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SCHOOLING EFFECTS AND EARNINGS OF FRENCH UNIVERSITY GRADUATES : SCHOOL QUALITY MATTERS, BUT CHOICE OF DISCIPLINE MATTERS MORE

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Schooling Effects and Earnings of French University Graduates : School Quality Matters, but Choice of Disciplines Matters More

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Résumé

Our aim in this article is to study the relation between earnings of French universities graduates and some characteristics of their universities. We exploit data from the Céreq's « Génération 98 »survey, enriched with information on university characteristics primarily from the ANETES (yearbook of French institutions of higher education). We employ multilevel modeling, enabling us to take advantage of the natural hierarchy in our separate datasets, and thus to identify, and even to measure potential effects of institutional quality. Since we take into account many individual students characteristics, we are able to obtain an income hierarchy among the different disciplines : students who graduated in science, economics or management obtain the highest earnings. Below them, we find students who graduated in law, political science, communication or language and literature, while the ones who graduated in social studies earn the lowest incomes. On the institutional level, we find two significant quality effects : the first is from the socioeconomic composition of the university's student population, and the second effect is from the university's network in the job market. These last two results remain stable when we examine subsamples of universities according to their dominant teaching fields, except for universities that are particularly concentrated in science.

Keywords : Demand for schooling, educational economics, human capital, salaries wage differentials, school choice

JEL classification : C29, I23, J31

Introduction

While the French financial effort in terms of education is higher than the average of the OECD countries, it is essentially concentrated in secondary schooling where the cost per pupil is nearly the same as in the United States. On the other hand, in higher education the cost per student is noticeably below the OECD average and inferior by half to the level in the United States. This lesser investment in higher education is in part linked to the dual structure of the French higher educational system : on one side are the post-high-school preparatory classes, followed by the elite Grandes Écoles, either public or private but overwhelmingly autonomous, that select a very small proportion of students for admission to this branch of higher education where they are offered training at relatively high expense. On the other side are the universities, quasi-exclusively public, offering training without the least selection at admissions, with very low per student expense, practically not financed at all by tuition, which is lower still. The cost per student in the first year at a French university in 2006 was below 8,000 euros, whereas it was nearly 14,000 euros in the first year of a post-high-school preparatory class for elite schools. To these differences in cost are added the quite appreciable differences in returns to education - to the advantage of the most selective educational tracks (Gurgand and Maurin, 2007). These cost differences lead to speculation about the quality of education in the universities, representing more than 60% of students

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enrolled in French higher education and more than 80% of the diplomas awarded at the B.A./M.A. and B.S./M.S. levels. The question is all the more urgent that new programs of reform for higher education recommend granting more autonomy to these universities, which until present have been quite tightly controlled by the Ministry of Education. It is appropriate to question the capacity of these institutions to promote the value of their graduates' training on the labor market, which is a necessary element for regulating the agency or mandate relationship between the State and the universities (Cohen, 1997).

A double question arises nevertheless about the specific effect in the labor market of attending a given university institution and about explaining that effect by variables relating to educational quality. In various countries, the economic literature on the returns to schooling concerning quality effects of secondary or university institutions frequently presents weak or insignificant results for the different educational inputs (financial resources per student, teacher quality) and for the outputs, be they average earnings or returns to schooling (Rumberger and Thomas, 1993). The low level of autonomy of French universities leaves the institutions relatively little room for maneuver to the extent that the greater proportion of their financial resources is allocated by the State according to the number of students enrolled in each degree track (Gary-Bobo and Trannoy, 1998 ; Trannoy, 2006). Certain universities have succeeded in differentiating themselves from the others by specific policies linked to their educational offerings, their size, their location, their research specialization or their relations with the economic environment. However, do their graduates benefit from the effects of such differentiated quality when entering the labor market ?

In this research, we propose to offer a few elements of an answer to this question, based on a retrospective survey concerning the first three years of professional activity of youth who left the French educational system in 1998. Beginning with a sample of 55,000 youths, we selected the individuals leaving the university who had successfully completed three, four or five years of study after the *Baccalauréat*[1]. These individual data are paired with administrative data drawn principally from the ANETES (yearbook of French institutions of higher education). These latter furnish information on the institutions' resources, notably financial, as well as on certain characteristics of their educational offerings.

This article is divided into four parts. We present in the first part certain strands of the economic literature, which enable us to establish the link between the institutional effect and the remuneration of graduates. In the second part, we introduce the data exploited. In the third, we describe the econometric methodology employed, which lies in the domain of multilevel models. Finally, in the fourth, we present the principal results obtained during our empirical study, before introducing several elements in conclusion on the existence of an institutional effect and its explication by characteristics that are specific to French universities.

1 Schooling Effects and Earnings

1.1 Empirical Studies on the « Quality of Education-Earnings »Link

After the work of Becker (1962) and Mincer (1974), an abundant empirical literature in the economics of education focused on the link between the number of years of study and earnings. Regardless of the methods and data employed, this research generally was in agreement on the existence of positive returns to education that can nevertheless vary from 5% to 15%, and sometimes by more. It is appropriate to clarify somewhat the term « returns to education ». Indeed, there exist two types of returns to schooling : private returns and social returns. By private returns, what must be understood is the financial gain that will benefit the individual, and only him ; whereas, social returns from the profit accruing to the society as a whole from the investment of individuals in training. In this study, we study only private returns to education. The estimation of these returns in different countries, essentially based on the data from the OECD (2003, 2006) - for a synthesis, see Maguain (2007) - permits the construction of international comparisons so as to draw lessons

1. The French Baccalauréat, designated « Bac », is a national diploma sanctioning the studies completed in the secondary school system (*Lycée and Collège*), corresponding to an American high school diploma, plus a varying amount of American university credits, which may be obtained through « Advanced Placementexaminations.

for public policy, or at least for good practice. France's position in such comparisons has evolved over time : slightly above the 11.8% average of OECD countries in 2003 with returns in the range of 12.2%, they were in the order of 8.4% in 2008 as compared to the 12.2% average, again based on OECD data. It will be, however, difficult to compare our results to these figures inasmuch as the field of the research is different since we only consider university graduates with a national diploma, corresponding roughly to American degrees between the Bachelor of Arts/Science and Master of Arts/Science levels [2], therefore requiring from 3 to 5 years of study beyond the French « Bac », while the OECD's study takes into account all graduates from higher education. Moreover, this type of report is not concerned with the differentiation of diplomas between universities; and yet, the content of a year of study - even though it may nevertheless correspond to a national diploma - is not necessarily the same everywhere, which begs the question of the quality of education. Intuitively, it is possible to imagine a relation between the level of financial resources invested by the educational institution and the returns to education. However, as early as 1966, the Coleman Report pointed to the weak effect of resources invested in public schools on pupils' achievement. Subsequently, numerous empirical studies searched for the presence of effects linked to institutional resources and the educational quality on student achievement, notably using the data from standardized achievement tests. This quality effect was linked to different inputs in the educational production function : spending per pupil, class size, pupil-teacher ratio or teachers' educational level. The empirical studies led to nuanced results : while some defended the existence of a rather positive effect (Greenwald, Hedges and Laine 1996), others globally found an absence of significant effects (Hanushek 2003).

The question of students' professional prospects also arose. In conformity with the theory of human capital, it would be reasonable to expect that the quality of education should improve the returns to certain educational tracks. However, the results of empirical studies on the connection between the quality of education and earnings led to a contrasting assessment. Using earnings data from the 1980 United States Census, Card and Krueger (1992) showed that the returns to a supplementary year of education were greater for average individuals in areas that had devoted greater resources to education. They used variables on educational quality in American states at different dates and tested their effects on the returns to education for several cohorts. Heckman et al. (1996), however, qualified the preceding results. Using American census data yet again, but also utilizing more recent statistics, the authors demonstrated that taking into account variables related to the regional labor supply and demand broadly reduced the effect linked to the quality of education. In reality, the links between school quality and the returns to education only begin to be truly significant at the level of higher education. The results of Betts (1995), using in this instance information on the level of each school, led to the rejection of the hypothesis of an effect linked to school quality, at least as it was measured in the inquiry [3], while the percentage of disadvantaged students, as well as the school drop-out rate, were negatively correlated with salary. The review of the literature on school quality and salary proposed by Betts (1996) globally confirmed the following results : the link is in general significant only when the dataset on school quality had been aggregated at the state or district level, and this, for the cohorts born before 1960. By using data relative to Italian universities, Di Pietro and Cutillo (2006) established an ambiguous relation between the quality of institutions and the professional position of young graduates in the labor market, which seemed overwhelmingly dependent on the choice of their « performance indicator ». They also isolated a significant and positive effect of the quality of research on the fact of having a post corresponding to the level of qualification for men and for women, as well as a positive effect of research on earnings for men. On the other hand, the effect on earnings of the quality of teaching, measured by a composite indicator including notably the student-professor ratio, had a negative sign, which led to questioning of the pertinence of this last indicator. They concluded that

2. More precisely, the highest diplomas in our sample are the *Diplôme d'Etudes Approfondies* (DEA) and the *Diplôme d'Etudes Supérieures Spécialisées* (DESS), usually requiring 5 years of study after the French Bac.

