lack of resources - e.g., time, knowledge about school contents, poor schooling facilities - yields parents to hire private tutoring to support their child's learning.[9] Mainly based on evidence on developing countries, the literature shows that urban, wealthiest, and more educated parents are more likely to opt for this support (Bray et al., 2014, Azam, 2016, Liu and Bray, 2017, Pallegedara and Mottaleb, 2018). Thus, private tutoring, which initially appears to reduce educational inequalities, seems to reinforce them.

The last support considered here is the availability of digital resources at home. Why should it be considered as promoting learning? Bulman and Fairlie (2016) provide evidence on the growing importance of technology in education. More notably, access to such facilities -namely computers and internet connection at home - rapidly increases in western countries and seems to benefit pupils' educational achievement. For instance, computers availability (Battle, 1999, Schmitt and Wadsworth, 2006, Fiorini, 2010, Fairlie et al., 2010)[10] and broadband access (Belo et al., 2014, Faber et al., 2015, Kho et al., 2019) associate with an increase of grades. Pupils having such facilities from home have

[8] Few studies evaluate to what extent parents react toward changes in school inputs (BonesrØnning, 2004, Datar and Mason, 2008, Das et al., 2013). No clear evidence regarding that matter emerges from the literature despite a tendency from parents to compensate for a decrease in school quality (Datar and Mason, 2008, Das et al., 2013).

[9] '*Shadow learning*' concept inspires from the great demand for private tutoring in developing countries, mainly from south-east Asia (Park et al., 2016). Two arguments are commonly discuss : *i)* a competitive educational system (Kim and Chang, 2010, Lee et al., 2010) with *ii*) poor schools quality (Bray, 1999, Dang and Rogers, 2008).

[10] We acknowledge that several other studies contrast this finding by not observing any, or a negative, effect. For instance, Fuchs and Woessmann (2004) show that owning a computer is associated with a lower test score using the PISA database. Others studies based on RCT providing computers to students depict low impact (Fairlie and Robinson, 2013, Fairlie and London, 2012, Beuermann et al., 2015, Cristia et al., 2017).

access to unlimited access to free educational content, promoting their achievement at school.

Lastly, little evidence suggests that disadvantaged households cluster fewer educational resources (Angus et al., 2004, Bol, 2020). In other words, parents with poor abilities to support their children are less likely to propose other resources. It is hence relevant to jointly investigate their provisions.

Conjectures

A large body of the literature emphasizes the heterogeneity of homework impact. Parents with higher education might foster '*efficient help*', defined as the parental ability to help their child, compared to less educated ones. Boonk et al. (2018) review the literature from 2003 to 2017 related to parental involvement and academic performance. The authors observe that children's success expectations, parents-to-children communication regarding school, and learning support are the main channel through parental involvement improve child's success. Besides that, parental education tends to provide higher quality help to their child (Sirin, 2005, Bol, 2020).

H_1: Highly educated parents are more likely to help their children with their homework.

Formal tutoring is the first way to overcome these disparities. Parents who are not able to help their children might resort to external resources. Most of the research highlight that the wealthiest households are more likely to resort to private tutoring (Bray et al., 2014, Azam, 2016, Liu and Bray, 2017, Pallegedara and Mottaleb, 2018, Azam, 2016, Wahyuni and Susanti, 2018). It remains unclear whether these households resort to private tutoring due to a lack of times or a more significant concern regarding their child success (Jung and Lee, 2010, Calarco, 2018). More specifically, several studies show that formal tutoring provision is negatively associated with employment status and parental time availability (Jung and Lee, 2010, Elamin et al., 2019).

Thus, the above literature allows us to conjecture that :

H_{2a}: Parents with higher income are more likely to resort to formal tutoring.

H_{2b}: Parents with less time availability are more likely to engage in formal tutoring

The third body of literature investigates the importance of technology in education

(see Bulman and Fairlie (2016) for an overview). Evidence suggests that having access to the Internet or, more broadly, a computer at home positively influences school achievement. The literature suggests that the observed positive effect of owning a computer might be due to unobserved parental characteristics (Schmitt and Wadsworth, 2006, Fairlie et al., 2010, Malamud and Pop-Eleches, 2011, Vigdor et al., 2014). Two explanations arise to explain those findings. First, computer availability combines a mix of '*efficient*' and '*inefficient*' uses of the resource (Barrera-Osorio and Linden, 2009, Belo et al., 2014, Comi et al., 2017, Falck et al., 2018). It is doubtful that all pupils develop educational uses when digital resources are available. More particularly, the availability of computers at home includes educational and leisure usages (gaming, entertainment) (Fairlie and London, 2012, Fairlie and Robinson, 2013, Faber et al., 2015). Second, parental digital literacy and their ability to use digital resources might drive the positive effect of owning digital devices on school achievement.

H_3 : Parents' digital literacy positively influences children Internet access.

3.3 Descriptive statistics

3.3.1 Data

This study uses an online survey covering 1,000 French parents having at least one child in middle school. The survey was collected in November 2018 by CODHA, a polling institute. We aim to document parental decisions to provide homework support in a 'traditional' setting (*i.e.* before the COVID outbreak). Appendix 3.A displays the entire survey. Quotas on gender, marital status, and regions ensure the sample representativeness. Appendix 3.B represents summary statistics of individuals' characteristics.

The survey divides into four parts: socio-demographic characteristics, parents' and children's digital practices, access to the news within the household, homework supports received. The analysis might be biased since we measure children's practices through parent's declarations. Thus, those having a closer relationship with their children have more precise knowledge about their time-use. Since we are interested in homework support provided by parents, the beliefs (accurate or not) regarding children's achievement and children's time-use represent a motivation to allocate homework supports.

3.3.2 Scope of the analysis

This survey proposes evidence on individual practices that might be relevant for policy implementation. While causal evaluation measures the effectiveness of a given input, the methodology presented here allows us to understand what parental characteristics are associated with each support. The author acknowledges that this design only depicts correlations between homework support provision and individual attributes. Despite the lack of causality, it gives a perspective on those practices in France. It allows us to understand the profiles of those not benefiting from these forms of help.

This paper aims to understand the parental decision to provide homework support and their characteristics to give access to a specific support. An alternative approach would be to study the relationship between access to homework support and school achievement. Since we are interested in the parents' motivation to provide homework supports, school performance is an independent variable. The underlying idea is that parents consider their child's grades to provide additional resources.

In this survey, three limits of taking school performance as a dependent variable can be put forefront: *i*) our measure of school achievement is a categorical variable (*i.e.* really bellow the average, below, average, above the average, really above) which is not precise enough for such specification; *ii*) our design does not allow to claim for causation; thus, we will not be able to say which support promotes school achievement; *iii*) it is unlikely that pupils chose their homework support; parents account for their child's schooling performance in the decision to provide educational resources. Those arguments suggest integrating school performance as an independent variable to obtain a comprehensive overview of parental motivations.

We consider here three homework support types in perspective of parental characteristics. We are interested in the parental decision to resort to private tutoring (*i.e.* private tuition), informal help (*i.e.* parental), and access to the Internet while doing their homework. This choice restricts the scope of the analysis. It is motivated by the small share of respondents declaring using a local organization or pupils doing their homework with their friends, respectively 2% and 1%.

We have one variable of interest for each homework support considered. First, we approach private tutoring as giving private tuition to the children during the last academic year. Second, we grasp informal help as the frequency of informal help provided by parents to help their children (*i.e.* never, rarely, sometimes, often). Third, *digital educational* access is defined as the pupil's access to the Internet while studying.

3.3.3 Main Explanatory Variables

We present here our main variables of interest. In the following of the article, digital parenting refers to the first three variables: shared internet use, restriction in access to the Internet, and inter-generational comparison of digital skills.

Shared Internet Use is defined as the reported frequency of parents having shared time using the Internet with their children. The frequency is often, sometimes, rarely, and never. This variable mirrors the willingness of parents to allocate time to their children using a digital resource (*i.e.* digital parenting). Two effects are present. On one hand, parents spend more time with their children to compensate for the lack of alternative homework supports. On the other hand, having shared digital time between parents and their children might complement other forms of homework support. Parents would then provide multiple resources to their children to study.

Restricting access to the Internet mirrors the reported frequency - often; Yes, most of the time; No, Most of the time; Never - of parents restricting access to digital resources. This variable measures digital parenting since it accounts for how parents restrict their child's digital practices. Parents framing their child's digital access might foster an educational use of the resource since they can restrict usages not related to homework.

Inter-generational comparison of digital skills summarizes parents' digital ability compared to their children, measured with a qualitative variable taking four values: Often, Sometimes, Rarely, Never. It measures parental beliefs regarding their ability to use the Internet compared to their children, which their abilities for restricting children's digital practices.

Access to online resources is tracing whether parents provide a free or costly educational and digital extracurricular resource. We initially distinguish between those

being costly and free but find little evidence on parents using them. The variable is equal to one if the child has access and zero otherwise. We expect parents are providing such access if they lack times or resources to support their children with their homework.

