

# Higher Education Institutions Quality and Graduate Wages in Tunisia

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We estimate the effect of university characteristics on the return to higher education in Tunisia. We use a variety of administrative data from the Ministry of Higher Education and Research, the Ministry of Vocational Training and Employment and the National Social Security Fund. We consider econometric approaches based on multilevel modeling, which distinguishes more precisely between the effects of individual factors and institutional factors on earnings. Our findings confirm the relationship between the income and some university characteristics such as the number of permanent teachers, the selectivity of the higher learning institutions at the academic orientation, and the unemployment rates of the previous generations.

Keywords : University effect, Tertiary education, Incomes, Development country, Multilevel Models

J.E.L. : I23, J31, C29

## 1. Introduction

According to human capital theory, any investment in education is justified by the positive effects it has on the individual and society (Becker, 1962). Indeed, this theory states that the accumulation of human capital is an important factor in a country's economic growth through the possibility of access to new technologies and their use in an efficient manner (Darreau, 2003). Some empirical studies estimate that the output of higher education is relatively higher especially in a country depending on knowledge-based economy (Carnoy, 1995). However, this result is not always valid in many middle-income countries. Several studies have highlighted the relationship between higher education and the labor market in such countries (Colclough et al., 2010). Higher education policy may affect this relationship since it sometimes focuses on the quantitative aspects at the expense of the qualitative ones. Besides, problems in the structure of the employment of graduates who are geared towards the public-sector which is less productive can also affect the performance

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of higher education (Pissarides and Varoudakis, 2005). In the past few years, several studies have increasingly been concerned with the qualitative aspect of education.

In Tunisia, the transition from an elitist education to mass education was due to the increasing demand for education and hence the rise of number of graduates. Thus, the number has increased sharply in recent years to reach 85,000 in 2010 (the Ministry of Higher Education and Scientific Research, 2015). Moreover, the unemployment rate among graduates also rose, coming to around 20% (National Institute of Statistics, 2014). This issue is marked by a wide disparity through universities and higher education institutions. Indeed, in 2011, the unemployment rate hit almost 80% of graduates according to data released by the National Employment Agency and Self Employment (ANETI).

In addition, faced with this increasing education demand, offer has increased and was accompanied by a diversification of tracks, types of institutions, curricula and duration of studies. Because of the backdrop of educational offers, considering the number of schooling years as a means for measuring education can be a useful estimate in practice but is conceptually dubious if no quality education is provided.

Accordingly, assuming that the quality of education provided determines the efficiency of the educational investment in the labor market, it is crucial to study the link between the characteristics of schools and the private outputs of education.

The task is nonetheless arduous because the outputs of education result from the combination of a large number of factors to the extent that it is has become difficult to distinguish between those that pertain to the individual sphere such as school performance or the individual choice and those that fall under institutional quality.

This raises several questions: can we identify additional characteristics other than the individual ones that would influence the professional careers of the graduates? Is there for instance an institutional factor that could be related to a quality effect? Could such an effect be explained by variables related to the characteristics of the institutions such as those dealing with allocated resources or selectivity? One might think that in the case of higher education, the teacher-student ratios affect the quality of education and subsequently the wages of graduates. Belfield and Fielding (2001) investigated this question in the UK. Other features such as the selectivity of institutions during the university guidance or its reputation in terms of labor market performance can function as a 'signal' to employers (Spence, 1973) and affect the salary of graduates.

This paper aims at studying the links between individual characteristics, the characteristics of higher education institutions and the wages of graduates in Tunisia. This research employs rich data taken from administrative records. We created this dataset by matching several

databases from the Ministry of Higher Education and Scientific Research, the Ministry of Vocational Training and Employment and the Social Security National Fund.

Our final database is composed of 12,524 graduates (150 higher education institutions) in 2010. To provide answers to the above raised questions, we have dealt with individual variables (ie gender, marital status, specialty, etc.) and with variables related to the educational institutions (ie the number of permanent teachers, the unemployment rate for higher degree holders, etc.). We use a multilevelled model that is more suited to the hierarchical structure of our data.

We start by a brief literature review before dealing with the higher education system in Tunisia. We then present our data and of the econometric methodology. Finally, we reach a conclusion with a discussion of the main results of this study in the last part.

## **2. Literature review**

Since the 1960s, several economists have shown interest in the educational outputs and studied the connection between the number of schooling years and salaries (Becker, 1964; Mincer, 1974). Following the early works that have been mainly conducted in the United States, several studies have been carried out especially in developed countries. Most of them state that an additional year of study has a positive effect on the individual's earnings. The results of empirical studies suggest that the returns of an additional year of study vary from 5 to 15%.

According to the theory of human capital, it is reasonable to expect that the quality of education improves the returns depending on the tracks chosen. In fact, the links between quality and the returns of education can only become significant starting from higher education (Giret and Goudard, 2007).

In the 1990s, the literature on educational outputs, and especially that focusing on the impact of the quality of education on the individual's income, has proliferated in a significant manner. Several economists such as Brewer and al. (1996) and Harmon and al., (2001), have shown interest in the impact which the quality of university education has on student income in the labor market. We note that the quality of education is a multidimensional concept. The resources invested by the institutions, the quality of school infrastructure, the class size, the total number of teachers, the number of experimented teachers, their know-how and competencies are usually considered as factors that impact the quality of education. Efficiency is a crucial issue as well as fixing the priorities of any public policy aiming at improving students' performance and hence allowing them to integrate the labor market.

Some economists examine the link between the resources invested by educational institutions and the returns to education. Although most studies agree that the quality of universities attended by

students has a significant and positive effect on their earnings; estimates vary substantially according to the methodology and data used. The estimates provided by Card and Krueger (1992) based on US data suggest that the resources invested by educational institutions have a significantly positive effect on the returns to education. However, when they use data derived from French universities, Giret and Goudard's (2007) study does not show a relationship between human or financial resources invested by university institutions and the earnings of graduates. Furthermore, they suggest that other factors linked to the quality of education or to a signaling effect of establishments to employers have a positive effect on the earnings of graduates. Similarly, Bourdon et al. (2012) suggest that the selectivity level at the admittance to engineering schools in France and the teacher ratios in the University Institutes of Technology (IUT) impact the wage of their graduates. Di Pietro and Cutillo (2006) have examined the connection between the characteristics of the Italian universities and the fact of obtaining a non-graduate job. They suggest that students graduating from universities focusing on research are more likely to perform better on the labor market than those attending institutions where research activities are less dynamic. They show that the age of the university can be explained by a network or reputation effect, and that it has a positive impact on the quality of jobs filled by its graduates.

Despite the increasing number of studies on the quality of education, very few have been conducted on middle-income countries and even less on African countries. Moreover, much of the literature uses relatively obsolete data that date back to the 1970s, 1960s. We do not therefore know whether these differences still apply to the graduates of successive generations.