3. The author notably selected : the ratio of full-time teachers to pupils, the salary of the beginning certified teachers with a B.A. degree, the percentage of teachers having at least a Master's degree or higher, as well as variables concerning the number of books in the library, a dummy variable of 1 if 7 vocational curricula were available at the school, the percentage of young Afro-Americans, the number of teachers who had left the establishment in the preceding year for reasons other than death or retirement.

the variable selected to qualify research undoubtedly captured a reputational effect, as well as part of the effect linked to the quality of the teaching imparted, a search for quality ensuring a renewal and regular updating of knowledge. From the corpus of microeconomic research in this area, we will bear in mind that the conclusions vary according to the inputs selected to define this quality effect, the most robust finding being the level of the teacher's diploma. Altonji and Dunn's (1996) approach is more original to the extent that they used the data on children from a same family to study the effect of the quality of the American secondary teaching institutions on earnings. By using this type of data, the authors were able to free themselves from the bias in the choice of schools, which may be related to the family environment [4]. Their results validated the existence of an effect of institutional quality on earnings, but not on the returns to education through the positive effect on earnings of variables such as the diploma of the teachers, the ratio of the number of pupils to teachers, or still the level of expenditure per child in school.

Other research employed multilevel models to permit the enrichment of individual data by institutional data. Rumberger and Thomas (1993) concentrated on the returns to a single diploma in American higher education, the bachelor's degree, and this, from individual data bearing on 15,082 diplomas delivered by 404 colleges. The multilevel analysis, similar to the method used in following sections of our study, allowed them to reveal the effect of institutional characteristics on salaries for different academic disciplines. They showed that the average selectivity at admissions to the institution, measured by means of the SAT test, affected the salary of the youths for the majority of disciplines. On the other hand, their results do not suggest the presence of an unfavorable effect of the socioeconomic composition of the student body for youths from minorities. As for the effects linked to the institution's resources, they varied greatly according to the discipline and were often not significant, when they were not counterintuitive. Thus, the student-teacher ratio or the proportion of part-time students had a positive effect on the remuneration of graduates in the sciences and in education. The results Tobias and Li (2003) obtained from the data on youths passing through the American secondary educational system were more conclusive, notably in what concerns the presence of a school-quality effect. They showed that the level of teachers' diplomas, namely of having a Master's degree or not, increased without ambiguity the revenue and returns to the years of study after secondary education. They also concluded that there existed an effect from the socioeconomic composition of the student body, measured by the effect of family revenue, on the remuneration of youths. However, the authors mentioned that the greater part of the variance among institutions could not be explained by their modeling.

1.2 Structure of French Higher Education and Schooling Effects

The research reviewed in the preceding paragraph does not make it possible to establish without ambiguity a positive link between the quality of educational institutions and the earnings of graduates, although it does seem that this link appears to be more founded for higher education. In France, to our knowledge, no study has attempted to reveal this type of relation. The absence of homogenous information concerning institutions, in particular on the employment of their graduates, constitutes a first obstacle. In addition, the institutional specificities related to the structure of higher education and the labor market may reinforce the limits of the analysis. We present here a few of these characteristics, which are not all exclusively applicable to the French case.

In a forthcoming article, Brodaty, Gary-Bobo and Prieto (2008) study the effect of having to repeat a year of schooling on the access to employment and on the earnings of graduates from French higher education. In particular, they integrate the clearly endogenous dimension of the length of studies, and furthermore exploit this endogeneity to deduce the impact of having to repeat a school year on professional job opportunity. Moreover, the presence of numerous control variables enables them to obtain an estimation of the returns to schooling that is the least biased possible, with a surplus salary per supplementary year of study in the vicinity of 7%. The original methodology they employ rounds out a framework for discussing the consistency of the « signaling »theory"

4. They also showed that the choice of institution is not connected to specific aptitudes of certain children within each family.

proposed by Spence (1973) with the reality of the recruitment process.

Since the structures of American and French higher education differ widely, the comparison between American and French universities therefore is not self-evident, especially in terms of study costs and admission selectivity. It may be thought that the selective aspect of access to universities reinforces the logic of filters in the United States. The American system may generate « cream-skimming »behavior (Epple and Romano, 1998), which will enable the most selective universities to attract the best students. The eventually positive effect that the university may have on the returns to education might correspond in part to its level of selection, which is less clear in the French case. For French universities having little autonomy and working under the « San Remo »norms that have an equalizing influence, the competition in attracting students is not as intense as in other countries. In addition, the Law prohibits universities from applying the principal of selection at admittance, while at the same time tolerating a few exceptions. However, the selection process, spread out over the whole degree program (Vincens and Krupa 1992), can make it possible both to recognize progressively the best students and to discourage the others. Competition will rather take place, beginning at the B.A. or B.S. and Master's degree levels, when the students are more mobile.

Then, when considering earnings, another difficulty appears that is linked to numerous factors unrelated to education and that depends particularly upon the degree of labor-market regulation or segmentation. The structure of the labor market, as well as geographical factors tied to the demand for labor, can largely influence salaries, as Heckman et al. (1996) emphasized in the analysis they carried out on educational data originating in various American states. For the graduates of higher education, the development of the service sector and the polarization of the labor market in certain urban areas, linked to the presence of corporate headquarters of major firms or to the existence of activities with high added value, will affect the labor supply and the associated remuneration. In addition, matching processes in the labor market may vary in function of the evolutions of supply and demand for labor, which generate problems of poor spatial matching in certain cases. The risk that one runs here is to attribute a spatial specificity of the labor market to an institutional effect.

It is also appropriate to examine the conditions of choice of certain institutions by the students in France. Indeed, parents' social capital may influence their children's educational trajectory by giving priority, for example, to institutions which they know have a better reputation, taking advantage of privileged information. Parents can also intervene by being able to finance more easily geographic mobility during the course of study. The financial aspect will be that much more important when the institutions practice selection during the course of study because the families will be able to bear the higher costs of education and thus limit salaried activities during studies, whose negative effects on achievement in higher education are known. Subsequently, these differences in social capital can have a determining effect as well on the explanation of the differences in earnings of young graduates. Hence, having a father who is a manager may in the first instance enable the youth to finance his studies in the most attractive establishments, then in a second stage, to gain access to networks and to information facilitating access to the best-paying jobs. Beyond the effect of social capital on the individual, one may wonder as well if there exists an effect of socioeconomic composition of the student population within certain universities. For one reason, universities are inscribed in specific socioeconomic and cultural environments, on which will depend the demand for labor present in each region. This effect of the population materializes at the educational level : a positive environment can stimulate productivity in school, and inversely in the case of negative surroundings, as the research of Goux and Maurin (2005) demonstrated for secondary education. The scholastic and social characteristics of undergraduates may then influence the academic environment of the university and subsequently affect the information of graduates on the labor market. One may think, for example, that network effects could bring benefits more broadly to the entire student body of a university.

2 The Data

2.1 The Sample

In this study, we principally make use of the data generated by the Céreq's[5] « Generation 98 »survey. This survey, carried out in the spring of 2001 on the entire population of students terminating an initial education in 1998, with the objective of studying the professional integration of a generation of youths who entered the labor market in the same year. In 1998, 742,000 young people left the educational system. Among these numbers, 168,000 came from a university or from an associated establishment, and more particularly for the population that we are studying, 112,000 held a university diploma at the B.A./B.S. or M.A./M.S. levels. The *Céreq* has done a more recent survey, « Generation 2001 », carried out in the spring of 2004 on students who had left the educational system in 2001. However, the comparatively modest number of respondents in this last survey did not enable us to exploit it in this article, which is why we used the data from the preceding generation. The initial sample was constituted of 55,000 individuals, representative of the 742,000 outgoing students. We retained for this study a subsample corresponding to those leaving the universities (N = 15,895 individuals), without including the university engineering schools or university technological institutes. Then, we selected among this population only the individuals who had validated between three and five years of higher education (N = 7,205), which is to say, with at least a B.A./B.S. and at most a Master level degree, DEA or DESS[6]. Many of the youths who left the university after having validated less than three years of study were in a situation of academic failure, and their professional integration was especially difficult. In addition, the individuals who had validated more than five years of higher education also constitute a population whose professional integration is specific : since public sector research is a natural professional prospect for holders of doctoral degrees, their salaries therefore have a tendency toward equalization, thus losing their exploitable variability. We then withdrew from the sample the individuals who did not reside in France at the time of the survey (N = 7,122 individuals). Lastly, since the purpose of our study is to link the institutional effect to the salaries of outgoing university students, we have selected only the individuals who had in fact an employment in the spring of 2001 (N = 6,091), for whom the working time was correctly documented (N = 5,905, of whom 575 working part time). For practical reasons, we have voluntarily eliminated individuals from universities for which we have less than 15 observations. In the end, our sample consisted of 5,883 individual observations, belonging to 73 universities, which can be grouped into four categories according to their dominant discipline(s) - science and health science, multidisciplinary with a medical component, multidisciplinary without a medical component, service sector. It is appropriate to mention here the presence in our sample of individuals from a university that openly applies selection at admissions.