Controls variables. Employment and marital status, number of children, reported income, highest parental degree. The first two are binary variables equal to one if the respondent is employed and in a couple. The third is the total number of children, and the fourth the higher parental degree if parents report being in a couple.

3.4 Results

After presenting basic summary statistics, we investigate the determinants of parental decision to provide homework supports to their child using multivariate estimations which allow error terms to be correlated for each specification. The correlation's sign provides the complementary-substitutability between each support and the magnitude of the strength of the relationship. Second, we document determinants of different digital usages to understand how parental digital practices matter to provide digital resources. These estimations are also based on a multivariate probit to account for correlations between error terms.

3.4.1 Summary Statistics

Let us begin first by document homework supports in our sample. The share of parents resorting to formal tutoring is non-negligible: 20.80% declared providing formal tutoring during the school year and 5.60% during the holidays. The duration differs: from less than a month (14.90%), to a quarter (35.10%) to a year (40.38%) or even more than a year (9,61%).

Regarding informal help, 50.06% declare that their child sometimes benefited from this support, 31.23% rarely and 18.71% often. The quality of the help provided might differ according to parental ability. A minority of parents (3.54%) report their inability to help their children. While 55.77%of our sample is confident to help with homework, 40.69% would not be comfortable with all disciplines. 75.40% of the parents declared that their child has access to the Internet while studying, making it the most used support in our sample.

3.4.2 Determinants of Help for Homework

Table 3.1 reports the determinants of providing additional homework support: formal, informal, and online resources. Formal tutoring is a dummy equal to one if the pupils benefit from it during the last year. Informal help represents the frequency of help received and access to the Internet while studying. The probability of having access to formal and online resources is measured with a probit, whereas the frequency of informal help with an ordered probit.

Parents might jointly decide to provide homework support. We run a trivariate model to estimate each support's provision and assess our results' robustness in Appendix 3.D. This specification simultaneously estimates each model and allows correlation between each equation residual. A positive correlation between two residuals suggests a complementarity between them since it shows that their variation follows the same pattern. A negative coefficient draws the opposite pattern and suggests then substitutability. Results are similar between both specifications. We then only report traditional probit regressions results.

Let's focus first on the determinant of formal tutoring (column 1 - table 3.1). First, grades are the principal determinant of providing external resources for homework ($p < 0.05$). Higher grades associate with a lower probability to benefit from formal tutoring. Moreover, a higher frequency of informal help increases the likelihood to benefit from formal tutoring.

Second, a weak restriction to digital uses, captured by access restriction frequency, is negatively associated with benefiting from formal tutoring ($p < 0.1$). These second results suggest that parents' time to familiarize children with digital resources lowers the probability of providing formal tutoring. The relationship between parental characteristics is, if not null, rather weak. Parental age coefficient is positive a ($p < 0.05$). Each additional year raises the likelihood of benefiting from formal tutoring probability of 0.1%.

In opposition to the related literature, we do not observe any household characteristics that influence the decision to allocate such support. Nor education nor household

Table 3.1: Determinants of homework support provision

	Formal tutoring		Informal help	Online resources	
	(1) Coeff.	(2) Margins	(3) Coeff.	(4) Coeff.	(5) Margins
Employement status Ref : Yes	0.092	0.024	0.085	-0.117	-0.042
	(0.136)	(0.036)	(0.115)	(0.125)	(0.045)
Marital Status Ref : Couple	0.220	0.058	-0.222*	-0.134	-0.049
	(0.160)	(0.042)	(0.123)	(0.148)	(0.054)
Reported Income (ref : Confortable)					
Doing fine	0.095	0.025	0.055	-0.073	-0.026
	(0.146)	(0.038)	(0.102)	(0.126)	(0.046)
Find life difficult	0.080	0.021	-0.045	0.016	0.006
	(0.158)	(0.041)	(0.115)	(0.138)	(0.050)
Find life really difficult	-0.099	-0.025	0.049	0.127	0.045
	(0.179)	(0.044)	(0.141)	(0.160)	(0.057)
Child's grades (ref : Below the average)					
Average	-0.695**	-0.250**	0.146	0.333	0.123
	(0.212)	(0.076)	(0.187)	(0.209)	(0.077)
Above the average	-1.262**	-0.410**	-0.104	0.392*	0.144*
	(0.214)	(0.075)	(0.187)	(0.208)	(0.077)
Really above the average	-1.401**	-0.439**	-0.574**	0.406*	0.149*
	(0.247)	(0.079)	(0.203)	(0.228)	(0.083)
Higher parental degree (Ref : Less than Baccaulaureat)					
Bac Pro	0.213	0.057	-0.371*	-0.192	-0.071
	(0.230)	(0.062)	(0.180)	(0.198)	(0.074)
Bac général et technologique	0.379*	0.105*	-0.037	-0.313*	-0.116*
	(0.209)	(0.058)	(0.162)	(0.187)	(0.069)
Bac +2	-0.053	-0.013	0.017	0.094	0.034
	(0.188)	(0.046)	(0.146)	(0.166)	(0.061)
Bac +3/4	0.096	0.025	0.027	0.158	0.057
	(0.187)	(0.047)	(0.142)	(0.166)	(0.061)
Number of children	0.058	0.015	-0.081*	0.054	0.020
	(0.051)	(0.013)	(0.039)	(0.048)	(0.017)
Freq. Shared Internet use (ref : Often)					
Sometimes	-0.076	-0.021	-0.066	-0.087	-0.031
	(0.122)	(0.033)	(0.098)	(0.109)	(0.039)
Rarely	-0.260	-0.067	-0.351**	-0.611**	-0.228**
	(0.184)	(0.046)	(0.132)	(0.155)	(0.057)
Parents Age	0.003**	0.001**	-0.002**	0.003	0.001
	(0.001)	(0.000)	(0.000)	(0.007)	(0.002)
Restricting access to Internet Ref : Often					
Yes, most of the time	-0.074	-0.020	-0.156	-0.072	-0.026
	(0.125)	(0.035)	(0.101)	(0.112)	(0.040)
No, most of the time	-0.224	-0.059	-0.136	-0.209*	-0.076*
	(0.142)	(0.038)	(0.111)	(0.126)	(0.046)
Never	-0.426*	-0.106*	-0.134	-0.116	-0.042
	(0.204)	(0.047)	(0.141)	(0.168)	(0.061)
Having better digital skills than their children Ref : Often					
Sometimes	0.076	0.020	-0.050	-0.013	-0.005
	(0.125)	(0.033)	(0.098)	(0.114)	(0.041)
Rarely	0.125	0.033	-0.222*	-0.162	-0.059
	(0.138)	(0.037)	(0.112)	(0.129)	(0.047)
Never	-0.138	-0.034	-0.158	-0.179	-0.065
	(0.193)	(0.046)	(0.141)	(0.161)	(0.059)
Access to online resource	0.159	0.042	0.143*		
	(0.105)	(0.028)	(0.079)		
Informal help ref : never					
Rarely	0.027	0.006		0.252*	0.093*
	(0.178)	(0.039)		(0.143)	(0.053)
Sometimes	0.457**	0.117**		0.217	0.080
	(0.157)	(0.037)		(0.137)	(0.051)
Often	0.476*	0.123**		0.360*	0.131*
	(0.185)	(0.047)		(0.166)	(0.060)
Benefit from tutoring (ref : No)			0.324**	0.147	0.053
			(0.092)	(0.114)	(0.041)
Observations	1000	1000	1000	1000	1000
Log likelihood	-469.709		-1238.614	-631.457	
LR χ^2	135.783		126.296	84.074	
Prob > χ^2	0.000		0.000	0.000	

Significance levels: ***0.01 **0.05 *0.10 . Regions and city size dummies included.

Columns (1) and (2) are probit estimations, respectively coefficients and margins, on the decision to provide tutoring to their child (*i.e.*) yes = 1) Column (2) is based on an ordered probit whith the frequency of informal help as the variable of interest. Columns (4) and (5) are probit estimations (respectively coefficients and margins) on the probability for the child to have access to internet for homework. Multivariate estimations display in appendix 3.E for coefficient and in 3.G for correlations between error terms

income influence the probability of the child benefiting from tutoring. The relationship between the highest parental degree is positive but not significant. As previously discussed in Section 3.2, the studies related to private tuition are mainly based on developing countries where educational systems are radically different. Our data do not allow us to explain this difference. We can reasonably argue that western countries' schools have higher learning productivity and, somehow, less unequal schooling system. Private tutoring is complementary to traditional school inputs and represents leverage for poor-performing students rather than high-performing students.

Result 1: Poor grades are the primary motivation to resort to private tutoring

Result 2: Parental characteristics do not influence homework supports provision.

