An experimental test of sociological theories of education and intergenerational mobility.

Preliminary draft

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September 2011

Abstract

This paper presents a real task experiment that intends to reproduce an educational system with three social classes. We assess the elements that determine motivation and success. The experiment investigates how the payoffs' framing, by modulating the reference point and thus creating artificial social classes, can influence aspiration levels. We have three treatments, one in which payoffs are presented as gains (gain treatment, GT), the second one as losses (loss treatment, LT), and the last one presents payoffs first as losses and then as gains (intermediate treatment, IT). Two types of curriculum that differ in their difficulty level are also introduced. Results show that ability is the main determinant of success as well as confidence as long as subjects are not over-confident. The IT has a significant impact on success and motivation when we distinguish high and low ability subjects. Moreover, we find that levels of aspiration combined to ability levels leads to differences in confidences levels between the three treatments. Along this paper, a parallelism is made between our experiment, sociological theories and empirical findings.

Keywords: Experimental economics, educational choices, social classes, self-confidence.

JEL classification: C91 J24 D80 I21 A12

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1 Introduction

What is the influence of the social context in which individuals evolve, on educational choices and educational output? It would be a mistake to assert that this has never interested economists (Damoiselet, 1998), but they may have underestimated it, for theoretical and empirical reasons. This paper tries to test different sociological models through experimental economics methodologies. We try to test the effect of aspiration levels and self-confidence on educational choices. But also the effect of the institutional context represented by the different curricula available and the duration of the common studies on educational outcomes.

Since Becker (1967), the economic theory, considering educational choice as an investment choice, has privileged the rationing or the unequal credit cost to education according to the parents' wealth in order to explain intergenerational inequalities. However, other social sciences have always had a larger view, highlighting that beside the financing factors the demand factors may play an important role: educated parents convey their abilities and their preferences to their children through a sort of cultural osmosis (Bourdieu, 1964); these parents have greater educational ambitions that often schools internalize (Duru-Bellat, 2003). Boudon (1973) added that children from different social background do not make the same choices because they do not have the same reference point. Children from low social background consider success what children from high social background would consider as a failure. Moreover, the assumption of the homogeneity of the human capital can be criticized in a way that it does not allow considering the different tracks (general or vocational curricula) but only the duration of education. Bourdieu and Passeron (1968, 1970) introduced the role of self-confidence which would have an impact on schooling duration. Self-confidence level of low social backgrounds children is lower, which would imply a self-selection, therefore a decrease in the years of schooling.

On the empirical side, the economists found great difficulties measuring the contexts' effects all things being equal. There are ambiguous and controversial results from many estimations of the educational input effects, as to the class size and the teachers' training, on the output (Angrist and Lavy 1999, Piketty and Valdenaire 2006). By output we mean the acquisition of knowledge and former students' wages (see for example Hanushek 1986, Card and Krueger 1992, Dolton et al. 2004). Even though comparisons in time and space, as quality or the number of measurable variables, are well used to progress, the variability of the contextual factors are such that the agreement is difficult to get in that field. Nevertheless, progressively, economists become more interested in social context and institutional effects on educational choices and returns. Some sociological

assumptions have been introduced in economic models (Becker and Tomes, 1979) and have been extended to more than the family context: e.g. the neighborhood effect (Goux and Maurin 2006, Moizeau et al. 2008), peer effects (Hoxby 2000, Markman et al. 2003).

Concerning theories, recent works have shown that the assumption on the credit constraints imperfection can be relaxed [1]. Recent works suggested also that the heterogeneity of abilities is valued on the labor market (Bowles et al. 2001 , Heckman and Rubinstein 2001). This heterogeneity can be summarized through cognitive (learning abilities) and non-cognitive abilities (valuable skills). This implies that the residual inequality of opportunities, even though we suppose no credit constraints, exists because of the input demand. After controlling for the direct effect of cultural transmission by the parents, we still need to understand why children well endowed are more encouraged to go further in their studies than the others, given the same abilities, and if schooling institutions are more or less biased in selecting abilities. In fact, we observe differences in human capital investment partly because of social inequalities. And these can be partly explained by differences in aspiration levels: upper social background students will have a higher aspiration level than the lower social background students, and will thus be more likely to pursue schooling more years.

Indeed, observed inequalities are present as soon as kindergarten starts and they increase the further we go on the educational path (Duru-Bellat, 2003). Two reasons may explain this phenomenon: students from low social background succeed less, and the orientation choices are influenced by the social environment. It seems that social inequalities in schools are more salient when choices occur between different tracks and curricula. Indeed, parents from low social background are more risk averse and less ambitious than parents from high social background and consequently choose more often technical/professional paths for their children (Duru-Bellat et al. 2011, Albouy and Wanecq 2003).

To simulate a social context we assume that children take their schooling decisions with their family and that they have different reference points (we do not take into account, in this experiments, the opportunity differences students from different social backgrounds can face). Hence, instead of considering social classes through their resources (revenues, social and cultural parents' capital, credit cost...) we distinguish these classes by different levels of aspiration and self-confidence. The prospect theory (Kahneman and Tversky, 1979) could be one explanation of the greater ambition of high social background children because they manifest a risk aversion in gains perception, but a risk seeking in loss perception (Page 2005). This assumption has been confirmed by Page et

[1] Through four identification methods Cameron and Taber (2004) find that policies on students' credits will have little impact on education attainment.

al.(2007)[2].

In this paper we aims to reproduce an educational system with three social classes and three levels of schooling containing different stages.[3]. In order to do that, we built an experiment where participants have to make a real-effort task based on three levels of difficulty that can be succeeded or failed [4]. There are three treatments corresponding to three potential endowments: a Loss Treatment (LT) in which subject are well endowed with 35€, an Intermediate treatment (IT) endowed with 20€, and a Gain Treatment (GT) in which subjects are not endowed at all. Thus, the LT and the IT were placed in a loss frame; the further they go in the experiment the less they could lose. Whereas the GT only earns money. The purpose of this design is to simulate three levels of aspirations. We wanted the IT to be able to experience an upward mobility (as the middle class can experience). So if they succeed the second level, and decide to continue, they would keep all their initial endowment and if they succeed the 3rd level they would win an additional amount of money this time. It turns out that this opportunity to win money increases the probability for the IT subjects to achieve the second level or to go further, but only for the highly able subjects. The opposite effects happens for the low ability participants. A last main feature of our experiment is that we introduce two tracks that differ in their levels of difficulty. We observe some differences in behavior and success between both of the tracks, but not significant enough (we will precise this in section I).

Our experiment allows us to test sociological assumptions and empirical facts. We highlight different interesting results in this paper: the IT treatment has a significant impact on success and motivation, and this effect is more salient when we distinguish high and low ability subjects. We confirm one of Bourdieu's assumptions. By analyzing self-confidence levels of the high and low ability subjects, we find that inside the LT there are no differences in confidence-level between these two categories, whereas there is for the GT and the IT participants. Finally, we refute Boudon's hypothesis that is low social background stop earlier and more than the others.

The rest of the paper is organized as follows. Section 2 will describe the experiment and how we try to cope with some of the sociological insights with an economic method. Section 3 will analyze determinants of the upper level's attainment. Section 4 presents the different tests of sociological theories. Section 5 will shed a light on the particular effect of our intermediate treatment (IT). Finally, section 6 will discuss the results and conclude.

[2]In this paper, the authors frame payoffs either as losses or gains. They find that subjects in a loss frame continue and succeed better in their experiment

[3]The design is fully inspired by Page et al. (2007) and Askari (2010).

[4]Detailed description is provided in the next section.

