BETA
Bureau
d'économie
théorique
et appliquée

Documents de travail

« The Cliometric Model of Glutting: An Experimental Analysis »

Auteurs

Claude Diebolt, Magali Jaoul-Grammare

Document de Travail n° 2019 – 01

Janvier 2019

Bureau d'Économie Théorique et Appliquée
BETA

www.beta-umr7522.fr

@beta_economics

Contact :
jaoulgrammare@beta-cnrs.unistra.fr

Université de Strasbourg · cnrs · UNIVERSITÉ DE LORRAINE · INRA SCIENCE & IMPACT · AgroParisTech

The Cliometric Model of Glutting: An Experimental Analysis

Claude DIEBOLT and Magali JAOUL-GRAMMARE[1]

SUMMARY: In this paper, we are interested in the behaviors taking place before the decision-making in terms of educational study choices. We report on an experiment whose aim is the production of data controlled in order to test the cliometric model of glutting developed by Diebolt (2001), and especially the sensitivity of individuals to expected wages and to the risk as related to a limited number of positions on the labor market.

KEYWORDS: Economics of Education, Experiment, Glutting, Study Choices.

JEL Codes: C91, I26, N3.

INTRODUCTION

The cliometric model of glutting developed by Diebolt (2001) analyses the macroeconomic consequences of individual behavior in educational choices and more particularly the phenomenon of the saturation/desertion of certain sectors of higher education. As in the recursive models of Freeman (1971), it establishes a relationship between the evolution of the number of students and labor market movements. According to the model, the evolution of the number of students in the various sectors is conditioned by the strategies of orientation of the individuals, themselves determined by the conditions on the labor market. Indeed, the evolution of wages and the number of available jobs for these professions on the labor market are two fundamental elements of the choices of individuals.

The problems highlighted by the model are consequences resulting from the evolution of academic sectors: if all individuals reason identically, an increase in the wages of a profession or an increase in the number of available jobs in a professional sector will attract all individuals within the matching training. This implies a saturation of some sectors while others are deserted. The phenomenon then spreads to the labor market (decrease of the number of available jobs, less attractive wages); so the trend reverses and other professions become attractive, then modifying the behavior of choice of individuals and the distribution of the latter among various academic sectors.

The theoretical model, based on a *translog* modeling and elasticity calculations applied to the case of Germany (1820-1941), highlights two phenomena: on the one hand, it shows a substitution relationship between the various sectors, and on the other hand a complementarity relationship between the wages of a profession and the number of students enrolled in the matching training.

[1]CNRS-BETA, Université de Strasbourg, 61 Avenue de la Forêt Noire, 67085 Strasbourg Cedex.
E-mail : cdiebolt@unistra.fr, jaoulgrammare@beta-cnrs.unistra.fr

Three main causes may explain this phenomenon: expected wages, the need for workers due to ageing of those in place in the profession, and a need for workers due to an increase in the number of available jobs. According to the theoretical model, when these three causes are cumulative, there is a strong attraction effect that essentially affects the weakest social standing, thus opening up careers to individuals more socially distant from academic training. Despite the empirical evidence of these macroeconomic relationships, the underlying microeconomic behaviors and in particular the rationality of individuals are not here analyzed because of the lack of individual-level data.[2] This assumption of rational expectations is of course questionable: Demeulemeester (1994) shows that students' expectations are adaptive (for females) or static (for males). Another questionable aspect is the moment of decision-making: according to this model, individuals do not seem to worry about their orientations at the time of entry into higher education. However, it is in secondary education that one observes an increasing importance of family strategies in the study choices (Duru-Bellat, 2002). Throughout their school careers, individuals and families have choices of orientation such that at every possible juncture they face various alternatives where the risk of failure, the cost of the studies and anticipation of the future are essential elements (Boudon, 1973). Depending on their risk aversion, they arbitrate between the various options based on a cost/advantage comparison which results in a socially differentiated self-selection (Duru-Bellat, 2003; Jaoul-Grammare & Nakhili, 2010).

While the mechanisms mentioned previously are essential in the development of educational choices, other aspects can also be taken into account.

First of all, individuals must perceive a socio-economic advantage in order to continue their studies. Indeed, according to the theory of the human capital, education involves an investment which allows an increase in the productivity of those who profit from it and implies an increase in their remuneration. Thus an individual who decides to invest in education anticipates a certain return on this investment (Wolter, 2000; Botello & Costa-Pinto, 2004). However, this advantage in continuing studies depends on two elements: assets/personal weaknesses in terms of competences, and intellectual interest related to the studies proposed. Indeed, Montmarquette et al. (1998), show that the choice of studies depends both on the chances of success and the chances of access to associated employment. Consideration of the chances of access is also taken into account by Demeulemeester and Rochat (2001), who show that students take into account two components in their study choices: economic returns and chances of success. They also show that students coming from modest backgrounds give more weight to risk; thus, the social background influences the study choices and the composition of the academic sectors. This is also one of the conclusions of Diebolt (2001) and Jaoul (2004): an empirical study carried out on the French case between 1980 and 2000 underlines the strong relationship between the study choice in higher education and the parents' professional occupations, where children whose parents are executives generally choose more prestigious sectors (Health, CPGE [Post-secondary preparatory school]), whereas children whose parents are workmen or employees tend to choose university.