We focus then on the determinants of informal help frequency (column 3 - Table 3.1). The independent variable is the reported frequency of parental support. Coefficients are based on an ordered probit. First, our results show that grades are negatively associated with the frequency of domestic help. The result is less straightforward than formal tutoring. We observe that only those considered as '*really above the average*' are less likely to receive support from their parents ($p < 0.05$). There is also weak evidence on the role of demographics in the decision to provide informal help. Single parents and children are negatively correlated with parental help ($p < 0.1$). Thus, this form of help is more time-demanding for parents.

Parents allocating fewer times to develop a digital shared use are less likely to support their children for their homework. Pupils rarely benefiting from such time are less likely to receive parental support ($p < 0.1$). Additionally, parents furnishing online resources are also more likely to provide such support ($p < 0.1$).

Result 3: School achievement decreases the informal help frequency.

Result 4 : Digital parenting increases the likelihood of parental help.

Lastly, we present the determinants of Internet access while studying in Table 3.1 - column 5 . The decision to give such access does not relate to pupils' educational performance. This result suggests that parents do not consider it as direct leverage for grades but as a '*soft*' support. Parents with more advanced digital parenting, defined as self-declared digital skills compared to their children, are more likely to let access to

digital resources while studying. Parents rarely devoting such time are less likely to allow such resources ($p < 0.05$). There is a tendency for performing pupils (*i.e.* above and really above the average) to access the Internet while studying ($p < 0.1$), suggesting that high achiever are more likely to benefit rom online resources while studying. Besides, pupils benefiting from informal support are more likely to have access to this resource, but the relation is mixed (*i.e.* not significant for all categories).

Correlations between errors' terms offer additional information regarding the relationship between the provision of each resource. We display coefficients in Appendix 3.E. The correlations between all types are positive and significant, suggesting a complementarity between them. Formal and informal tutoring are those where the correlation is more salient ($\rho = 0.191$). This estimation suggests a complementarity between the three types of support considered here.

This section shows that poor achieving students benefit from several homework supports. Regarding parental characteristics, we find little evidence on their education or income role, while their digital practices are highly correlated with several supports provision. In the following section, we distinguish the access to online resources while studying between several usages, allowing us to understand the influence of parental characteristics on the development of each type of use.

3.4.3 Multiple usages of the Internet while studying

An extensive literature emphasizes that digital resources' availability leads to mixed results, caused by a combination of advanced educative and recreational uses (Barrera-Osorio and Linden, 2009, Belo et al., 2014, Comi et al., 2017, Falck et al., 2018).[11] The distinction between both usages is not easy since those considered recreational might also benefit pupils. For instance, pupils reporting chatting with their friends might use digital resources to share ideas and schooling content. We do not binarily distinguish

[11]This distinction is mainly motivated by the literature on Computer-Assisted Instruction Time showing that additional instructions are subjected to a tradeoff between computer-assisted instructions and traditional classes and their productivity. Pupils have then different usages regarding their (expected) outcomes. For instance, The 'One Laptop per Child Program' evaluation depicts a negligible effect since computers were not used for their intended purpose (Barrera-Osorio and Linden, 2009). Belo et al. (2014) also present a negative impact of school broadband access on pupils' performance where it is lower for schools restricting the access to websites such as Youtube.

between educative and recreational usages but rather document how pupils use the Internet while studying from home.

We aim here to test whether digital parenting shapes their child's Internet use. Our data allow us to distinguish four uses: preparing for a presentation, deepening knowledge regarding a specific matter, doing additional exercises, chatting with friends regarding schoolwork, or mutually helping each other. In the following of the paper, the latter usage will be presented as '*chatting with friends*'. The identification is based on a multivariate probit, where we run four simultaneous probit estimations for each type of use, allowing residuals to be correlated. The multivariate probits differs from multinomial probit since it does not restrict individual choices to a unique category.

Table 3.2 shows substantial heterogeneity of usages. Three variables associate with the probability of having a given usage: child achievement at school, parents' education, digital parenting.

The first usage considered here is '*using the Internet for Presentation*' (Column (1) and (2) - Table 3.2). Parents with a university degree (*i.e.* Bac + 2 / Bac +3/4) are more likely to report this usage. Children not often having a share digital use with their parents are less likely to use the Internet in that manner ($p < 0.1$). In the same vein, parents' digital abilities are associated with this usage ($p < 0.05$). The fewer parents declared themselves having better skills than their children, the more likely their child will develop this use.

The second usage is to '*use the Internet to deepen knowledge*' (Column (3) and (4) - Table 3.2). Pupils having higher grades are more likely to have this use compared to those considered as '*below*' ($p < 0.01$). We also show that parents giving additional digital resources (*i.e.* access to an online resource) are more likely to declare their child having this use ($p < 0.01$). As noted for the previous usage, the frequency of parental-child shared usage is negatively associated with this second use ($p < 0.05$). Parents often allocating time to have joint digital practices with their children are more likely to report this use.

The third use considered here is to '*use the Internet to realize additional exercices*' (Column (7) and (8) - Table 3.2), which is mainly determined by digital parenting. More precisely, we find that parents allocating less time to have joint digital practices with their children are more likely to use the Internet for additional exercises ($p < 0.05$).

Table 3.2: Multiple Uses of Internet

	Presentation		Deepen Knowledge		Additional Exercices		Chat with friends	
	(1) Coeff.	(2) Margins	(3) Coeff.	(4) Margins	(5) Coeff.	(6) Margins	(7) Coeff.	(8) Margins
Child's grades ref : Below the average								
Average	-0.127	-0.026	0.506**	0.166**	0.245	0.082	0.687**	0.173***
	(0.280)	(0.054)	(0.252)	(0.073)	(0.242)	(0.077)	(0.290)	(0.057)
Above the average	-0.079	-0.015	0.714***	0.243***	0.159	0.052	0.687**	0.174***
	(0.284)	(0.054)	(0.255)	(0.074)	(0.245)	(0.078)	(0.293)	(0.057)
Really above the average	0.021	0.004	0.733***	0.250***	0.277	0.093	0.709**	0.181***
	(0.310)	(0.058)	(0.270)	(0.081)	(0.261)	(0.085)	(0.309)	(0.065)
Higher parental degree Ref : Less than Baccaulaureat								
Bac Pro	0.327	0.082	-0.186	-0.069	0.291	0.098	0.061	0.016
	(0.265)	(0.065)	(0.229)	(0.085)	(0.235)	(0.079)	(0.253)	(0.066)
Bac général et technologique	0.379	0.093	0.029	0.011	0.518**	0.180**	0.395*	0.116*
	(0.251)	(0.061)	(0.213)	(0.080)	(0.221)	(0.076)	(0.236)	(0.069)
Bac +2	0.392*	0.096*	-0.219	-0.081	0.198	0.065	0.303	0.086
	(0.209)	(0.054)	(0.179)	(0.066)	(0.188)	(0.061)	(0.204)	(0.055)
Bac +3/4	0.506***	0.118**	-0.255	-0.094	0.187	0.062	0.404**	0.119**
	(0.195)	(0.051)	(0.167)	(0.062)	(0.176)	(0.056)	(0.190)	(0.051)
Number of children	0.035	0.007	-0.014	-0.005	0.073	0.025	0.123**	0.039**
	(0.063)	(0.013)	(0.049)	(0.018)	(0.050)	(0.017)	(0.053)	(0.016)
Using Internet with children Ref : Often								
Sometimes	-0.330**	-0.061**	-0.212*	-0.080*	-0.257**	-0.092**	0.071	0.022
	(0.155)	(0.026)	(0.112)	(0.042)	(0.114)	(0.041)	(0.123)	(0.038)
Rarely	-0.416*	-0.080	-0.605***	-0.218***	-0.400**	-0.139**	0.261	0.085
	(0.234)	(0.049)	(0.185)	(0.063)	(0.189)	(0.063)	(0.186)	(0.061)
Parents Age	0.011	0.002	-0.000	-0.000	-0.003	-0.001	0.001	0.000
	(0.010)	(0.002)	(0.002)	(0.001)	(0.005)	(0.002)	(0.002)	(0.000)
Restricting access to Internet Ref : Often								
Yes, most of the time	-0.174	-0.037	-0.046	-0.017	-0.035	-0.012	0.444***	0.130***
	(0.153)	(0.032)	(0.122)	(0.045)	(0.125)	(0.044)	(0.139)	(0.038)
No, most of the time	0.092	0.017	0.150	0.056	-0.069	-0.024	0.437***	0.128***
	(0.183)	(0.034)	(0.137)	(0.051)	(0.143)	(0.049)	(0.153)	(0.044)
Never	0.253	0.044	-0.011	-0.004	-0.145	-0.050	0.556***	0.168***
	(0.271)	(0.043)	(0.193)	(0.071)	(0.196)	(0.066)	(0.203)	(0.065)
Informal help ref : often								
Rarely	0.168	0.031	-0.132	-0.048	0.099	0.033	0.187	0.060
	(0.211)	(0.040)	(0.158)	(0.058)	(0.164)	(0.055)	(0.169)	(0.053)
Sometimes	-0.026	-0.005	-0.027	-0.010	0.137	0.046	0.045	0.014
	(0.196)	(0.040)	(0.151)	(0.056)	(0.156)	(0.052)	(0.164)	(0.050)
Often	-0.230	-0.052	-0.086	-0.032	0.232	0.080	-0.131	-0.038
	(0.226)	(0.051)	(0.182)	(0.067)	(0.186)	(0.064)	(0.204)	(0.060)
Benefit from tutoring (ref : No)	-0.176	-0.036	-0.082	-0.030	-0.055	-0.019	0.160	0.050
	(0.145)	(0.029)	(0.121)	(0.044)	(0.123)	(0.042)	(0.128)	(0.040)
Access to online resource	0.103	0.021	0.343***	0.126***	0.502***	0.173***	0.156	0.049
	(0.114)	(0.023)	(0.091)	(0.032)	(0.094)	(0.031)	(0.096)	(0.030)
Having better computer skills than their child Ref : Often								
Sometimes	0.238	0.053	-0.033	-0.012	0.071	0.024	0.193	0.058
	(0.150)	(0.034)	(0.121)	(0.045)	(0.124)	(0.043)	(0.133)	(0.039)
Rarely	0.361**	0.076**	-0.060	-0.022	0.016	0.006	0.307**	0.095**
	(0.174)	(0.036)	(0.136)	(0.051)	(0.141)	(0.048)	(0.148)	(0.046)
Never	0.404*	0.084*	-0.200	-0.073	0.063	0.022	0.236	0.072
	(0.227)	(0.043)	(0.176)	(0.064)	(0.179)	(0.062)	(0.184)	(0.057)
Observations	754	754	754	754	754	754	754	754
Log likelihood	-278.895		-484.372		-456.304		-417.005	
LR χ^2	50.858		59.823		65.097		59.936	
Prob > χ^2	0.010		0.001		0.000		0.001	