2 The experimental design

This experiment aims to reproduce an educational choice process. We insist on the selective characteristic of the design rather than on a learning approach. The subject must maximize her educative output measured here by the gains or the attained level. In order to do that, subjects have to make a real effort task and have to make decisions during the experiment. We use a real effort task so we can obtain different effort and motivation measures as to the subjects' stress, their confidence in succeeding this task, their satisfaction etc... As in Page et al. (2007) subjects have to resolve anagrams on many stages and in a limited time.

The structure of the experiment has three levels. To succeed one level, subjects need to resolve a minimum number of anagrams. If they succeed, they can choose either to stop and leave with their payoffs, or to continue to the next level, which then imply resolving more anagrams and try to increase their payoff if they succeed this next level[5]. Fifteen stages are grouped through the three levels, and one stage consists in resolving a series of anagrams.

- Level 1: 9 stages.
- Level 2: 3 stages.
- Level 3: 3 stages.

To create the anagrams we used the list of the 2000 six letters most French words used. We then randomly chose 114 words, for which we randomly mixed the six letters.

Individuals have 8 minutes at each stage to find anagrams. To clear one level, subjects have to solve at least two third of the total anagrams presented in the level. Thus the difficulty increases by the increasing number of anagrams that have to be solved in the same limited time of 8 minutes at each stage.

At the end of the first level, and only if they succeed and decide to continue, subjects have to choose between two curricula; a vocational curriculum (VOC) or a general curriculum (GEN). Payoffs for both curricula are the same, only the difficulty through the number of anagrams to be solved at each level changes (see table 1). Subjects have to choose between the curricula once they complete the level 1 and decide to continue further. The GEN track increases sharply the difficulty for the level 2 (facing 10 anagrams per stage and consequently having to resolve 20 anagrams to clear the level), but from level 2 to level 3 the difficulty is constant with the same conditions. So

[5]Failing the level implies quitting the experiment.

subjects choosing the GEN curriculum have to increase their effort level from level 1 to level 2, but once they passed the second level and decide to pursue to the next level, their effort just needs to stay constant. Concerning the VOC track, between the first and the second level, the difficulty increases, but very marginally. Instead of seeing 6 anagrams per stage, subjects face 8 anagrams and have to solve 16 anagrams to clear the second level. If they decide to take the third level, the difficulty increases a lot: there are now 12 anagrams per stage, and 24 anagrams have to be solved to succeed the last level.

Participants with low abilities should choose VOC to be more likely to succeed at least the second level which provides them the opportunity to earn more with less effort than if they had chosen GEN. Subjects who choose GEN who manage to succeed level 2 should have a probability close to 1 in succeeding level 3.

This design replicates the progression of a general curriculum and a vocational curriculum as in many educational systems. The general track is selective as the performance must increases sharply from the first to the second level. This design aims at representing a common-core syllabus and then a choice between two "specialized" studies. To avoid any parallelism between the VOC and GEN curricula and the reality we named both tracks A and B and reversed the presented order in half of the sessions (see figure 6 in appendix) [6].

Levels	Level 1	Level 2		Level 3	
Chosen curriculum		VOC	GEN	VOC	GEN
Number of stages	9	3	3	3	3
Number of anagrams by stage	6	8	10	12	10
Minimum number of anagrams to succeed	36	16	20	24	20

Table 1: Number of anagrams that have to be solved by level and curriculum

Table 2 presents the different payoffs according to the success or the failure at each level among treatments. We thus simulate three social classes with three levels of endowments that modulate the perception of the payoff (loss or gain) and thus the reference point (see the prospect theory of Kahneman and Tversky, 1979). This aims at artificially creating different levels of aspirations.

The decision that a subject has to make at the end of each succeeded level becomes a choice between a sure payoff (when she decides to stop and to leave) and a lottery with a probability p of winning the next level and a probability $1 - p$ of failing the level (when she decides to continue).

[6] In the results' analysis we make sure to control for this.

		Treatments		
Levels		Gain *Low Class*	Intermediate *Middle Class*	Loss *Upper Class*
	Initial endowment	0€	20€	35€
L1 - Low group	Fail	2€	-18€	-33€
	Pass and stop	10€	-10€	-25€
L2 - Middle group	Fail	4€	-16€	-31€
	Pass and stop	20€	-0€	-15€
L3 - Upper group	Fail	11€	-9€	-24€
	Pass and stop	35€	+15€	-0€

Table 2: Initial endowments and additional gains and losses

In this manner, the whole experiment can be summarized as a decision process (see the appendix figure 7 to have a better idea on the decision tree subjects face). In fact, if one is not sure of its ability, continuing is risky as if you fail the level, you leave with a smaller payoff that if one had chosen to stop. This represents the opportunity cost of continuing. As students invest in their study, if they succeed, this investment is profitable. But if they fail, they lose this investment (we make the assumption that there are no differences in opportunities between the subjects).

We ran a total of 14 sessions [7]. Half of them were run in Montreal (Cirano) and the other half in Paris (at the Laboratoire d'Economie Expériementale de Paris). One session corresponded to one treatment (see table 10 in appendix). We always read the instructions aloud before starting the experimental program. Subjects were free to ask as many questions as they wanted. To make sure they understand the experiment perfectly they had to answer a comprehension questionnaire (11 questions) before starting resolving anagrams. They could not go on until every answer of these questions were correct. Moreover, after this questionnaire, subjects were asked some demographics questions about their age, their gender, their study level, their mother tongue, their frequency playing scrabble or crossed words etc.... These were to make sure that if we found any significant differences between our groups, we would be able to control for them in our estimations. After having answered to all of these questions, they could start the level 1 of the experiment. Decisions always remained individual, communication was not allowed. When they finished their experimental session, before getting their payoff, they had to answer to two subjective questions about their level of stress and their satisfaction.

[7] We started with 12 sessions but we had to add two additional sessions as we had significantly less subjects in the GT and IT treatments.

We had a total of 243 participants and they all got a participation fee of 7€[8] (see table 3 for descriptive statistics).

Variables	Modality	GT	IT	LT	difference [9]
Gender	Men	48,7%	47,6%	55,6%	ns
Age		26,5	27,2	26,6	ns
Level attained		1,5	1,7	1,6	ns
Mother tongue	French	75,0%	73,2%	56,8%	$**_{IT \neq LT}$ $**_{GT \neq LT}$
Prior participation in an experiment	Yes	81,2%	84,1%	77,8%	ns
Educational level [10]	Bac +3 to bac+5 or more	61,2%	63,4%	70,4%	ns
Occupation	Work or study	90,0%	95,1%	95,1%	ns
Risk Aversion [11]	Yes	66,3%	80,5%	74,1%	$**_{GT \neq IT}$
Cross words	Occasionally or regularly	26,3%	34,2%	34,7%	ns
Scrabble	Occasionally or regularly	11,0%	28,1%	16,1%	$**_{IT \neq LT}$ $***_{IT \neq GT}$
Number of comprehension mistakes		2,1	2,6	2,2	ns
Satisfaction [12]	scale from 1 to 7	3,8	4,4	4,0	$**_{GT \neq IT}$
Stress	scale from 1 to 7	4,9	4,9	4,8	ns
N		80	82	81	ns

Table 3: Descriptive statistics
Significance levels of t-test: ** 5% *** 1%

Our experiment aims at testing economic and sociological assumptions:

H1: Ability is the main determinant of educational choices and success.

H2: (Bourdieu and Passeron, 1964) Upper class students (loss treatment) are more confident in their abilities than lower class students (gain treatment). Besides, greater confidence entail greater performance (to some extent).

H3: (Boudon, 1973) Upper class students (loss treatment) have higher levels of aspiration than lower class students (gain treatment).Besides, higher aspiration entail high performance through the pursuit of studies.

[8] In Montreal, all payments were in Canadian dollars assuming the parity of purchasing. But we'll keep the euro currency in the rest of the paper.

[9] Difference are tested with a two-tailed t-test.