To our knowledge, the only research conducted on African countries is the one carried out by Case and Yogo (1999). Indeed, based on data from the 1996 Census made in South Africa, their study focused on the impact of the educational institution on the returns to education for learners belonging to the black community in South Africa. Unlike many studies conducted in developed countries, the researchers suggest that the student-teacher ratio has a crucial impact on the probability of finding jobs especially for South African women. This brings forth the question of the drivers of the quality of education in the context of middle-income countries where the problems and disparities between schools are generally different from those of developed countries.

The outcome of studies on the effects of the educational institution also depends on the empirical methodology used. Conventional methods are often based on logistical estimates or on the ordinary least squares (OLS). However, the outcomes of these methods show several limitations in that they do not take into account the heterogeneity of behavior patterns within a population. Various improvements have been made to these researches since the mid-1980s and have mainly

helped in overcoming some limitations of the conventional methods. They use new procedures such as multi-level modeling (Rumberger and Thomas, 1993), which allows taking into account the correlation between observations and integrating institutional variables in the estimates. Thus, this modeling is able to take into account the hierarchical structure of the data.

### **3. Tunisian Higher Education Context**

#### **a. Major Shifts in Tunisian Higher Education**

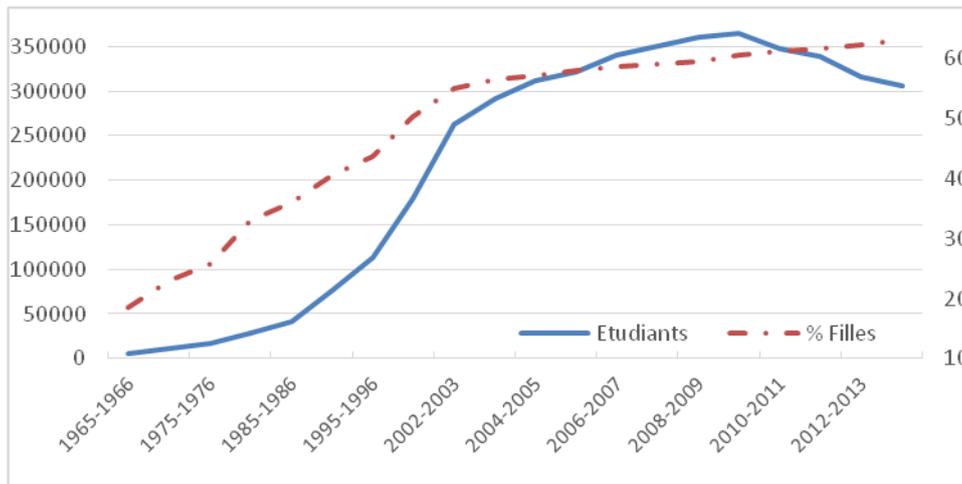
The Tunisian University was founded in 1960 and was composed of only five higher educational institutions, all of which were located in Tunis. At that time, the University had experienced the first wave for the creation of institutions. Most of them were established in Tunis and were geared towards the main conventional educational tracks. The second wave of reforms was adopted in the mid 1980s to confront the new challenges of higher education (i.e. the increasing number of institutions in higher education and the expansion of the map of universities in Tunisia). Furthermore, to facilitate communication between universities and their hierarchical authorities and to achieve decentralization, three regional universities were founded in 1986. These reforms aimed at strengthening educational programs oriented towards technical studies, information and communication technology studies. Reforms have continued well into the 1990s. In 1992, the network of Higher Institutes of Technological Studies (I.S.E.T.) was established. These institutions offer technical training. In 2006, higher education saw the implementation of the new European system LMD (Bachelor degree - Masters - Doctorate). The aim of that reform was to ensure flexibility and international comparability with the Tunisian educational system.

In Tunisia, the only requirement to have access to higher education is the Baccalaureate which is a national degree awarded on completion of 13 years of primary and secondary education<sup>1</sup>. The mass education that the country has gone through for decades has helped increase the flow of entrants to higher education. In fact, we moved from an elitist system where only 6.5 percent of youth aged 19-24 years enrolled at higher education in 1984 to a mass system: 34.6% of this age group attended universities in 2007. Insofar as the massification of secondary education is automatically passed on to higher education when obtaining the Baccalaureate, hence, the Tunisian university was soon faced with an explosive growth in student number.

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<sup>1</sup> Apart from the Baccalaureate exam, there is an exam set at the end of the primary education (6 years) which is a regional exam and another exam set at the end of the prepschool (9 years) which is a national exam.

Chart 1: Evolution of the number of students



Source: Ministry of Higher Education and Scientific Research

Eversince 1997, the success rate in the Bacallaureate has increased in parallel with the increasing the number of candidates. This has been accompanied by a decline in the quality of education as well as a deterioration of the academic performance of students. Indeed, the 2006 PISA survey ranked Tunisians students 55<sup>th</sup> among 57 participating countries, all of whom were assessed in mathematics.

Against this background, it is worth explaining the admission requirements at the national Bacallaureate exam enjoyed by young graduates of 2011. A decree issued by the Ministry of Education on 2<sup>nd</sup> November set forth these requirements<sup>2</sup>. Hence, the conditions to pass whether during the main session, the retake session and the “rachât” (the possibility to redeem the student who has a grade that is slightly lower than the pass grade) are as follows:

- to be admitted, a candidate must have obtained an overall average equal to at least 10 out of 20. The overall average is calculated as follows:

$$\frac{(Average\ of\ Bacallaureate\ exam \times 3) + Average\ during\ the\ year}{4}$$

4

The overall average during the graduation year accounts for 25% of the average obtained in the Bacallaureate exam ;

- to sit for the retake exam, a candidate must obtain an overall average equal to at least 7 out of 20;
- A candidate with an average that is slightly lower than ten and who is eligible to pass during the main session or the retake session must obtain an overall average equal to at least 9 out of 20 and an overall average during the graduation year equal to at least 10 out

<sup>2</sup> This decree is on the bacallaureate exam, Official Printing Office of the Republic of Tunisia (JORT) No. 090, year 2001, p 3887 and following.

of 20. In addition, the candidate must have an average equal to 8 out of 20 in some specific subjects during the graduation year and must not have received a score of 0 out of 20 in a major subject, and finally he must show proper conduct and a regular attendance profile.

All these conditions were applied to candidates for the 2011 Baccalaureate exam. The number of graduates who were admitted was 79 466.

It is noteworthy that before 2001, another decree had set forth the admission requirements for the Baccalaureate during the main session, the retake session and for pupils with scores slightly lower than the pass grade. They were defined by the Ministry of Education according to the decree released on 24 June 1992<sup>3</sup> :

- in order to pass, a candidate shall have a general average equal to at least 10 out of 20 ;
- to be eligible for the retake session, a candidate must obtain an overall average equal to at least 8 out of 20, or he must obtain at least an overall average equal to at least 7 out of 20 and an overall average equal to at least 10 out of 20 during the graduation year ;
- For candidates with scores slightly lower than the average, the candidate will succeed if he obtains an overall average equal to at least 9 out of 20 and an overall average equal to at least 10 out of 20 during the graduation year in addition to an average equal to at least 9 out of 20 in some specific subjects during the graduation year and finally he must not have obtained a score of 0 out to 20 in any compulsory subject.