Significance levels: ***0.01 **0.05 *0.10 . Dummies for city level and regions included. The 754 represents the number of parents answering that their child have access to the Internet while studying. Each dependent variable is a dummy equal to one if the child has developed the given use. Multivariate estimations display in Appendix 3.H.

Our result also suggests that parents providing extra digital resources are more likely to declare this use. Digital parenting and pupils' achievement at school are primary determinants of having this usage.

The last type of use is '*chatting with friends* (Column (5) and (6) - Table 3.2). School achievement increases the likelihood of having parents reporting this usage ($p < 0.01$). This result is somewhat counter-intuitive since we might expect that high-performing children would have developed more advanced usages (*i.e.* Having better computer skills than their child) such as using the Internet to deepen knowledge or process additional exercises. However, successful pupils could use digital resources to develop collaborative learning - such as chatting with friends - with their classmates, resulting in higher grades. We also find that parents with an advanced degree (Bac + 3/4) are more likely to report this use ($p < 0.05$), so as the number of children ($p < 0.05$). Lastly, our result suggests that restricting access to the Internet is positively associated with this usage ($p < 0.01$).

Result 5 : Digital parenting matters in the development of Internet usages.

The multivariate analysis suggests a strong complementarity between using the Internet to prepare presentations and chat with friends ($\rho = 0.325$). Efficient use is represented by deepening knowledge and doing additional exercises, which are also complementary ($\rho = 0.231$). Both types of use seem to substitute considering the strong correlation between using it for a presentation and deepening knowledge ($\rho = -0.400$) and the non-significant correlation with additional exercises.

Result 6 : We can distinguish two types of uses: educationally driven and 'standard' usages.

This section draws evidence on the role of parental mentoring in the development of digital uses. Parents influence how their children resort to the Internet while studying by restricting or having common uses. Overall, digital parenting might deepen schooling inequality by promoting advanced digital usages.

3.5 Conclusion

This chapter investigates multiple aspects of homework support and its determinants based on a unique database representative of French parents having at least one child in middle school in France. We investigate the multiple forms of homework supports - precisely formal tutoring, familial help, and access to online resources- and their links to parental characteristics. Besides, we break digital usages down to document significant heterogeneity in digital practices for homework purposes among teenagers. Three innovative results arise from our study.

First, the decision to provide formal tutoring to children is mainly driven by school achievement. This result is surprising considering that previous literature documents the core role of parental education and household wealth to resort to this support (Park et al., 2016). The core question of Dang and Rogers (2008) was to discuss whether private tutoring widens inequalities in developing countries or wastes resources. Our findings suggest that parents provide additional resources to pupils who need them, reducing educational inequalities. Parental characteristics still associate with the decision to provide additional educational resources. Digital parenting strongly influences homework support provision and the way pupils are using the Internet while studying.

Second, we observe a relative homogeneity in the determinants of providing homework support over types. Formal tutoring, familial support, and access to online resources have the same determinants. Our results also suggest complementarity between the three supports considered; once a child faces schooling difficulties, parents allocate several resources to help him.

Third, we document the heterogeneity in the use of digital resources. The single availability of digital tools hides a severe heterogeneity in the usages developed since pupils' school achievement and digital parenting strongly differ regarding the use considered. More particularly, the joint digital time between parents and children is positively associated with each usage. Our results also suggest that parents allocating digital educational resources are more likely to have their children using the Internet with more 'advanced' usages.

This chapter provides several pieces of evidence on the impact of schooling outside school walls, suggesting that parental characteristics and, more particularly, digital

parenting influence the intensity and the forms of supports provided. Since learning has been conducted from home through digital facilities during the lock-down, we expect that parents' digital abilities enhance efficient learning for their children for two reasons. First, they provide their child with more accurate learning facilities and, second, promote an educational use of digital resources. Digital parenting seems an important educational inequalities widener during school closure.

Overall, we provide here evidence on the determinants of resorting to particular types of support. This study drives a contribution to the understanding of the way teenagers do their homework. Our results suggest that differences in digital uses might emphasize educational inequalities. Our study has several possible extensions. For instance, an experimental design could evaluate whether a form of homework support causes higher achievement. More attention must be devoted to document the importance of outside school educational practices.

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Appendix

3.A Survey

3.A.1 Questions d'introduction

1. Avez –vous un ou des enfants scolarisés ... ? Plusieurs réponses possibles

    - En maternelle
    - En primaire
    - Au collège
    - Au lycée
    - En études supérieures
    - Autres
    - Je n'ai pas d'enfant scolarisé

2. Combien d'enfants avez-vous ?

    - 1 enfant
    - 2 enfants
    - 3 enfants
    - 4 enfants
    - 5 enfants
    - 6 enfants et plus

3. Quel âge a (ont) votre (vos) enfant(s) ? Si vous avez plus de 6 enfants, nous allons nous intéresser au 6 plus jeunes d'entre eux

4. Quel est le sexe de votre (vos) enfant(s) ? Si vous avez plus de 6 enfants, nous allons nous intéresser au 6 plus jeunes d'entre eux

5. Pour chacun de vos enfants, pouvez-vous préciser s'ils vivent encore chez vous ou non ? Si vous avez plus de 6 enfants, nous allons nous intéresser au 6 plus jeunes d'entre eux

6. Quel est votre diplômé le plus élevé ?

    - Aucun diplôme
    - CAP/BEP
    - Brevet des collèges
    - Bac Professionnel
    - Bac Général & Technologique

- Bac +2
- Bac + 3, + 4
- Bac + 5 ou plus

7. Vivez-vous en couple ?
   - Oui
   - Non
8. Quelle est la catégorie professionnelle de votre conjoint(e)?
   - Agriculteurs exploitants
   - Artisans
   - Commerçants
   - Chefs d'entreprise
   - Cadres et professions intellectuelles supérieures, professions libérales
   - Professions intermédiaires
   - Employés
   - Ouvriers
   - Retraités ou pré retraités
   - Etudiants
   - Sans activité professionnelle (à la recherche d'un premier emploi, homme ou femme au foyer, invalide..)
   - Autres (précisez)
9. Quel est le diplôme le plus élevé de votre conjoint(e) ?
   - Aucun diplôme
   - CAP/BEP
   - Brevet des collèges
   - Bac Professionnel
   - Bac Général & Technologique
   - Bac + 2
   - Bac + 3, + 4
   - Bac + 5 ou plus
10. Quelle description s'approche le plus de l'opinion que vous avez du revenu actuel de votre ménage ? Une seule réponse possible
    - Vous avez une vie très confortable avec le revenu actuel de votre ménage
    - Vous avez une vie confortable
    - Vous vous en sortez
    - Vous trouvez la vie difficile
    - Vous trouvez la vie très difficile avec le revenu actuel de votre ménage
    - Je ne souhaite pas répondre
11. Dans quelle tranche de revenu total mensuel (en NET) se situe votre ménage ?
    - Moins de 1400 euros

- Entre 1400 et 2000 euros
- Entre 2000 et 2900 euros
- Entre 2900 et 4000 euros
- Plus de 4000 euros
- Je ne sais pas
- Je ne souhaite pas répondre

3.A.2 Digital uses

Nous allons maintenant vous poser quelques questions sur votre utilisation de l'ordinateur, d'Internet et du numérique. Pour les deux prochaines sections, nous incluons pour le terme 'Internet' les activités que vous pouvez avoir, que ce soit à travers un navigateur Internet ou tout autre logiciel ou application connectée.

