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EDUCATION, EARNINGS AND RETURNS
TO SCHOOLING IN TUNISIA

Imed Limam and Abdelwahab Ben Hafaiedh

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Send correspondence to:
Imed Limam
Arab Fund for Economic and Social Development
ilimam62@gmail.com

Abstract

This paper aims at identifying the main determinants of earnings, estimating the private returns to education and highlighting the main sources of heterogeneity in these returns in Tunisia. The estimation results show that education is an important determinant of private earnings. However, the private rate of return to schooling is relatively low by international standards, especially for basic education. It is argued that in addition to the limited capacity of the economy to create high-productivity jobs, institutional factors such as the low quality of education, rigid tracking system after secondary education, inadequacy of the available skills for the need of the private sector and nepotism may explain the low and heterogeneous returns to education in Tunisia. The returns to schooling are found to increase by level of education showing a systematic bias toward higher levels of education at the expense of basic education, due to credentialism and focus on certification. We find evidence of heterogeneity of returns to higher education across varying regions and socioeconomic backgrounds, which undermines the role of education as a social elevator. Regional disparities by place of residence, both in earnings and returns to higher education, may be explained by the lack of economic opportunities and low exposure to market forces in many inland regions, which is reminiscent of an unbalanced regional development. These disparities may also be attributed to information failure as good employment opportunities are less visible to jobseekers in rural and inland areas. We also argue that rural-urban disparity in returns to higher education by place of birth may be explained by differentiated early-life conditions in terms of socio-economic and family backgrounds as well as inequality of opportunity in access to quality education. Moreover, educational wage differentials are found to be significant between the formal private sector and the informal sector, between the public and private sectors and across occupational categories. These results are used to suggest directions to strengthen the role of public policies in reducing inequality of opportunities in both schooling and earnings.

JEL Classifications: J1

Keywords: Education; Earning; Returns to school; Tunisia.

ملخص

تهدف هذه الورقة إلى تحديد المحددات الرئيسية للدخل، وتقدير العوائد الخاصة للتعليم، وتسليط الضوء على المصادر الرئيسية لعدم التجانس في هذه العائدات في تونس. وتدل نتائج التقدير على أن التعليم هو أحد المحددات الهامة للعائدات الخاصة. ومع ذلك، فإن معدل العودة الخاص إلى التعليم منخفض نسبيا وفقا للمعايير الدولية، وخاصة بالنسبة للتعليم الأساسي. ويقال إنه بالإضافة إلى محدودية قدرة الاقتصاد على خلق وظائف ذات إنتاجية عالية، فإن العوامل المؤسسية مثل تدني جودة التعليم، ونظام تتبع جامد بعد التعليم الثانوي، وعدم كفاية المهارات المتاحة لحاجة القطاع الخاص، قد يفسر العائدات المنخفضة وغير المتجانسة للتعليم في تونس. ويتبين أن العائدات إلى التعليم تزداد حسب مستوى التعليم الذي يظهر تحيزا منهجيا نحو مستويات أعلى من التعليم على حساب التعليم الأساسي، وذلك بسبب الاعتماد والتركيز على إصدار الشهادات. نجد أدلة على عدم التجانس في عوائد التعليم العالي عبر مختلف المناطق والخلفيات الاجتماعية والاقتصادية، مما يقوض دور التعليم كمصعد اجتماعي. ويمكن تفسير الفوارق الإقليمية حسب مكان الإقامة، سواء في الأرباح أو في التعليم العالي، بسبب الافتقار إلى الفرص الاقتصادية والتعرض الضعيف لقوى السوق في كثير من المناطق الداخلية، الأمر الذي يذكرنا بالتنمية الإقليمية غير المتوازنة. ويمكن أن تعزى هذه التفاوتات أيضا إلى فشل المعلومات نظرا لأن فرص العمل الجيدة أقل وضوحا بالنسبة للباحثين عن عمل في المناطق الريفية والمناطق الداخلية. ونرى أيضا أن التفاوت بين الريف والحضر في العودة إلى التعليم العالي حسب مكان الولادة يمكن تفسيره بظروف متباينة في الحياة المبكرة من حيث الخلفيات الاجتماعية والاقتصادية والأسرية فضلا عن عدم تكافؤ الفرص في الحصول على التعليم الجيد. وعلاوة على ذلك، يتبين أن الفوارق في الأجور التعليمية هامة بين القطاع الخاص الرسمي والقطاع غير الرسمي، وبين القطاعين العام والخاص وعبر الفئات المهنية. وتستخدم هذه النتائج لاقتراح اتجاهات لتعزيز دور السياسات العامة في الحد من عدم المساواة في الفرص في كل من التعليم والدخل.

1. Introduction

Since its independence in 1956, Tunisia has accorded an unwavering support for education both as a source of intellectual capabilities and skills necessary to improve productivity, and as an important vector for inequality reduction and social mobility. However, the substantial investments in education has not always led to a significant leap in productivity and growth. On the other hand, the role of education as a "social elevator" has been hampered by a host of factors, which have resulted in a differentiated access to education, school attainment and labor market outcomes.

As in many countries of the Middle East and North Africa (MENA) region, the social return to education in Tunisia, measured by its contribution to total factor productivity, has been very modest (El-Erian, Helbling and Page, 1998, Makdisi, Fattah and Limam, 2007). A number of factors could explain such a low contribution. The most notable of which, is the low quality of education. Moreover, the educational system had been focused on preparing students to work in the public sector where remunerations are set without consideration for productivity or alternative employment opportunities. The modest social return to education may also be due to the deployment of human capital in wasteful and rent-seeking activities with little effect on productivity and growth, typical of countries with perverse institutional environment (Pritchett, 2001).

Previous estimates show that the private returns to education in Tunisia are also low by international standards.[1] Despite the improvement in the overall education level of the labor force and the large supply of educated jobseekers, access to remunerating jobs, especially for the highly educated, remain low and uneven across people and regions.

Analyzing the link between education and earnings and underscoring the causes of heterogeneity of returns to education across people have very important implications for policies aiming at reducing inequality of opportunity both in educational and labor market outcomes. From this premise, using data from the 2014 Tunisia Labor Market Panel Survey (TLMPS, 2014) and from other sources, this paper aims at estimating returns to schooling and analyzing the reasons of the limited success of education to promote upward social mobility in Tunisia by assessing the main sources of observed disparity in these returns.

In section 2, we analyze the organization of the Tunisian education system and the underlying characteristics that may explain the weak link between education and earnings and the heterogeneity in the private returns to schooling. Section 3 provides estimates of the returns to schooling and analyzes the empirical results. Section 4 summarizes the main findings and concludes.

2. The Education System in Tunisia

2.1. Organization and stylized facts

The Tunisian education system comprises three main pillars: basic education, secondary education and higher education. The basic education system includes two cycles: the primary education cycle which is made of six grades from 1 to 6, and the preparatory or pre-secondary cycle made of three additional grades from 7 to 9, leading to the End of Basic Education Certificate. Since September 2007, technical middle schools were established at the 8th and 9th grades of the preparatory cycle leading to the award of the End of Basic Technical Education Certificate, (EBTEC).

At the end of basic education, students are channeled either to a general track or technical track based on both students' choice and grades. The general secondary education track comprises four years made of a first year of common curriculum, after which each student is oriented in

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[1] Most of the available studies, which will be mentioned in section 3, provide estimates of the average rate of return to education in Tunisia below the world average estimated at 10 percent (Montenegro and Patrinos, 2014).

the second year to one of five branches based on performance and scholastic aptitudes. Toward the end of the second-year students are channeled to one of seven sections. At the end of the fourth year, students take the baccalaureate (BAC) exam and are channeled to higher education fields based on their scores in the exam and according to the section they have chosen in the previous two years.

According to the Decree No. 2008-10 dated 11 of February 2008 published in the Official Journal of the Republic of Tunisia, the Vocational Education and Training (VET) system comprises two types of trainings: initial training and continuing training. The initial training is constituted of three diploma-conferring cycles: The first cycle leads to the award of the "Certificat d'Aptitude Professionnelle" (CAP) diploma., open to those who have pursued their studies until the end of the ninth year of Basic education (preparatory, technical and general). The second cycle comprises two branches: a branch leading to the award of the "Brevet de Technicien Professionnel" (BTP), open to holders of the CAP diploma and those who have continued their studies until the end of the second year of secondary education, and a second branch leading to the Professional Baccalaureate open to successful candidates holding the (CAP) diploma and those who have successfully completed the second year of secondary education. In addition, recipients of the BTP certificate may be authorized to apply for the examination of the Professional Baccalaureate.