[2]However, the author stresses the restrictive side of this assumption of the perfect rationality of individuals: "*We are nevertheless aware that the uncertainty, risk and imperfect information (including pay illusion) are critical factors in the socio-economic life to which students have to face at the time of their investment decision. They allow, where appropriate, to better understand the 'under optimality' of their choice*" (Diebolt, 2001).

Diebolt shows that the effects of attraction of the deserted sectors first act on individuals from the weakest social backgrounds: when there is a shortage of students in a selective formation, individuals who are the most socially distant from the matching professions will use the shortage as a social elevator.

Beyond a pure academic attraction, the interest aroused by certain disciplines may also be related to the economic situation. In their analysis on the loss of interest in the scientific sector in the French Community of Belgium, Belleflamme et al. (2008) showed that the attraction of the scientific sector is related, on the one hand, to the image of science and, on the other hand, to the economic context. Indeed, from the beginning of the 20th century until the end of "the Glorious Thirty", the image associated with scientists appeared positive and often synonymous with technical progress; during this period, the scientific sector attracted many students. Later, the negative image of the scientific profession (Ourisson, 2002) and the awareness of the limits of technical progress diverted students towards other disciplines, such as finance and trade, more in fashion at this period. The desire to obtain a diploma can also explain choices of orientation. Indeed, an individual may wish to continue studies and to obtain the matching diploma because that represents a positive signal on the labor market at the time of recruitment (Spence, 1973).

Another aspect is related to employment (Stallman et al., 1993), and specifically the associated expected wage as well as the social status potentially to be reached by the individual with a given profession. The choice of certain sectors will depend thus on the social prestige conferred by society on one profession or another (Fershtman & Weiss, 1993) as well as on the situation on the labor market (Freeman, 1971; Diebolt, 2001). Indeed, the worse the situation on the labor market, the weaker the incentive to engage in higher studies.

Lastly, an aspect that is important as much for economists as for sociologists, is the existence of a reference point to which the individual will refer at the time of decision-making concerning his schooling. For Easterlin (1995), the interest in specific training is explained by an imitation effect of individuals regarding the previous generations and by their higher aspirations, in particular with respect to their parents.

Transposing the work on decision theory by Kahneman and Tversky[3] (1979, 1992) to educational choices, Page (2005) justifies the assumptions of Boudon (1973) in terms of school choices, namely that the divergences of reference points affect the idea of the success of individuals and consequently their schooling choices. By supposing that the reference level is that of the social success of the parents, Page shows that the higher the reference point of individuals, the riskier their choices. The existence of a reference point is less present in the model of glutting insofar as the individuals will use the situation of imbalance as social elevator.

In this paper, we are interested in the behaviors taking place before the decision-making in terms of choices of orientation. Therefore we report on an experiment whose aim is the production of data controlled in order to test the cliometric model of glutting, and especially the sensitivity of individuals to expected wages and to the risk as related to a limited number of positions on the labor market.

[3]According to them, individuals evaluate the options relative to a reference point in terms of profit/loss.

1. EXPERIMENT

Experimental economics is a young discipline, notably rewarded in 2002 with the Nobel Prize granted to Vernon Smith and Daniel Kahneman. It consists in the laboratory reconstruction of a framework of precise economic decisions and in studying individual economic behavior.

Based on a precise experimental protocol in a controlled environment, the experimenter generates decision-making acts and interactions between the experimental subjects. The information exchanged according to specific rules and participants' actions faced with variations in the environmental parameters constitute a set of data which are then used for statistical tests. The aim is essentially to observe the behaviors of the subjects taking part in the experiment and to compare the results with the forecasts of the economic theory. The advantage of laboratory experimentation is that it allows the various elements of the individual decision to be isolated.

The areas of experimental economics are varied, but this discipline is particularly effective in the analysis of decision-making in situations of risk. Several authors have used it to analyze behaviors in educational choices.

Botelho and Costa-Pinto (2004) study the expected returns on educational investment. The experiment consists in requesting the subjects to estimate their future wages according to their levels of diploma and years of experience. The subjects are divided into four groups according to how the individual estimates the average wage or his own wage and according to what he considers to be the supposed wages or the real wages. In the groups which are asked to consider the real wages, a bonus is given according to the accuracy of the amounts. First of all, the results underline that generally the students are relatively aware of the possible returns of higher studies. However, there are some differences. On the one hand men tend to overestimate these returns. On the other they show that the junior students have a higher perception of these returns in comparison with senior students; this can be explained by the fact that the seniors have better information about the labor market.