[10] Equivalent Canadian educational levels are "Etudes secondaires to diplômes d'études professionnelles"' and "'Etudes collégiales to études universtaires".

[11] A one simple question was presented to the participants. They had to chose between a sure payment of 5€ and a 10€ payoff with uncertain probability. The answer to this question had no impact on the final payoff.

[12] For satisfaction and stress: a scale between 1 and 7. The smaller the number, the less stressed or satisfied.

3 Ability and self-confidence are the main determinants for attaining upper levels of education

In this section we try to test the first hypothesis H1 by looking at the different variables that could explain failure or success of our subjects.

Results: We find that indeed, as we are able to measure the ability of our subjects in resolving anagrams, this is the main determinant of their failure. Ability plays the role of a selective factor that eliminates the weakest participants in this task. We find that success is determined by ability as well, but also by self-confidence. Robust results show that a moderate level of confidence in succeeding level 2 increases the probability of success. However, being overconfidence in succeeding level 3 decreases the probability of success. Finally, we find a first evidence of a strong IT effect that we will describe in section 4.

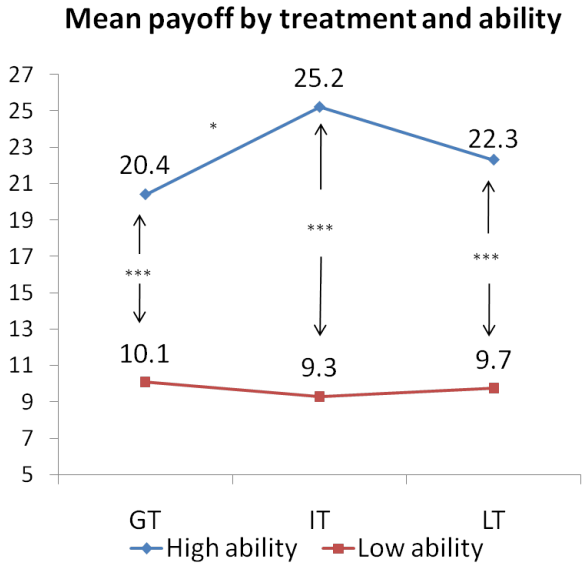


Figure 1: Mean payoffs according to ability and curriculum.
Significance levels of two-tailed t-test: * 10% *** 1%

Figure 1 indicates the differences in mean payoffs between treatments and ability levels. Low and high ability participants are specified on their capacity in resolving anagrams. We create a variable, called *average time cost*, indicating the average time a subject took to resolve one anagram during the first four stages. High ability subjects are below the median of this variable, and low ability subjects are above this median. In the rest of the paper, when we refer to high

	Lower group (L0-L1)	Middle group (L2)	Upper group (L3)
Lower class (GT)	51,3%	22,5%	26,3%
Middle class (IT)	48,8%	12,2%	39,0%
Upper class (LT)	51,8%	22,2%	26,0%

Table 4: Simulated intergenerational mobility table.

and low ability subjects, it will always remain this same specification. Proportion of high and low performers in the different treatments are not significantly different[13]. Without any surprise, high ability subjects earn significantly more than low ability ones. First, this validates our ability measure, and it shows that a lack of ability in resolving anagrams leads to a higher probability of failure. Moreover, among the high ability participants there is a significant difference between the IT's and the GT's payoffs (two-tailed t-test's $p - value = 0.09$).

Table 4 shows the overall distribution of the participants in each treatment and for each group level and can be considered as an intergenerational mobility table. The row variables (the treatments) can be considered as the original social background of the subjects. The column variables are the final social class subjects attain. If a subject starts in a low social class but attain a high level of education she then experiences a social mobility.

We observe that overall there is no difference of intergenerational mobility between the lower and the upper classes. So, differences in opportunities and social externalities, that we do not include in our experiment, are the main factors of intergenerational inequalities. However, we find an upward mobility for the middle class (IT) that are more represented in the upper group ($p = 0.04$).

The cumulative payoffs' distribution function (see figure 2) indicates that IT stochastically dominates at the first order GT and LT [14] which support an treatment effect of the IT.

The IT is set so the subjects can manage keeping their endowment quite easily (as they just need to clear the second level) and they can earn "extra" money against an effort cost due to continuing the experiment, and thus solving some more anagrams. This seems to be a real motivation trigger.

We run two probits on two dependent variables : *being relegated into the low group* (either: failing level 1 or succeeding level 1 and stop or failing level 2) , and *attaining middle or upper*

[13]There are 47,5% of high ability subjects in the GT, 56,1% in IT and 45.7%. A two-sided z-test gives a $p - value_{GGvsGI} = 0.27$, $p - value_{GGvsGP} = 0.82$, and $p - value_{GGvsGI} = 0.18$.

[14]Let be $F_{GT}(x)$, $F_{IT}(x)$ and $F_{LT}(x)$ be respectively the payoffs' cumulative distribution function of the GT, IT and LT subjects, with x the different possible payoffs. IT stochastically dominates at the first order GT and LT because $F_{GT}(x) > F_{IT}(x)$ and $F_{LT}(x) \geq F_{IT}(x)$, for all x.

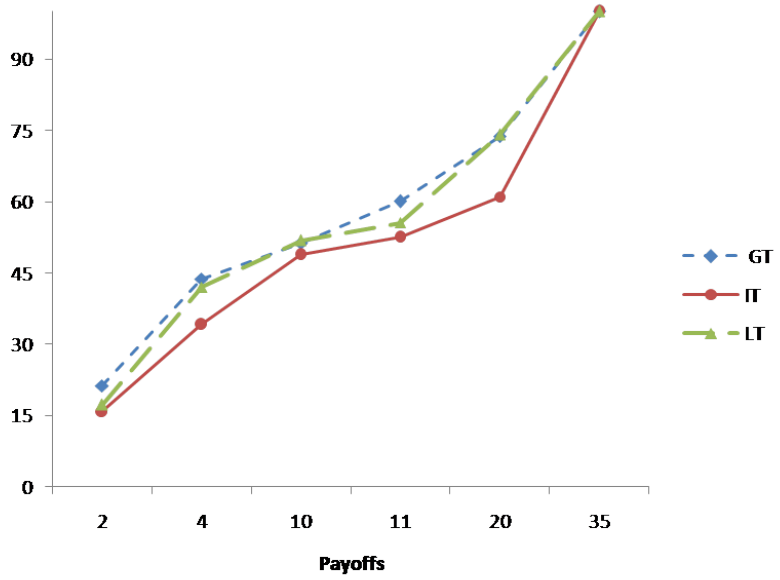


Figure 2: Cumulative distribution of payoffs

groups (conditionally on continuing to level 2, either: succeeding it and stop, or failing level 3 or succeeding level 3). In order to measure the impact of performance we use dichotomous variables corresponding to the quartile of our average time cost variable. We wanted this performance measure to be as exogenous as possible. Ability 2, Ability 3 and Ability 4 refer to the last three quartiles (the reference quartile is the first one which contains the 25% best participants).

We have 5 declared self-confidence levels in total (ranging from 0 to 100). We first ask subjects' self-confidence in succeeding each level during level 1, at the end of stage four. We repeat these questions just before level 2 starts, so only for subjects who succeed level 1 and decide to continue. Tables 5 and 6 show estimations of these probabilities.

Globally, we cannot see any treatment effect. The probability of being relegated into the low group is greater as the subjects do not belong to the first quartile. On the contrary, if we look at the probability of attaining middle and upper groups, performance has still a significant impact on success: if subjects belong to the second, third or fourth quartile, their probability to succeed decreases. Self-confidence also has a significant effect on the probability to succeed. In fact, being confident in succeeding level 2 predicts a higher probability of success, whereas an increase in confidence in the level 3 attainment predicts a lower probability of success. This shows that confidence has a positive impact on success as long as you have the ability to succeed, but being too confident in

one's future success has the opposite effect. Being a men increases also the probability of reaching the middle and upper groups. This gender effect could be explained by the taste of men for competition. Choosing VOC predicts also a greater probability of success, but only for level 2 as level 3 becomes much harder than the GEN path.