Students holding a Professional Baccalaureate can enroll in a two-year "Brevet de Technicien Supérieur" (BTS) in branches that may lead to higher education institutions.[2] The above certificates namely, CAP, BTP and BTS are part of the Vocational Education and Training (VET) system, which is under the jurisdiction of the Ministry of Vocational Training and Employment, in coordination with other relevant ministries and agencies.

The other component of VET system in Tunisia, continuing training, aims at developing the knowledge and skills workers, with a view to improving their productivity and strengthen the competitiveness of enterprises. Training may be conducted by the enterprises themselves or through public and private training institutions.

VET represents the Achilles heel of the Tunisian education system. Historically, VET has been perceived as a catching up process for those who failed general education. In 2008, about half of those who have chosen VET have done so after 1 to 5 years of dropping out from a general education institution.[3] VET attracts only a small fraction (less than 5 percent) of the student-age population, and cursory evidence shows that there is an increasing resentment to VET. For instance, there has been a marked decline in the number of students in basic technical education from 16.8 thousand in 2010 to 12.1 thousand in 2014.[4] This may be a prelude for future decline in the number of VET trainees since the public sector dominated VET apparatus has shown limitations in terms of giving youth promising professional alternatives and anticipating market needs in the different sectors.

Since September 2006, the higher education system has progressively moved to a "Bachelor-Master-Doctorate" (LMD) system based on three-degrees: a three-year Bachelor degree "Licence", a two-year Master degree and a 3-year Doctorate degree. Many Higher Educational Institutions also offer short-cycle education awarding the degree of "Technicien Supérieur". The diagram in Figure 1 summarizes the main features of the Tunisian education system.

During the academic year 2014/2015, the Tunisian education system hosted about 2.1 million students at the basic and secondary education levels distributed over 6.6 thousand educational

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[2] Although stipulated in Decree No. 2008-10 dated 11 of February 2008, up until the writing of this paper, the "BAC Professionnel", which marks the end of secondary technical education has not been implemented. Also, secondary schools exclusively dedicated for post-basic education technical tracks are yet to be created.

[3] ILO et al. (2013), op. cit.

[4] Ministry of Education (2015b).

institutions, 589 of which are private. In addition, about 323 thousand students were registered at the higher education level distributed over 264 higher education institutions, 61 of which are private.[5]

Since its independence, education has been considered as a national priority. Over the period 2007-2013, education has had an average share of about 15 percent of public spending and 4.6 percent of GDP, surpassing what many developing countries with similar income per capita allocate to education. The net enrollment rate for people aged between 6 and 11 has reached about 99 percent in the year 2014/2015, 81 percent for the 12-18 years' age bracket and about 36 percent for people between 20 and 24.

As a consequence, the mean years of schooling for population aged 15 and above increased from 1.79 in 1970 to 7.48 in 2010.[6] According to the latest version of the Barro and Lee dataset for the year 2010, comprising 146 countries, Tunisia has ranked among the top twenty countries in terms of schooling increases.[7] Tunisia has also experienced a noticeable improvement in average class sizes in basic and secondary public schools declining from 33.1 in the academic year 1989/1990 to 25.1 in 2014/2015, and in pupil-teacher ratio, which declined from 19 to 12 during the same period.[8]

2.2. The challenges from within the education system

The education system has undergone a series of important reforms starting from the 1958 reform laying the foundations of the post-independence system and adopting the principle of universal access to education. The law enacted in 1991, made schooling compulsory for people between 6 and 16 years of age, and created the basic education system described in Figure 1. At the same time, the 1991 law abolished the previous mandatory exam at the end of the primary school and replaced both the short cycle of post-primary vocational education and technical education at the secondary school, by a new technical and vocational track.[9] The 2002 law generalized pre-primary education in the public sector and introduced support programs for children with difficulties at school. The 2000s saw also the promulgation of important reforms aiming at improving the quality of education notably by providing more options in technical and vocational education, creating pilot middle-schools, encouraging private education, strengthening higher education by improving its link with the labor market through the launching of the LMD system. However, despite these reform efforts the education system is facing many serious challenges, which are undermining the role of education as social elevator and eroding its exchange value in the job market.

2.2.1. Low quality

The increase in the enrollment ratios, improvements in the classroom sizes and pupil-teacher ratio have not been even across regions and have not been matched by improvements in the quality of graduates and educational outcomes. Access to education remains unequal, especially between urban cities and rural areas in the inland regions.[10] Moreover, the considerable growth in enrollment ratios at all levels of education was not accompanied by equal opportunity of access to the same quality of educational infrastructure and teachers.

Among the indicators of the low quality of education is the declining internal efficiency of the basic and secondary education system exemplified by the alarming increase in repetition and dropout rates, which have reached for basic and secondary education 17.7 percent and 5.5

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[5] Ministry of Education (2015), and Ministry of Higher Education (2015a).

[6] Based on the World Bank EDSTATS Database, accessed December 17, 2015.

[7] See http://www.barrolee.com.

[8] Ministry of Education and Ministry of Higher Education (2015, op. cit).

[9] ILO et al. (2013).

[10] Trabelsi (2013).

percent, respectively.[11] The dropout rates are 12.5 percent at the secondary level, 10.2 percent for the preparatory level and less than 1 percent for the primary level. Most of the dropout occurs at grades 4, 5 and 6 for the primary level, grade 7 for the preparatory level and during the first year of secondary education, at grade 10.

Recent studies have revealed that the difficulties at school are mostly linked to the socio-economic background of students, with marked regional disparities.[12] For instance, in the governorate of Jendouba in 2011, it was found that for 37 percent of students who dropped out of schools for work had an unemployed father, 97 percent of the cases had an unemployed mother and 82 percent of the cases an illiterate mother.[13] These studies found that Center-West governorates tend to have lower enrollment rates than other governorates. In addition, children in rural areas have access to lower quality educational infrastructure and are more likely to leave school for work than their peers in urban areas.

Although school dropout is often attributed to the poor socio-economic and family backgrounds of the students, it is also directly linked to factors affecting the quality of education such as, the inadequacy of the curriculum, outdated program contents, archaic teaching methodology and poor teachers' qualifications, in addition to weaknesses in the overall governance of the education system.[14]

In this respect, education has been plagued by governance problems including weak external and internal accountability, inadequate regulation and quality control. Teachers' absenteeism is widespread and qualifications of teachers have deteriorated over the years. This state of affairs has led to the erosion of trust in the education system and encouraged dropout and resort to personal connections and corruption as survival tools. [15] [16]

Although there are no published indicators for measuring education quality through cognitive skills – literacy and numeracy – acquired through basic schooling in Tunisia, other proxies are quite revealing.[17] For instance, the proliferation of private tutoring at all levels of education[18] and the poor results of Tunisian students in international competitions in math and science are indicators of the low quality of education.

Success in schooling has increasingly become determined by spending on private lessons. Based on the sample provided by the TLMPS (2014) survey, it is estimated that about 12 percent of those who went to school have either taken private lessons or sought after-school help. Moreover, the data also show that more than 50 percent of those who took private lessons were taught by own classroom teachers/professors, who are likely to reward disproportionately the more privileged who can pay for the private lessons at the expense of those who cannot afford them. As a consequence, the role of education as social elevator is undermined, learning is sacrificed for grades, and the whole education system becomes more focused on passing exams than on learning acquisition.

Another indicator of the low quality of education, is the poor score of Tunisian students on the Programme for International Student Assessment (PISA) test, which assesses fifteen-year old's level of acquisition of applied knowledge and skills in reading, math and science, and which represent a good indicator of the employability of graduates, are much below international

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[11] Nsiri (2015).

[12] Tunisia Country Report on Out-of-School Children, UNICEF & Ministry of Education, October 2014.

[13] ILO et al. (2013), op. cit.

[14] Ministry of Education (2016) and Nsiri (2015), op. cit.

[15] Faour (2015).

[16] Brixi (2015).

[17] Nsiri, op. cit. indicates that Tunisian students at the end of high school lag their peers in the developed countries in terms of skill acquisition by about three years.