According to the theoretical arguments of the 'Prospect theory', Page, Levy-Garboua and Montmarquette (2007) carry out an experiment which analyzes the impact of the level of aspiration on educational choices and especially on the continuation of studies. They determine the reference point in terms of profit or loss relative to the highest profit. They show that the fact of considering the result obtained in terms of profit or in terms of loss significantly influences the choices of the subjects: those belonging to the group whose score is evaluated in terms of loss tend more frequently to choose the continuation of the experiment where they can aim at a higher profit in exchange for a given tariff; on the contrary, subjects belonging to the group whose score is evaluated in terms of profit tend more frequently to choose to stop the experiment and get their profits paid.

Thus, experimentation appears as one of the privileged tools in the economics of education, in particular for analyzing students' behavior (Page, 2010).

In the following, we set up an experiment in order to test the model of glutting, and especially the behavior of students faced with a limited number of positions and varying expected wages.

1.1 Experimental protocol

The subjects have the choice between three card tables standing for three orientations in higher education. In order to avoid any bias, the packs are presented to the subjects without mentioning the match with higher education (cf. questions in Appendix).

- Table A: sector with weak selection not requiring an important financial investment, e.g. university.
- Table B: sector with average selection implying an average investment, e.g. short technical studies.
- Table C: sector with strong selection requiring a large investment, e.g. medicine, engineering schools.

The subjects have to choose between the three games A, B, C, with an initial endowment of 4EU. The characteristics of each game are presented in Table 1.

Table 1: Characteristics of the games

Game A		
Bet	1	
Maximum number of players	3	
Number of people who chose the game A (n_A)	$n_A \leq 3$	$n_A = 4$
Payoff	2	0
Game B		
Bet	2	
Maximum number of players	2	
Number of people who chose the game B (n_B)	$n_B \leq 2$	$n_B > 2$
Payoff	4	0
Game C		
Bet	4	
Maximum number of players	1	
Number of people who chose the game C (n_C)	$n_C = 1$	$n_C > 1$
Payoff	8	0

Another problem occurs when we take into account the social background of the individual. For this purpose, three starting situations are considered, in which the individuals have a variable initial endowment in Experimental Units (EU).

- Situation 1: initial endowment of 4EU (individuals coming from a modest background)
- Situation 2: initial endowment of 6EU (individuals coming from a middle-class background)
- Situation 3: initial endowment of 8EU (individuals coming from a higher background).

Changes in the choices of the subjects, due to the variation of the initial endowment (6EU then 8EU), are analyzed thereafter. Without telling the individuals what their profit/loss would have been after their first choices, we ask them (cf. questions 2 and 3) what would have been their choices if the initial allocation had been 6 EU (question 2) or 8 EU (question 3); they are also asked to clarify this choice.

1.2. Experimental framework

Each subject is assigned an anonymous number.[4]

Once all the subjects have made their choices, we set up random groups of four people in order to implement "the game" described above. This also makes it possible to avoid any agreement between players, since they do not know *ex ante* the individuals with whom they will play. The experimenter calculates the various profits of the quartets.

A pilot experiment was undertaken on a group of PhD students and assistant professors and the final experiment concerns 56 students in statistics.

We are aware that the size of our sample is quite low. However, "the empirical significance of the experiment results is less dependent from the sample size or the population characteristics than from the consistency of the observed phenomena over many repetitions" (Jacquemet, Haridon & Vialle 2014). Here, despite a little sample, we were able to replicate the pilot experiment and we were able to observe similar results. Moreover, as underlined by Falk and Heckman (2009, p. 7), "the sample size question is a ploy" and efficient methods have been implemented to study experiment over little samples (Siegel 1957; Heckman & al., 2009).

After a verbal presentation of the experiment, the instructions and an example are read to the students. In order to ensure that individuals understand the experiment properly, other examples are proposed in an interactive way in verbal form.

Then the experiment takes place. It is held in two rounds:

- With an initial endowment of 4EU, the subjects simultaneously make their choices of game (A, B, and C) without communicating (Cf. Questions in Appendix).
- Once the choice of game of each subject is recovered, the experimenter randomly sets up groups of four people and calculates the payoffs of each participant on the basis of 1 EU = 0.25 €.[5] During this time, the students fill out questionnaires on their individual characteristics (age, gender, social origin) and a verbal part (allowing the experiment to determine if the individuals always adopt the same reasoning).

The payoffs are communicated to the students only after all the questionnaires have been collected.

We first analyze the behavior of the individuals according to the payoffs and the risks related to the limited number of players. We then study the behaviors of the students when the initial endowment varies; finally we cross-check the various verbal questions in order to specify the strategies of the students according to their individual characteristics (baccalaureate, gender, social origin).

Even though the game tries to implement individual choices in a way closest to the theoretical model, we are conscious that the implementation of such an experiment cannot guarantee total internal validity. Indeed, between the context of the game and the real context, there are differences in level of information, costs and number of individuals, which can limit this validity.

[4]The anonymous numbers are those assigned to students for examination and are known only by the students.
[5]We paid subjects with "coffee vouchers" with an identical value to their payoff in euros.

2. RESULTS

The phase of comprehension reveals that 4 students did not correctly answer the verbal questions. They are thus not taken into account in the experiment.[6] The experiment is undertaken on 52 individuals, 35 males (67%) and 17 females (33%), that is to say 13 groups of 4 players.