12. Quelle est le type de votre connexion fixe Internet à la maison ?

    - ADSL
    - Fibre optique, câble
    - Autre (précisez)
    - Je n'ai pas de connexion Internet à mon domicile
    - Je ne sais pas

13. Chez vous, disposez-vous de : (Plusieurs réponses possibles par ligne)

	En accès partagé pour l'ensemble de la famille	Dédié(e) à vous et à votre conjoint	Dédié(e) à vos enfants	Je ne dispose pas de cet équipement
Ordinateur fixe ou portable				
Tablette				
Smartphone				
Télévision				

14. Etes-vous présent sur les réseaux sociaux suivants ? (Plusieurs réponses possibles)

    - Facebook
    - Snapchat
    - Instagram
    - Twitter
    - Réseaux professionnels (Linkedin, Viadéo)
    - Autres (précisez)
    - N'est présent sur aucun réseau

15. Le weekend, à quelle fréquence utilisez-vous ces appareils ?

	Plusieurs fois par week-end	Une fois par week-end	Occasionnellement	Jamais	Je ne dispose pas de cet équipement
Ordinateur fixe ou portable					
Tablette					
Smartphone					
Télévision					

16. Sur une journée de weekend ou une journée non travaillée, vous utilisez Internet pour : (Cocher une case pour chaque ligne)

	Plusieurs fois par week-end	Une fois par week-end	Occasionnellement	Jamais
Vous tenir au courant de l'actualité				
Consulter vos comptes bancaires				
Lire vos mails et en envoyer				

17. Dans le cadre de votre travail ou de vos études, à quelle fréquence utilisez-vous un ordinateur ?

- Plusieurs fois par jour
- En moyenne une fois par jour
- Plusieurs fois par semaine
- Plusieurs fois par mois
- Plus rarement
- Jamais
- Non concerné

18. Pour la série de phrases suivantes, cochez les propositions qui vous correspondent. Plusieurs réponses par ligne possibles.

	Je sais faire	Je ne sais pas faire	Mon conjoint sait faire	Mon conjoint ne sait pas faire	Aucune de ces réponses
Se connecter un réseau wifi					
Télécharger et installer un logiciel sur un ordinateur					
Faire des achats en ligne					
Modifier les paramètres de confidentialité de mon profil sur un réseau social					

3.A.3 Acces to information

19. Estimez-vous important de suivre l'actualité nationale et internationale ?

- Très important
- Important
- Peu important
- Pas important
- Je ne sais pas

20. Par quel(s) moyen(s) vous informez-vous ? (Plusieurs réponses possibles)

- Facebook
- Twitter
- Chaines de télévision (nationales / régionales)
- Radio
- Presse nationale
- Site ou blog d'information
- Presse régionale
- Par vos connaissances (collègues, amis, famille)
- Vous ne suivez pas l'actualité
- Autres (précisez)

21. Dans quelle mesure estimez-vous que les informations diffusées par cette source sont fiables ? (Cocher une case pour chaque proposition)

	0	1	2	3	4	5	Je ne sais pas
Presse nationale							
Site ou blog d'information							
Chaines de télévision généralistes (TF1, France2 ...)							
Radios généralistes (Europe 1, France Inter ...)							

3.A.4 Children access to Internet

Nous allons désormais vous poser des questions sur votre enfant au collège. Si vous avez plusieurs enfants qui sont au collège, merci de répondre pour votre enfant au collège le plus jeune.

22. Votre enfant est-il présent sur les réseaux sociaux ?

    - Oui
    - Non
    - Je ne sais pas

23. Lesquels ? (Plusieurs réponses possibles)

    - Facebook
    - Snapchat
    - Instagram
    - Twitter
    - Autre (précisez)
    - Je ne sais pas

24. Restreignez-vous l'accès à Internet de votre enfant à la maison ? (Limite d'horaire, interdiction d'utiliser sans surveillance, etc.)

    - Oui, toujours
    - Oui, la plupart du temps
    - Non, la plupart du temps
    - Jamais
    - Je ne sais pas

25. Avez-vous mis en place un logiciel de contrôle parental sur ces appareils ?

	Oui	Non	Ne sais pas
Ordinateur fixe ou portable			
Tablette			
Smartphone			
Télévision			

26. Pour la série de phrases suivantes, pouvez-vous dire si la proposition vous correspond ?

	Tout à fait	Plutôt oui	Plutôt non	Pas du tout	Je ne sais pas
L'utilisation d'Internet a des effets positifs sur la réussite scolaire de votre enfant					
L'utilisation d'Internet est importante pour que votre enfant entretienne de bonnes relations avec ses camarades					
L'utilisation d'Internet a changé vos relations avec vos enfants					
Votre enfant passe trop de temps sur Internet					

27. Vous arrive-t-il de dire à votre enfant de vérifier les informations trouvées sur Internet ?
    - Souvent
    - De temps en temps
    - Rarement
    - Jamais
    - Je ne sais pas
28. Vous arrive-t-il d'utiliser Internet avec votre enfant ?
    - Souvent
    - De temps en temps
    - Rarement
    - Jamais
    - Je ne sais pas
29. Pensez-vous être plus à l'aise que votre enfant dans l'utilisation d'Internet ?
    - Tout à fait
    - Plutôt oui
    - Plutôt non
    - Pas du tout
    - Je ne sais pas

3.A.5 Devoirs, scolarité et soutien de votre enfant

30. Où votre enfant fait-il le plus souvent ses devoirs ? (Plusieurs réponses possibles)
    - À la maison
    - Au sein d'une association
    - Chez des amis
    - Au collège
    - Autres (précisez)
31. Votre enfant est-il aidé par des personnes pour faire ses devoirs ?
    - Souvent
    - De temps en temps
    - Rarement
    - Jamais
    - Je ne sais pas
32. Qui aide votre enfant à faire ses devoirs ? Plusieurs réponses possibles
    - Vous-même et/ou votre conjoint
    - Ses frères et sœurs
    - D'autres Membres de la famille
    - Des amis ou voisins
    - Des surveillants / enseignants

- Autres (précisez)

33. Vous sentez-vous compétent pour aider votre enfant à faire ses devoirs ?
    - Oui
    - Non
    - Cela dépend des disciplines/des matières
    - Je ne sais pas
34. Comment se situent les résultats scolaires de votre enfant par rapport à la classe ?
    - Très au-dessus de la moyenne
    - Au-dessus de la moyenne
    - Dans la moyenne
    - En-dessous de la moyenne
    - Très en dessous de la moyenne
    - Je ne sais pas
35. Depuis son entrée au collège, votre enfant a-t-il bénéficié d'un soutien scolaire (aide aux devoirs) EN DEHORS des vacances scolaires ?
    - Oui
    - Non
    - Je ne sais pas
36. En dehors des vacances scolaires, de quel(s) type(s) de soutien scolaire (aide au devoir) votre enfant a-t-il bénéficié ? (Plusieurs réponses possibles)
    - Au sein de l'école
    - Dans une association de soutien scolaire
    - Cours individuel payant
    - Cours collectif payant
    - Cours à distance (visio-conférence, ...)
    - Plate-forme de soutien scolaire en ligne
    - Je ne sais pas
37. Combien de temps ce soutien scolaire a-t-il duré?
    - Moins d'un mois
    - Pendant un trimestre
    - Sur une année scolaire
    - Pendant plus d'un an
    - Autre
38. Depuis son entrée au collège, votre enfant a-t-il déjà bénéficié d'un soutien scolaire (aide aux devoirs) PENDANT les vacances scolaires ?
    - Oui
    - Non
    - Je ne sais pas

39. Pendant les vacances scolaires, de quel(s) type(s) de soutien scolaire (aide au devoir) votre enfant a-t-il bénéficié ? (Plusieurs réponses possibles)

    - Au sein de l'école
    - Dans une association de soutien scolaire
    - Cours individuel payant
    - Cours collectif payant
    - Cours à distance (visio-conférence, ...)
    - Plate-forme de soutien scolaire en ligne
    - Je ne sais pas

40. Pensez-vous que le soutien scolaire améliore les résultats de votre enfant ?

    - Oui, beaucoup
    - Oui, plutôt
    - Non, pas vraiment
    - Non, pas du tout
    - Je ne sais pas