[18] Ministry of Education (2016), op. cit.

average. For the 2012 PISA test, the ranking of Tunisia out of the 65 participating countries was 56 for reading with a score of 404 (compared to 496 points in OECD countries), 60 for math with a score of 388 (494 points in OECD countries), and 61 for science with a score of 398 (501 points in OECD countries).[19]

Available evidence also points to the low quality of higher education.[20] Courses are increasingly taught by less experienced part-timers and assistant professors.[21] The low quality is also due to the fact that higher education institutions continue to be centrally managed by the government through budgetary allocations and students tracking. The budgetary allocations are not merit or outcome-based, hence stifling competition among and within institutions, and reducing incentives for better performance. Despite the high average success rate as a whole, estimated at about 88 percent, repetition, dropout and de-motivation among students are on the rise.[22]

2.2.2. Overly selective and rigid tracking system

As in many countries of the MENA region, the education system is characterized by the prevalence of a logic of selection over that of learning.[23] The over-emphasis on selection in Tunisia is best epitomized by the rigid tracking system especially after the BAC exam. This system orients students to majors in higher educational institutions based on the score they obtain in the BAC exam at the end of secondary education (Figure 1). Students with high scores are channeled to fields that are in high demand for they offer better paying jobs. These fields include medical studies, engineering and business and management in top higher-education institutions. Figure 2 shows the mean wage per main fields of university graduates.

The choice of studying in certain institutions is often conditioned by the cultural and the socio-economic backgrounds of students. Figure 3, which is based on Zaiem (2011), shows that students from low-income brackets whose parents are from modest socio-professional categories are more likely to score low in the BAC exam and be oriented toward branches with lower employment prospects and pay, such as Literature, Arts and Humanities, than their wealthier peers.

Data provided in Zaiem (2011) shows that the lowest average scores in the 2010 session of the BAC exam were recorded by the poorest non-coastal governorates. This cursory evidence shows that family background and regional considerations have important implications for school achievement as well as for job market outcomes.[24]

The success rate in the BAC exam has declined from 72 percent in 2002 to 56.6 percent in 2014. Over the same period, the average share of students who have passed the BAC exam and specializing in Literature is 22.8 percent surpassing the other six sections in the secondary school, followed by the sections of Experimental Sciences and Economics and Management (refer to Figure 1).[25] The three sections together represented the majors of about half of the total number of unemployed university graduates for the same period. Therefore, not only has the tracking system been impeding social mobility, it has also contributed to the oversupply of branches of study with limited relevance to the job market needs. Figure 4 shows the high

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[19]   Data available on the internet at: http://pisa2012.acer.edu.au, and analysis of country test results is available at http://gpseducation.oecd.org

[20] Boughzala, Ben Hafaiedh and Ghazouani (2016).

[21] ILO et. al. (2013), op. cit.

[22] Ben Ammar (2009).

[23] Moreno (2015).

[24] This point was also made by the Ministry of Education (2016) "White Book", which represents a road map for reforming the education system in Tunisia.

[25] Ministry of Education (2015a, b).

shares of the fields of humanities, health and social sciences over the period 2009-2013. These fields lead in most cases to public sector jobs.

The current profile of university graduates is also reminiscent of the distorted labor market signals sent by the public-sector dominated job market. The higher wages and benefits provided in the public sector have often resulted in educational choices leading to public sector jobs and a whole education system more focused on certification than on quality of the curriculum. This situation has been exacerbated by a rigid tracking system at the end of secondary school that is not keeping pace with the evolving nature of job requirements.[26]

2.3. Limited relevance of education to labor market outcomes

The relevance of education to the labor market outcomes has been affected by a number of factors. The first factor purports to the increasing mismatch between educational outcomes and labor market needs. The inadequacy of the skills dispensed by the education system is corroborated by the high number of surveyed employers in Tunisia who assert that graduates lack the requisite skills for the job. According to the 2013 World Bank's Enterprise Survey, about 29 percent of interviewed Tunisian employers assert that workers' skills are a leading constraint.[27] Moreover, 70 percent of employers believe that engineers and professionals do not have the required skills for the job.[28]

The second factor explaining the limited relevance of education to labor market outcomes is the concentration of this market in low-productivity and low-wage jobs. This is often attributed to the incapacity of the post-independence economic model to create enough jobs for the fast-increasing educated labor force and to move Tunisia up the value chain.[29] Recent statistics show that while more than 60 percent of new jobseekers are university graduates, about 60 percent of the available jobs are for lower levels of education.[30] This has resulted in high unemployment rates among the highly educated. Currently, about one in every three unemployed has a university degree.[31] Overqualified individuals are increasingly attracted to low-paying jobs, including in the informal sector.

Another evidence of the incompatibility between educational outcomes and labor market needs is the extent of the education-occupation mismatch. The comparison of the educational attainment of workers to their occupational categories based on TLMPS (2014), shows that there is a non-negligible degree of education-occupation mismatch. As shown in Table 1, there are highly educated workers employed in lower occupational categories and under-educated workers employed in higher occupational categories. However, the latter mismatch is more obvious.

For instance, there are about 82 percent of workers with less than secondary-level education employed in occupation requiring a secondary-level education. Moreover, there are about 38 percent of workers with a secondary education or less working in occupations requiring higher-education levels. Heuristic and aggregate as they may be, these figures point to the fact that education is not the only factor determining the allocation of workers over occupational categories.

A number of other factors may also have played an important role in this allocation particularly in Tunisia. In a system where labor market regulations are restrictive and the quality of

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[26] Faour (2015), op. cit.

[27] World Bank, Enterprise Surveys: http://www.enterprisesurveys.org.

[28] World Bank (2014), p. 174.

[29] World Bank (2014), op. cit..

[30] Ministry of Planning and International Cooperation (2013).

[31] INS (2015),

education is low, hence representing an unreliable signal for personal skills and ability, hiring employees with lower levels of education may be perceived as a lower cost option.

From a political economy point of view, Tunisia is a country that witnessed, especially over the past three decades, a situation of crony capitalism where meritocracy in terms of access to jobs has been undermined. In such a context, personal connections and network relationships become far more important for securing employment than education or qualification. This may explain the existence of fairly large proportions of low-educated workers in high occupational categories.

The existence of highly-educated employees in low-occupational categories may be explained by the lack of employment opportunities for highly-educated jobseekers, overstated job specification by some employers, the lack of information on job availabilities and the inadequate use of job searching techniques. Based on TLMPS (2014), less than 4 percent of the jobseekers in the three-months prior to the survey were registered in an employment office.

3. Returns to Schooling in Tunisia

In this section, we estimate the returns to schooling and identify the main sources of heterogeneity of these returns in Tunisia. The main empirical framework used in the literature to measure the relationship between wages and education has been the earnings equation developed by Mincer (1974). It shows how private earnings vary with the level of education and experience while controlling for differences in personal characteristics and family background as well as differences in other pertinent factors that affect earnings. The canonical earnings equation suggested by Mincer to estimate the private returns to education is briefly discussed in the Appendix.[32]

Many studies have estimated the private returns to schooling using the Mincerian framework in a multi-country context. These include the works of Psacharopoulos (1972, 1985, 1994 and 2002), Card (2001), Willis (1986) and Griliches (1977), to name just a few. Meghir and Rivkin (2010) and Blundell, Dearden and Sianesi (2001), have also made excellent reviews of the different methodologies used in estimating returns to education in more recent studies. More recently, Montenegro and Patrinos (2014), have presented comparable private returns to education for 139 economies based on data constructed from 819 national household surveys.

A number of studies have estimated the private returns to education in the MENA countries. These include the works of Assaad et. al. (2016), Tzannatos et. al. (2016), Arbak (2012), Salehi-Isfahani (2009), Huitfeldt and Kabbani (2007); Said and El-Hamidi 2005); Tansel (1994, 2001, 2002 and 2005), Abdulgadir (2003), Wahba (2000) and Assaad (1997); to name just a few. Most of these studies report that the average private returns to schooling are low by international standards. Moreover, these returns tend to be high at the higher education levels.

For the specific case of Tunisia, Zouari-Bouatour (1980) reports an increasing rate of return to education by level of education namely, 5.6 percent for primary education, 19.2 percent for secondary education and 24.6 percent for higher education. Comparing the returns to education based on two national surveys of population and employment, Zouari-Bouatour et al. (2014) report a declining overall rate of return to education from 9.5 percent in 1980 to 5.9 percent in 1999. This decline has affected, males and females, urban and rural areas, and all levels of education with higher education being affected the most due to the lack of demand for high-skill labor. They also find increasing returns by level of education, higher returns in urban areas than in rural areas, overall and for each level of education, and higher returns for females than for males.

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[32] The canonical Mincerian earnings equation has been applied and extended in a wide variety of ways and contexts. For reviews of the early studies on the link between education and earnings, see for instance, Psacharopoulos (1972, 1985, 1994 and 2002), Griliches (1977) and Card (1999, 2001).

A few international comparative studies have also provided average returns to education in Tunisia for different points in time. For example, Pscharopoulos (1994) reports a total rate of return to education in Tunisia of 8 percent for 1980. On the other hand, King et al. (2010) report a rate of return equals to 6.5 percent for 2001, while Montenegro and Patrinos (2014) estimate the average rate of return at 8.5 percent for the same year.