Given that we study the gender effect, the non-respect of the parity could bias the results. However, although it is like better, this latter is not always observed in experimental studies analyzing gender effect (Eber, 2006)[7]

2.1 The behavior of students *vis-à-vis* payoff and risk

The notion of risk used here refers to the more or less limited number of positions associated with each game A, B, C. We first consider the base case where the initial endowment is 4 EU (Table 2).

Table 2: Choices of the individuals (endowment 4EU)

Choice	Males	Females	Number	%
A	11	3	14	26.9
B	12	13	25	48.1
C	12	1	13	25
Total	**35**	**17**	**52**	**100**

According to the model of glutting, as individuals reason in terms of expected earnings and available seats, this should guide their choices towards game A because of the large number of positions, and towards game C due to the expected payoff. However it appears that the game most often chosen is B (48%), which represents both average payoff and average risk. Games A and C are selected in similar proportions (27% and 25%).[8]

The analysis of the choices of individuals in relation to gender reveals that females behave more carefully than males: only 5.8% (1 out of 17) choose game C, against 34 % for males. 76% chose the average game against 34% of males.

The reasons given for the choice of individuals are 52% risk (27 individuals out of 52) and 35% payoff (18 individuals out of 52); 14% of individuals establish their choices by anticipating the behaviors of others[9] (Table 3). If we analyze the reasons for choosing each game, we find the theoretical prediction is in part fulfilled: individuals who chose game A did so because of low risk (60%) and the guaranteed payoff (40%). Game B is chosen mainly because of the average risk that it offers (58%); the fact that it offers an average payoff explains only 33% of the motivations of individuals.[10] Finally, 8% of individuals choosing B anticipate the behavior of other individuals. The choice of game C depends equally on payoff and risk (31%) and on the anticipation of the behavior of the other players (38%). People who are risk averse think that the other players fear risk more than they like payoff. The fact

[6] They were foreign students who did not really understand French.

[7] In order to test gender effect on individual behavior, an experiment is undertaken on 77 females and 49 males.

[8] We also observed these proportions in the pilot experiment.

[9] When individuals are requested to explain their choices, they respond clearly: 'I chose game B because I think that many individuals will choose C game due to the high gain', or 'I chose game C because I think that despite the high gain it offers, many individuals will be afraid to choose this game because of the risk it represents'.

[10] These reasons were mentioned in identical percentages during the pilot experiment.

that few individuals anticipate the behavior of others reveals a limited rationality similar to that described in the model of glutting.

Table 3: Reason for the choice of the individuals (endowment 4EU)

		Reason for the choice							
Choice		Low risk	Average risk	High risk	Assured payoff	Average payoff	High payoff	Anticipation	**Number**
	A	8	0	0	6	0	0	0	**14**
	B	0	15	0	0	8	0	2	**25**
	C	0	0	4	0	0	4	5	**13**
	Number	**8**	**15**	**4**	**6**	**8**	**4**	**7**	**52**

2.2 The behavior of subjects when the initial endowment varies

When the initial allocation increases from 4 EU to 6 EU, we expect that individuals will choose higher-risk games, the relative loss appearing less important. Thus, individuals who had chosen game A should choose B or C, and individuals who had chosen game B should choose game C. According to the tested model, all individuals reason in this way, without taking into account the behavior of the other players; it should lead to a 'saturation' of game B and a desertion of game A.

In order to analyze the behavior of subjects when the initial endowment increases (without specifying the amount of the gain/loss obtained previously), we then ask the subjects what would have been their choices with this new allocation. 63% of subjects do not change their choices despite an increase in the initial allocation (Table 4); only 21% of individuals change their choices for a riskier game (grey boxes) and 15% modify their choices for a less risky choice (dark grey boxes).

Table 4: Distribution of the number of individuals according to the 1st choice (E = 4EU) and the 2nd choice (E =6EU)

		Choice with the initial allocation E = 6 EU			
Choice with the initial allocation E = 4 EU		**A**	**B**	**C**	**Number**
	A	8	6	0	**14**
	B	3	17	5	**25**
	C	2	3	8	**13**
	Number	**13**	**26**	**13**	**52**

All individuals who modify their choice B for C, do so because of the increase in the endowment (Table 5); for individuals changing from A to B, this reason is mentioned only in 50% of the cases; indeed 33% of them anticipate the behavior of individuals[11] and 1 out of 6 refer to the payoff. The reason most cited by individuals who modify their choices for a less risky game is the anticipation of the behavior of other individuals: this is the case for 67% of the subjects from B to A and 60% of those who moved from C to A or B. In smaller proportions, the reason is the payoff. Unlike the hypothesis of limited rationality assumed by the model of glutting, many individuals take into account the behavior of others in their choices.

[11] In the questionnaire, when subjects were asked to explain their choices, they responded clearly: "As the endowment is larger, I prefer game C but as everyone will think so, I choose game B".

Table 5: Reasons for the change of game selection when endowment changes from 4 to 6 EU.