These conditions for admission in the Baccalaureate used to be stricter in so far as the annual average was not taken into account in the formula for calculating the final average in the Baccalaureate.

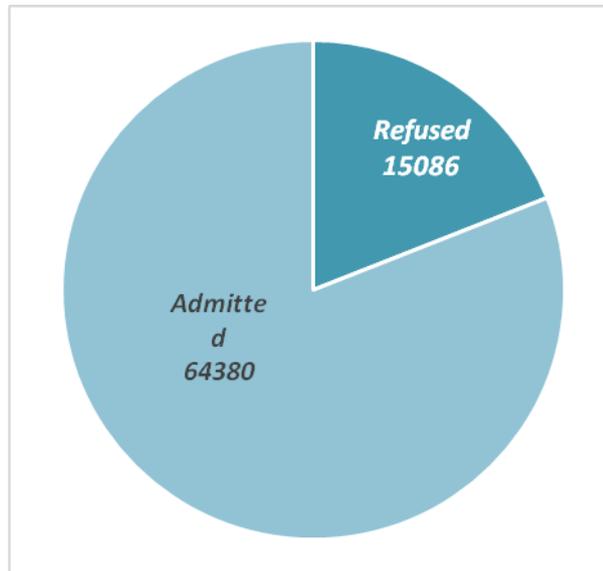
We have conducted a simulation by relying on data taken from the Ministry of Education on the marks obtained by the candidates in the different tests given in the 2011 national Baccalaureate exam. The simulation allows recalculating the average of the candidates under the conditions set forth by the decree of 24 June 1992. We have noticed that the final averages vary between 6 and 19 out of 20. Among the 79 466 Baccalaureate holders, 15 086 (20% of them) should access to higher education but without, in theory, having the required knowledge that would allow them to start their university studies in the best conditions. They should have failed this test and be denied access to higher education. One may infer that the implementation of such an assessment system for the Baccalaureate exam has caused a decline in the academic performance of graduates who access higher education as well as a decline in the quality of education.

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<sup>3</sup> This decree is on the baccalaureate exam, JORT No. 041, year 1992, p 819 and following.

Accordingly, the new system that allows pupils to pass with grades slightly lower than the average impacted the changing flow of pupils enrolling at universities. This has led to the massive growth of the number of students at university in Tunisia. Furthermore, this new system that admits students with slightly lower averages has led to a deterioration of the skills of young graduates.

Chart 2: Success rate of 2011 graduates according to Decree 1992



Thus, higher education in Tunisia is experiencing considerable change both quantitatively and qualitatively. Today, half a century after the establishment of the first Tunisian university, nearly 400 thousands students are enrolled in 200 higher educational institutions in Tunisia.

The growth of student population has placed higher education before a major challenge that lies in ensuring the quality of training and competitiveness of graduates on a national and international labor market which is increasingly demanding and competitive (Zghal 2007 ). Faced with these unplanned changes in student enrollment, higher educational institutions are now suffering from various problems.

### **b. Attractiveness Gap between Institutions**

In Tunisia, higher education has no control over the enrolment flow, since all Baccalaureate holders need to find a place at university. The Ministry of Higher Education ensures university guidance. Prior to 1976, Baccalaureate holders were free to choose their studies during the academic counselling since the number of new entrants was not significant. Since 1997 the increasing number of graduates and the high success rate in the Baccalaureate has obliged the Ministry of Higher Education and Scientific Research to set up a specific system. It consists of “matching” the profile of students with the nature of educational institutions. This system ensures access to all graduates at university, while regulating the allocation between sectors and

institutions and taking into account the admission requirements they set forth. It is an “automated assignment system” based on the following four steps (Ben Sédrine, 1998):

- The choice as well as the school grades of each Baccalaureate holder are entered into the system and the applicant is ranked;
- The admission requirements and the capacity of each institution are entered into the system<sup>4</sup> ;
- The computer system assigns graduates according to their rank and grades ;
- The system performs a series of iterations to complete the assignment of graduates in four rounds.

Whilst graduates cannot choose freely their track, this orientation system helps to avoid too many erratic risks in the university guidance. So, the scores of the new graduates reflect the attractiveness gap existing between Tunisian higher education institutions. In this way, universities dominated by conventional academic trainings suffer from a surplus in students’ number which can harm the effectiveness of teaching and the quality of results. Students with the lowest scores are usually assigned to such universities. During their first undergraduate studies, the students undergo an indirect and perverted selection process which allows only those who are able to succeed in university studies. Damoiselet and Levy-Garboua (2002) argue that the selection is made at two different levels: on the one hand, there is a selection process according to the general capabilities and this occurs during the primary education or during the preparatory school. On the other hand, selection through specific knowledge pre-requisites operates at higher levels of education. In the study they have conducted, on the OECD countries, they suggest that the deterioration in the levels of education is caused by the delay in the differentiation timing according to the general capabilities when talent can be assessed.

Regarding educational institutions and schools where training costs are relatively higher, these attract the most deserving graduates with the highest scores. These educational institutions provide students with a good mentoring and ensure adequate conditions of qualification and success. Hence, some of the most renowned institutions, such as engineering schools, medicine faculties, and business schools, which offer training cycles regarded by Baccalaureate holders as offering better job opportunities enroll the “best” pupils. The other universities have to put up with pupils with lower academic skills.

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<sup>4</sup> All baccalaureate holders are handed out a guide with information on the criteria for access to higher education cursus and their capacity. The score of the last Baccalaureate holder enrolled in each stream during the last three years is mentioned in order to help candidates be aware of the competitiveness to be enrolled there. Such information help the baccalaureate holder to rank his favourite choices.

This dual system, where some educational institutions welcome the “best” students and others the less gifted ones, is not in line with the objectives of a broad access policy and in line with the enhancement of the quality of higher education. Hence, Baccalaureate holders have different chances of success and different career prospects.

Moreover, this adverse selection process highlights the hierarchical organization of the system. Thus, students with low scores are tracked into academic training that is supposed to produce and enhance knowledge and requires excellence. On the other hand, students with high scores are over-represented in professional courses.

Universities should opt for a teaching methodology that provides excellent standards of learning and follows a logic of knowledge production. Trainings provided during the first and the second cycle of university studies are supposed to select those who should teach in secondary schools. On the other hand, postgraduate studies select those who should teach at universities and who should conduct research activity. This postgraduate training which requires, in theory, excellence, does not always attract the “best” students because it is subject to the significantly high demand.

Moreover, schools and institutes are marked by a system which is more open to the outside world and diversified. The curriculum includes compulsory internships in companies which may be a professional support since they allow graduates to become acquainted with practical knowledge and skills sought by employers. In addition, these educational institutions regularly invite business stakeholders to offer some courses. This practice allows students to build relationships with the business world. Thus, these educational institutions usually have a strong professional vocation and develop their training programs around employment. Therefore, these trainings are usually subject to high demand during the academic orientation which increases the institution selectivity at the enrollment.