In the framework of our analysis of the education-earnings relation, we have included numerous variables concerning individuals as much as institutions. The method of modeling employed (to be described in the following section) enables us to situate ourselves at the level of individuals as well at the level of universities, and thus to be able to obtain the estimation of eventual institutional effects.

2.2 The individual variables

The variables selected concerning individuals were for the most part generated by the Generation 98 survey and linked to academic and sociodemographic characteristics of youths holding B.A./B.S., M.A./M.S. or DEA or DESS diplomas, augmented by variables for experience in the labor market and seniority in employment. Following the example of the usual methods in the literature on earnings functions, we thus introduced for the individual, the number of years of study - whose estimated coefficient makes it possible to obtain the returns to education - seniority in the employment, as well as the experience in the labor market (experience prior to the

5. *Céreq* : the French Center for Research on Education, Training and Employment.

6. The so-called « LMD reform »(Licence-Master-Doctorat) has arrived in the meantime, so that instead of a DEA (*Diplôme d'Études Approfondies*) or of a DESS (*Diplôme d'Etudes Supérieures Spécialisées*), we speak today of a Master degree, eventually indicating its orientation, research or professional.

employment held at the time of the survey) and their squared values to take into account the concavity of income profiles, plus a gender variable. We included a range of dichotomous variables to characterize the educational track to the diploma, which is to say : the exact sciences; social sciences; language and literature; law, political science and communication [7]; economics and management, as well as a variable indicating if the training undergone was of the professional variety (DESS, MSG, IUP) [8]. Moreover, we also integrated information on the students' degree course to take into account, at least partially, possible variations in the student selection process, since the survey did not make available more precise information on school and university achievement. We introduced as well various Baccalaureate series - L (Literary), ES (Economic and Social), S (Scientific) or other types, the age at which the Baccalaureate was obtained (early, normally, late), as well as the first registration in higher education (admissions into a selective or non-selective degree course). We equally took into account the family's socioeconomic context by having recourse to the father's socioeconomic category, or failing that, to the mother's. Along these lines, we distinguished four variables : managers and higher professions, intermediate professions, farmers-craftsmen-shopkeepers-entrepreneurs, office employees and factory workers. So as to integrate the consequences of spatial disparities in the labor market, we included a variable indicating the unemployment rate in the individual's region of residence at the time of the survey (measured as a difference from the national unemployment rate in that period, 8.6%). We also included a variable indicating the share of managers and intermediate professions in the working population of the zone of employment where the individuals lived at the time of the survey. These two variables are from the INSEE's [9] employment survey. Finally, in the perspective of estimating the earnings function, we only had at our disposal monthly salary data. So as to work with the set of all salaried personnel, we therefore included four variables indicating the degree of part-time work (the reference being full-time), which is to say : less than half-time, half-time, roughly 60%, roughly 80% of full-time employment.

The examination of correlations between the variables for individuals made it possible to spot several interesting aspects. Please note that we only comment here the correlations above 0.15-0.20. First of all, we observed that the number of years of study is correlated with the type of Baccalaureate the individuals obtain, positively for the scientific track (0.21) and negatively for the literary track (−0.18). We observed equally a correlation with the variables indicating the state of the labor market, the share of managers and intermediate professionals in the working population (0.19), as well as with the discipline of the diploma at graduation, in particular language and literature (−0.25). Lastly, the number of years of study were very strongly correlated (0.51) with the type of educational track, whether a professional-qualification or not, which can be explained by the fact that professional B.A./B.S. (*licences professionnelles*) were not created until after 1998 so that there can be no individuals leaving the university from a professional track with a Bac+3 level in the data. As can be seen, the number of years of study seemed to be correlated with many of our variables for individuals, a result that could be expected in view of the results presented in the literature (Brodaty, Gary-Bobo and Prieto, 2008).

Next, the characteristic of being a man was also correlated with two general types of Baccalaureates, scientific and literary (respectively 0.21 and −0.23), as well as with certain disciplines of diplomas at graduation : hard sciences (0.25) and language and literature (−0.17), which simply translated the reality of the masculine/feminine distribution of students at the secondary school, then university levels. Turning our attention now to the registration in degree courses that are selective after the Bac, a correlation emerges with the non-general Bac series (0.19), this category of Baccalaureate holders had a stronger tendency than those from the general Bac series to enroll in IUT (*Instituts Universitaires de Technologie*) or in BTS (*Brevet de Technicien Supérieur*) technical tracks. These same individuals then rather tend to be oriented towards diplomas in the

7. A single variable was used for these three disciplines. Moreover, we had recourse to the same interdisciplinary groupings as the Ministry of National Education. It would have been more logic to class communication with language and literature, a classification we did test, without a modification of results.

8. DESS (*Diplôme d'études supérieures spécialisées*), MSG (*Maîtrise de sciences de gestion*), IUP (*Institut Universitaire Professionnalisé*).

9. France's National Institute of Statistics and Economic Studies (*Institut National de la Statistique et des Etudes Economiques* : INSEE).

exact sciences (0.18). As for the degree course of the Baccalaureate, we observed a foreseeable correlation between the fact of obtaining the Bac late and obtaining a non-general Bac (other series). Then, if we examine the working time, we noted a correlation between working hours that are less than or equal to 50% of full-time employment and diplomas in language and literature, indicating underemployment among these youths. The proportion of managers and intermediary professionals in the working population is fairly logically correlated negatively with the regional unemployment rate (-0.16). Finally, the discipline of the diploma was correlated with whether or not the character of the diploma is a professional-qualification, positively for diplomas in exact sciences and economy/management/AES [10], negatively for diplomas in language and literature, as well as in the social sciences.

2.3 The Institutional Variables

We likewise indentified the characteristics at the level of the different universities that can influence the remuneration of their diplomas on the labor market. Some of the indicators, moreover, may be considered as inputs to the university's production function. This is notably the case for the human and financial means that are available within the university, which is to say : the student-staff ratio (number of students per teaching personnel), as well as the amount of resources in Euros that are available per student, these two indicators were drawn from the ANETES [11] institutional yearbook of higher education (1999). Moreover, so as to gauge the orientation of the university in terms of research and professionalization, we selected the number of doctorates awarded per 1,000 students within the university under consideration and the proportion of professionalized diplomas in the set of all diplomas awarded by the institution. Another indicator gives an idea of the university's admissions policy concerning selection at the beginning of the degree course ; we selected the cumulative five-year success rate at the level of the Diploma of General University Studies (DEUG), usually obtained after two years of study. Finally, the last variable indicates the socioeconomic composition of the institution : the study-grant rate (on social criteria and the CROUS' [12] special assistance criteria), which made it possible to estimate the positive or negative influence of the students among themselves as a function of their milieu of origin. This last indicator was again drawn from the ANETES. As previously pointed out, we took into account the presence in our sample of a university practicing selective admissions by introducing a binary variable.

The above variables were calculated with respect to their means for the whole set of universities present in the sample under consideration for the purpose of characterizing a university's tendency to place greater emphasis on research than the average, to award more professionalizing diplomas that the average, etc.

TABLE 1 – *Institutional Variables*

Variable	Average	Standard deviation	Min	Max
Doctorates per 1,000 students	5.87	4.46	0.08	19.63
Share of professionalizing diplomas	26.47	12.07	2.20	52.3
Ratio : number of students per teacher	24.41	8.00	12.54	49.1
Finantial resources per student	1488.38	672.4	528.86	4996.7
DEUG diploma success rate	80.26	9.75	41.8	100
Rate of Study grants	21.47	6.34	7.12	42.29

Source : Vie Universitaire and ANETES

Inspection of Table 1 gives an insight into the existing disparities among French universities. The first two indicators, *the number of doctorates awarded per 1,000 students* and the *proportion*

10. AES (*Administration Économique et Sociale*).
11. ANETES (*Annuaire des établissements d'enseignement supérieur*).
12. CROUS (*Centre Régional des uvres Universitaires et Scolaires*), an organization reporting to the French Ministry of National Education that is the principal public source of financing for university study grants, conferring a social character to its assistance.

of professionalized diplomas awarded, may be considered in the nature of the university's *outputs*, resulting from choices made since its creation in the domain of research and professionalization of training. These choices are extensively dependent on the length of the university's existence, as well as on its endowments. Thus, the number of doctorates varied from 0.1 to 19.6 per 1,000, with an average of nearly six doctorates presented per 1,000 students ; whereas, the share of professionalizing diplomas varied from 2% to 52%, with an average on the order of 26.5%.