With E = 4, choice of the game A				
	Choice with E= 6 EU			
Reason of the choice	**A**	**B**	**C**	**Number**
Larger endowment so riskier choice	0	3	0	**3**
Low risk	6	0	0	**6**
Assured payoff	2	0	0	**2**
Average payoff	0	1	0	**1**
Anticipation of the behavior of other individuals	0	2	0	**2**
Number	**8**	**6**	**0**	**14**
With E = 4, choice of the game B				
	Choice with E= 6 EU			
Reason for the choice	**A**	**B**	**C**	**Number**
Larger endowment so riskier choice	0	0	5	**5**
Low risk	0	9	0	**9**
Assured payoff	1	0	0	**1**
Average payoff	0	6	0	**6**
Anticipation of the behavior of other individuals	2	2	0	**4**
Number	**3**	**17**	**5**	**25**
With E = 4, choice of the game C				
	Choice with E= 6 EU			
Reason for the choice	**A**	**B**	**C**	**Number**
Larger endowment so riskier choice	0	0	4	**4**
Low risk	1	0	0	**1**
Assured payoff	0	1	0	**1**
Average payoff	0	0	3	**3**
Anticipation of the behavior of other individuals	1	2	1	**4**
Number	**2**	**3**	**8**	**13**

When the initial allocation doubles (Table 6), 40% of the subjects change their choices for a riskier game (grey boxes) and 11.5% for a less risky game (dark grey boxes).

Table 6: Distribution of the number of individuals according to the 1st choice (E=4EU) and 2nd choice (E=8EU)

	Choice with initial endowment E=8 EU				
Choice with initial endowment E=4 EU		**A**	**B**	**C**	**Number**
	A	5	3	6	**14**
	B	1	12	12	**25**
	C	4	1	8	**13**
	Number	**10**	**16**	**26**	**52**

In the case of the choice of a riskier game (Table 7), with the change from A to B or C, three reasons are equally given: the increase of the endowment, the higher payoff (game C) and the risk (game B). To change from B to C, 67% of the subjects cite the increase of the endowment and 25% cite the payoff. In 67% of the cases, the reason for a choice of a less risky game is the desire for the payoff; other reasons are the weakness of the risk and the anticipation.

Table 7: Reasons for the change of game selection when endowment changes from 4 to 8 EU.

With E = 4, choice of game A				
	Choice with E = 8 EU			
Reason for the choice	**A**	**B**	**C**	**Number**
Larger allocation so riskier choice	0	0	3	**3**
Low risk	4	0	0	**4**
Average risk	0	3	0	**3**
Assured payoff	1	0	0	**1**
High payoff	0	0	3	**3**
Number	**5**	**3**	**6**	**14**
With E = 4, choice of game B				
	Choice with E = 8 EU			
Reason for the choice	**A**	**B**	**C**	**Number**
Larger allocation so riskier choice	0	0	8	**8**
Average risk	0	3	0	**3**
High risk	0	0	1	**1**
Assured payoff	1	0	0	**1**
Average payoff	0	3	0	**3**
High payoff	0	0	3	**3**
Anticipation of the behavior of the others	0	6	0	**6**
Number	**1**	**12**	**12**	**25**
With E = 4, choice of game C				
	Choice with E = 8 EU			
Reason for the choice	**A**	**B**	**C**	**Number**
Low risk	1	0	0	**1**
High risk	0	0	3	**3**
Assured payoff	2	0	0	**2**
Average payoff	0	1	0	**1**
High payoff	0	0	4	**4**
Anticipation of the behavior of the others	1	0	1	**2**
Number	**4**	**1**	**8**	**13**

3. ANALYSIS OF THE VERBAL PART AND MODELING OF THE CHOICES OF INDIVIDUALS

In a second time, subjects are placed in the situation where, after a loss, they can play again. By analogy with the student world, this allows us to study the behaviors of individuals in the case of a repetition or a reorientation. In this situation, all loss/gain opportunities possible during the initial choice are envisaged; individual reason on the basis of all new situations possibly offered to them. They do not know the real gains/losses obtained with the initial choices. The individuals explain their choices (Table 8) by the willingness 'to ensure a payoff' (75%) and 'to take all-risks' (13%). According to the model of glutting, we see that the expected wage has, in this case, a relatively larger weight in the decision than the number of places available.

Table 8: Reason for the choice of game after losing 1 time

	Number (females)
To ensure a payoff	39 (16)
To take all-risks	7 (0)
Lower risk	2 (0)
Anticipation of the choice of the other individuals	1 (1)
Other reason	3 (0)
Total	**52 (17)**

The willingness 'to ensure a payoff' concerns 16 females out of 17 (94%) against 23 males 35 (66%) while 7 individuals making their choices by wanting to 'take all the risks' are males. The observation of riskier behavior for men may come from a difference in level of aspiration. Indeed, Page et al. (2007) show that the influence of the aspiration level on educational choices is higher for men: men seem to have a higher level of aspiration. This is consistent with the results of Gneezy, Niederle and Rustichini (2003), who show in their experimentation that the higher the environmental competitiveness, the less numerous and powerful are the women.