In sum, the Tunisian university system offers the power to select when enrolling in some professional tracks which are costly and deprive faculties which in turn adopt a severe selection process during the studies.

### **c. The labor market for graduates**

Tunisia has made significant efforts to develop human capital and to promote human resources *through* the development of education. The main objective was to train a workforce intended for the labor market. However, this specific backdrop that is mainly marked by a massive number of students attending tertiary level education, produces more and more graduates who would encounter difficulties to find a job (Zamel, 2011). Between 1991 and 2005, the size of a cohort of graduates thus rose from 7 000 to 48 000. The issue of graduate employability has become a

priority of governments. Thus, a breakdown of the unemployed according to their level of education reveals that the unemployment rate of higher education graduates rose from 1.4% in 1994 to 8.5% in 2004. In 2009, this rate was 23% for university graduates (INS). This rate is particularly high among new graduates. In addition to that, the unemployment rate reaches 32% three years and a half after graduation (Ministry of Vocational Training and Employment and World Bank, 2008).

The investment in human capital has therefore not made it possible to increase productivity and neither improved the living standards of young Tunisian graduates. Therefore, it seems that the Tunisian economy is unable to generate enough job opportunities for these young people and absorb the labor supply which is increasingly growing. The mismatch between the needs of the economy in terms of skills and production of higher education system has increased the phenomenon of unemployment among university graduates. Furthermore, the implementation of structural reforms in 1986 has helped strengthen some weaknesses particularly in the labor market. Since the late 1980s, the absorption capacity of the workforce in the public sector has been in decline. Moreover, the Tunisian private sector has played a fairly active role in job creation. SMEs which are the main drivers of job creation in other countries represent a rather small share in the Tunisian economy. They are mostly concentrated in the secondary sector and with a low added value (56.2%) and in the tertiary sector (41%) (NBR, 2009). Their share in job creation is limited. This has created a major increase in the unemployment rate of graduates during the past two decades.

In addition, the quality of jobs of higher education graduates has worsened to the extent that they do not find occupations that match their qualifications. This results in the increasing number of graduates who are in a precarious situation on the labor market. These latter find internships or fixed-term employment contract and earn low wages.

In 2010, higher education institutions allow for the graduation of more than 78 000 students, around 47% of them have not succeeded in finding their first job one year after leaving university and enrolled in the “AMAL” program<sup>5</sup>. This program was implemented in March 2011 for graduates who left higher education no later than 2010. The beneficiaries received a monthly grant of about 150 DT, around half of the minimum wage. Within this perspective, the beneficiary rate was very close to the share of unemployment for the most recent generations.

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<sup>5</sup> This system aimed at allowing graduates who are first-time jobseekers to develop their personal capacities for active job search and at facilitating their integration into professional life. The number of beneficiaries of this program amounts to 188 500 young people (MFPE, 2012).

Moreover, the unemployment issue spares no type of graduates even if it particularly affects people graduating from management or law. Nevertheless, it is selective insofar as it does not affect graduates from various academic institutions with the same degree. For example, students graduating from the Higher Institute of Management of Tunis (ISG) were less impacted by unemployment in June 2011 compared to those graduating from other institutions despite the economic slowdown experienced by Tunisia at the start of the year. Thus, in 2010, only 20% of ISG Tunis graduates enrolled in the program “AMAL”. Moreover, students graduating from “new” universities (Gafsa, Jendouba, Gabes) cannot have the same opportunity. Indeed, 56% of graduates from ISG Gabes were in June 2011 still first-time job seekers.

Hence, the quality and the return of higher education is a hot topic. Disparities in terms of graduate employability among regions and institutions indicate the existence of an institutional effect on the output of higher education in Tunisia. In this context, we estimate the university effect on the graduate’s salaries.

#### **4. Data**

This study is based on original data extracted exclusively from administrative files. Our data were developed by matching multiple databases derived from the Ministry of Higher Education and Scientific Research, the Ministry of Vocational Training and Employment and the Social Security National Fund (CNSS).

The primary source of data is the database of the 2010 graduates. During that year, 86,000 young people were granted a university degree. They were enrolled at the 194 higher education institutions belonging to 13 universities. Among these young people, there were nearly 75 000 Tunisians who obtained an initial training diploma (Bachelor degree, Engineering degree, doctorate in medicine, pharmacy and National Diploma of Arts). We did not take into account foreign graduates and all postgraduates (Master and PhD) in the present study.

We matched the data with the social security files managed by the Social Security National Fund (CNSS), and this for the purpose of identifying graduates who were hired in the private sector<sup>6</sup>. We have performed the pairing between the two administrative files based on the ID number which is available in both information systems. We have also used several control variables available in both databases to ensure compliance of pairing as for instance the date of birth and gender. The use of administrative records allows us to perform the analysis on all the 2010

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<sup>6</sup> It is the Social Security National Fund which is in charge of collecting the national insurance contribution for those working in the private sector.

graduates, and not on a sample as is the case in statistical surveys. This allows us to have quite a significant number of observations regarding each institution. However, data derived from the Social Security National Fund (CNSS) do not include individuals hired in the informal sector. Our study therefore focuses on higher education graduates who are employed in the formal sector.

The information available in the CNSS files relates to wages declared from the beginning of 2011 until the end of 2014. At first, we have selected individuals whose employers issued payrolls for them (or income for the self-employed workers) for at least a quarter during 2014. Then, for statistical significance issues, we have also excluded from our analysis graduates from universities for which we do not have at least 10 observations. In the end, we have selected 12 524 graduates from 150 universities for our study.

To study the effect of educational institutions on graduates' wages, we have supplemented these data with information on academic institutions resulting from the matching of various files and administrative documents.

### **Individual variables**

We introduce at the individual level the number of years of education according to the degree obtained. We also have information on gender and on the marital status of the graduate at the beginning of 2014 (Single 76% Married 23%). In order to study the effect of school performance, we shall also add educational underachievement by using information concerning the age of graduates. We shall use a series of dichotomous variables to describe the corresponding education cursus to the degree obtained in 2010: information and communication technology (18%); the Health Sciences (7%); economics and management (26%); Law (3%); social sciences (4%); languages and literature (9%); arts (4%); sciences (7%) and Applied Sciences and Technology (22%). We shall integrate the unemployment differential variable so as to take into consideration the high regional disparities on the labor market in Tunisia. It is determined by comparing the national unemployment rate of higher education graduates (which is 20.17%) and the unemployment rate in the graduates' governorate in 2014. This information derives from the 2014 general population census.