41. Votre enfant utilise-t-il Internet lorsqu'il fait ses devoirs à la maison ?

    - Oui
    - Non
    - Je ne sais pas

42. Pour quelle(s) tâche(s) votre enfant utilise Internet lorsqu'il fait ses devoirs ? (Plusieurs réponses possibles)

    - Pour la préparation des exposés
    - Pour approfondir les connaissances vues à l'école
    - Pour faire des exercices supplémentaires, pour s'entraîner
    - Pour échanger avec les copains/copines sur les devoirs ou s'aider mutuellement
    - Aucun
    - Autres (précisez)

43. Vous et/ou votre enfant, utilisez-vous des sites éducatifs, applications ou ressources éducatives en ligne ...

		Oui	Non
	Gratuites		
	Payante		

44. Quel est le nom de la ressource la plus utilisée ?

45. Ces ressources vous ont été conseillées par ... ? Plusieurs réponses possibles

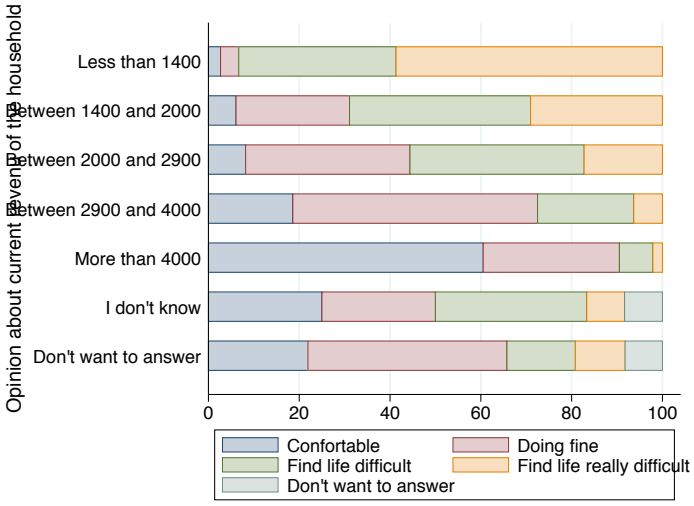
    - Un professeur
    - Des amis
    - De la famille
    - Présentées par le collège
    - Trouvées par vous-même
    - Autres (précisez)
    - Aucune de ces réponses

3.B Descriptive statistics of our dataset

Variables	Description	count	min	max	mean	sd
Frequency of Informal help	Takes 0 if parents never provide Help, 1 if rarely, 2 if sometimes and 3 for often	996	0	3	1.59	0.92
Formal tutoring provision	Takes 1 if tutoring provided, 0 otherwise	999	0	1	0.23	0.42
Online resources provision	Takes 1 if online resources provided, 0 otherwise	999	0	1	0.58	0.49
Internet for homework	Takes 1 if the child use Internet during homework, 0 otherwise	999	0	1	0.75	0.43
Internet use for presentation	Takes 1 if the child use Internet for presentation, 0 otherwise	753	0	1	0.86	0.35
Internet use to deepen knowledge	Takes 1 if the child use Internet to deepen knowledge, 0 otherwise	753	0	1	0.43	0.49
Internet use to realize additional exercises	Takes 1 if the child use Internet to realize additional exercises, 0 otherwise	753	0	1	0.35	0.48
Internet use to Chat with friends	Takes 1 if the child use Internet to Chat with friends, 0 otherwise	753	0	1	0.28	0.45
Efficient Internet use	Takes 1 if the child use Internet efficiently	753	0	1	0.59	0.49
Frequency of shared use of Internet between parents and child	Takes 0 if often, 1 if sometimes, 2 if rarely	999	0	2	0.91	0.60
Parental skills to use Internet	Takes 0 if often, 1 if sometimes, 2 if rarely, 3 if never	999	0	3	1.21	0.97
Restriction of Internet use at home	Takes 0 if ' Yes ,always', 1 if 'Yes, most of the time', 2 if 'No, most of the time', 3 if ' Never', 4 if 'I don't know'	999	0	4	1.15	0.93
child's grades	take 0 if Below the average, 1 if Average, 2 if Above the average, 3 if Really above the average	999	0	3	1.74	0.83
Highest parental degree	Take 0 if Less than , 1 if vocational Bac , 2 if Bac,3 if Bac +2 ,4 if Bac +3/4	999	0	4	2.90	1.37
Size of the city	Take 1 if Rural, 2 if Less than 20k, 3 if Between 20k and 100k, 4 if More than 100k, 5 Paris Area	999	1	5	2.89	1.40
Region	Take 1 if North-East, 2 if North-West, 3 if Area of Paris, 4 if South-East, 5 South-West	999	1	5	2.81	1.37
Having a job	Take 1 if unemployed, 0 otherwise	999	0	1	0.15	0.36
Living with a partner	Take 1 if in couple, 0 otherwise	999	0	1	0.15	0.35
Opinion about revenue of the household	Take 0 if comfortable , 1 if Doing fine , 2 if Find life difficult, 3 if Find life really difficult,4 if Don't want to answer	999	1	5	2.38	1.01
Age group	take 0 if respondent age is between 18-34, 1 if 35-49, 2 if 50 or more	999	0	2	1.18	0.48

3.C Declared revenue and reported well-being

Figure 3.1: Declared revenue and reported well-being



3.D Trivariate model for additional resources

Table 3.3: Multivariate estimations of homework supports povision

	Formal tutoring	Informal help	Online resources
Employement status Ref : Yes	0.058	-0.058	-0.094
	(0.132)	(0.135)	(0.123)
Marital Status Ref : Couple	0.126	-0.240	-0.158
	(0.156)	(0.168)	(0.146)
Reported Income (ref : Confortable)			
Doing fine	0.096	0.086	-0.075
	(0.144)	(0.153)	(0.125)
Find life difficult	0.085	-0.156	-0.017
	(0.156)	(0.161)	(0.136)
Find life really difficult	-0.061	-0.225	0.077
	(0.177)	(0.186)	(0.160)
Child's grades (ref : Below the average)			
Average	-0.651**	0.303	0.310
	(0.207)	(0.232)	(0.202)
Above the average	-1.251**	0.091	0.325
	(0.210)	(0.229)	(0.201)
Really above the average	-1.474**	-0.423*	0.307
	(0.239)	(0.242)	(0.215)
Higher parental degree (Ref : Less than Baccaulaureat)			
Bac Pro	0.145	-0.464*	-0.201
	(0.222)	(0.229)	(0.194)
Bac général et technologique	0.383*	-0.236	-0.276
	(0.205)	(0.221)	(0.187)
Bac +2	-0.010	-0.073	0.107
	(0.186)	(0.208)	(0.166)
Bac +3/4	0.170	0.038	0.183
	(0.186)	(0.197)	(0.166)
Number of children	0.051	-0.059	0.047
	(0.049)	(0.053)	(0.047)
Freq. Shared Internet use (ref : Often)			
Sometimes	-0.101	0.116	-0.093
	(0.120)	(0.127)	(0.108)
Rarely	-0.414*	-0.251	-0.682**
	(0.176)	(0.166)	(0.152)
Parents Age	0.003*	0.001	0.002
	(0.001)	(0.001)	(0.004)
Restricting access to Internet Ref : Often			
Yes, most of the time	-0.106	0.100	-0.086
	(0.122)	(0.133)	(0.109)
No, most of the time	-0.236*	0.148	-0.232*
	(0.137)	(0.146)	(0.123)
Never	-0.447*	-0.053	-0.173
	(0.204)	(0.184)	(0.166)
Observations	1000		
Log likelihood	-1496.351		
LR χ^2	261.108		
Prob > χ^2	0.000		

Significance levels: ***0.01 **0.05 *0.10. Dummies for city level and regions included. Coefficient for multivariate estimations.Formal tutoring is a binary variable qual to one if the pupils benefit from this support for the last academic year. Informal help is a caterogical variables with three outcommes and online resource is a dummy equal to one if the pupils have access to the Internet while doing his homework.

3.E Correlation error terms triviate model

Table 3.4: Correlation residuals—trivariate model

	Coef.	Std. Err.	P-value
ρ_{12}	0.191	0.053	0.000
ρ_{13}	0.104	0.047	0.029
ρ_{23}	0.118	0.063	0.061

Notes : ρ_{12} represents the correlation between residuals of the first and the second equations ; ρ_{13} for the first and the third ; ρ_{23} for the second and the third.