In order to analyze the influence of individual characteristics (gender, social origin, baccalaureate, whether to work to finance studies) on the fact of taking into account the risk/payoff when choosing, we perform a test of association between qualitative variables. The size of our sample is relatively restricted (52 individuals), so we use a non-parametric test for independence between qualitative variables. We use a Log-likelihood ratio test (G test) which is a robust alternative to the more classical chi-square test (Williams, 1976; Larntz, 1978) and to which we apply the Williams correction since here we have a sample of under 200 individuals. Even though the G statistic has its own critical values tabulated, it generally uses tabulated values for a chi-square test, giving identical results (Soliani et al., 2005).

We retain the following individual variables: gender (M/F), baccalaureate (Economic (ES), Scientific (S) and technological (T)). We estimate the individuals' social origin with the possession of a student job (lower social background) or not (higher social background). Finally, the 2 behavior variables analyzed are 2 binary qualitative variables with 2 modalities (Yes/No) depending on whether the individual declares he takes into account the payoff/risk in his choice of game.

With regard to the risk behavior (Table 9) and the payoff (Table 10), the results show that only gender has an influence on the probability of choice. More specifically, to be a female increases the probability of making a choice based on the payoff whereas to be a male has a positive effect on the fact of making a choice based on risk. This is consistent with the results of Page et al. (2007) mentioned above, or evens those of Halek and Eisenhauer (2001) where men display riskier behavior. In their demographic analysis of risk aversion, they show that women are significantly more risk averse than men.

Table 9: Influence of individual characteristics on taking account of risk

	Taking account of risk in the choice of game (Yes/No)			
Variables (Modalities)	**G'**	**Critical value**	**p-value**	**Conclusion**
Gender (Females/Males)	7.79	3.84	0.005	Influence
Social origin (Low/Average/High)	1.22	5.99	0.49	No influence
Baccalaureate (ES/ S/T)	2.16	5.99	0.32	No influence
To work to finance studies (Yes/No)	1.27	3.84	0.25	No influence

Table 10: Influence of individual characteristics on the taking into account of the payoff

	Taking account of the payoff in the choice of the game (Yes/No)			
Variables (Modalities)	**G'**	**G'**	**G'**	**G'**
Gender (Females/Males)	5.71	3.84	0.01	Influence
Social origin (Low/Average/High)	3.595	5.99	0.15	No influence
Baccalaureate (ES/S /T)	0.403	5.99	0.81	No influence
To work to finance studies (Yes/No)	0.416	3.84	0.51	No influence

The cliometric model of glutting and our previous work are thus here called into question. Indeed, in the initial analysis, Diebolt showed that social origin prompts the most socially distant students within a profession to use shortages as a social elevator, thus highlighting a double effect: human capital and social capital. However, here it seems that social origin is not a determining factor in the choice of individuals. Finally, when asked clearly about the reason for their choices of studies (Table 11), 54% of the students cite their interest in the discipline. For 21% of students, the choice is influenced by the fact that there are significant professional opportunities related to their studies. Only 4% cite a monetary reason, this being the least common reason. This somewhat qualifies the results confirming the cliometric model of glutting.

Table 11: The reasons for the choice of studies

	Number
Near the parents' house	4
Significant professional opportunities	11
Interest for the discipline	28
Friends inside the field	4
High wages	2
Other	3
Total	**52**

CONCLUSION

The aim of this paper was to report on an experiment designed to analyze the behavior of individuals when three problems are presented to them in the form of a game: a limited number of positions, a variable payoff, and a variable endowment. To analyze the strategies of students in their educational choices, and more particularly to test the cliometric model of glutting, these three controlled variables allow us to study the behavior of individuals according to the number of available places on the labor market and the evolution of wages, but also to take into account their social origins.

The experiment reveals that subjects in their choices take into account the number of positions and the payoff, with a greater relative weight given to the expected payoff. We also show that a significant proportion of individuals declare that they make their choices by trying to anticipate the behavior of others. The limited rationality of the individuals highlighted in the theoretical model is questioned here. The analysis of the verbal part also qualifies the predictions of the theoretical model: individuals clearly express 'taste' as a reason to justify their choices of study.

The analysis of behavior vis-à-vis payoff and risk according to the individual characteristics shows that only gender seems to have a significant role on the behavior of individuals: we show that although females appear more sensitive to gain, males meanwhile have a preference for risk, thus confirming the results of Halek and Eisenhauer (2001), Gneezy, Niederle and Rustichini (2003) or Page et al. (2007). Contrary to the predictions of the model of glutting, social origin does not seem to be decisive in the behavior of individuals in terms of choice.

An interesting extension of this study would be to include in the analysis the notion of social prestige as assigned to any particular orientation in higher education. Finally, the implementation of an experiment on a larger scale with a protocol that depended on the capabilities of each individual (Page et al. 2007) would give a greater internal and external validity to our analysis.