3.1. Description of the data

The data is drawn from the Tunisian Labor Market Panel Survey for 2014. The survey includes data on 16430 respondents in relation to their personal and family background, education, employment and job characteristics. The data used in the estimation of the earnings equations in this paper include only respondents aged 15-64 with positive earnings and who are not enrolled in schools. Figure 5 provides the percentage distribution of this sample by educational attainment.

Earnings represent the most binding data constraint since only 1561 individuals have positive income and all of them belong to the wage employees' category, which represents about 60 percent of the employment categories in the whole sample.

Earnings data for other employment categories such as employers and self-employed are not available. These data constraints not only limit the generalizability of the findings but also reduces the reliability of results when there is a need to slice the dataset into smaller subsets to compare between groups or geographical areas, especially for the purpose of estimating separate earning models.

The second problem is that of missing or lack of data on other relevant variables in the relationship between earnings and education. This precludes us from accounting for the effect on earnings and returns to education of variables such as, the quality of education, the participation in employment programs and VET education.

Table A1 of the Appendix provides description and summary statistics for the main variables used in the empirical part of the paper. The empirical analysis relies on the estimation of various versions of the Mincerian earnings equation. In all these versions, the dependent variable used is the logarithm of the hourly wage at the respondent's most recent primary job. It should be mentioned that although earnings may be estimated by wages over different time periods, the measure of earnings used in this paper is hourly wage. This is premised on the fact that hourly wage reflects productivity, which is the part of earnings (the product of hourly wage and hours of work) that is more connected to the level of education. In contrast, wages measured over longer periods, such as monthly or yearly tend to reflect participation in the labor market, which may be related to other factors not necessarily related to education.

The hourly wage is obtained by dividing the monthly earnings from the primary job by the number of hours worked per month. No data on non-monetary earnings are available and hence were not included. Data on earnings include premium, supplementary salaries, bonuses and overtime on top of regular wages. These are included as part of the wages because they tend to reflect personal characteristics and education. Thus, excluding them will lead to an underestimation of returns to education.

Since the number of completed years of education is not directly available from the survey, it is calculated based on respondents' self-declared level of educational attainment and last level of school attended.[33] In other words, years of schooling are estimated from the life events calendar and not by assigning a number of years to each education level. Education attainment is estimated both as years of schooling and as education level. This is based on the fact that

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[33] The data on the estimated hourly wages, years of education and effective years of work experience were calculated and kindly provided by Caroline Krafft.

using the number of years of completed education to estimate the returns to education may not reflect the heterogeneity of returns across different education levels and education streams.

Unlike many studies in the literature, experience was estimated based on historical record and not the usually used potential experience (age-years of schooling- starting school age). Potential experience tends to overestimate effective experience since it includes years of unemployment or interruption of normal work. Work experience is included as a human capital variable, and experience squared is also included to account for the decreasing marginal returns to experience.

3.2. Estimation results

The empirical analysis will proceed in stages. In the first stage, we adopt a parsimonious yet informative specification to estimate the earnings equation for the whole sample as well as by region. In the second stage, we control for many important factors that are simultaneously affecting earnings and account for non-linearity of the relationship between education and earnings. In the third stage, we relax both the assumption of homogeneity and separability of the effect of education on wages. In this stage, heterogeneity of returns to education across individuals is allowed for by making the effect of education on wages depends on location as well as pre-market and in-market characteristics.[34] In the final stage, heterogeneity across individuals is allowed while taking into account self-selection into work states. All estimations, unless otherwise stated, are performed using adequate sampling weights in order to obtain consistent estimates of the corresponding population parameters.

3.2.1. Returns to education and certification effect

Table A2 in the Appendix reports the estimated regressions of the basic Mincerian earnings equation. Column (1) shows that the average marginal return to an additional year of completed education for the whole sample in 2014 is estimated at 7.3 percent, which is much lower than the world average rate of 10 percent reported in the study of Montenegro and Patrinos (2014) covering 819 surveys worldwide. It is also lower than the average rate of return of 9.5 percent for 1980 and higher than the rate of 5.9 percent for 1999, reported in Zouari-Bouatour et al. (2014).

The estimation results confirm the existence of a concave relationship between log hourly wage and experience, hence confirming decreasing marginal returns to experience. The marginal rate of return to experience is estimated at about 2.7 percent for the mean number years of experience in the sample, which is 10 years.

The results also show that log wage is non-linearly related to education. In other words, marginal returns to education are not uniform across education levels. This non-linearity was captured in three different manners (specifications (2)-(4) in Table A2).

In the first specification, the effect of years of education depends on the number of years of education and its square. The results show that the marginal returns to schooling are increasing by level of education, in view of the positive sign of the coefficient of the square of the number of completed years of education in specification (2) of Table A2. In addition to signaling potential heterogeneity in returns to education across individuals (Card 1999, pp. 1810-1815), the higher return for higher levels of education is a feature of systems placing a premium on higher education and certification. This is generally due to the effect of the distorted labor-market signals sent by a predominant public sector through higher wages, better benefits and at times an explicit or implicit policy to systematically hire university graduates. A second explanation for the high returns to higher levels of education, has to do with the fact that for the most part, more-able students are more likely to achieve higher level of schooling and better

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[34] Pre-market characteristics mainly refer to socio-economic background factors and in-market characteristics refer to factors affecting access to employment or earnings and opportunities for training and experience.

labor market outcomes, which is typical of elitist education systems with tough selection criteria and rigid tracking into higher education levels, like the one in Tunisia.[35]

In the second specification provided in column (3) in Table A2, non-linearity is captured through a discontinuous spline to test whether returns to education increase disproportionately during diploma years.[36] The variables (S≥13) and (S≥17) represent dummy variables equal to 1 if the number of completed years of education is greater than or equal to 13 and 17, respectively, corresponding to the baccalaureate year and bachelor's degree year, and equal to zero otherwise. These dummy variables allow for testing the presence of sheepskin or diploma effect. The variable (S≥13)*(S-13) is the interaction of (S≥13) and the variable (S-13). It represents the returns differential between those above 13 years of education and those below that level.

The positive and significant dummy coefficients for (S≥13) and (S≥17) point to the importance of the wage gain for obtaining the BAC diploma and university degree. The effect of one additional year of schooling on the logarithm of hourly wage is about 0.0243 for those below 13 years of schooling, increases to about 0.416 (0.0243+0.3916) for the 13th year of education corresponding to the holders of the BAC diploma, diminishes to 0.047 (0.0243+0.0228) between the 14th and 16th years of education, and climbs up to 0.617 (0.0243+0.5702+0.0228) for those with 17 years of education or more. The null hypothesis of no sheepskin effect was rejected at the 0.01 significance level.[37] This result points clearly to the importance of signaling and certification in explaining wage differentials in Tunisia.

In the third specification, the effect of education on log wage depends on the level of education, namely Primary, Preparatory, Secondary, Intermediate and University. In order to estimate the return to education by level, we follow the conventional methodology used in the literature consisting of estimating the return at each level k by the difference between its coefficient and the coefficient corresponding to the previous level (k-1) divided by the number of incremental years of schooling between the two levels. Since not all the dummy variables corresponding to each level of education can appear in the estimation equation, a level of education has to be taken as reference. In specification (4), it is the level of Less than Primary. In this case, it is conventional to estimate the return to the primary level as the ratio of its estimated coefficient and the number of years of schooling in primary, and to assign only three years for this level. This stems from the fact that students at later years of primary education may work for money, and therefore not all years of primary correspond to foregone income or opportunity cost.[38]

Based on the estimation of specification (4), the average return to education by level is 3.3 percent for the primary level, -0.001 percent for the preparatory level, 10.3 percent for the secondary level, 16.6 percent for the intermediate level and 23.1 percent for the university level. Unlike the regularity detected in early cross-country studies, such as in Psacharopoulos (1994), of decreasing marginal returns to schooling by level of education, our results show that the returns to schooling in Tunisia tend to increase with the level of education. They are in line with the results of previous studies on Tunisia such as those of Zouari-Bouatour (1987) and Zouari-Bouatour et al. (2014).

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[35] Salehi-Isfahani (2009), reached similar conclusions in his comparison of the structure of returns in Egypt, Iran and Turkey, and so did the studies on Tunisia by Zouari-Bouatour (1987) and Rejeb (1976), cited in Zouari-Bouatour's study .

[36] Spline functions have been suggested to capture non-linearity and discontinuity in the relation between earnings and their explanatory variables. See for instance, Hungerford and Solon, 1987; Belman and Heywood 1991, and Jaeger and Page, 1996.

[37] The F-statistic of the test: (S≥13) = (S≥17) =0, is 15.83. It is significant at the 0.01 level.