Table 5. Probit on being relegated to the low group

VARIABLES	
Intermediate Treatment	0.186
	(0.254)
Loss Treatment	-0.004
	(0.252)
Ability 2	1.065***
	(0.296)
Ability 3	1.395***
	(0.291)
Ability 4	2.401***
	(0.374)
Confidence for level 1	-0.010
	(0.007)
Confidence for L2 (end of stage 4)	-0.019
	(0.012)
Confidence for L3 (end of stage 4)	0.010
	(0.008)
Men	-0.262
	(0.212)
Constant	0.852
	(0.755)
Controls	YES
N	243
R^2	0.37
Robust standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

Note: All variables except confidence levels (between 0 and 100) and age are dichotomous. Control variables do not appear but are included in the probit: stress=1 if the score is greater or equal to 4, risk aversion=1 if the subject chose the sure payment, study levels=1 if the participant has three or more years of university studies (or equivalent). French=1 if the mother tongue of the participants is French (negative sign and significant at a 1% level). Scrabble=1 if she plays regularly or occasionally scrabble. Participation=1 if she has already participated to an experiment. Order ab corresponds to the order of the curriculum subjects were presented. Paris=1 if the experiment is in Paris and =0 if it is in Monteral (negative sign and significant at a 10% level).

Table 6. Probit on attaining middle and upper groups

VARIABLES	
Intermediate Treatment	0.361
	(0.325)
Loss Treatment	0.202
	(0.306)
Ability 2	-0.966***
	(0.354)
Ability 3	-1.875***
	(0.382)
Ability 4	-1.516***
	(0.503)
Confidence for L2 (end of stage 9)	0.045***
	(0.014)
Confidence for L3 (end of stage 9)	-0.031***
	(0.012)
Men	0.508*
	(0.266)
Chose VOC	1.043***
	(0.302)
Constant	-0.934
	(0.845)
Controls	YES
N	173
R^2	0.35
Robust standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

Note: Observations are 173 because the probit estimation is conditional on pursuing level 2.
Choose VOC=1 if the participants choose the VOC curriculum. The same control variables were included (Mother tongue and playing scrabble estimates are significant at a 10% level respectively with a positive and negative sign. Order ab and Paris estimates are significant at a 5% level respectively with a negative and positive sign.

4 Testing sociological theories

4.1 The effect of social class on self-confidence: a test of Bourdieu and Passeron's predictions.

Bourdieu and Passeron's assumptions (1964) link confidence and social background to success (H2). According to parts of this theory, individuals from low social background are less confident than high social background agents, and thus self-select themselves by not pursuing their studies or choosing less selective tracks. Overall, we find that participants are under-confident for their success at the first level and over-confident at the following levels. Only IT subjects are accurate

(see figure 12 in appendix).

The main idea of Bourdieu and Passeron's theory (1970) is that schooling systems support social classes' reproduction, and this happens through self-confidence. They assert that pupils from higher social background get higher school outcomes and are more confident. According to Bourdieu, children from upper classes have parents that detain more cultural, social and economic capital which lead to a greater endowment in these than for lower social classes' children. This higher level of capital allows pupils to be more comfortable with oral speaking and to behave in a manner expected and appreciated by teachers. This behavior is in return more valued by teachers. This creates, by a positive feedback, a higher self-confidence that pupils from lower social background would not have and would not be valued for. This mechanism must be even more true for less able pupils: if less able children come from high social background they still have this cultural and economic capital that even though they do not perfectly succeed at school. Nevertheless, they internalize the code and the knowledge that are appreciated in the schooling systems, so they would still be congratulated. If less able children come from low social background they would be even less confident because they have worse schooling outcomes and they do not fit in the right behavioral codes. We test this last assumption in our experiment.

Proposition 1 (testing H2): By differentiating high ability and low ability subjects, self-confidence in success should be lower for low ability subjects, and upper class (LT) subjects should be more confident than lower class (GT) subjects.

Result 1: We find that indeed, upper class subjects are significantly more confident than the low class subjects, but only among low performers. Moreover, as high ability subjects from the low class are more confident than their low ability counterparts, but confidence levels differences are smaller between high and low ability LT subjects. Figure 3 presents self-reported confidence in succeeding each level, by treatment (only upper and lower class) and by ability. Let's just first consider the confidence levels reported at the end of stage 4. In regard to self-confidence for level 1, the differences between high ability subjects' and low ability subjects' self-confidence is significantly greater than 0 at a 1% level for the three treatments. Moreover, among the low ability participants, the ones who belong to the LT are significantly more confident than the GT ($p = 0.07$). The same conclusion can be drawn for self-confidence of level 2 ($p = 0.04$). Low ability subjects in the LT are more confident than the GT individuals (p-value for a two tailed t-test=0.08 and a one tailed t-test yields a p-value=0.04).

When looking at the self-confidence levels reported at the stage 9, we could not find any treatment

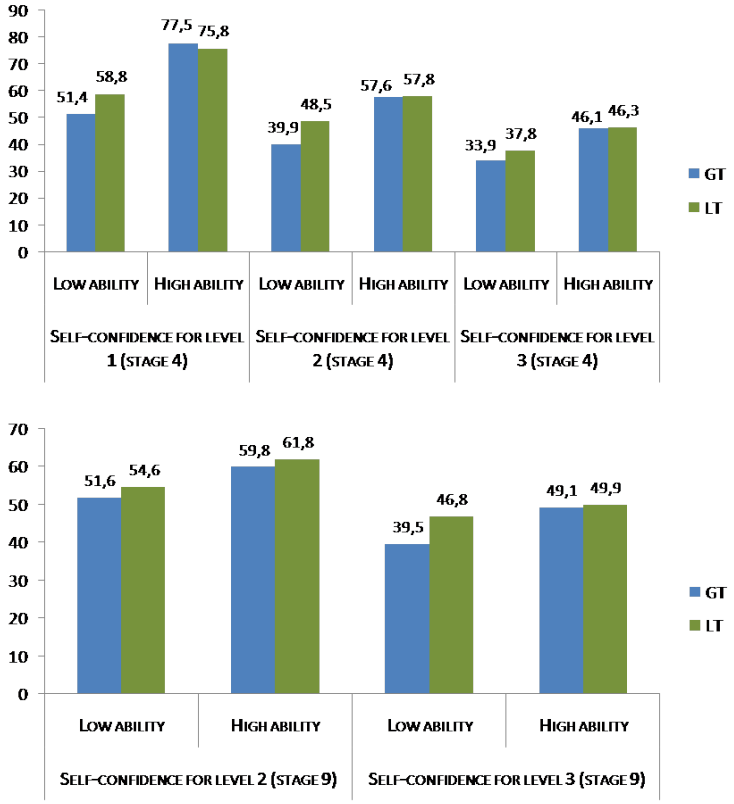


Figure 3: Self-reported confidence for the success of each level, score: 0 to 100, according to GT and LT and abilities.

effect for the subjects with the same level of performance. But, a one tailed t-test shows that for level 2 and 3, high ability participants in the GT are significantly more confident than less ables (for level 2 and 3, respectively with a p-value <0.05), but there is no difference between LT high and low ability subjects.

These results are consistent with an increasing concave dependence of self-confidence on class and ability. The fact that among high ability subjects, even though aspirations levels are set to differ, individuals are aware of their own capacity and thus calibrate more their levels of confidence on their known performance rather than on their aspiration levels. Whereas among low ability levels, as they are aware that they are not so good performers, the aspiration levels may overcome this objective awareness and hence create differences in confidence levels. That is why low ability GT subjects having a low aspiration level report lower confidence levels than a low ability LT participant.