On the other hand, the human and financial means per student may be considered as *inputs* to the university's production function, even if they are also strongly constrained by certain characteristics of the university, notably its dominant disciplinary orientation. In fact, the needs are not the same for a university that has a large scientific or medical component as for predominantly tertiary university. Therefore, we observe important differences in terms of financial resources per student, with a range of 1 to 9 in financial resources between the two « extreme »universities, and a range of 1 to 4 in student-teacher ratios. Finally, the last two indicators also uncovered large disparities between universities. The DEUG diploma success rate varied considerably between certain universities. It can even reveal an absence of selection policy during the degree course of the first cycle, in particular for a university displaying a 100% success rate. Inversely, a university presenting a success rate below 50% proves to be extremely selective, the average cumulative 5-year success rate being roughly 80%. The variation between universities in the rate of students on study grants based on social criteria similarly reflected great heterogeneity of the socioeconomic composition of the student population within French universities. The range in rates of study grants was from 1 to 6, which in percentage is from 7% to 42%, the average being 21%.

3 Econometric Modeling

To estimate the effect of institutional characteristics on the salaries of young graduates, the simplest strategy would have been to use OLS estimation. However, such a method would not be appropriate to the extent that it would not capture the hierarchy present in the data : the observations relating to individuals graduating from the same institution being correlated. For this reason, in this study we used a multilevel model such as the one presented by Goldstein (1993). We of course had at our disposal data that are structured on two layers : a first level (individual), and a second level (institutional). Our variables made it possible to describe the units on each level, which is to say, the individuals and the universities. From this juncture, it became possible to test if belonging to a given institution affects the salaries of individuals who graduate from it, and after that, to measure the effect of certain characteristics of the universities on earnings. In a first step, we concerned ourselves with the effect on the average earnings (via the intercept of the earnings-schooling relation), which constitutes a direct effect, then afterwards, we observed the eventual effect on the returns to education - that is, the slope of the education-salary relation - and here we speak of an indirect effect.

Formally, we write :

- y_{ij} the logarithm of the monthly salary earned three years after leaving the university by the individual i from university j ;
- $INDIV$ the matrix of k explanatory variables on the level of the individual (sex, number of years of schooling, seniority, experience, educational track, academic discipline...), $INDIV_{ij}$ the vector containing the information relating to the individual i from university j ;
- $EDUC$ the variable containing the number of years of schooling, $INDIVM$ the matrix of $k-1$ explanatory variables other than $EDUC$, eventually indexed as $INDIV$;
- $ETAB$ the matrix of m explanatory variables on the level of the institution, $ETAB_j$ vector containing the information relating to the university j ;
- γ_{00} gives the estimation of the intercept of the model, making it possible to identify an « average salary », conditionally on the variables introduced into the model ;
- β a vector containing the estimation of k (or $k-1$) parameters associated with the *individual* variables ;
- γ a vector containing the estimation of m parameters associated with *institutional* variables ;

- The constant term of the model varying between institutions, the variability estimated by σ_u^2 ;
- The residual variability on the individual level is measured by σ_e^2 ;
- The ratio $\rho = \frac{\sigma_u^2}{\sigma_e^2+\sigma_u^2}$ permits the evaluation of the inter-institutional variance, which is the part of residual variance that can be attributed to the institutional level;

And in its structural form, the model is written in the following manner :

Model 1

$$
\begin{aligned}
\text{level 1 : } y_{ij} &= \beta_{0j} + \beta INDIV_{ij} + e_{ij} \\
\text{level 2 : } \beta_{0j} &= \gamma_{00} + \gamma ETAB_j + u_{0j} \\
\text{assuming that :} & \\
e_{ij} &\sim N(0, \sigma_e^2) \\
u_{0j} &\sim N(0, \sigma_u^2) \\
e_{ij} &\perp u_{0j}
\end{aligned}
$$

The reduced-form being :

$$
y_{ij} = \gamma_{00} + \beta INDIV_{ij} + \gamma ETAB_j + u_{0j} + e_{ij}
$$

In a first stage, we considered the case of an effect of the level-2 variables ($ETAB$) on the constant term alone β_{0j}, which is to say the case of direct effects. Moreover, the decomposition into two parts of the error term can be seen from the reduced-form equation, separating the individual level e_{ij} and the university level u_{0j}, each part being normally distributed and independent from each other. Model 1 is mixed, with a random effect, which we supposed by hypothesis to be uncorrelated with the explanatory variables.

In a second stage, we hoped to obtain an estimation of the eventual indirect effects of institutional variables on earnings, via the return to education. We therefore withdrew the variable $EDUC$ (years of schooling) from the matrix $INDIV$. The estimation of the coefficient β_{1j}, which now varies between universities in association with this variable, permitted us to obtain the return to a supplementary year of education.

In its structural form, the model is thus written :

Modèle 2

$$
\begin{aligned}
\text{level 1 : } y_{ij} &= \beta_{0j} + \beta_{1j} EDUC_{ij} + \beta INDIVM_{ij} + e_{ij} \\
\text{level 2 : } \beta_{0j} &= \gamma_{00} + \gamma_0 ETAB_j + u_{0j} \\
\beta_{1j} &= \gamma_{10} + \gamma_1 ETAB_j + u_{1j} \\
\text{assuming that :} & \\
e_{ij} &\sim N(0, \sigma_e^2) \\
(u_{0j}, u_{1j}) &\sim N(0, T) \\
e_{ij} &\perp (u_{0j}, u_{1j})
\end{aligned}
$$

with

$$
T = \begin{bmatrix} \tau_{00} & \tau_{01} \\ \tau_{01} & \tau_{11} \end{bmatrix}
$$

The distribution of the couple (u_{0j}, u_{1j}) is a bivariate normal distribution with variance-covariance matrix T. While the diagonal terms τ_{00} and τ_{11} reflect the variations of the intercept and the return to schooling, the presence of covariance term τ_{01} indicates the possible joint evolution of the intercept and the slope of the education-salary relation.

The error term at the institutional level is now composed of two terms, u_{0j} and $EDUC_{ij}u_{1j}$,since we consider that the intercept and the return to education both vary from one institution to another.

In reduced form, model 2 is thus written :

$$\begin{aligned} y_{ij} &= \gamma_{00} + \beta INDIVM_{ij} + \gamma_0 ETAB_j + \\ &\quad \gamma_{10} EDUC_{ij} + \gamma_1 ETAB_j EDUC_{ij} + \\ &\quad u_{0j} + EDUC_{ij} u_{1j} + e_{ij} \end{aligned}$$

The principal difference between model 1 and model 2 is that the $ETAB$ variables now appear twice : once affecting the parameters γ_0, giving an estimation of the direct effects, and a second time with the parameters γ_1, multiplied by the variable $EDUC$, giving an estimation of the indirect effects.

4 Results

4.1 The Effect of Individual Characteristics

The following commentary concerns Table 4 in annex.

While the purpose of this research is to obtain an estimation of eventual institutional effects, we have taken into account individual characteristics, whose effects capture an important part of the variability in earnings, and from which we can draw some lessons.

We obtained an estimation of the return to a supplementary year of schooling beyond the baccalaureate on the order of 10%, which is within the range of the findings of the various studies mentioned in section 1.1. The coefficient associated with the type of degree track shows that the professionalization of training procures for the youths a salary advantage slightly above 5%. The diploma's discipline had a strong impact on earnings : compared to social science graduates, the youths graduating from departments of sciences, economy/management/economic and social administration benefit from the highest salary premiums, from +10.2% to +11.6%, which, because of the standard deviations associated with these coefficients, did not however permit the discrimination between the two groups of disciplines. Next, the diplomas in law and political science, as well as degrees in language and literature, benefit from a significantly lower salary premium, on the order of +5.5%, once again without being able to discriminate between these two degree tracks.

Beyond the diploma sanctioning completed training, other variables were introduced relating to the school path of the youth during his studies. These variables may be considered as indicators of students' potential scholastic capacities. Thus, those who were reoriented to the university after studying in a selective degree course the year after the Baccalaureate benefited from a +6.8% salary premium. Similarly, the youths who got their baccalaureate early had a +2.8% salary advantage, while symmetrically, those who got theirs late were penalized by −2.3%. Likewise, as compared to holders of the baccalaureate S (sciences), those with baccalaureates in other series, frequently less selective, receive remuneration that was inferior, by from −5.4% to −6.2% for the general series, and as much as −7.5% for the other series, although we were not able to discriminate statistically among all these degree courses.