[38] On the methodological issues involved in the estimation of the returns to education see for instance, Psacharopoulos (1994 and 1995).

In addition, while the average rate of return for primary school in Tunisia is found to be lower than the world average of 10.6 percent, the average rate of return for the tertiary level, namely intermediate and university, is higher than the world average of 15.2 percent.[39]

3.2.2. Regional earnings and returns to education differentials

In this section, we investigate whether the regional dimension matters in explaining earnings and returns to education differentials. We assume that earnings depend on the level of education and on years of experience and its square, while controlling for the effects of regions (governorates), residence category (large/small cities or rural areas) and birthplace. Table A3 in the Appendix shows the determinants of earnings of the different levels of education for the whole sample (column (1)) and by place of residence (columns (2)-(3)). The results show that earnings increase with the level of education for the whole sample and by place of residence, hence lending further evidence to the importance of credentials as an important determinant of earnings in Tunisia. Table A3 – column (1) shows that, holding other variables constant, a holder of a university degree or higher earns about 263 percent more than a person in the reference group of less than primary education level.[40] Other things being equal, respondents living in rural areas tend to have lower wages than their peers living in large cities, which are taken as reference.

In terms of geographical areas, respondents living in the non-coastal Western areas are found to have lower wages than the reference area of Greater Tunis. The wage differential in comparison with the area of Greater Tunis is largest and statistically significant for the North-West area. The hourly wage rate in the North-West area is on average about 24 percent lower than wages in the Greater Tunis area. The South-West area earnings are about 3.8 percent less than the Greater Tunis area, and about 1.9 percent for the Center-West area. Also, it was found that earnings in the Center-East area are 0.4 percent less than earnings in the Greater Tunis area.

Table A3 - columns (2) and (3) - show that higher education commands higher earnings in urban areas than in rural areas. As shown in the Figure 6, the returns to higher education in urban areas are higher than in rural areas.[41] The difference in returns to tertiary education by place of residence may be explained by the fact that large firms, which are concentrated in the Greater Tunis area and in the Coastal urban areas, tend to rely more on schooling credentials and experience for hiring potential employees than smaller establishments located in the rest of the areas.[42]

In addition to the differentiated availability of economic opportunities and exposure to market forces, regional disparity in returns to education may also be explained by the information gap between urban and rural areas, resulting in urban jobseekers participating in employment programs and registering in employment offices more than their rural peers.[43] The higher returns to education for intermediate and primary levels in the rural areas may be due to regional segmentation of the labor market for these levels of skills. This may take place especially if the demand for low-skills is region-specific and if there is an over-supply of unskilled labor in urban areas, which puts a downward pressure on earnings.

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[39] The world average rates of return to education are reported in Montenegro and Patrinos (2014).

[40] This is obtained as $100 * (e^{1.2889} - 1)$, where 1.2889 is the coefficient estimate of the indicator variable University in column (1) of Table A3 in the Appendix. The effect of indicator variables on earnings in the remaining part of the paper will be calculated in the same way.

[41] This result is in accordance with the results reported in most of the literature, see for instance, Orazem and King (2008). Zouari-Bouatour et al. (2014) report the same pattern in Tunisia based on the 1980 and 1999 national surveys of population and employment.

[42] Stolzenberg (1978), provides justifications of why large establishments tend to rely on credentials more than small establishments.

[43] Many of the employment programs in Tunisia are not adequately targeting the graduates with the highest risk of being unemployed, especially in the inland regions. See for instance, Broecke (2012).

It should be mentioned that the analysis above, assumes that the assignment of individuals to places of residence (urban/rural) is random. In fact, as argued by Todaro (1969), people tend to migrate from rural to urban areas in response to differences in expected earnings, as well as to a host of other push and pull factors. Hence, the need to explicitly recognize the endogenous nature of internal migration or the assignment of individuals to urban vs. rural areas. Neglecting this self-selection process may bias the estimates of earnings and returns to education differentials between rural and urban areas.

From this premise, we have estimated a model (not shown here for space consideration) consisting of two earnings equations for urban and rural areas, respectively, as well as a decision equation sorting individuals over the two areas which includes, in addition to the explanatory variables incorporated in specifications (2) - (3) in Table A3, age and age squared, gender, marital status and number of siblings. The results show no evidence of self-selection bias.

Separate earnings equations, not reported in this paper, were also estimated by place of birth. The results were fairly similar to the urban-rural comparison based on place of residence. More specifically, the comparison of returns to education based on either the place of residence or the place of birth shows insignificant differences at lower levels of education and significant differences at higher levels. This may be due to the fact that the impact of differences in early-life conditions and socioeconomic backgrounds on earnings, becomes apparent only for higher education graduates. As discussed in section 2.2.2, university graduates with low socioeconomic backgrounds, especially from the inland regions, tend to have lower scores at the BAC exam and therefore are more likely to be channeled to fields with relatively inferior employment outcomes.

3.2.3. Effects of observable characteristics on returns to education

In this section, we test whether the effect of years of education on wage varies with respect to observable pre-market and in-market characteristics. In analyzing the returns to education according to group characteristics such as sex, place of residence, family background, public sector vs. non-public sector and formal jobs vs. informal jobs, we do not estimate separate regressions for each group. This may unduly entail slicing the sample into small sub-samples, hence negatively affecting the robustness of the results. Differences across groups are tested by running one regression for all groups, using dummy variables for group membership and interaction terms between group membership and the number of years of education.

As shown in Table A4 of the Appendix, the effect of years of education on wages varies with a number of in-market characteristics. This effect varies positively with years of experience, occupational category and extent of formality of the primary job of the respondent. It also tends to be higher in the public sector. For instance, the significant positive coefficient for the interaction between the public-sector dummy and years of schooling indicates that a university graduate with 17 years of schooling working in the public sector enjoys an expected hourly wage premium in comparison with those working in other sectors of about 39 percent.

The wage premium for a university graduate with a formal primary job over the wage he would earn in an informal job is about 59 percent. Taking the occupation category 1 as a reference, the higher categories have a wage premium for each year of schooling, which becomes statistically significant for category 4.[44] With respect to place of residence, the estimation results indicate that the effect of education on earnings is higher for the reference group of large cities than small cities or rural areas. However, the differential effects are found to be not statistically significant. On the other hand, it is found that non-trade union members earn, on

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[44] Categories are defined in the footnote of Table A2.

average, about 25 percent less than union members. Figure 7 portrays the impact of some of the in-market characteristics on the respondents' earnings by years of education.

With respect to the personal characteristics and family background, the results indicate that while females tend to have a lower wage than males for any level of years of education, they benefit more in hourly wage from each year of additional schooling than men. Although statistically not significant, the higher impact of schooling on earnings for females may be attributed to the fact that education tends to reduce earnings differentials between males and females that are due to factors such as discrimination, tastes and circumstances.[45] It may also be

due to the fact that females form a more select group at higher levels of education due to their higher drop-out rates at earlier grade levels.[46]

The father's level of education, as well as the mother's levels of education, in particular at the university level, broadly have a positive effect on the earnings of their offspring. However, the positive impact of highly educated parents on the earnings of children tends to decrease by level of education of the latter. This may be due to the effect of unobserved factors that intervene between parents' education and the labor market outcomes of their offspring.[47] These include for instance, labor market conditions, peer influence and the increasing importance of outside-family environment in determining employment choices.

In contrast, the father's occupation when the respondent was 15 is found to have a positive impact on the returns to education of his children, especially at the highest occupational category. This may be due to the fact that fathers working in this category are capable of ensuring better jobs for their children by dedicating more resources to better quality education, and by the higher likelihood of having better connections leading to better job outcomes. Figure 8 summarizes visually the predicted differential effect of years of education on log hourly wages of a number of pre-market characteristics.

3.2.4. Returns to Education and Work States

In this section, we estimate the returns to education and analyze heterogeneity of these returns over work states. We account for observable characteristics as well as unobservable characteristics determining the choice of one of the following four work states: not employed, employed in the public sector, employed in the formal private sector and employed in the informal sector. The focus on these work states is premised on the potential importance of labor market segmentation in terms of public versus private and formal versus informal sectors, in explaining educational wage differentials.

Often, being in any of these work states is not random but guided by self-selection, where individuals themselves make choices of being in one state or another. When these choices are not random but based on a systematic process that is not controlled for, a bias in the estimation of the effect of education on earnings may result.[48]

To account for self-selection, we use a model that consists of jointly estimating the wage equations and selection equations of being in any given state.[49] The dependent variable of the

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[45] Dougherty (2005).

[46] We owe this point to an anonymous referee.

[47] Mare (1980).