4.2 Higher aspirations induce higher level of effort: a test of Boudon's predictions

Boudon has a completely different approach than Bourdieu and Passeron. Even though both are established on an individual decision process independent of schools and try to explain the impacts of social inequalities on schooling choices, Bourdieu builds a culturalistic model based of the notion of habitus, whereas Boudon develop a model of rational agents.

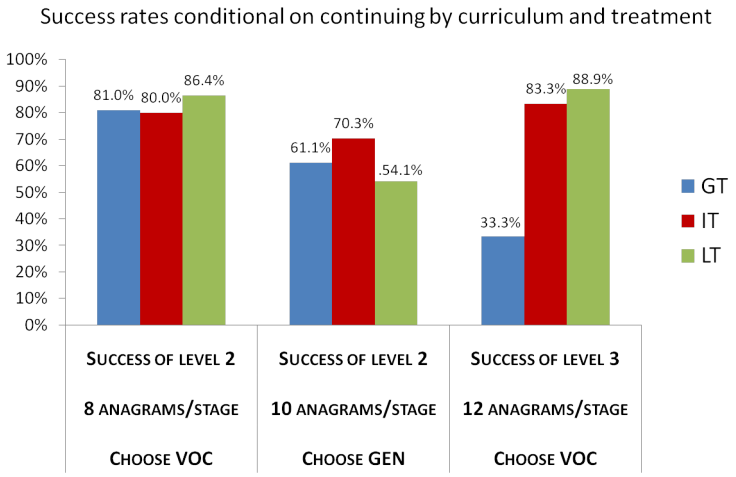


Figure 4: Level 2 and 3 success rates by curricula and treatments.

According to Boudon's theory, for an equivalent level of performance, the decision to continue or not schooling is not the same among the different social backgrounds. In fact, it is the individuals' rational choices according to their social class that explain social mobility. When a family faces a schooling choice (to continue or to drop out from school, investing in one or another path etc...) she makes a utility computation by analyzing likely costs and returns of investment, and choose according to these criteria. Thus a family that has few financial resources would not be able to invest consequently in the studies of its children. Social origin has a bigger role as there are more orientation choices and when entering the schooling system. Hence, for comparable performances, schooling decision are different according to the social class the family belongs to. The performance's influence on aspiration levels is less important, less discriminative, if the social background is high.

Propositions 2: High level of aspirations entail high performance through the pursuit of studies.

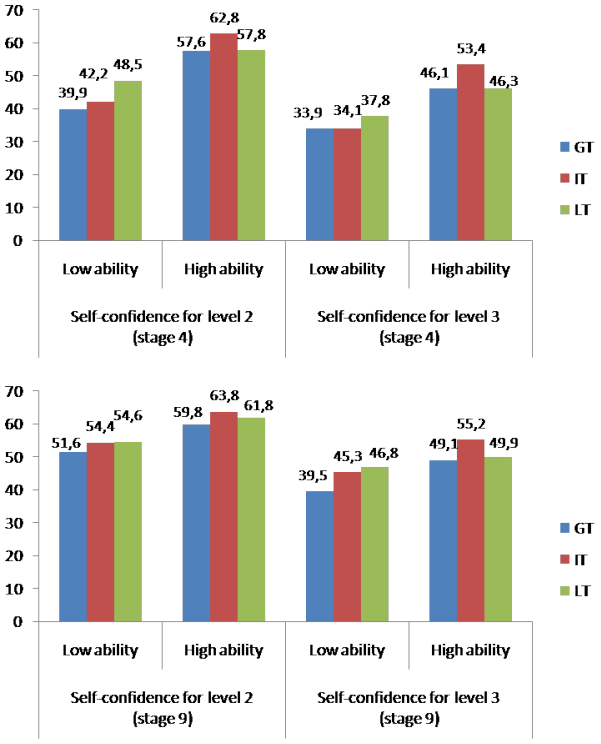
In this experiment variation of effort, inducing different levels of performance, can be observed across the different curricula and levels. We assume that upper class subjects (from LT) should have higher levels of aspirations leading to higher level of effort when needed to succeed. Figure 4 indicates success rates by different levels of effort that have to be exerted to succeed. We separate our subjects by ability. Looking at level 3 success of VOC choosers (when effort has to be very high), IT and LT (respectively middle and upper class subjects) succeed significantly better than GT (low class) subjects ($p=0.01$ for both differences). Initial aspirations are conditioned by endowed reference level, given here by the treatments.

Result 2: Aspirations increase when subjects perform beyond their initial reference level, and higher aspirations induce higher level of effort.

4.3 An additional social class

These three sociologists mainly assume two social classes. In this case, class and aspirations coincide. However, in our experiment we add the middle class and it turns out that this class behaves very differently according to the ability level. Indeed, with this third class the coincidence between classes and aspirations disappears. Knowing one level of ability will imply a different behavior for the middle class subjects: the low ability subject realizes her capacity level and starts to behave as a low class subject. However, the high ability middle class subjects are positively surprised by their success and behave like the upper class subjects. Aspiration level becomes in this case a function of endowment and performance surprise. By performance surprise we mean this fact of realizing ones ability level that could create deception or good surprise both having an impact on self-confidence and thus success. We report in figure 5 confidence levels according to treatment and ability as in figure 3 but we add middle class subjects' self-confidence. Low-ability middle class subjects' confidence is situated between their low and upper class counterparts. However, high ability IT subjects are more confident than the others subjects.

Result 3: Low-ability-middle-class subjects experience a negative performance surprise and behave like lower class subjects. Whereas high-ability-middle-class subjects experience a positive performance surprise and even outperform upper class subjects.



[!h]

Figure 5: Self-reported confidence for the success of each level, score: 0 to 100, by abilities and the three treatments.

5 The middle class effect

Previous estimations showed that performance has the main role on success. We present in this section a intergenerational mobility table separating participants by ability (see table 7). This sheds a light on an interested result.

Table 7 indicated that low ability middle class subjects are more represented in the low group than the other classes. However, high ability middle class subjects are significantly more representer in the upper group than the other classes(a one-on tail t test between the IT and the GT yields $p = 0.02$ and between IT and LT $p = 0.08$). IT seems to have a greater impact on success or failure depending on the ability level.We call this *the middle class effect*.

		Lower group (L0-L1)	Middle group (L2)	Upper group (L3)
Low ability	Lower class (GT)	71,4%	14,3%	14,3%
	Middle class (IT)	80,6%	8,3%	11,1%
	Upper class (LT)	72,7%	18,2%	9,1%
High ability	Lower class (GT)	28,9%	31,6%	39,5%
	Middle class (IT)	23,9%	15,2%	60,9%
	Upper class (LT)	27,0%	27,1%	45,9%

Table 7: Intergenerational mobility table by treatment and ability level.

Proposition 3: The aggregate effect masks two opposite trend stemming from the fact that differences in aspirations, that reflect social classes, interact with ability.

Table 7 can be considered as a schematic view of the selection by ability our experimental system created. Educational systems select students on their social class but also on their abilities. The system tracks children with high ability, allowing them to succeed better and to go further in their studies which in not the case for less performers. The latter are often left aside, choose more professional paths and study less longer.

Our experiment can only establish levels of ability in resolving anagrams, and we consider this ability as the only cognitive ability we can control for. That is why we distinguish on our low and high ability subjects on their capability to resolve anagrams at the beginning of the experiment, without considering any learning effect. This variable is exogenous and can be considered as cognitive and cultural capital our subjects already have. To shed a light on this social mobility, we hence separated our sample in two groups according to their exogenous ability. We ran the same probits as in the previous section, but on both ability categories separately. Table 8 and table 9 report these estimates.