The other variables we introduced into the modeling are relatively standard. The coefficients associated with the number of years of seniority in the firm (+5.5%) and of experience on the labor market (+7.9%) were slightly higher than those generally found, which was related to the fact that we were observing the beginning of professional activity (the three first years, at the most), a period during which seniority, and especially experience, offer greatest salary advantage. The coefficients associated with the squares of seniority and of experience, on the other hand, were not significant. This result is related to the fact that we were observing our individuals for at most three years on the labor market, while the squares of experience (and seniority) were introduced to capture the concavity characterizing the evolution of the salary throughout the life cycle.

We observed an important gap in salary between men and women : in equal situations, men earned 13.3% more than women.

The variables associated with working time yielded expected results, but we were not really able to exploit these estimates because we only had at our disposal working time data that were approximate and that had been declared by the individuals themselves. Moreover, the variables enabling us to control the state of the labor market showed that a regional unemployment rate that was higher than the national average in the region where the youth worked reduced his salary. Inversely, a high proportion of currently active managers in the employment zone had a positive effect on salary. Finally, the youths' social capital, measured here by the social status of the parents, influenced salaries : the remuneration of children of managers and higher professions was significantly higher than that of children of intermediate professions or again farmers-craftsmen-shopkeepers-entrepreneurs - without being able to discriminate statistically between these last categories - which were in turn significantly higher than the remuneration of children of factory workers and office employees, constituting the reference category from which the differences were calculated.

Before analyzing eventual effects of the institution, we considered a « model 0 », which did not include any *institutional* variables. The interpretation of the residual variance of this model, in particular of σ_u^2 (corresponding to the institutional level), informed us about the interest of pursuing our analysis by introducing the characteristics of universities into the model. This preliminary stage also furnished us with an indication of the relative weight of the institutional characteristics with respect to characteristics belonging to the individual through the correlation coefficient ρ. The estimations of variance are resumed in Table 2 below.

TABLE 2 – *Primary Variance*

	Empty Model	Model 0	% Reduction
Variance level 1 : σ_e^2	0.1329***	0.07284***	45.19
Variance level 2 : σ_u^2	0.01766***	0.001284***	92.73
Variance inter-university (%) : ρ	11.73	1.73	85.25
R^2	0.116	0.522	
$N_{individual}$	5883	5883	
$N_{university}$	73	73	

Significance levels : *** : 1 % ** : 5 % * : 10 %

Empty model : model including only an intercept that varies between universities.

Model 0 : model including all individual variables, but no institutional variables.

Thus, after taking into account the characteristics of individuals, the residual variance at level 1 was reduced by approximately 45%, while the residual variance at level 2 was reduced by nearly 93%. The share of unexplained variance attributable to the institutions, which was valued at 11.73% in the empty model, fell to 1.73% upon the introduction of individual variables. Faced with this finding, one might expect to obtain a weak effect for university characteristics on the salary of their graduates, both directly and a fortiori indirectly. In addition, we obtained an R^2 with a value of 0.522, which was greater than the 0.30 generally found for the estimation of « Mincerian »earnings functions, indicating that the individual variables, other than the number of years of schooling, seniority and experience, had practically the same explanatory power as these fundamental variables.

4.2 The Schooling Effect on Average Earnings

The findings discussed here concern the estimation of Model 1, described at the bottom of Table 4 in annex. Apart from the individual variables, the institutional variables were introduced separately, then jointly, into the analysis, for those among them that were significant. The results concerning the separate introduction of these variables showed that only two of the six had a significant effect on earnings. The rate of study grants based on social criteria was negatively correlated with salary (the effect remained modest, -0.38 % per percentage of grants holders), which can be analyzed as an effect of the socioeconomic composition of the student population : one may think, for example, that the parents with high social status are potential employers or that they know potential employers, who will consequently favor the graduates of that university in their recruitment. Another significant result : the share of professional diplomas in the university also had a second-level effect on the remuneration of the youth (here too, the effect was modest, $+0.15\%$ per percentage of professional diplomas). This may be explained by a networking or signaling effect of the university with employers : the implementation of professional diplomas implies additional partnerships between the university and employers. Training periods, the obligation to bring professionals into teaching, more frequent requests for continuing education for these graduates enable the university to multiply its contacts among potential employers. This mediation permits employers to conceive of this process as a means to reduce the uncertainty concerning the quality of the graduates they hire. Furthermore, the binary variable indicating that the students were graduates of the one university applying selectivity did not have a significant effect on salary [13]. The other variables displayed a reduction of the negative variance, which led us not to use them in the rest of the analysis. Let us take note that neither the number of doctorates granted, nor the student-teacher ratio, nor still the level of financial resources per student were significant, contrary to what might have been expected concerning these three variables that could have reflected the quality of the research and teaching in the universities. Similarly, the rate of success at the DEUG, which illustrates the level of selection in the university's degree courses, did not have any effect on earnings. In total, the introduction of the two significant level-2 variables, which is to say, the rate of study grants and the rate of professionalizing diplomas awarded, caused a reduction of residual variance on the order of 38.5% at the institutional level.

4.3 Schooling Effects on the Returns to Education

The findings presented here refer to the estimation of Model 2, described in Table 5 in annex. In the preceding section, we detected and quantified the institutional effects on the youths' average earnings, effects that we qualified as direct : only the average level of salary (the intercept) varied from on institution to another. We may nevertheless think that the characteristics of the institutions might also influence the returns to education, in which case, we are speaking of indirect effects. Let us recall the notation introduced previously, in particular the notation relating to variance at the institutional level. As soon as we are involved with indirect effects, the returns to education will vary between institutions, as will the intercept. The institutional level error term is now composed of two terms, which follow a bivariate normal distribution of the variance-covariance matrix T, written :

$$T = \begin{bmatrix} \tau_{00} & \tau_{01} \\ \tau_{01} & \tau_{11} \end{bmatrix}$$

Thus, τ_{00} is the variance term associated with the intercept, τ_{11} is the variance term associated with returns to education, τ_{01} indicates the covariance between the intercept (or « average salary ») and the returns to education. Just as the analysis of the residual variance at the institutional level (see Table 2) conditions the introduction of *institutional* variables, the analysis of the variance associated with returns to education indicate whether we can pursue the modeling, by crossing the university characteristics with the number of years of schooling, and thus to obtain the estimation of eventual indirect effects. The results presented in Table 3 show that the returns to education actually do vary from one institution to another. In addition, the covariance term is significant too, indicated a joint evolution of the intercept and of the returns to education, the correlation being -0.87.

The strongly negative value of this correlation indicates that the higher the average salary level in an institution, the less a supplementary year of schooling in that university will be important.

13. However, we only had at our disposal 55 individuals who graduated from that university, which could explain the absence of significant effect.

TABLE 3 – *Estimation of Variance components in Model 2*

Variable	Estimation (10^{-3})	Std. Deviation (10^{-3})
Variance intercept : τ_{00}	4.689***	1.932
Variance returns : τ_{11}	0.567**	3.3
Covariance intercept/returns : τ_{01}	-1.42*	7.49
Variance level 1 : σ_e^2	72.54***	1.366

Significance levels : *** : 1 % ** : 5 % * : 10 %

As we can see in Figure 1, the slope of the straight lines diminishes as the distance along the ordinate increases from the origin. This result shows that the institutional effect must be analyzed more as a global premium on the average salary that benefits the set of all graduates from a given university, regardless of the diploma : B.A./B.S., Masters 1 or Masters 2. Globally, all the students, whatever their university, will benefit from continuing their studies by a supplementary year, so great is the gain in salary indicated by the slopes of the returns to education curves, even if they are at a university with a high average salary. However, in institutions with a lower average salary premium, students will profit still more by pursing their schooling.

The analysis of the direct effects was extended to recuperate the indirect effects linked to the institutional variables. The results presented in Table 5 in annex do not allow us to demonstrate such indirect effects since none of the coefficients associated with crossed variables (Professional Diploma X Number of years of schooling and Study-grant holders X Number of years of schooling) is significant. In view of elements present in the literature, it was possible to expect to obtain an influence of human and financial means on earnings, not only directly through the average salary, but also indirectly through the returns to education. On the other hand, we did not find an eventual influence of a university-networking effect in the labor market or an effect of the socioeconomic composition of the student body on the returns to education. Therefore, the specification we selected was Model 1.