BIBLIOGRAPHY

Belleflamme, A., Graillon, S. & Romainville, M. *La désaffection des jeunes pour les filières scientifiques et technologiques. Diagnostic & remèdes*, Rapport de synthèse élaboré à la demande d'Essenscia Wallonie, 2008, 25p.

Botelho, A. & Costa-Pinto, L., "Students' Expectations of the Economic Returns to College Education: Results of a Controlled Experiment", *Economic of Education Review*, 23, 2004, pp. 645-653.

Boudon R., *L'inégalité des chances*, Paris, Armand Colin, 1973.

Demeulemeester J.-L., « Une évaluation empirique de la rationalité des étudiants et étudiantes belges (1954-1987) », *Économie et Prévision,* 116, 1994, pp. 137-151.

Demeulemeester J.-L. & Rochat D., "Rational Choice under Unequal Constraints: the Example of Belgian Higher Education", *Economics of Education Review,* 20, 2001, pp. 15-26.

Diebolt, C., « La théorie de l'engorgement », *Economie Appliquée,* 54, 4, 2001, pp. 7-31.

Duru-Bellat, M., *Les inégalités sociales à l'école. Genèse et mythes*, Paris, Presses Universitaires de France, 2002.

Duru-Bellat, M., *Inégalités sociales à l'école et politiques éducatives*, Paris, Unesco, 2003.

Easterlin R. A., "Preferences and Prices in Choice of Career: the switch to business, 1972-1987", *Journal of Economics Behaviour and Organisation,* 27, 1995, pp.1-34.

Eber, N., « Les sportifs sont-ils (vraiment) différents ? Une approche par l'économie expérimentale », *Revue économique*, 57, 3, 2006, pp. 623-633

Falk, A., Heckman, J.J., "Lab Experiments Are a Major Source of Knowledge in the Social Sciences", IZA *Discussion Papers*, n° 4540, October 2009.

Fershtman, C. & Weiss, Y. "Social Status, Culture and Economic Performance", *The Economic Journal*, 103 [July], 1993, pp. 946-959.

Freeman, R., *The Market for College-Trained Manpower. A Study in the Economics of Career Choice*, Cambridge: Harvard University Press, 1971.

Gneezy, U., Niederle, M. & Rustichini, A., "Performance in Competitive Environments: Gender Differences », *Quarterly Journal of Economics*, 118, 3, 2003, pp. 1049-1074.

Halek, M. & Eisenhauer, J. G., "Demography of Risk Aversion", *Journal of Risk and Insurance*, 68, 1, 2001, pp. 1-24.

Heckman, J.J., Pinto, R., Shaikh, A.M., Yavitz, A., "Compromised Randomization and Uncertainty of Treatment Assignments in Social Experiments: The Case of the Perry Preschool Program", 2009, Working Paper, University of Chicago.

Jacquemet, N., L 'Haridon, O., Vialle, I., « Marché du travail, évaluation et économie expérimentale », *Revue Française d'Economie*, XXIX, 1, 2014, pp.189-226.

Jaoul, M., « Enseignement supérieur et origine sociale en France : étude statistique des inégalités depuis 1965 », *International Review of Education,* 50, 5-6, 2004, pp. 463-482.

Jaoul-Grammare, M. & Nakhili, N., « Quels facteurs influencent les poursuites d'études dans l'enseignement supérieur ? », *Net.doc,* 68, Août, 2010, 26p.

Kahneman, D. & Tversky A., "Prospect Theory: An Analysis of Decision under Risk", *Econometrica*, 47, 1979, pp. 263-291.

Kahneman, D. & Tversky A., "Advances in Prospect Theory: Cumulative Representation of Uncertainty", *Journal of Risk and Uncertainty*, 5, 3, 1992, pp. 297-323.

Montmarquette C. Mourji F. & Mahseredjian S., « Les choix de filières universitaires par les lycéens marocains : préférences et contraintes », *Revue d'Analyse Économique,* 74, 3, 1998, pp. 485-522.

Ourisson, G., *Désaffection des étudiants pour les études scientifiques*, Rapport pour le Ministère de l'Education Nationale, 24p, 2002.

Page, L., « Des inégalités sociales aux inégalités scolaires. Choix éducatifs et prospect theory », *Revue Economique*, 53, 3, 2005, pp. 615-623.

Page, L., Levy-Garboua, L. & Montmarquette, C., "Aspiration Levels and Educational Choice. An Experimental Study", *Economics of Education Review*, 26, 6, 2007, pp. 747-757.

Page L., "Experimental Economics Method to Study Pupils Motivation", *Revue d'Economie Politique*, 5, 120, 2010, pp. 779-792.

Siegel, S., "Nonparametric Statistics", *The American Statistician*, 11, 3, 1957, pp. 13-19.

Spence, M., "Job Market Signalling", *Quarterly Journal of Economics*, 87, 3, 1973, pp. 355-374.

Stallmann, J., Johnston, T.G., Mwachofi, A., Flora, J.L. "Labour Market Incentives to Stay in School", *Journal of Agricultural and Applied Economics*, 25, 2, 1993, pp. 82-94.