3.F Marginal effect of probit for internet uses

Table 3.5: Uses of the Internet

	Internet uses			
	Presentation	Deepen knwoledge	Additional exercices	Chat with friends
Using Internet with children Ref : Often				
Sometimes	-0.341*	-0.222*	-0.265*	0.058
	(0.154)	(0.111)	(0.112)	(0.122)
Rarely	-0.438*	-0.668**	-0.467*	0.221
	(0.232)	(0.183)	(0.185)	(0.184)
Having better computer skills than their child Ref : Often				
Sometimes	0.245*	-0.025	0.068	0.193
	(0.149)	(0.120)	(0.122)	(0.132)
Rarely	0.372*	-0.091	-0.026	0.295*
	(0.173)	(0.136)	(0.139)	(0.147)
Never	0.436*	-0.224	0.008	0.200
	(0.224)	(0.174)	(0.175)	(0.183)
Restricting access to Internet Ref : Often				
Yes, most of the time	-0.175	-0.063	-0.070	0.411**
	(0.152)	(0.121)	(0.123)	(0.137)
No, most of the time	0.107	0.126	-0.120	0.398**
	(0.180)	(0.137)	(0.140)	(0.152)
Never	0.276	-0.005	-0.142	0.525**
	(0.268)	(0.191)	(0.192)	(0.200)
Child's grades ref : Below the average				
Average	-0.091	0.540*	0.248	0.572*
	(0.276)	(0.247)	(0.238)	(0.285)
Above the average	0.000	0.781**	0.200	0.573*
	(0.277)	(0.247)	(0.237)	(0.284)
Really above the average	0.108	0.789**	0.306	0.565*
	(0.303)	(0.261)	(0.251)	(0.299)
Informal help ref : often				
Rarely	0.154	-0.102	0.123	0.176
	(0.208)	(0.157)	(0.162)	(0.168)
Sometimes	-0.046	0.016	0.196	0.069
	(0.193)	(0.150)	(0.153)	(0.162)
Often	-0.253	-0.049	0.269	-0.132
	(0.223)	(0.180)	(0.183)	(0.200)
Higher parental degree Ref : Less than Baccaulaureat				
Bac Pro	0.264	-0.193	0.238	0.047
	(0.263)	(0.227)	(0.233)	(0.253)
Bac général et technologique	0.313	-0.017	0.447*	0.380
	(0.248)	(0.211)	(0.217)	(0.233)
Bac +2	0.361*	-0.222	0.180	0.274
	(0.206)	(0.178)	(0.186)	(0.202)
Bac +3/4	0.472*	-0.252	0.172	0.375*
	(0.192)	(0.165)	(0.173)	(0.188)
Observations	753	753	753	753
Log likelihood	-,280,732	-,490,847	-,472,901	-,422,207
LR chi2	46,883	45,764	31,036	48,875
Prob > χ^2	0.007	0.010	0.227	0.004

Significance levels: ***0.01 **0.05 *0.10 . Dummies for city level and regions included

3.G Multivariate estimations—error terms' correlation

Table 3.6: Correlation residuals—Multivariate probitl

	Coef.	Std. Err.	P-value
ρ_{12}	-0.400	0.080	0.000
ρ_{13}	0.007	0.077	0.920
ρ_{14}	0.325	0.088	0.000
ρ_{23}	0.231	0.062	0.000
ρ_{24}	-0.005	0.064	0.926
ρ_{34}	0.127	0.065	0.050

Notes : ρ_{12} represents the correlation between residuals of the first and the second equations ; ρ_{13} for the first and the third ; ρ_{23} for the second and the third ; and so forth.

3.H Multivariate specifications with Internet usages

Table 3.7: Uses of Internet

	For presentation	To deepen my knowledge	Additional exercices	Chat with friends
Using Internet with children Ref : Often				
Sometimes	-0.325*	-0.224*	-0.264*	0.038
	(0.152)	(0.112)	(0.113)	(0.122)
Rarely	-0.410*	-0.659**	-0.448*	0.206
	(0.232)	(0.183)	(0.183)	(0.184)
Having better computer skills than their child Ref : Often				
Sometimes	0.234	-0.025	0.066	0.199
	(0.148)	(0.120)	(0.122)	(0.132)
Rarely	0.378*	-0.094	-0.029	0.301*
	(0.173)	(0.136)	(0.139)	(0.147)
Never	0.436*	-0.226	0.004	0.211
	(0.224)	(0.174)	(0.175)	(0.183)
Restricting access to Internet Ref : Often				
Yes, most of the time	-0.178	-0.064	-0.069	0.407**
	(0.151)	(0.121)	(0.123)	(0.137)
No, most of the time	0.113	0.114	-0.129	0.389*
	(0.179)	(0.136)	(0.139)	(0.152)
Never	0.253	-0.010	-0.151	0.521**
	(0.264)	(0.192)	(0.192)	(0.200)
Child's grades ref : Below the average				
Average	-0.064	0.520*	0.241	0.542*
	(0.272)	(0.243)	(0.235)	(0.280)
Above the average	0.027	0.761**	0.183	0.542*
	(0.273)	(0.243)	(0.234)	(0.279)
Really above the average	0.098	0.760**	0.292	0.526*
	(0.297)	(0.257)	(0.249)	(0.294)
I don't know	0.000	0.734	0.446	0.000
	(.)	(0.934)	(0.998)	(.)
Informal help ref : often				
Rarely	0.121	-0.106	0.120	0.182
	(0.208)	(0.157)	(0.162)	(0.168)
Sometimes	-0.064	0.004	0.190	0.065
	(0.194)	(0.149)	(0.153)	(0.162)
Often	-0.277	-0.056	0.267	-0.133
	(0.222)	(0.180)	(0.182)	(0.200)
Higher parental degree Ref : Less than Baccaulaureat				
Bac Pro	0.287	-0.221	0.225	0.029
	(0.264)	(0.226)	(0.232)	(0.251)
Bac général et technologique	0.356	-0.015	0.444*	0.376
	(0.250)	(0.211)	(0.217)	(0.233)
Bac +2	0.341*	-0.213	0.174	0.283
	(0.204)	(0.179)	(0.186)	(0.201)
Bac +3/4	0.474*	-0.247	0.173	0.381*
	(0.191)	(0.165)	(0.173)	(0.187)
Observations	754			
Log likelihood	-1637.042			
LR chi2	170.831			
Prob > χ^2	0.000			

Significance levels: ***0.01 **0.05 *0.10 The 754 observations represents parents declaring that their child benefit to the Internet while doing their homework. Estimations are based on a multivariate probit to allow correlations between residual of each specification. Each variable of interest equals to one if parents declared child develop such use. Dummies for city level and regions included

Conclusion Générale (in French)

Dans cette thèse, nous nous sommes intéressés à trois formes d'interactions sociales chez les adolescents : les préférences sociales, l'influence des pairs et la disponibilité des ressources à la maison pour étudier. Les trois chapitres de cette thèse contribuent à la discussion sur la réussite scolaire des élèves au collège.

Le **premier chapitre** analyse la relation entre les préférences individuelles et sociales et la réussite scolaire en utilisant un "*lab-in-the-field*" avec des collégiens de 5^{eme}. Nous mesurons le goût pour la compétition, l'altruisme et la coopération à un niveau individuel et les mettons en perspective avec la performance scolaire. Nous identifions le goût pour la compétition comme un déterminant majeur des notes dans la plupart des disciplines considérées. Le deuxième résultat de cette étude est la relation négative entre l'altruisme et la réussite scolaire. Ainsi, l'égoïsme est positivement corrélé aux notes. Nous mesurons la performance éducative à travers les notes dans plusieurs disciplines, nous permettant de tester si ces résultats sont observés dans différentes dimensions de l'apprentissage. Les relations entre goût pour la compétition, altruisme et performance scolaire sont présentes dans la majorité des disciplines étudiées. Cette étude souligne le rôle clé des préférences dans l'accumulation du capital humain.

Le **deuxième chapitre** étudie les déterminants de la coopération entre adolescents et évalue l'impact de la mise à disposition de sanctions et de récompenses non-monétaires sur les comportements coopératifs. Un apport de ce chapitre est d'appréhender les déterminants de la coopération. Nous observons que l'altruisme est positivement corrélé au montant alloué au bien public, les hommes tendant à être moins coopératifs que les femmes. Nos résultats montrent que la disponibilité de la (dés)approbation sociale augmente la coopération. Comme observée lors d'expériences précédentes avec des enfants, la menace d'être puni est la principale explication de la (dés)approbation sociale

: le nombre de récompenses ou sanctions directes reçu n'influence pas la coopération individuelle. Cette étude permet d'identifier les mécanismes sous-jacents de la pression des pairs.

Le **troisième chapitre** s'intéresse à la mise à disposition, par les parents, de ressources éducatives au sein du ménage. Elles représentent un important levier d'inégalités éducatives puisque les parents peuvent les mobiliser pour palier de possibles carences d'apprentissage à l'école. Nos résultats suggèrent que les parents investissent du temps, de l'argent et des ressources numériques pour aider leurs enfants s'ils en ont besoin. La mise à disposition d'aides aux devoirs est négativement corrélée avec la réussite scolaire : plus l'apprenant a des notes élevées et moins il est susceptible d'en recevoir. Nos résultats suggèrent que ni l'éducation ni la richesse n'ont d'impact sur l'attribution d'aides supplémentaires. Enfin, nous examinons dans quelle mesure les adolescents ont recours à Internet pour étudier à la maison et nous trouvons des différences significatives dans les usages, qui sont largement influencés par les pratiques numériques parentales.