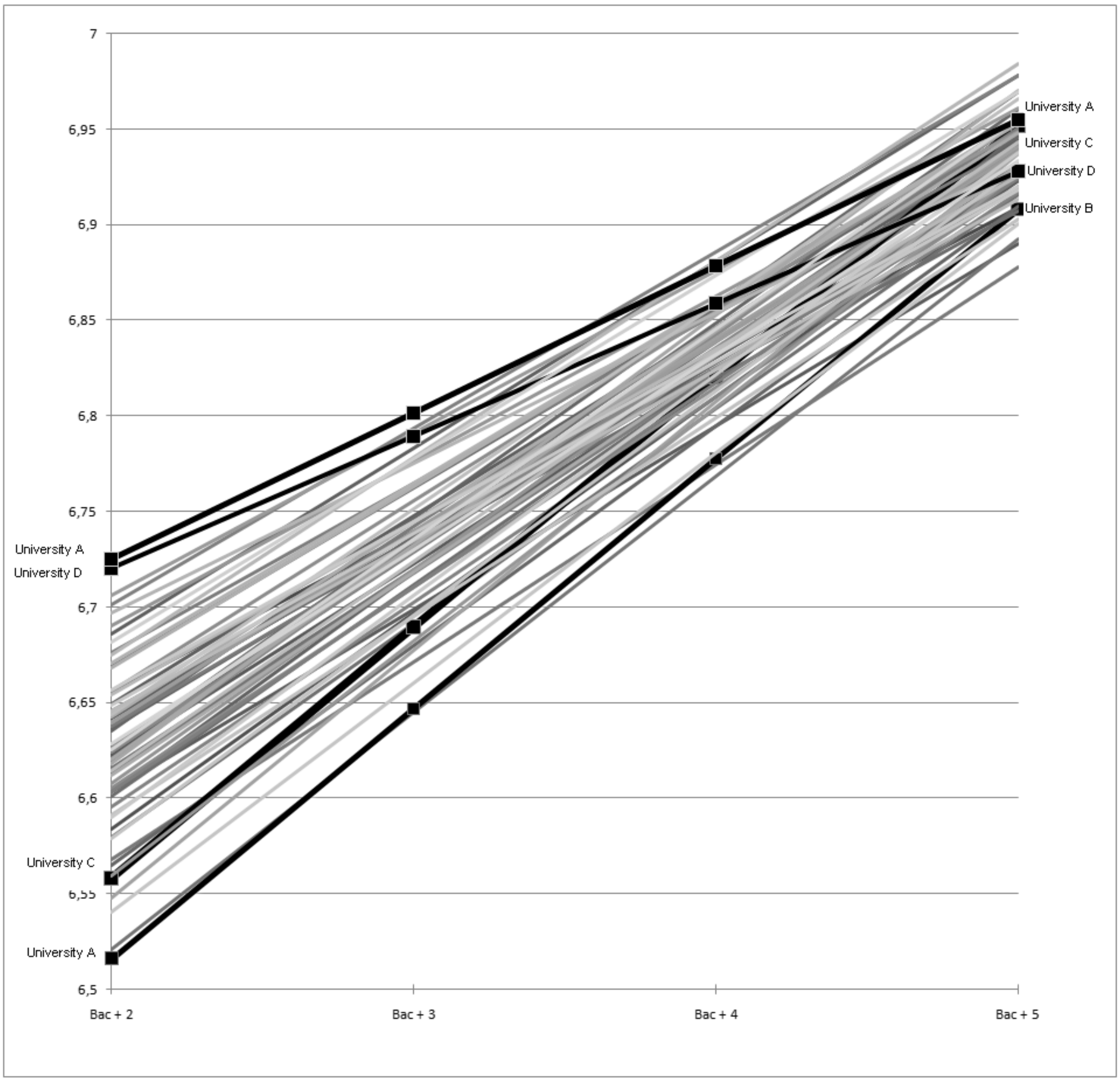
4.4 Analysis Broken down into University Categories

The composition of the disciplines taught in the universities varies substantially from one institution to another, generally in function of historical and geographic specificities. As the data in the ANETES (1999) yearbook show, the characteristics of the universities are appreciably different, notably in terms of means, according to their dominant discipline. So as to take this situation into account, we used the Ministry of Higher Education and Research's classification into five categories as a function of the dominant discipline in terms of personnel within a given university. A first category includes the universities with a scientific and/or medical dominant. A second category consists of the multi-disciplinary universities without a medical component. A third is comprised of multi-disciplinary universities with a medical component. A fourth gathers together the universities with a dominant in social sciences. The last incorporates the universities in which the law and economics departments are the most important.

Within our sample, we have merged these last two categories, which essentially train students for the service sector, and we did this to obtain relatively homogenous numbers of universities in the different subsamples of universities. Once we had done this division, we carried out the analysis of the schooling effects again, on each of the subsamples constituted in this way. The underlying idea was to attempt to zoom to the finest level of detail possible in describing and characterizing the universities. Ideally, we would have liked to have had at our disposal a sufficient number of individuals who had graduated of the universities in each of department, as well as institutional variables at this level of detail. Since we did not have access to these data, we restricted ourselves to distinguishing the institutions according to their dominant academic discipline(s), through the four categories described below.

On the whole, the results obtained with each subsample were comparable to those generated by the estimation carried out on our total population (see Tables 6 and 7 in annex). As for the variables

FIGURE 1 – Illustration of the Negative Covariance between the Level of Salaries and the Returns to Education (for each of 73 Universities



The chart is read as follows :
University A displays the highest level of salaries, but returns to education are among the lowest.
University B displays the lowest level of salaries, but the returns to education are among the highest.
University C exhibits one of the lowest levels of salaries, but the highest returns to education.
University D reveals the one of the highest levels of salaries, but the returns to education are the weakest.
The levels of salaries and returns to education reproduced here correspond to existing institutions, which we are legally obliged not to name.

concerning individuals, the direction of effects remained the same, although their magnitude was occasionally modified in moderate proportions (essentially for universities with dominant science and medical components). The findings relating to the hierarchy of earnings among disciplines was reproduced in each of the subsamples under consideration. However, it is appropriate to remain prudent with respect to the estimations of surplus salaries in one degree track as compared to the others since the structure of universities in a same category can vary without our knowledge of detailed information on the subject. Concerning the existence and statistical significance of the schooling effects, the results were more finely-shaded as well, pointing globally, however, in the same direction as the analysis done with the full set of universities. For the universities with a scientific and/or medical dominant, the characteristics of individuals capture the essential part of the explained variance of earnings (the coefficient of the variance associated with the intercept being no longer significant), and it was therefore not possible for us to detect schooling effects. As for the multidisciplinary universities, with or without a medical component, we observed a direct effect of the rate of professionalizing diplomas on earnings, although without being able to detect an indirect effect of this indicator. In the first case, all of the variance is captured at the level of the institution, while in the other case, the estimated variance associated with the returns to education, when it becomes a random effect, is no longer significant. As we previously contended, this finding illustrates the presence of networking or signaling effects of the university with respect to employers. Finally, in the case of universities with a dominant in disciplines for the service sector, we again obtained networking or signaling effects, completed by an effect from the socioeconomic composition of the student population, linked to the rate of study grants within the university, which was the identical finding obtained with the full sample.

5 Conclusion

The relation between the quality of education and the earnings of graduates has brought forth, particularly in the United States, an abundant microeconomics literature and numerous debates about the effectiveness of certain educational *inputs*. This research, moreover, has not created a consensus on the link between the different variables related to the quality of training in the institutions and earnings or the returns to education. Our research aimed at appraising the presence of schooling effects in the variance of earnings of graduates for the case of French universities and then at attempting to explain the differences by characteristics that can be attributed to the « quality »effects of the university training.

To reveal the schooling effects, we enriched the *Céreq's* survey relating to the professional integration of youths leaving the educational system in 1998 with data on the characteristics of French institutions of higher education. The use of multilevel models enabled us to account for the hierarchical structure of our data. We have shown that the schooling effects detected are principally explained by two university characteristics. The first is the rate of students receiving study-grants conferred on social criteria among the student population. The students' social capital to attain employment upon leaving the universities will be weaker, which reduces the recognition of the university and of its graduates among potential recruiters. The second significant characteristic is the proportion of professionalizing diplomas in the university, which can also be interpreted in terms of signals and information directed at employers. The universities having more professionalizing diplomas are more well-known due to internships and to the participation of professors with professional backgrounds in the training programs. While our results confirm the existence of schooling effects, they are relatively weak in comparison to the individual effects, linked notably to the level of the diploma, type of degree course, academic path and the discipline of study. In particular, we were able to draw up a hierarchy of salaries among the different disciplines : it turns out that the academic paths in economics-management on the one hand, and those in science on the other, enable their graduates to obtain the highest salaries. Come next the academic paths in political-science-law-communication, as well as in language and literature, and lastly, in social sciences, which are the least remunerated.