We take into account the number of declared quarters by the employer to the Social Security National Fund to study the career path of these graduates on the labor market. The experience in the last job is assessed via the number of years declared by the last employer. Regarding the professional experience, it is determined by the number of years declared since graduation regardless of the quarters declared during the last position. We also use the square of these variables to reflect the concavity of the income profiles. Within our database, we also have

information on the type of job: paid employees (93%) or self-employed (7%) as well as on the company size.

Finally, in order to master the seasonal effect, we shall use as a variable interest in the gain function, the wage/ average of the monthly income declared in 2014.

### **Institutions variables**

We have collected data on the characteristics and quality of higher education institutions which are entered at the institution level. Some introduced information concerns inputs in the production function of higher educational institutions. We introduce for example, quantitatively and qualitatively variables on human resources mobilized in each university. Indeed, information on the number of teaching staff during the academic year 2009 – 2010 are available to us. In terms of the teaching staff quality in such institutions, all data can be broken down by rank (experience) and affiliation (full professor or part-time lecturer). Professors and associate professors represent only 13% of the total of the teaching staff. This ratio may reach 75% in some institutions. On the other hand, many institutions suffer from the total absence of “corps A” or experienced teaching staff (40 establishments).

We use the orientation score of the new graduates in order to characterize the selectivity of the higher education institutions. For each establishment, there are four variables: i) the score of the last Baccalaureate holder enrolled for the academic year 2006-2007; ii) the capacity of enrolment in the first year iii) the total number of Baccalaureate holders who have requested to enroll in that educational institution during the orientation and iv) the average score of these Baccalaureate holders. It should be noted that had there been no failure cases, the majority of 2010 graduates would have obtained their Baccalaureate degree in 2006 or 2007, hence the choice of the observation year for the orientation scores. In order to characterize the academic performance of students attending higher education institutions, we also turn to a variable on rate of 2010-2011 graduates who do not satisfy the conditions of success in the national Baccalaureate exam in conformity with the decree of 24<sup>th</sup> June 1992 (see sub-section 3.a). This variable is created at the level of the educational institution from a simulation based on individual data on marks obtained during this test. We have noticed a significant disparity between institutions. Indeed, in some institutions, 100% of graduates pass the national examination in conformity with the conditions of the decree of 1992. However, for other establishments, this rate may reach 20%.

Furthermore, we use a database of the Ministry of Vocational Training and Employment to capture a variable that provides information on the performance of each institution in the labor market. In fact, for each institution, we have the share of graduates from among the three previous generations (2007-2009) enrolled in the program ‘AMAL’. It should be noted that this program is

relevant exclusively to first-time job seekers. Hence, the beneficiaries of this program were faced with the problem of unemployment throughout the period between 2007 – 2011, regardless of the effect of the economic situation on the labor market. Moreover, even if employers do not have accurate information on the unemployment rate per educational institution, they have nevertheless developed knowledge of graduate profiles coming from each institution through their experiences. This generally leads to filter candidates during recruitment interviews according to the institution they graduated from. Thus, it is the performance and skills of former graduates that give an idea about the reputation of an institution for employers. The age variable of the educational institution allows us to know which educational institutions have actually been founded compared to other older ones. Likewise, this may reflect a differentiation in terms of reputation among the various universities.

In addition, we have created a variable for the seat-occupancy rate for each educational institution. It is defined by ratio (number of students enrolled / capacity of the institution). It allows us to have an idea about the saturation level of the institution. In other words, does the university have the required resources and infrastructure to host or not the number of students who have been enrolled there?

We have finally set up a set of dichotomous variables that characterize the dominant track in each university; these are the institutions specialized in legal studies and humanities; institutions providing courses on economics and management; institutions providing courses on technologies and health studies or institutions delivering courses on sciences.

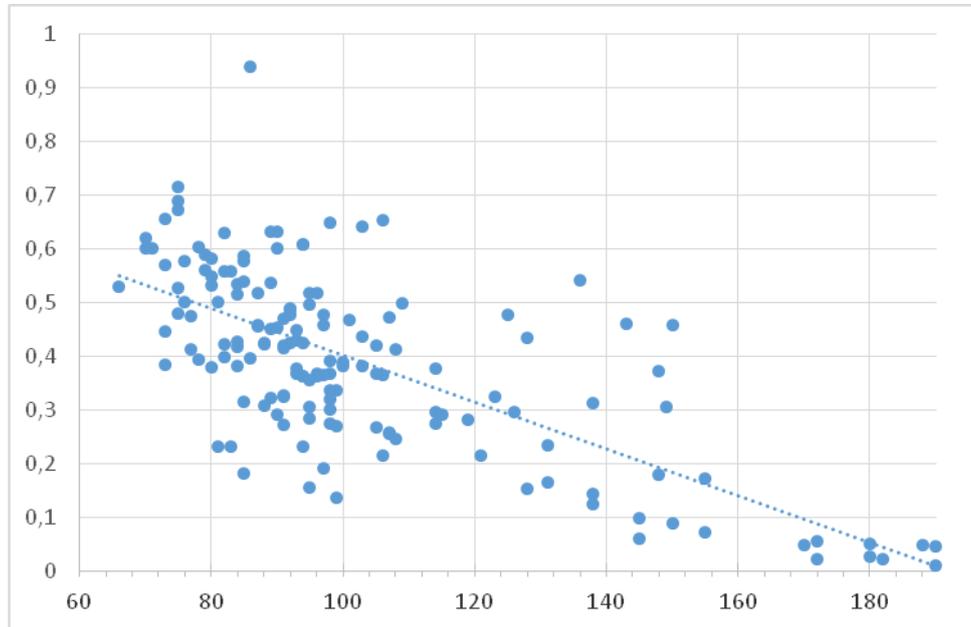
*Table 1 : Description of variables institutions*

Variables	Average	Standard deviation	Minimum	Maximum
Rate of permanent teachers	0,72	0,18	0,19	1
Rate of teachers « corps A »	0,09	0,14	0	0,75
Score last oriented 2006	102,67	27,69	66	190
2006 enrollment pressure	8,57	4,15	2,66	26,17
Sucess Rate baccalaureate (Decree 1992)	0,82	0,21	0,2	1
Rate registered « AMAL »	0,39	0,17	0,01	0,94

The following chart illustrates the relationship between the performance of the institution in the labor market through the rate of graduates enrolled in the program ‘AMAL’ - or even the rate of the unemployed - in each institution and the selectivity of the institution through the score of the last Baccalaureate holder enrolled there. We observe a strong correlation between these two

variables (-0.71). This statement of fact is the same for the correlation between the performance of the institution in the labor market and the rate of ‘corps A’ teaching staff : professors and associate professors (-0.5).

**Chart 3. The relationship between selectivity and the rate of unemployed**



## 5. The methodology

We have opted for a multilevel modeling to estimate the effect of the higher education institutions’ characteristics on the graduates’ wages. This method is the most appropriate for the hierarchical structure of our data (Singer, 1998). The first level represents micro-units composed of graduates and a second level is composed of the graduation institutions which represent macro-units (Bressoux, 2008).