[48] In the context of returns to education, self-selection may occur if these returns are estimated using data only on working individuals and not accounting for those who are not participating in the labor market. It may also stem from the fact that the assignment of individuals being studied to, for instance, sectors, occupational categories, place of work and schooling levels is not random. For space consideration and data limitations, we focus only on self-selection with respect to work states. Interested readers, may consult Willis (1986), among others.

[49] To account for potential self-selection in work states, we have estimated the multinomial logit model suggested by Bourguignon, Fournier and Gurgand (2004, 2007), using the selmlog routine in the Stata software developed by Bourguignon, Fournier and Gurgand (2004). Their model has the advantage of accounting for the potential correlation between the disturbance term of each wage equation with the disturbance term of each selection equation.

selection equations is a multinomial variable taking the value of zero if the respondent is currently not employed, one if he/she is employed in the public sector, two if he/she is employed in the formal private sector and three if he/she is employed in the informal sector.

The variables included in the selection equations are years of education, years of education squared, age, age squared, marriage status, an indicator of family size, a dummy variable for gender, a dummy variable for whether the respondent is living in an urban or rural place, youth unemployment rate for each governorate in 2010 as an indicator of the availability of job opportunities, an aggregate measure of parents' education, and dummy variables for six of the seven regions, while taking Greater Tunis area as reference. The model at hand is identified since some of the variables included in the selection equation are excluded from the wage equations.

The estimation of the selection model, provided in Table A5 in the Appendix, is based on the respondents aged 15-64 who are not enrolled in school, regardless of whether they work or not. The parameter estimates refer to odds ratios relative to the baseline category: being not employed. The results show that a higher number of years of education increases the predicted probability that a respondent works in the public or formal private sectors relative to the state of being unemployed. Age also is an important factor in choosing a sector. The odds of working in the public sector rather than not working at all increase with age and reach a maximum at age 43. The odds of working in the formal private sector, rather than not working, reach a maximum at 41, while the corresponding maximum age for the informal sector is 38. Married respondents have higher odds to work in the public or formal private sector, females have lower odds for being employed than males, and urban dwellers have higher odds for working in the public sector. Higher unemployment rates reduce the odds of being employed in the three sectors, particularly in the formal private sector. Higher parents' education is associated with higher odds for working in the formal private sector relative to being without a job.

The following Figure 9 shows the probabilities of being in any given state for rural versus urban dwellers and for males versus females, respectively, for a given number of completed years of education.

The results show that the probability for being in the public-sector increases with the numbers of years of education, especially for males. Females are less likely to be unemployed the more educated they are, and the propensity to work for the private sector starts to decline after about 10 years of education. Table A6 in the Appendix shows the selection-corrected wage equations for the public, formal private and informal sectors, respectively. The results indicate the lack of evidence that self-selection has induced bias in the estimates of the effects of education on earnings since all the selection-correction terms, m0-m3, in the wage equation are statistically insignificant at the 5 percent level.

The results show that the effect of education on earnings increases by level of education in the public and formal private sectors but not in the informal sector. However, the effect of any given level of education on earnings is higher in the public sector than in the formal private sector and higher in the formal private sector than in the informal sector. Moreover, non-unionization tends to have a more negative impact on earnings in the public sector than in the formal private sector. As in previous findings, gender wage differentials are not statistically significant, and individuals from the North-West region have, on average lower earnings than other regions, in particular the Greater Tunis area. Figure 10 depicts the education return differentials by work state.

The provided evidence points to the presence of wage and return to education differentials across work states, for the same levels of education. In particular, higher education confers a wage premium in the public sector in comparison with the formal private sector and informal

sector. This lends further evidence of the importance of labor market segmentation in explaining heterogeneity of returns to education.

4. Summary and Conclusions

As shown in this paper, education is an important determinant of private earnings in Tunisia. However, the average rates of return to schooling are low by international standards and heterogeneous across levels of education, region, personal and socio-economic characteristics and work states. In the early sections of the paper, we have argued that in addition to the limited capacity of the economy to create high-productivity jobs, institutional factors such as the low quality of education, rigid tracking system, inadequacy of the available skills for the need of the private sector and nepotism may explain the low and heterogeneous returns to education in Tunisia.

The estimation results show that returns to schooling increase with the level of education showing a systematic bias toward higher levels of education at the expense of basic education. This is mainly due to a distorted labor-market signal by the public sector placing a premium on higher education and credentials. In fact, the results point clearly to the presence of a "credential" effect consisting of important wage premia for the Baccalaureate diploma and Bachelor's degree years in comparison with regular years of education.

We find evidence of heterogeneity of returns to higher education across varying regions and socioeconomic backgrounds. Regional disparities by place of residence, both in earnings and returns to higher education, may be explained by in-market characteristics such as the lack of economic opportunities and low exposure to market forces in many inland regions, which is reminiscent of an unbalanced regional development. Moreover, these disparities may be attributed to information failure. Good employment opportunities are less visible to jobseekers in rural and inland areas, since they tend to use employment offices and participate in employment programs less frequently than their peers in the urban areas. It is argued that the rural-urban disparity in returns to higher education by place of birth may be explained by differentiated early-life conditions including socio-economic and family backgrounds as well as inequality of opportunity in access to quality education.

The segmentation of the labor market is also found to be an important cause of the heterogeneity in job opportunities and rewards in Tunisia. Educational wage differentials are found to be significant between the formal private sector and informal sector, and between the public and private sectors. In addition, the effect of years of completed schooling is found to differ by occupational category.

The heterogeneity of the marginal returns to education across individuals as well as across varying regions and socioeconomic backgrounds undermines the role of education as a social elevator. From this premise, the policy implications of our findings may be articulated as follows. First and foremost, the educational benefits and economic opportunities should be broadly available to all. Policies should mitigate the impact on educational and labor market outcomes of factors that favor those with advantageous socio-economic and geographic backgrounds. The education system should focus more on the acquisition of skills that address the current and future needs of the labor market, and less on certification and selection. Educational policies should also address many of the governance issues that have eroded the credibility of the education system and re-evaluate education tracks, such as within the VET apparatus, that lead to dead ends for jobseekers and compel them to either low-paying jobs or withdrawal from the labor force.

In terms of policies outside the realm of the education system, there is a need to assess the effectiveness of the many school-to-work transition programs that have been created to increase the employability of school graduates and improve their earnings.

More importantly, the overall structure of opportunities, signals and incentives need to be reviewed to make sure that graduates are able to find jobs that meet their aspirations and qualifications. For instance, addressing incentive distortions caused by public sector wage premium, encouraging formality, increasing labor market flexibility and reducing the urban-rural information gap and major regional imbalances in terms of available job opportunities, are essential short to medium-term policies. However, the achievement of this objective ultimately requires a fresh look into development policies, which confined the Tunisian economy mostly into low-skill job opportunities. The private sector should be enticed into new sectors to create more high-skill jobs for the educated youth.