In return, our research did not reveal any links between human or financial means per student on the graduates' earnings. Various reasons could explain this absence of relation. On the one hand, we did not have internal university data, notably on the Training and Research Units, the UFRs (*Unité de Formation et de Recherche*, departments of universities), which may be considered more discriminating because it is in fact at the level of UFRs that important differences in human or financial means as a function of academic discipline can be observed : the needs of a scientific or medical Training and Research Unit are not comparable to those of a UFR in social sciences. The introduction in the last part of this article of a classification of universities according to their dominant academic disciplines seemed to indicate differences between science and medical universities and the others. On the other hand, our data concern students having left the university in 1998. Since then, however, the extension of the professionalization of diplomas and of life-long learning, the LMD diploma reform (Licence-Master-Doctorat) and the modifications in the range of diplomas offered, as well as the implementation of the law on the autonomy of universities may lead to an evolution of these preliminary findings.

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Références

- Adnot, P. et J.-L. Dupont. 2008. *Le Financement des Universités : Pour un SYstème de Répartition des Moyens à l'Activité et à la Performance (SYMPA)*. Study group report for the Ministry of Higher Education and Research on the reform of the allocation of financial resources by the State to the universities. Paris : Senate.

- Altonji, J. and T. Dunn. 1996. "Using Siblings to Estimate the Effect of School Quality on Wages", *Review of Economics and Statistics*, 78(4) : 665-671.

- ANETES, *Annuaire des Établissements d'Enseignement Supérieur.* 1999. Direction de l'Enseignement Supérieur. Paris : Ministry of National Education.

- Becker, G. S. 1962. "Investment in Human Capital : A Theoritical Analysis", *Journal of Political Economy*, 70(5) : 9-49. Also in Becker, Gary S. 1993. *Human Capital, A Theoritical and Empirical Analysis with Special Reference to Education*, 3^{rd} Edition, Chicago : The University of Chicago Press.

- Betts, J. 1995. "Does School Quality Matter ? Evidence from the National Longitudinal Survey of Youth", *Review of Economics and Statistics*, 772 : 231-250.

- Betts, J. 1996. "Is There a Link Between School Inputs and Earnings ? Fresh Scrutiny of an Old Litterature", in Burtless, Gary, ed., *Does Money Matter ? The Effect of School Resources on Student Achievement and Adult Success.* pp. 97-140. Washington D.C. : Brookings Institution.

- Brodaty, T. O., R. Gary-Bobo et A. Prieto. 2008. "Does Speed Signal Ability ? The Impact of Grade Repetitions on Employment and Wages". *Mimeo*

- Card, D. and A. Krueger. 1992. "Does School Quality Matters ? Returns to Education and the Characteristics of Public Schools in the United States", *Journal of Political Economy*, 100(1) : 1-40

- Cohen, E. 2007. « La LOLF et l'autonomie des universités », in *Économie Politique de la LOLF*, Rapport du Conseil d'Analyse Économique. pp. 351-358. Paris : La Documentation Française.

- Coleman, J. S. *et al.* 1966. *Equality of Educational Opportunity.* Washington D.C. : Department of Health, Education and Welfare.

- Di Pietro, G. and A. Cutillo. 2006. "University Quality and Labor Market Outcomes in Italy", *Labour*, 20(1) : 37-62.

- Epple, D. and R. E. Romano. 1998. "Competition Between Private and Public Schools, Vouchers and Peer-Group Effects", *American Economic Review*, 88(1) : 33-62.

- Gary-Bobo, R. and A. Trannoy. 1998. « L'économie politique simplifiée du Mammouth : sélection par l'échec et financement des universités », *Revue Française d'Économie*, 13(3) : 85-126.

- Goldstein, H. 2003. *Multilevel Statistical Models,* 3^{rd} *Edition.* Oxford University Press.

- Goux, D. and E. Maurin. 2005. "The Effect of Overcrowded Housing on Children's Performance at School", *Journal of Public Economics*, 89(5-6) : 797-819.

- Greenwald, R., L. V. Hedges and R. D. Laine. 1996. "The Effect of School Resources on Student Achievment". *Review of Educational Research*, 66(3) : 361-396.

- Gurgand, M. and E. Maurin. 2007. "A Large Scale Experiment : Wages and Educational Expension in France". *Mimeo*

- Hanushek, E. A. 2003. "The Failure of Input-Based Schooling Policies", *Economic Journal*, 113(485) : F64-F98.

- Heckman, J. J., A. Layne-Ferrar and Petra, T. 1996. « Does Mesured School Quality Really Matter ? An Examination of the Earnings-Quality Relationship », in Burtless, Gary, ed., *Does Money Matter ? The Effect of School Resources on Student Achievement and Adult Success.* pp. 97-140. Washington D.C. : Brookings Institution.

- *La Réussite au DEUG par Université Session 1999, Note d'Information 01.47.* 2001. Direction de l'évaluation, de la prospective et de la performance. Paris : Ministry of National Education.

- Maguain, D. 2007. « Les rendements de l'éducation en comparaison internationale », *Économie et Prévision*, 180-181(4-5) : 87-106.

- Mincer, J. 1974. *Schooling, Experience and Earnings.* New York : Columbia University Press.

- OECD, *Education at a glance*, 2003. Paris.
- OECD, *Education at a glance*, 2006. Paris.
- OECD, *Education at a glance*, 2008. Paris.

- Rumberger, R. W. and S. L. Thomas. 1993. "The Economic Return to College Major, Quality and Performance : A multilevel Analysis of Recent Graduates", *Economics of Education Review*, 12(1) : 1-19.

- Spence, M. 1973. "Job Market Signaling", *Quarterly Journal of Economics*, 87 : 355-374.

- Tobias, J. L. and M. Li. 2003. "A Finite-Sample Hierarchical Analysis of Wage Variation Across Public High Schools : Evidence from the NLSY and High School and Beyond", *Journal of Applied Econometrics*, 18(3) : 315-336.

– Trannoy, A. 2006. « Financement des universités, financement des études », *Revue d'Économie Politique*, 116(6) : 745-782.

– Vincens, J. and S. Krupa. 1994. « Réussites et echecs dans les filières universitaires. Un essai d'analyse », *Revue Économique*, 45(2) : 289-319

A Annexes

TABLE 4 – *Direct Effects on Earnings*

Variable	Estimation (%)	Std. Deviation (10^{-2})
Intercept	6.640***	2.57
Numbers of years of study	10.24***	0.5527
Seniority	5.438***	1.937
Seniority^2	0.931*	0.5467
Man	**13.32*** **	0.7853
Experience	7.859***	1.683
Experience^2	0.4212	0.7386
Regional unemployment rate	-1.559***	0.1969
Share of managers and intermediary prof. in active pop.	0.5770***	0.0633
Bac : Admitted to a selective course	6.824***	0.8382
Bac : S (Scientific)	*reference*	
Bac : Other series	-7.559***	1.364
Bac : L (Language and Literature)	-5.500***	1.180
Bac : ES (Economic and Social)	-6.146***	1.052
Bac : Normal age (réf)		
Bac : early	2.774***	1.010
Bac : late	-2.262***	0.8371
Full-time	*reference*	
Part time : < half time	-82.48***	2.796
Part time : half time	-54.79***	1.917
Part time : 60 %	-48.68***	3.3317
Part time : 80 %	-24.18***	2.058
Parent's SES : Worker	*reference*	
Parent's SES : Superior	5.174***	0.8581
Parent's SES : Intermediate	3.010**	1.200
Parent's SES : farmer-craftsmen...	2.423**	1.082
Discipline : Social Sciences	*reference*	
Discipline : Exact Sciences	10.22***	1.341
Discipline : Language and Literature	5.456***	1.305
Discipline : Law-Political Science-Com.	5.509***	1.291
Discipline : Economy/Management/Social Econ. Admin.	11.63***	1.278
Professionalized Degrees tracks	5.406***	0.9192
Selective University	5.100	5.566
Professionalized degrees	0.1528***	0.0509
Study-grant holders	-0.388***	0.0994
Adjusted R^2	0.522	
$N_{individual}$	5883	
$N_{universities}$	73	