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La performance éducative des adolescents et ses déterminants présentés dans cette thèse permettent de considérer différents leviers pour lutter contre les inégalités éducatives. Notre approche basée sur de multiples formes d'interactions entre élèves et avec leurs parents nous permet de présenter deux pistes de réflexion sur le prolongement de nos résultats sur la performance éducative en termes de politiques publiques :

Le **premier chapitre** souligne le rôle des préférences sociales dans la performance scolaire. Une récente littérature témoigne de la malléalibité de ces comportements - à travers des programmes de type '*mentoring*' favorisant les comportements pro-sociaux (Kosse et al., 2020), ou des politiques encourageant la perservérance, réduisant la différence de goût pour la compétition par genre en Turquie (Alan and Ertac, 2019) - tout en soulignant son rôle dans l'accentuation des inégalités éducatives (Almås et al., 2016). Les compétences non-cognitives semblent également malléables et représentent un levier contre les inégalités éducatives (Ertac, 2020). Nos résultats suggèrent que le développement de ces préférences est fortement corrélé à l'origine sociale des apprenants. Une implication en termes de politiques publiques consiste à s'inspirer de cette littérature pour stimuler la performance éducative afin de réduire les disparités d'apprentissage en influençant les

préférences sociales.

Le **troisième chapitre** met en avant les ressources mises à disposition par les parents pour étudier. Nos résultats suggèrent que les capacités à utiliser les outils numérique des parents ont un rôle clé dans la décision d'allouer une aide aux devoirs. Les parents disposant d'une appéttence plus marquée pour les outils numériques sont ainsi en mesure de disposer d'un plus large socle de compétences pour aider leurs enfants. Ce constat suggère que les pratiques numériques au sein du ménage peuvent accentuer les inégalités. Une extension de cette recherche en termes de politiques publiques seraient la mise à disposition de ressources additionnelles auprès d'un public défavorisé de manière à leur accorder du temps et des individus ayant les connaissances pour les aider. Une telle intervention peut potentiellement réduire les disparités d'apprentissage naissantes au sein du foyer familial.

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Dans cette thèse, nous avons exploré différentes formes d'interactions sociales auprès d'une population d'adolescents : les préférences sociales, l'influence par les pairs, et les aides aux devoirs. Notre recherche comporte néanmoins certaines limites, qui peuvent représenter un programme intéressant pour de futures recherches.

Dans le **premier chapitre**, notre protocole expérimental rencontre deux limites.

Premièrement, nous ne sommes pas en mesure d'évaluer l'impact causal des comportements décrits sur la réussite scolaire. Deux possibles extensions en découlent :*i)* tester, à l'aide de politiques publiques visant à stimuler les préférences d'adolescents, si le goût pour la compétition et l'altruisme ont un effet causal sur l'éducation et *ii)* intégrer les déterminants individuels de ces comportements - par exemple, les traits de personnalité - dans cette relation.

Deuxièmement, la réussite scolaire est mesurée par le biais de notes attribuées dans un système éducatif scolaire particulier. Nos résultats représentent ainsi la capacité de réussir dans un cadre d'apprentissage donné, nous empêchant de distinguer si ces résultats sont propres au système éducatif français, ou s'ils sont réplicables dans d'autres environnements. Une extension possible serait alors de répliquer cette étude dans différents pays pour observer si ces résultats sont toujours présents.

Le **deuxième chapitre** révèle que la mise à disposition de la (dés)approbation sociale est un levier important pour la coopération.

Notre protocole expérimental analyse les mécanismes de récompenses et de sanctions simultanément de façon à retranscrire la pression par les pairs. Une première extension serait de réaliser deux traitements supplémentaires où un seul des deux mécanismes est disponible. Il serait alors possible de mesurer l'efficacité de chaque mécanisme et la réaction des adolescents à son égard.

Une deuxième extension serait de comprendre comment les croyances se forment et d'analyser leurs influences sur les décisions coopératives. Nos résultats, ainsi que ceux d'études antérieures, mettent en avant l'importance de l'effet indirect de la pression par les pairs : les adolescents tendent à changer leurs comportements du fait de sa simple disponibilité. La formation des croyances permettrait de comprendre si les individus sont intrinsèquement disposés à coopérer ou si les comportements coopératifs émergent du fait des croyances.

Une troisième extension serait de comparer la validité externe de nos mesures expérimentales avec des données observationnelles. Et, plus spécifiquement, d'observer si les individus soumis à la pression des pairs dans nos expériences changent également leurs "comportements sur le terrain" en étant exposés à des pairs différents.

Dans le **troisième chapitre**, nous analysons le rôle des ressources extérieures à l'école, représentées par l'aide aux devoirs, et les caractéristiques parentales associées à chaque type de soutien.

Notre étude se basant sur un unique questionnaire, nous ne sommes pas en mesure de démontrer un impact causal des activités extrascolaires sur les résultats scolaires. Ainsi, l'évaluation de politiques visant à orienter l'aide parentale, en corrigeant les croyances par rapport aux capacités de leurs enfants dans l'esprit de Dizon-Ross (2019), ou à fournir un soutien scolaire supplémentaire, permettrait d'identifier celles favorisant le plus la performance scolaire. Une telle étude permettrait d'aiguiller les parents tant dans leurs décisions d'apporter (ou non) de l'aide aux devoirs que sur les ressources favorisant un apprentissage efficace.

De plus, le caractère déclaratif de nos mesures ne nous permet pas d'estimer précisément

la relation entre pratiques numériques et soutien scolaire. Une extension de cette étude serait d'utiliser une enquête de type '*Time Use Survey*' afin d'identifier les différents arbitrages temporels que les parents réalisent pour aider leurs enfants.

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Cette thèse met en lumière de multiples aspects de la réussite scolaire des adolescents en France. Un prolongement possible de ce travail est d'évaluer différents programmes visant, d'une part, à stimuler les préférences des apprenants et, d'autre part, à fournir des ressources éducatives aux élèves afin de comparer l'ampleur de chaque effet. Ainsi, de telles évaluations pourraient changer fondamentalement notre vision des politiques éducatives en mettant en évidence que la fourniture de ressources n'est pas nécessairement aussi importante que le fait de s'occuper d'un enfant.

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UNIVERSITÉ DE RENNES 1

Titre : **Le rôle des préférences et interactions sociales dans la performance scolaire**

Mots clés : Préférences, Interactions sociales, éducation

Résumé : L'éducation joue un rôle clé dans les trajectoires économiques et sociales individuelles. Les disparités d'apprentissage sont déjà présentes chez les adolescents. Cette thèse étudie le rôle des interactions sociales, entre élèves et avec leurs parents, dans la performance scolaire. Plus spécifiquement, nous élicitons différentes préférences, à savoir le goût pour la compétition, l'altruisme et la coopération, et les mettons en perspective avec la performance scolaire mesurée par les notes. Dans un second temps, nous évaluons la mise à disposition d'un mécanisme d'approbation et de désapprobation par les pairs sur les comportements coopératifs auprès d'un public d'adolescents la subissant en-dehors de l'expérimentation. Dans un troisième temps, nous approchons les interactions verticales - e.g. avec les parents- à travers les ressources mises à disposition pour étudier au sein du ménage. Cette thèse souligne le caractère multidimensionnel des interactions sociales dans la performance scolaire. Les interactions sociales des adolescents influencent la performance scolaire à travers i) les préférences concernant autrui telles que le goût pour la compétition et l'altruisme, ii) la (dés)approbation sociale entre élèves favorisant les comportements coopératifs, iii) les pratiques numériques parentales influençant la mise à disposition de ressources pour étudier au sein du ménage. Nos résultats peuvent servir des politiques éducatives afin de stimuler les préférences des apprenants et faciliter leur apprentissage et pour implémenter des interventions visant à réduire les disparités en termes de ressources en dehors de l'école.

Title Preferences, social interactions and school achievement

Keywords : Preferences, Social interactions, education

Abstract : Education has a crucial role in individual economic and social outcomes, while learning disparities are already observed among teenagers. This thesis investigates the role of social interactions, between students and their parents, on school achievement. More specifically, we elicit several preferences, namely willingness to compete, altruism, and cooperation, and investigate their relationships with school performance, measured by grades. In a second chapter, we evaluate the availability of peer (dis)approval on cooperative behaviors among teenagers. In a third chapter, we approach vertical interactions -e.g., with parents- through the resources made available to study within the household. This thesis highlights the multidimensional aspect of social interactions on school performance. Adolescents' social interactions influence school performance through i) preferences regarding others - such as willingness to compete and altruism, ii) social (dis)approval promotes cooperative behaviors, iii) parental digital practices influence the availability of educational resources within the household. Educational policies can build on our results to, on the one hand, stimulate pupils' preferences to promote learning and, on the other hand, implement interventions to reduce outside school resource disparities.