We note  $Y_{ij}$  the logarithm of the average of the monthly wage which notified to the social security fund in 2014 by the graduates  $i$  from the university  $j$ ;

Umpty model: In the first step of this method, the wage is explained by an umpty model (without any explanatory variable)

$$\text{Level 1 : } Y_{ij} = \pi_{0j} + e_{ij} \text{ with } e_{ij} \sim N(0, \sigma_e^2)$$

$$\text{Level 2: } \pi_{0j} = \mu_0 + \alpha_{0j}, \text{ with } \alpha_{0j} \sim N(0, \sigma_\alpha^2)$$

$\mu_0$  represents the constant of the model and provides an estimate of the overall average of the wage.  $\alpha_{0j}$  represents the error associated with each institution  $j$ . Each average relating to an institution veers away from  $\mu_0$  of the quantity  $\alpha_{0j}$ .

$$\text{Model 0: } Y_{ij} = \mu_0 + e_{ij} + \alpha_{0j}$$

In this first stage, we seek to calculate the ratio  $\rho = \frac{\sigma_\alpha^2}{\sigma_e^2 + \sigma_\alpha^2}$  which is the coefficient of the

inter-class correlation. It measures the inter-institutional variance in the total variance of wages.

Individual model: The second stage consists in introducing into the level 1 model variables characterizing individuals. *NETU* is the variable relating to the number of years of university studies.  $X$  is the matrix of  $k$  individual variables and  $X_{ij}$  is the vector related to individual  $i$  of the institution  $j$

$$\text{Level 1: } Y_{ij} = \pi_{0j} + \pi_{1j}NETU_{ij} + \pi_{2j}X_{ij} + e_{ij}$$

The introduction of these variables helps identify possible effects of composition. That is to say, some wage variations may be due to differences in composition of the students' population.

$$\pi_{0j} = \mu_0 + \alpha_{0j} \text{ avec } \alpha_{0j} \sim N(0, \sigma_0^2)$$

$$\text{Level 2} \quad : \pi_{1j} = \mu_1$$

$$\pi_{2j} = \mu_2$$

$$\text{model 1: } Y_{ij} = \mu_0 + \mu_1NETU_{ij} + \mu_2X_{ij} + e_{ij} + \alpha_{0j}$$

Where  $\mu_1$  represents the estimate of the rendement of one year spent in higher education.  $\mu_2$  represents the effect of individual variables on wages

Complete model: The last step of this method consists in introducing simultaneously individual variables in the level 1 model and institutional variables in the level 2 model. First of all, we consider a multilevel model to measure only the direct effect of the educational institution variables on the graduates' wage. In this case we assume that the institution variables affect only the constant term  $\pi_{0j}$ . In this model we consider the matrix  $E$  that of institution variables and  $E_j$  the vector  $m$  variables relating to the institution  $j$ .

$$\pi_{0j} = \mu_0 + \gamma E_j + \alpha_{0j} \text{ avec } \alpha_{0j} \sim N(0, \sigma_0^2)$$

$$\text{Level 2} \quad : \pi_{1j} = \mu_1$$

$$\pi_{2j} = \mu_2$$

$$\text{model 2a: } Y_{ij} = \mu_0 + \mu_1NETU_{ij} + \mu_2X_{ij} + \gamma E_j + e_{ij} + \alpha_{0j}$$

As a second step, we determine the indirect effect of institutions variables on wages. We assume then that these variables act on the wage throughout the years of university studies (NE). The coefficient  $\pi_{1j}$  for the number of years of study varies thus from one institution to another

$$\pi_{0j} = \mu_0 + \gamma_0 E_j + \alpha_{0j}$$

$$\text{Level 2 : } \pi_{1j} = \mu_1 + \gamma_1 E_j + \alpha_{1j} \quad \text{with } \begin{bmatrix} \alpha_{0j} \\ \alpha_{1j} \end{bmatrix} \sim N \left( \begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_0^2 & \sigma_{01} \\ \sigma_{10} & \sigma_1^2 \end{bmatrix} \right)$$

$$\pi_{2j} = \mu_2$$

**model 2b:**

$$Y_{ij} = \mu_0 + \mu_1 NETU + \mu_2 X_{ij} + \gamma_0 E_j + \gamma_1 E_j NETU + [\alpha_{0j} + \alpha_{1j} NETU] + e_{ij}$$

$\mu_1 NETU + \mu_2 X_{ij}$ : The coefficients «  $\mu_1$  » and «  $\mu_2$  » of this term refer to the direct effects of individual variables on wages

$\gamma_0 E_j$ : the coefficient «  $\gamma_0$  » provides an estimate of the direct effects of the characteristics of the institution on the graduate's wage

$\gamma_1 E_j NETU$ : the coefficient «  $\gamma_1$  » evaluates the indirect effects related to institution variables on the graduates' wage.

## 6. Results

We recall that this analysis covers 12 524 graduates from 150 universities. Before beginning the analysis of some possible effects of individual or institutional characteristics, the empty model allows us to assess how the variance is divided between the two levels: individuals and institutions. The results show that the inter-class correlation ratio is 23.3%. This value reflects a high variability of the graduates' wage through academic institutions. These estimates are higher than the average of the results from the literature review. For example, Giret and Goudard (2007) estimate that the inter-class correlation ratio for graduates of higher education in France is around 11.7%.

We introduce individual variables. The variance estimates suggest a decline in the share of variance assigned to institutions  $\rho$  at 8.83%. This result confirms the existence of an effect on the characteristics of the institutions on the graduates' wages.

Table 3 : Distribution of the variance between the two levels

	Empty model	Individual		Direct effect			
		Model 1	Réduction	Model 2a	Réduction	Model 2b	Réduction
Variance within schools $\sigma_e^2$	0,44	0,3	31,6%	0,3	0%	0,3	0%
Variance inter-institution $\sigma_\alpha^2$	0,134	0,029	78,2%	0,019	32,1%	0,008	54,9%
$\rho$	23,3%	8,83%	62,1%	6,58%	25,5%	2,96%	55%

### **Effect of individual variables on wages**

We continue integrating the variables of both individuals and institutions to assess their influence on the graduates' wage. We will start by looking at the relationship between individual variables and the graduates' wages. We have an estimate on the return of the number of years of studies around 14.9%. This means that an additional year of schooling increases the wages of 14.9%. This is comparable to those obtained in other research studies investigating the outputs of education, which vary between 5 and 15% and even more (Maguain, 2007).

We note a significant wage gap between men and women: in similar situations, men earn 20.4% more than women. This result is anticipated since recent studies in Tunisia suggest that women are significantly more affected than men by the overeducated problem (Ministry of Vocational Training and Employment and the World Bank, 2008). Moreover, women face discriminatory practices in the labor market, particularly in the private sector (Gouider, 2009).

Young people who have failed and repeated some years during their schooling period, and thus graduate with a delay are subject to wage penalty of around 9.7% for each repeated year. The fact of living in a region with one point less in the unemployment rate compared to the national average increases the graduate's wage by 0.7%.