Significance levels : *** : 1 % ** : 5 % * : 10 %

Estimation in % except for intercept

Std. Deviation in 10^{-2} except for intercept

Reading exemple : Being a man increases salary by 13,32 %

Table 5 – *Indirect Effects on Earnings*

Variable	Estimation (%)	Std. Deviation (10^{-2})
Intercept	6.6412***	2.705
Numbers of years of study	10.22***	0.6500
Seniority	5.475***	1.937
Seniority^2	0.9203*	0.5469
Man	13.34***	0.7843
Experience	**7.931*** **	1.683
Experience^2	0.4008	0.7388
Regional unemployment rate	-1.637***	0.1975
Share of managers and intermediary prof. in active pop.	0.5657***	0.0633
Bac : Admitted to a selective course	6.806***	0.8371
Bac : S (Scientific)	*reference*	
Bac : Other series	-7.646***	1.362
Bac : L (Language and Literature)	-5.441***	1.179
Bac : ES (Economic and Social)	-6.052***	1.050
Bac : Normal age (réf)		
Bac : early	2.855***	1.1009
Bac : late	-2.199***	0.8366
Full-time	*reference*	
Part time : < half time	-82.29***	2.800
Part time : half time	-54.77***	1.915
Part time : 60 %	-48.68***	3.313
Part time : 80 %	-24.16***	2.057
Parent's SES : Worker	*reference*	
Parent's SES : Superior	5.156***	0.8573
Parent's SES : Intermediate	2.984**	1.198
Parent's SES : farmer-craftsmen...	2.399**	1.082
Discipline : Social Sciences	*reference*	
Discipline : Exact Sciences	10.12***	1.340
Discipline : Language and Literature	5.345***	1.309
Discipline : Law-Political Science-Com.	5.415***	1.289
Discipline : Economy/Management/Social Econ. Admin.	11.43***	1.277
Professionalized Degrees tracks	5.412***	0.9229
Selective University	4.694	5.467
Professionalized degrees	0.1765	0.1292
Professionalized degrees X Number of years of study	-0.0070	0.0548
Study-grand holders	-2.370	2.413
Study-grand holders X Number of years of study	-0.073	0.0990
Variance level 1 : σ_e^2	0.07242***	0.0014
Variance intercept : τ_{00}	0.0047***	0.0019
Variance Returns : τ_{11}	0.0006**	0.0003
Covariance Int. Returns : τ_{01}	-0.0016**	0.0008
Adjusted R^2	0.522	
$N_{individual}$	5883	
$N_{university}$	73	

Significance levels : *** : 1 % ** : 5 % * : 10 %

Estimation in % except for intercept and variance/covariance

Standard Deviation in 10^{-2} excpet for intercept and variance/covariance

Reading exemple : A year of experience increases earnings by 7,93%

TABLE 6 – *Detailed Analysis by University Category - part 1*

Category	Scientific - Medical		Multidisc. without Medical	
Variable	Estim. (%)	Std. Dev. (10^{-2})	Estim. (%)	Std. Dev. (10^{-2})
Intercept	6.5230***	0.052	6.6361***	0.0475
Nb. years	10.26***	1.294	9.861***	1.249
Seniority	**11.14*** **	1.361	6.306*	3.384
Seniority^2	*NA*		0.5529	0.9625
Man	18.02***	1.763	11.40***	1.337
Experience	11.30***	1.604	9.552***	2.852
Experience^2	*NA*		-0.587	1.269
Regional Unemp.	-2.139***	0.4286	-0.903**	0.3773
Managers and int. in active pop.	0.5537***	0.1237	0.075***	0.1269
Bac : selective course	7.163***	1.831	7.735***	1.440
Bac : S	5.856***	2.129	*ref*	
Bac : Other	*ref.*		-9.019***	2.249
Bac : L	*ref.*		-5.5650***	2.050
Bac : ES	*ref.*		-7.363***	1.806
Bac : Normal Age	*ref.*		*ref.*	
Bac : Early	5.259**	2.500	*ref*	
Bac : Late	*ref*		-4.842***	1.350
Full time (reference)				
Part time : < half	-120.01***	10.93	-83.77***	4.639
Part time : half	-46.77***	5.597	-52.30***	3.108
Part time : 60 %	-29.80***	8.961	-62.28***	5.477
Part time : 80 %	-18.17***	5.165	-28.42***	3.530
Par. SES : Worker	*NA*		*ref*	
Par. SES : sup.	*NA*		0.0481*	0.0140
Par. SES : Int.	*NA*		*ref*	
Par. SES : farmer...	*NA*		*ref*	
Discipline : Human sci.	*ref*		*ref*	
Discipline : Exact sci.	7.038**	3.372	11.60***	2.243
Discipline : Lang. and Litt.	*réf*		7.644***	2.329
Discipline : Law/Pol. Sci./Com.	9.005**	4.383	5.157**	2.058
Discipline : Eco./Manag.	12.77***	3.598	11.03***	2.087
Professionalized degrees tracks	5.081**	1.983	9.066***	1.597
Selective university	*NA*		*NA*	
Prof. degrees	*NA*		0.3884**	0.1546
Prof. degrees X Nb. Years	*NA*		*NA*	
Study-Grant holders	*NA*		*NA*	
Study-Grant X Nb. Years	*NA*		*NA*	
Variance level 1 : σ_e^2	0.0702***	0.0032	0.0722***	0.0023
Variance level 2/Int : σ_u^2 or τ_{00}	0.0008	0.0041	0.0005	0.0004
Variance Returns : τ_{11}	*NA*		*NA*	
Covariance Int/Returns : τ_{01}	*NA*		*NA*	
Adjusted R^2	0.468		0.517	
$N_{individual}$	1012		2033	
$N_{university}$	14		19	

Significance levels : *** : 1 % ** : 5 % * : 10 %

Estimation in % except for intercept and variance/covariance

Standard Deviation in 10^{-2} excpet for intercept and variance/covariance

Reading Exemple : A year of seniority increases earnings by 11,14 % for a student graduating from a scientific-mediacl university

TABLE 7 – *Detailed Analysis by University Category - part 2*

Category	Multi. with Med.		Service sector	
Variable	Estim. (%)	Std. Dev. (10^{-2})	Estim. (%)	Std. Dev. (10^{-2})
Intercept	6.6502***	0.0418	6.6746***	0.0570
Nb. years	9.659***	1.087	11.04***	1.192
Seniority	**7.130*****	0.9885	7.678*	4.266
Seniority^2	*NA*		0.5569	1.211
Man	12.02***	1.473	12.65***	1.801
Experience	7.330***	1.243	11.60***	3.920
Experience^2	*NA*		-1.072	1.678
Regional Unemp.	-2.254***	0.3369	-0.710	0.5494
Managers and int. in active pop.	0.8493***	0.1434	0.4068***	0.1145
Bac : selective course	5.777***	1.606	6.287***	1.920
Bac : S	*ref*		*ref*	
Bac : Other	-4.4742*	2.501	-12.44***	3.396
Bac : L	-5.155**	2.115	-6.817***	2.445
Bac : ES	-5.063**	1.997	-6.774***	2.296
Bac : Normal age	*NA*		*NA*	
Bac : Early	*NA*		*NA*	
Bac : Late	*NA*		*NA*	
Full time (reference)				
Part time : < half	-77.42***	5.616	-78.37***	5.046
Part time : half	-58.20***	3.699	-59.00***	3.978
Part time : 60 %	-39.04***	6.022	-47.93***	7.468
Part time : 80 %	-17.31***	4.301	-29.16***	4.016
Par. SES : Worker	*ref*		*ref*	
Par. SES : sup.	6.904***	1.556	3.281*	1.749
Par. SES : Int.	3.741*	2.203	*réf*	
Par. SES : farmer...	3.838*	1.990	*réf*	
Discipline : Human sci.	*ref*		*ref*	
Discipline : Exact sci.	7.257***	2.117	19.39***	5.489
Discipline : Lang. and Litt.	*ref*		4.413*	2.398
Discipline : Law/Pol. Sci./Com.	*ref*		5.933**	2.657
Discipline : Eco./Manag.	7.391***	1.950	11.76***	2.2696
Professionalized degrees tracks	3.927**	1.767	0.7958	2.210
Selective university	*NA*		1.918	7.536
Prof. degrees	0.2925**	0.1333	0.2308*	0.1209
Prof. degrees X Nb. Years	*NA*		*NA*	
Study-Grant holders	*NA*		-0.633**	0.2156
Study-Grant X Nb. Years	*NA*		*NA*	
Variance level 1 : σ_e^2	0.06619***	0.0024	0.0806***	0.0033
Variance level 2/Int : σ_u^2 or τ_{00}	0.0029**	0.0014	0.0008	0.0007
Variance Returns : τ_{11}	*NA*		0.0011*	0.0007
Covariance Int/Returns : τ_{01}	*NA*		-0.0026	0.0017
Adjusted R^2	0.533		0.541	
$N_{individual}$	1607		1231	
$N_{university}$	22		18	

Significance levels : *** : 1 % ** : 5 % * : 10 %

Estimation in % except for intercept and variance/covariance

Standard Deviation in 10^{-2} excpet for intercept and variance/covariance

Reading Exemple : A year of seniority increases earnings by 7,13 % for a student graduating from a multidisciplinary with medical university