Results on low performers: If we first look at what determine success or failure of low ability participants, we find that ability is still the main determinant for their failure. Being in the fourth quartile increases strongly the probability to only be relegated into the low group.Being confident in succeeding level 2 weakens this probability, however being confident in clearing level 3 has the opposite effect. We can see that belonging to the IT increases their probability to fail before level 2. Choosing VOC increases their probability of success, at least for the level 2. The number of observations shows that there are almost twice as more high performers than low performers that pass the second level. This validates once more our ability measure.

Results on high performers: Only 11 high ability subjects fail level 1 or passed level 1 and quit the experiment. The only characteristic that seem to prevent them of failing is to belong to the first quartile rather than to the second. However their success is highly driven by the fact of being in the IT treatment. Confidence for the success of level 2 increases also the probability of achieving at least level 2, but there is no effect of their confidence for level 3 (even though we still obtain a negative sign on the estimate). A gender effect appears in the high performers: being a man increases the probability of success, as well as having chosen VOC.

Hence, these estimations also show how confidence can lead to success but also how over-confidence can lead to failure. The intermediate treatment distinguishes low and high ability participant's achievement which can explain the observed fact of downward and upward intermediate class's social mobility.

The feature of having the opportunity to win 15€ more have two effects:

1) it depreciates success of low ability subjects.

2) but it boosts high performers to go further, and allow them to effectively earn more.

Amongst social professional groups, the middle class has the most important social mobility. In other words, it is the class that experiences the more frequently social group changes. There are two types of change: an upward mobility which is the entry in the upper category (higher professional, managerial workers), and a downward mobility that corresponds to an entry in lower classes (low skilled and no skilled employees, non professional self-employed...). The probability of having an upward or downward social mobility for the intermediate class differs according to the diploma level of the individuals, the schooling level of her parents, the social and cultural capital of the family etc. Many different types of jobs are included in the middle class. Some jobs are well endowed in cultural capital (teachers, social or health workers), and there are some routine

Table 8. Probit on being relegated to the low group

VARIABLES	Low ability	High ability
Intermediate Treatment	1.168***	-0.408
	(0.422)	(0.381)
Loss Treatment	0.488	-0.219
	(0.397)	(0.361)
Ability 2		1.198***
		(0.321)
Ability 4	1.720***	
	(0.414)	
Confidence for level 1	-0.008	-0.014
	(0.011)	(0.011)
Confidence for L2 (end of stage 4)	-0.046**	-0.036
	(0.020)	(0.024)
Confidence for L3 (end of stage 4)	0.024*	0.028
	(0.014)	(0.018)
Men	0.288	-0.601
	(0.565)	(0.506)
Constant	2.056*	1.551
	(1.182)	(1.211)
Controls	YES	YES
N	122	121
R^2	0.4	0.3

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Same control variables are used as in the previous probits (for the low performers: mother tongue estimates is negative with 5% sign., playing scrabble is positive with p=0.004, ab order is negative with p=0.035, paris is negative with p=0.09. For high performers, ab order is positive with p=0.02).

occupations that are not (employee, skilled workers...). These two types of workers will have two effects on their children's choice of schooling: the first ones, having high cultural capital and cognitive resources will transmit these to their children which will allow them to succeed better in school and continue further. However, the other type of worker have less of these characteristics and cheer less their children to go on longer studies. Thus, higher cognitively endowed students, that usually come from the "'upper middle class"' will pursue long studies. On the contrary, lower cognitively endowed students will stop earlier.

This section shows how differently high and low ability people react and how different characteristics affect them, even though performance and self-confidence levels impact them the same way. We insisted here on the IT effect. We will now show that parts of some sociological theories that link self-confidence to success and motivation are verified.

Table 9. Probit on attaining middle and upper groups

VARIABLES	Low ability	High ability
Intermediate Treatment	-0.788	1.094***
	(0.562)	(0.419)
Loss Treatment	-0.364	0.444
	(0.456)	(0.425)
Ability 2		-1.199***
		(0.374)
Ability 4	0.049	
	(0.570)	
Confidence for L2(end of stage 9)	0.080**	0.034*
	(0.032)	(0.019)
Confidence for L3(end of stage 9)	-0.044*	-0.026
	(0.025)	(0.017)
Men	0.391	1.429**
	(0.828)	(0.620)
Chose VOC	1.114**	1.549***
	(0.528)	(0.529)
Constant	-4.529***	-0.997
	(1.635)	(1.347)
Controls	YES	YES
N	63	110
R^2	0.42	0.41

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: Same control variables are used as in the previous probits (for the low performers: education is positive with p=0.023, mother tongue is positive with p=0.006, playing scrabble is negative with p=0.006, paris is poiotive with p=0.07. For high performers, age is positive with p=0.09 ab order is negative with p=0.000).

6 Discussion and conclusion

Our experiment aims at reproducing an educational system with simple features of schooling: a cognitive task, choices of pursuing or not, success or failure, choice of a curriculum. Three social classes are simulated by framing the payoffs, self-confidence level for success is asked five times.

In this paper, we try to explain how strong are the effects of endowments and confidence on motivation and success. We refer to empirical facts and sociological theories that are often minor in economics of education theories.

The feature of the curriculum choice was made to establish a link between social background and the choice between a general and a vocational path. It is well confirmed empirically that choices in education are different according to the social backgrounds. Given the same ability level, the

probability for a student from a low social background to turn to a vocational curriculum is greater than for a student from a high social background (Duru-Bellat et al. 2011)[15]. As the study level increases, the proportion of students from low social background decreases [16]. Duru-Bellat (2002) explains that when there are choices between vocational and general paths, students from low social background will chose more often the first one because their level of aspirations is lower. We do not observe that GT subjects choose more the VOC path than the GEN path. However, within the VOC curriculum, we find that they succeed less than the others. Plus, we find that the IT participants seem not to be sensitive to the difficulty differences between the two curricula which show that in a certain extent, the payoff framing has an effect on the curricula choice and success. We hence show that our treatments have indeed an impact on success and motivation, especially when we split our sample between low and high ability participants. Indeed, we observe many behavioral differences between these two categories with respect to the treatments. The middle class low ability subjects (IT) are less likely to pass level 1, while the middle class high ability subjects succeed better than the others. We identify this effect as the intermediate class downward and upward mobility that is empirically observed. Finally, the main determinant of success, the treatments set aside, is the cognitive ability.

Nevertheless, the way an individual perceives himself and the context he is in determine his motivation. There are many determinants of their motivation when individuals need to succeed in a task : the value perception of the task, the perception of their ability to accomplish the task, and the control they think they have on this task. Stress and high confidence can increase motivation and influence choices. Confidence has a motivating effect on pupils' decisions to continue schooling, and in better selective tracks. As an example, it is often observed that when taking two children from a low and an upper social background, with the same average grade, the first one will be more likely to choose a vocational track, whereas the latter will chose more likely selective tracks.We find indeed that being confident in the task prevent from failing and can even increase the success probability. But we also find that over-confidence has the opposite effect, saying that to much confident can lead failure.

Finally, motivation can be computed as the probability of success multiplied by the incentive value

[15]The main point is hence to evaluate how social inequalities in education arise. Either it depends on the education levels or through different tracking methods and specialties. Another assumption made by Goux and Maurin (1997) is that the more the educational system is complex, the more the parents who understand well this system take benefit from it, and these parents are usually from high social background.