The degree's track has also a strong impact on wages. Indeed, compared to graduates from Information and Communication Technologies (ICT), young people benefit from significantly lower wage bonuses. For example, this gap is 12.2% for those graduating from tracks in arts or 18.1% for graduates from the humanities or 22.8% for those graduating from tracks in economics. The other variables included in the model are relatively standard ones. The coefficient associated with the number of years of experience in the last job is 14.3%. This rate is higher than that which is generally obtained. This may be due to the fact that we observe the first four years of

graduates' working life, during which experience offers a higher wage perk. The coefficient associated with experience in the labor market is 3.8%. This value can be explained by the fact that around 75% of young people who are included in our study have not changed jobs since entering the labor market.

We notice a significant wage gap between graduates working in large companies and those who are self-employed (-57.8%). This wage gap is reduced compared to those working in micro enterprises (-7.5%). Regarding small firms, their employees receive wage 9.1% higher than those working in large firms. This can be explained by the fact that large companies are structured and governed by laws where wage negotiations are more difficult than in small companies. Furthermore, salary differences depend on business sectors. Indeed, most companies operating in the field of Information and Communication Technologies (ICT) are small and medium enterprises. The salaries associated with such activities are generally higher than those of other sectors. Several studies, including those conducted by CRES and by the ILO in 2011, confirm this observation. Moreover, there is no significant wage difference between those working in large companies or in medium-sized enterprises.

The marital status variable is not significant, unlike what is expected. Moreover, cross-checking this variable with the variable gender leads us to note the lack of any relationship with the wage. In addition, we do not have information on the parents' social status since we are using administrative data. In Tunisia, the variables associated with the parents' social status are usually not significant in the case of higher education graduates. Indeed, Ben Halima et al. (2012) relied on graduates' tracer survey of 2004 which included several variables on the parents' social status. They suggest that the variable relating to a father who works in the public sector has no effect on the graduate's wages.

Table 4 : The direct effect of the variables on wages

Variable	Individual Model		Direct effect			
	Estimation	Standard deviation	Modèle 2a		Modèle 2b	
			Estimation	Standard deviation	Estimation	Standard deviation
<b>Constant</b>	5,278 ***	0,043	4,914 ***	0,079	5,615 ***	0,105
<b>Nb. Years studies</b>	0,17 ***	0,01	0,149 ***	0,01	0,132 ***	0,01
<b>Man</b>	0,203 ***	0,011	0,204 ***	0,011	0,204 ***	0,011
<b>School delay</b>	-0,098 ***	0,012	-0,097 ***	0,012	-0,094 ***	0,012
<b>Unemployment differential 2014</b>	0,008 ***	0,001	0,007 ***	0,001	0,007 ***	0,001
<b>Tracks</b>	<b>Reference TIC</b>					
<b>Arts</b>	-0,233 ***	0,051	-0,122 ***	0,05	-0,206 ***	0,043
<b>Law</b>	-0,153 ***	0,052	-0,156 ***	0,05	-0,194 ***	0,044
<b>Economy &amp; Management</b>	-0,057 ***	0,02	-0,057 ***	0,02	-0,062 ***	0,019
<b>Language</b>	-0,107 **	0,044	-0,037 **	0,043	-0,074 **	0,037
<b>Health</b>	NS	-	NS	0,046	NS	-
<b>Applied science</b>	-0,047 ***	0,019	-0,049 ***	0,019	-0,052 ***	0,019
<b>Human science</b>	-0,236 ***	0,046	-0,181 ***	0,045	-0,216 ***	0,039
<b>Sciences</b>	-0,22 ***	0,028	-0,228 ***	0,027	-0,218 ***	0,027
<b>Experience</b>	0,039 ***	0,004	0,038 ***	0,004	0,038 ***	0,004
<b>Experience<sup>2</sup></b>	0 ***	0,0004	0 ***	0,0004	NS	-
<b>Seniority</b>	0,143 ***	0,004	0,143 ***	0,004	0,143 ***	0,004
<b>Seniority<sup>2</sup></b>	-0,005 ***	0,0002	-0,005 ***	0,0002	-0,005 ***	0,0002
<b>Type company</b>	<b>Reference Large Company</b>					
<b>Independent</b>	-0,571 ***	0,02	-0,578 ***	0,02	-0,582 ***	0,02
<b>Micro Enterprise</b>	-0,073 ***	0,017	-0,075 ***	0,017	-0,075 ***	0,017
<b>Small business</b>	0,091 ***	0,015	0,091 ***	0,015	0,092 ***	0,015
<b>Medium Enterprise</b>	NS	-	NS	-	NS	-
<b>BAC success rate (decree 92)</b>			0,005 ***	0,001	0,001 *	0,001
<b>Permanent teaching staff « corps A » /100 students</b>			0,049 ***	0,01	0,026 ***	0,008
<b>Rate benef. AMAL / 100 graduates</b>			-	-	-0,008 ***	0,001
<b>Adjusted R<sup>2</sup></b>	0,48	-	0,5	-	0,5	-
<b>N<sub>ind</sub></b>	12 524	-	12 524	-	12 524	-
<b>N<sub>insti.</sub></b>	150	-	150	-	150	-

### Institutions effects on wages

We explain the effects of institutions on the graduates' salaries. We notice that the presence of the 'corps A' (professors and associate professors) for 100 students leads to an increase in wage equal to 4.9%. This variable is significant insofar as it reflects the quality of teaching and research at universities. Empirical studies lead to nuanced results: while some give evidence of a positive effect of the number of teachers and the salary, others conclude that no such effect exists (Giret et Goudard, 2007). In this work, we were able to confirm the existence of a relationship between the

number of teachers and the wage when we took into account both the experience and affiliation of all the working in the higher education institutions. The overall rate of teaching staff does not affect the wage. This leads us to think that resorting to supply nonpermanent teachers and / or contractual employees to offer some courses in the institutions that lack teachers, does not necessarily improve the quality of the training.

Moreover, the relatively small increase in the Baccalaureate success rate for the 2010 graduates, according to the decree of 24<sup>th</sup> June 1992, indicates to a 0.5% increase in wages. The simulation of tighter conditions for succeeding in the Baccalaureate underscores the fact that a young Baccalaureate holder who comes from an institution where almost all students have passed this national exam sends a signal to employers about the quality of this educational institution and the skills of young people graduating from it. On the other hand, this result suggests that it is also a reinforcement of skills and competences (general and / or specific) due to the favorable and competitive academic environment.

In another variant of the complete direct effect model (model 2b), we introduce a variable relating to the share of the estimated unemployed using the rate of those enrolled at the program "AMAL" for 100 graduates. It is negatively correlated with wages (-0.8%). In fact, as we saw in section 3.c, young people graduating from institutions with low performance in terms of integrating its graduates into the job market during the previous generations suffer from wage penalties. It should be noted that the variable relating to the graduate's residency region, introduced at the individual level, should capture the regional effect of the labor market. The negative effect of the share of unemployed among the previous generations can be explained by a signal effect of the institutions to the employers. Indeed, according to Spence's signalling theory (1973), the employer will involve certain combinations of 'signals' (education level, type of institution, institutional reputation, professional experience, etc.) and "indices" (gender, age, etc.) to the productive capacities of graduates. The fact that there are many former students graduating from an institution and enrolled in the program 'AMAL' should send a signal of weak performance and inadequate skills in the labor market to the employers.