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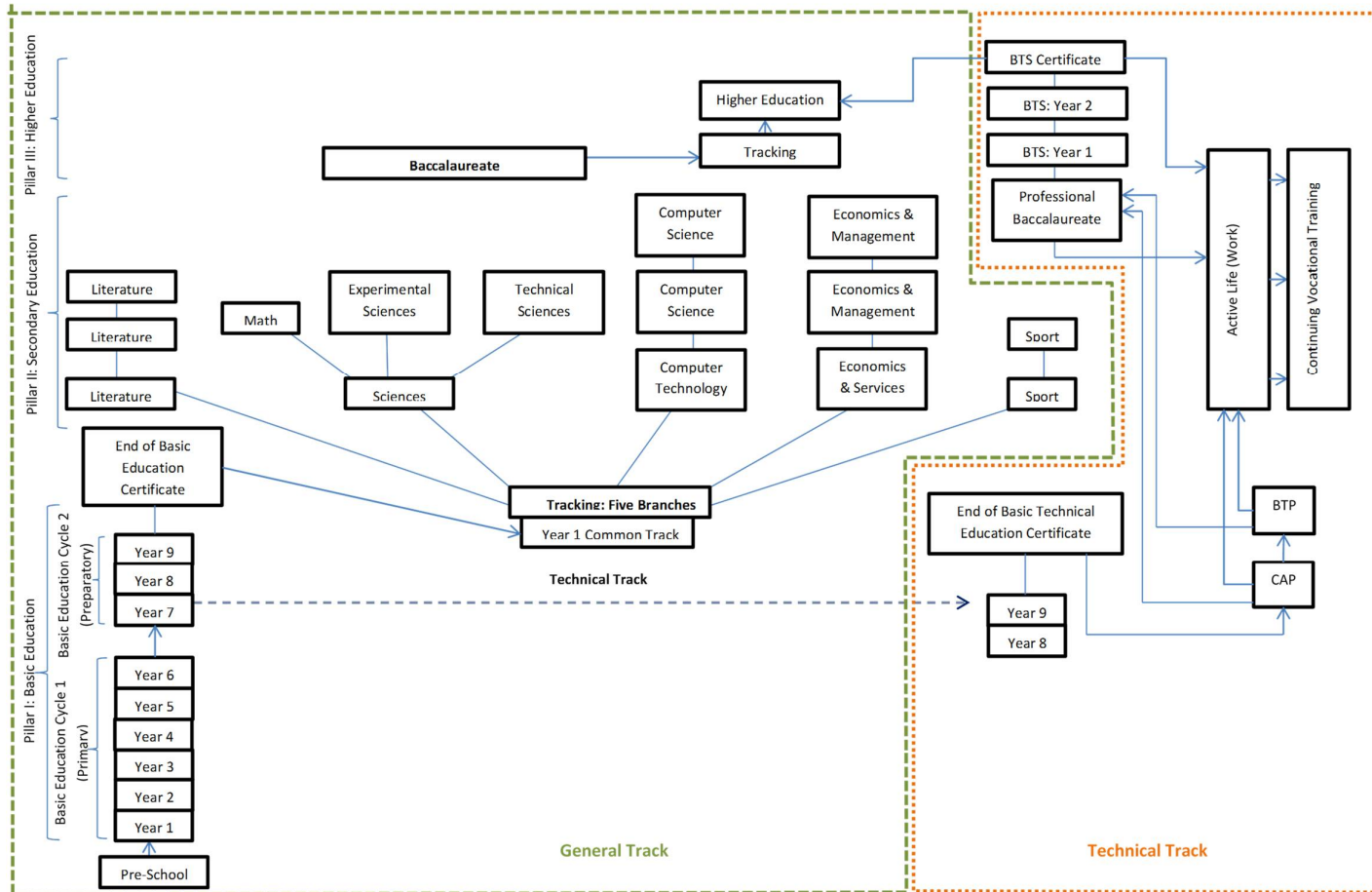
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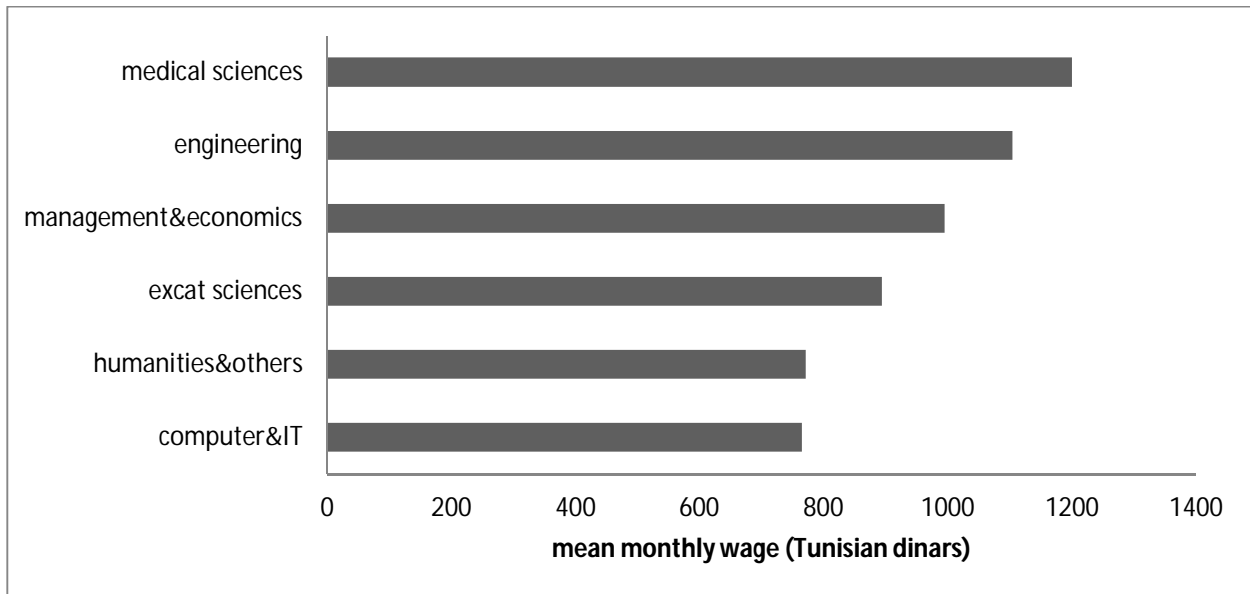
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Figure 1: Organization of the Tunisian Education System from 1989 to 2015

Source: UNICEF and Tunisia's Ministry of Education (2014), Ministry of Education (2009) and Decree No. 2008-10, Official Journal of the Republic of Tunisia.

Figure 2: Mean of Monthly Wage by Main University Fields (2014)

Figure 3: Post-BAC Tracking of Students and Exam Scores by Socio- Professional Category of the Father (2010)*
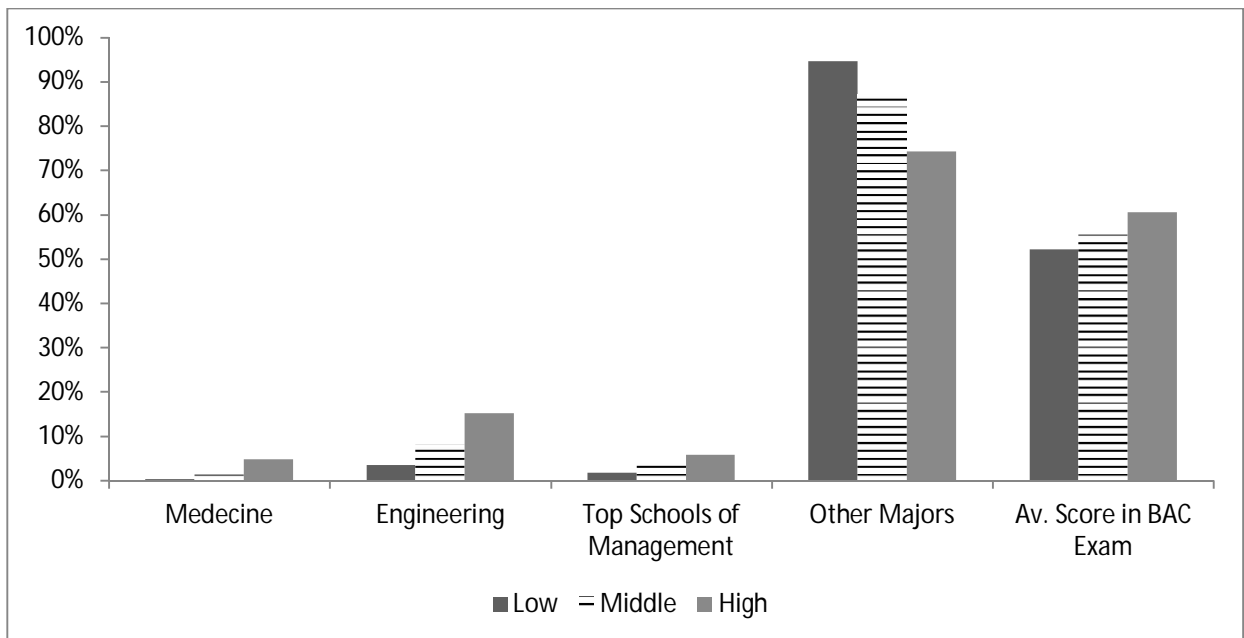
Notes: *Exam scores were converted from 0-20 scale to 0-100 scale for easy reading of the graph.