[16]Of note is that while in France, 38% of pupils in 6th grade are from low social background and 16% are from the upper class, in the selective tracks of universities, there are respectively 9% from the working class and 56% from the upper social class. 1995 data that come from the French ministry of education.

of the success. In schools, good students allocate their success to their effort they made and to their intellectual skills. They explain their failure by internal and controllable causes like lack of study. However, less able students will allocate their difficulties to external causes or to a lack of effort. High ability and low ability students do not perceive causes of success and failure the same way. Self-confidence stimulates motivation to continue the experiment, but it is the effort and thus performance that will play a role on success. We need actions on motivation and confidence determinants to neutralize the mechanism of self-depreciation and reduce the likelihood of dropouts, especially of the least ables. Moreover, it is clear that impact of inheritance of wealth, cognitive and non-cognitive capacities on educational attainment and outcomes have to be taken into account to explain why we observe differences between countries, social classes, men and women etc.

Analyzing inequalities in schools rely on two different approaches: observed inequalities along the years of schooling are first explained by the different choices made by the pupils and their parents. And then, there exists different choices of students because of disparities the educational system's functioning creates.

References

Akerlof, G. A. (1984): *An Economic Theorist's Book of Tales*, no. 9780521269339 in Cambridge Books. Cambridge University Press.

Albouy, V., and T. Wanecq (2003): "Les inégalités sociales d'accès aux grandes écoles suivi d'un commentaire de Louis-André Vallet," *Economie et Statistique*, 361, 27–52.

Angrist, J. D., and V. Lavy (1999): "Using Maimonides' Rule to Estimates the Effect of Class size on Student Achievement," *The Quaterly Journal of Economics*, 114(2), 533–575.

Askari, M. (2010): "Risk, confidence and education," Ph.D. thesis, Université Paris I Panthéon-Sorbonne.

Becker, G. S. (1967): *Human capital and the personal distribution of income: an analytical approach*. Institute of Public Administration.

Becker, G. S., and N. Tomes (1979): "An Equilibrium Theory of the Distribution of Income and Intergenerational Mobility," *Journal of Political Economy*, 87(6), 1153–89.

Boudon, R. (1973): *L'inégalité des Chances : la Mobilité Sociale dans les Sociétés Industrielles*. Paris: Armand Colin.

Bourdieu, P., and J. Passeron (1964): *Les Héritiers*. Paris: Editions de Minuit.

——— (1970): *La Reproduction*. Paris: Editions de Minuit.

Bowles, S., G. H., and O. M. (2001): "The Determinants of Earnings: A Behavioural Approach," *Journal of Economic Literature*, 39, 1137–1176.

Brinbaum, Y. (2005): "D'une génération à l'autre, les aspirations éducatives des familles immigrées : ambition et persévérance," *Education et formations*, 72, 53–75.

Cameron, S., and C. Taber (2004): "Estimation of Educational Borrowing Constraints Using Returns to Schooling," *Journal of Political Economy*, 112, 132–182.

Card, D., and C. Taber (2004): "Does School Quality Matter? Returns to Education and the Characteristics of Public Schools in the US," *Journal of Political Economy*, 100, 1–40.

Chauchat, H., and C. Labonne (2006): "La hiérarchisation des filières scolaires : de la relation dominant/dominé dans le jeu des identités et la reproduction sociale.," *L'orientation scolaire et professionnelle*, 35/4, 555–577.

Damoiselet, N. (1998): "Effets des systèmes scolaires sur le comportement éducatif individuel," *L'Actualité Economique*, 74, 29–61.

Dolton, P., R. Levacic, and A. Vignoles (2007): *Human capital over the life cycle: a European perspective*chap. The economic impact of schooling resources, pp. 36–52. in C. Sofer UK: Edward Elgar.

Duru-Bellat, M. (2002): "Genèse des inégalités scolaires et portée des politiques éducatives," in *Séminaire CERC-DPD/MEN-INSEE*.

——— (2003): *Social Inequality at School and Educational Policies*. UNESCO-IIEP.

Duru-Bellat, M., A. Kieffer, and D. Reimer (2011): "Les inégalités d'accès à l'enseignement supérieur : le rôle des filières et des spécialités. Une comparaison entre lŠAllemagne de lŠOuest et la France," *Economie et Satistique*, 433, 3–22.

Garcia, S. M., and A. Tor (2009): "The N-Effect: More Competitors, Less Competition," *Psychological Science*, 20(7), 871–877.

Goux, D., and E. Maurin (1997): "Démocratisation de l'école et persistance des inégalités," *Economie et Satistique*, 306, 27–33.

——— (2006): "Close Neighbours Matter: Neighbourhood Effects on Early Performance at School," IZA Discussion Papers 2095, Institute for the Study of Labor (IZA).

Hanushek, E. A. (1986): "The Economics of Schooling: Production and Efficiency in Public Schools," *Journal of Economic Literature*, 24(3), 1141–77.

Heckman, J., and Y. Rubinstein (2001): "The Importance of Noncognitive Skills:Lessons from the GED Testing Program," *American Economic Review*, 91, 145–154.

Hoxby, C. (2000): "Peer Effects in the Classroom: Learning from Gender and Race Variation," Working Paper 7867, National Bureau of Economic Research.

Kahneman, D., and A. Tversky (1979): "Prospect Theory: An Analysis of Decisions Under Risk," *Econometrica*, 47, 263–291.

Lévy-Garboua, L., N. Damoiselet, G. Lassibille, and L. Navarro-Gomez (2004): *An Economist's View of Schooling Systems*chap. Human capital over the life cycle: a European perspective, pp. 53–68. in C. Sofer, ed. Cheltenham UK: Edward Elgar.

Markman, J. M., E. A. Hanushek, J. F. Kain, and S. G. Rivkin (2003): "Does peer ability affect student achievement?," *Journal of Applied Econometrics*, 18(5), 527–544.

Moizeau, F., J.-P. Tropeano, and J.-C. Vergnaud (2008): "Effets de voisinage et localisation : la ségrégation urbaine est-elle inéluctable ?," Université Paris1 Panthéon-Sorbonne (Post-Print and Working Papers) halshs-00344780$_v$1, *HAL*.

Montmarquette, C., K. Cannings, and S. Mahseredjian (2002): "How do young people choose college majors?," *Economics of Education Review*, 21(6), 543–556.

Page, L. (2005): "Des inégalités sociales aux inégalités scolaires : Choix éducatifs et Prospect Theory," *Revue Economique*, 56, 615–623.

Page, L., L. Lévy-Garboua, and C. Montmarquette (2007): "Aspiration Levels and Educational Choices : An experimental study," *Economics of Education Review*, 26(6), 747–757.

Piketty, T., and M. Valdenaire (2006): *L'impact de la taille des classes sur la réussite scolaire dans les écoles, collèges et lycées français - Estimations à partir du panel primaire 1997 et du panel secondaire 1995*. Ministère de l'éducation nationale.

Simon, H. (1955): "A Behavioral Model of Rational Choice," *Quaterly Journal of Economics*, 69, 99–118.

——— (1976): *From Substantive to Procedural Rationality*. Method and Appraisal in Economics, S.J. Latsis (ed.), Cambridge: Cambridge University Press.