We don't find a significant effect of the institution's age on wages. Indeed, the university's social activities should normally allow to train and mobilize networks in particular through alumni relations. However in Tunisia, the lack of such activities deprives especially the oldest establishments of this comparative advantage. Graduates who attended the old institutions do not generally maintain links with their graduation university. It could have improved returns in the labor market for the following generation.

Finally, we note that neither the seat-capacity nor even the pressure made during enrollment has an effect on wages.

### **Indirect Effects of the Institution's Variables on wages**

In this final step, we integrate both individual variables and institutions variables. We also add the number of schooling years variable as a random effect. This model allows us to get rid of the constraint previously imposed and which establishes the same relationship between the number of schooling years and graduates' wages in all higher education institutions. Thus, we can reply to this level if the performance during a year of education varies from one institution to another.

We note that the covariance between the constant and the number of schooling years is significantly negative. This result confirms that the return to education varies between institutions. Thus the impact of an educational year is positive but it is relatively less important in institutions where the average wage is high.

The results suggest that the performance of one year of education is slightly less important for institutions specialized in legal studies and humanities. This can be explained by the fact that some occupations associated with these tracks are regulated. For example, to become a lawyer, a solicitor or a judge requires a definite number of years of education. This regulation deprives young people from deciding whether to carry on their university studies, which could lower the performance of an additional year of education.

Furthermore, we don't find other indirect effects of the characteristics of the institutions on wages. Indeed, the results suggest that there is no link between the output of one year of education and the age of the institution or the human resources deployed.

## **7. Conclusion**

This study aims at questioning the links between the individual's characteristics, the characteristics of higher education institutions and the graduates' wages in Tunisia. To do this, we relied on data derived from various administrative records of the Ministry of Higher Education and Scientific Research, the Ministry of Vocational Training and Employment and the National Social Security Fund. In addition, we have opted for a multilevel modeling.

The key findings presented in this study is the existence of an institution effect on the graduates' wages: the inter-institution variance represents 23.3% of the total variance. Individual variables (ie the number of schooling years, education track, gender, school delay, the unemployment differential in 2014, experience in the labor market, etc.) have an impact on wage. However, our research does not highlight a relation between marital status and education return.

Furthermore, we explain that the effects of institutions pointed out are mainly due to three characteristics of higher education institutions in Tunisia. The first is the availability of full-time 'Corps A' (Professors and associate professors) for 100 students, which we explain as an effect on the quality of teaching and research at universities. The second significant feature is the success rate in the Baccalaureate exam according to the decree of 24<sup>th</sup> June 1992. This result shows that institutions that have attracted the "good graduates" are doing better than others in the labor market. The opening of higher education to "ill-prepared" graduates can lead to an inflation of degrees, which like any inflation, tends to reduce their market value. This is fueled by the strategy to prolong the years of education adopted by the youth who would avoid joblessness. Barouni and Broecke (2014) noted that Tunisia has both a relatively high number of graduates among the working age population and a return to higher education among the lowest in the 12 countries studied. On the other hand, this can also be attributed to stronger academic performance due to a favorable academic environment in the most selective institutions. The third is the rate of unemployment estimated by means the rate of those enrolled at the program "AMAL" for 100 graduates and which can be interpreted as a signal for employers. The fact of pursuing studies at an institution with a high number of graduates enrolled at the program "AMAL" during the previous generations should send a signal of weak performance and inadequate skills in the labor market to the employers.

We have also tried to highlight the indirect effects which the characteristics of higher institutions have on wages. The output of one year of education varies between institutions: the institutions of the legal and human sciences offer a wage increase for one additional year of education which is less significant than other institutions. This could be explained by the fact that some jobs associated with these tracks are regulated. For example, becoming a lawyer or a judge requires a definite number of years of education.

The results of this study do not highlight an indirect influence of other institutions variables on the education return in Tunisia.

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## Appendix

**Table A: Comparison of means according to the rules of calculation in 1992 versus 2001**

Finale average	Decree 2001		Decree 1992	
	Frequency	Percent	Frequency	Percent
<b>6</b>	-	-	34	0,04
<b>7</b>	-	-	1351	1,7
<b>8</b>	-	-	13519	17,01
<b>9</b>	22137	27,86	20559	25,87
<b>10</b>	22993	28,93	15284	19,23
<b>11</b>	12122	15,25	9403	11,83
<b>12</b>	7421	9,34	6027	7,58
<b>13</b>	4936	6,21	4353	5,48
<b>14</b>	3483	4,38	3117	3,92
<b>15</b>	2744	3,45	2523	3,17
<b>16</b>	2039	2,57	1825	2,3
<b>17</b>	1183	1,49	1080	1,36
<b>18</b>	395	0,5	380	0,48
<b>19</b>	13	0,02	11	0,01
<b>Total</b>	79466	100	79466	100

**Table B: Indirect effects of variables on wages**

Variable	Complect model Indirect effect Model 3	
	Estimation	Standard deviation
Constant	5,611 ***	0,112
Nb. Years studies	0,128 ***	0,014
Man	0,204 ***	0,011
School delay	-0,094 ***	0,012
Unemployment differential 2014	0,007 ***	0,001
<b>Track</b>	<b>Reference TIC</b>	
Art	-0,197 ***	0,044
Law	-0,189 ***	0,043
Economy & Management	-0,053 ***	0,019
Language	0,076 *	0,057
Health	NS	-
Applied science	-0,049 ***	0,019
Human science	-0,081 *	0,055
Sciences	-0,208 ***	0,027
Experience	0,038 ***	0,004
Experience <sup>2</sup>	NS	-
Seniority	0,143 ***	0,004
Seniority <sup>2</sup>	-0,005 ***	0
<b>Type company</b>	<b>Reference Large Company</b>	
Independent	-0,583 ***	0,02
Micro Enterprise	-0,076 ***	0,017
Small business	0,091 ***	0,015
Medium Enterprise	0,031 **	0,013
BAC sucess rate (decree 92)	0,001 *	0,001
Permanent teachers « corps A » /100 students	0,026 ***	0,014
Rate beneficiary AMAL / 100 graduates	-0,007 ***	0,001
Nb. Years Studies X dominant right & human sciences institutions	-0,053 ***	0,016
Constant variance $\sigma_0^2$	0,092 ***	0,027
No. variance. years of education $\sigma_1^2$	0,007 ***	0,002
Covariance $\sigma_{01}$	-0,024 ***	0,007
Variance within schools $\sigma_e^2$	0,299 ***	0,004