Williams, D.A., "Improved Likelihood Ratio Test for Contingency Tables", *Biometrika*, 63, 1, 1976, pp. 33-37.

Wolter, S., "Wage Expectations: A Comparison of Swiss and US Students", *Kyklos*, 23, 1, 2000, pp. 51-69.

APPENDIX

QUESTIONNAIRE

This experiment is designed to study the behaviors of individuals faced with some choices. There is no 'good' or 'bad' response. What interests us is your personal choice. This experiment takes place in the form of a game. You have at the beginning an endowment of 4 EU **(1EU = €0.25)**. It offers 3 different games whose characteristics (bet, number of players, payoff) are variable. You choose what game you want to play. Once all participants have made their choices, you will be split randomly into a group of 4 people. This is designed to ensure that you do not know the people with whom you are going to play and thus avoid any possible agreements between players.

Features of the 3 games

Game A: Bet: **1 EU**
Maximum number of possible players = **3**
Gain / Loss: n_A = number of subjects having chosen game A in your group of 4 people.
If $n_A \leq 3$, each subject wins **G = 2 EU.**
If $n_A = 4$, subjects win **G = 0 EU.**

Game B: Bet: **2 UE**
Maximum number of possible players = **2**
Gain / Loss: n_B = number of subjects having chosen game B in your group of 4 people.
If $n_B \leq 2$, each subject wins **G = 4 EU**.
If $n_B > 2$, subjects win **G = 0 EU.**

Game C: Bet: **4 EU**
Maximum number of possible players = **1**
Gain / Loss: n_C = number of subjects having chosen game C in your group of 4 people.
If $n_C = 1$, the subject wins **G = 8 UE.**
If $n_C > 1$, subjects win **G = 0 EU.**

In General, regardless of the game, if there are more players than that allowed by the game, no one wins.

Example:
Individuals have 4 EU.
All individuals in the room make their choice of game.
Individuals are randomly divided into groups of 4 people.
Let consider 1 group of 4 persons I, J, K, and L.
I choses game A,
J choses game B,
K and L have chosen game C.

We have $n_A = 1$; $n_B = 1$; $n_C = 2$.
Finally:

I bet 1 EU and won 2 EU. He now has 5 EU.
J has bet 2 EU and won 4 EU. She now has 6 EU.
K and L have bet 4 EU and won 0 EU. They have therefore nothing.

Conduct of the experiment and game rules

During the experiment, you mustn't communicate with other individuals. This would distort the games and... your winnings! Individuals who attempt to communicate with others will be automatically excluded from the game. Therefore, they can't win anything.

Summary of the 3 games:

GAME A		
Bet	1	
Maximum number of possible players	3	
Number of subjects having chosen game A (n_A)	$n_A \leq 3$	$n_A = 4$
Payoff	2	0
GAME B		
Bet	2	
Maximum number of possible players	2	
Number of subjects having chosen game B (n_B)	$n_B \leq 2$	$n_B > 2$
Payoff	4	0
GAME C		
Bet	4	
Maximum number of possible players	1	
Number of subjects having chosen game C (n_C)	$n_C = 1$	$n_C > 1$
Payoff	8	0

(1) You have 4 EU. Make your choices: A, B or C.

(2) Enter your anonymous identification number and your choice on the reply-coupon below and cut it out.

(3) Raise your hands. I will pick up your reply-coupon. Do not stand to bring it. Never reveal your choice to other players.

(4) You will be randomly divided into groups of 4 people. I consider the results of the game, and I calculate your earnings.

(5) While I am doing that, please answer the questions below.

✂----------✂----------

Reply-Coupon

Anonymous identification number:

CHOICE: A B C (Circle your choice)

Questions

1. The initial endowment E = 4 EU. What game did you choose?.....
   Why?.....
2. If the initial endowment E = 6EU, what game would you choose?.....
   Why?.....
3. If the initial endowment E = 8EU, what game would you choose?.....
   Why?.....
4. If after the calculation of the new allocation, you lost the EU but you have enough EU for a second round, what do you do in the following cases?

Initial allocation	New allocation E' after loss	Possible games	Choice
E = 4	E' = 3	A, B	
	E' = 2	A, B	
E = 6	E' = 5	A, B, C	
	E' = 4	A, B, C	
	E' = 2	A, B	
E = 8	E' = 7	A, B, C	
	E' = 6	A, B, C	
	E' = 4	A, B, C	

5. Explain your reasoning in a few words:
   ……
   .....
   ……
   ……
6. You are: ❑ Female ❑ Male
7. How old are you ?.....
8. What is your father's profession?.....
   And your mother's?.....

9. What type of baccalaureate do you possess?
   ❑ ES ❑ L
   ❑ S ❑ Other (specify)……
10. Are you working to fund your studies? ❑ Yes ❑ No

11. What influenced your choice of studies after the baccalaureate?

    ❑ You liked the subject taught ❑ There are professional opportunities
    ❑ It's near your parents' home ❑ Wages are higher after these studies
    ❑ Your friends have chosen the same studies ❑ Other (specify): ……

☺ Thank you very much for your participation ☺