A Appendix

	Montréal		Paris		
	AB	BA	AB	BA	Total
GT	16	15	19	30	80
IG	19	19	20	24	82
LT	20	21	20	20	81
Total	55	55	59	74	**243**

Table 10: Number of participants per session and in total

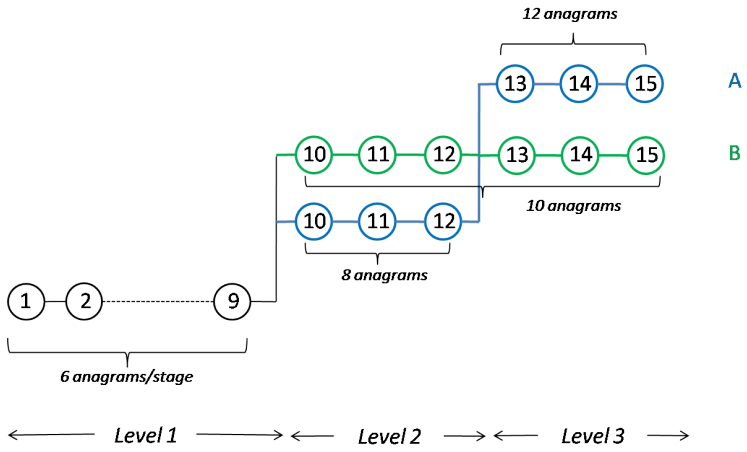


Figure 6: Experiment scheme

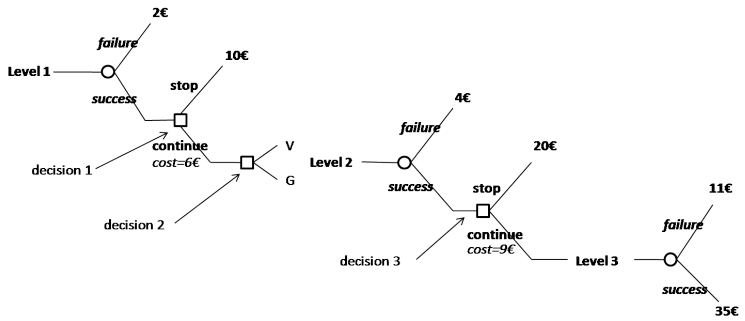


Figure 7: The decision process for a subject belonging to the GT treatment

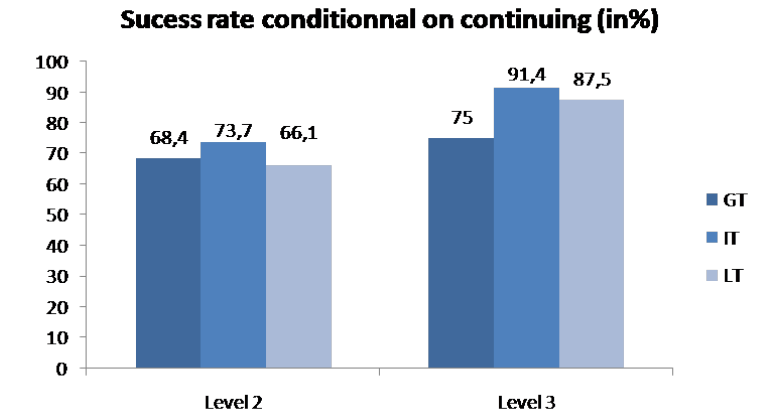


Figure 8

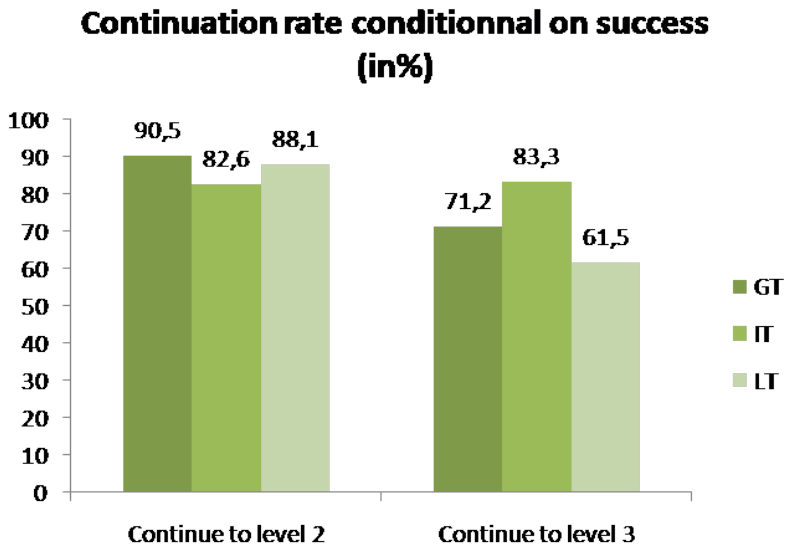


Figure 9

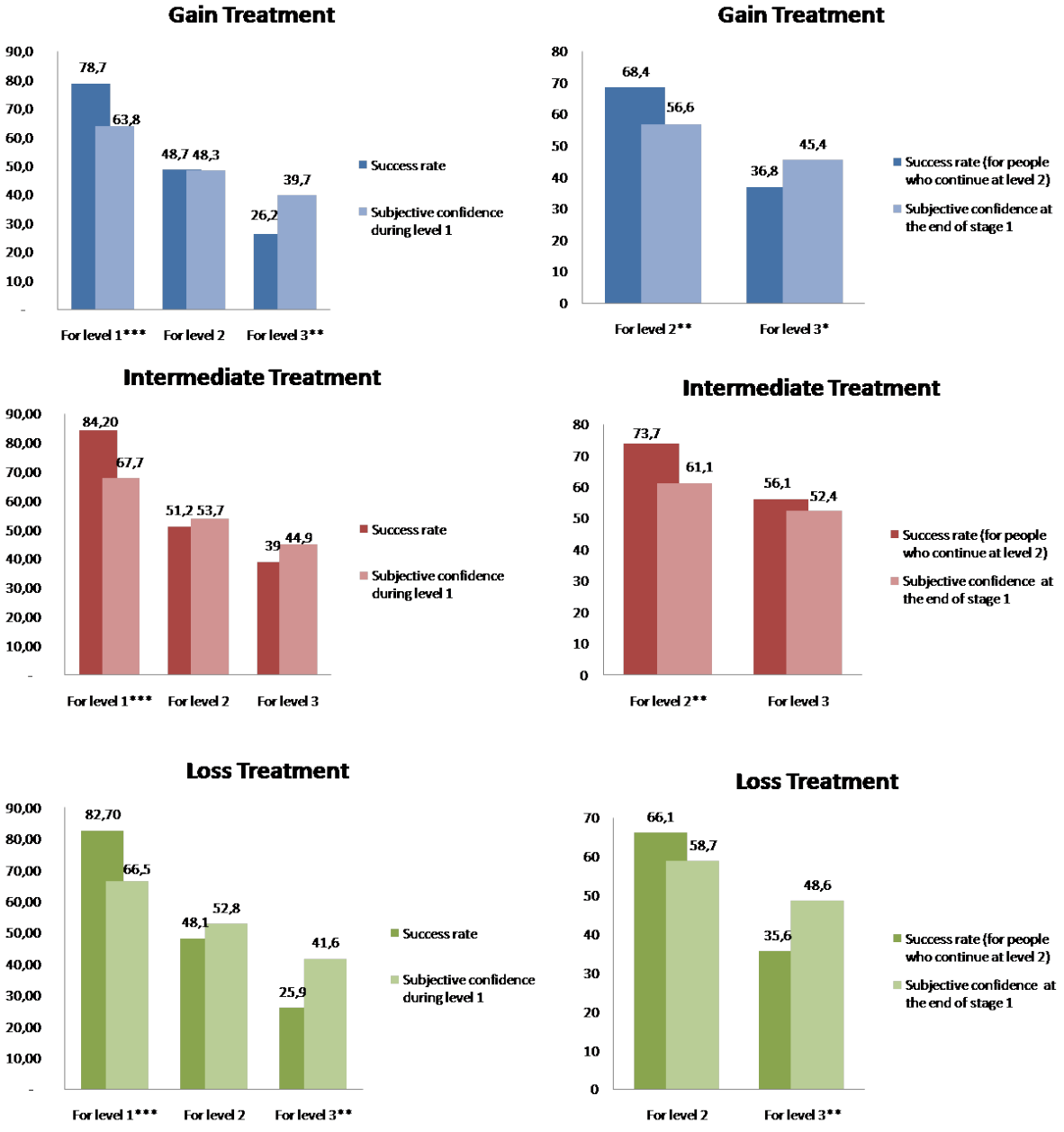


Figure 10: Confidence rate vs. success rate significance:* 10%, ** 5%, *** 1%