Figure 4: Share of Areas of Specialization for University Graduates (2009-2013)
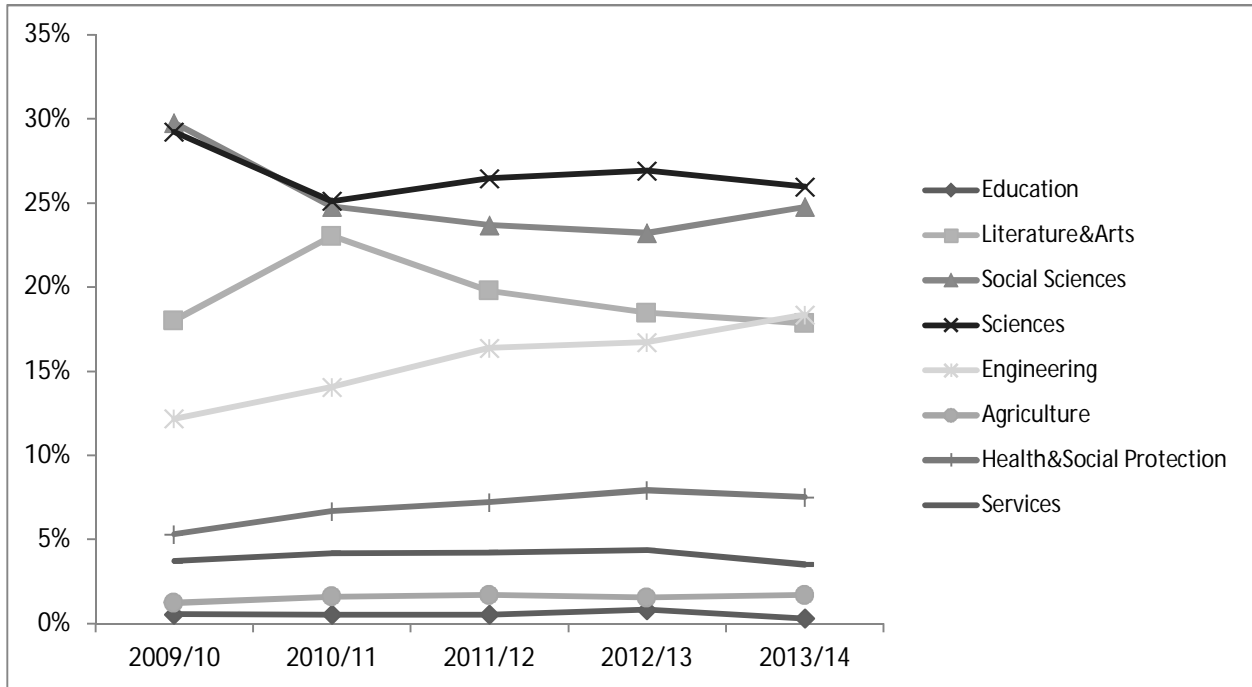
Source: Ministry of Higher Education (2015b).

Figure 5: Distribution of Population 15-64 by Educational Attainment
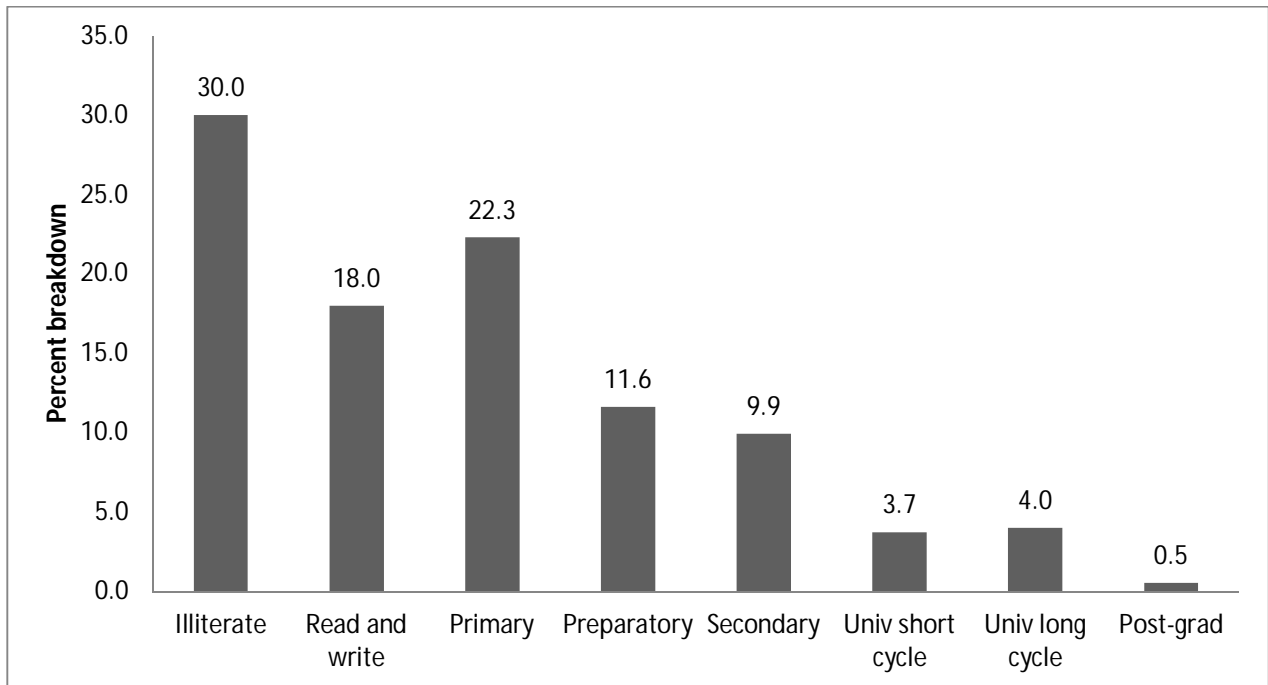
Source: Constructed by authors using TLMPS (2014).

Figure 6: Returns to Education by Place of Residence(percent)
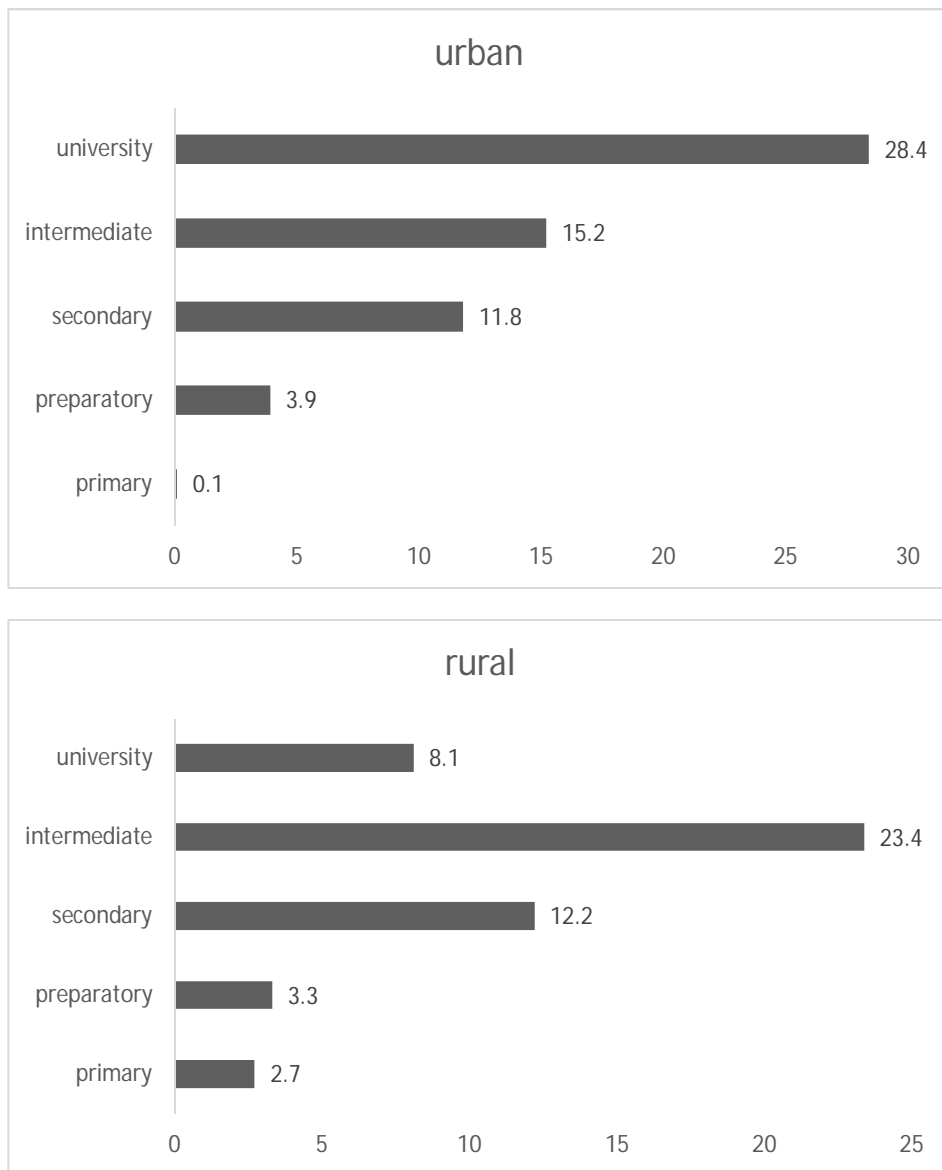
Source: Constructed by authors using TLMPS (2014).

Figure 7: The Effect of In-Market Characteristics on Log Hourly Wage
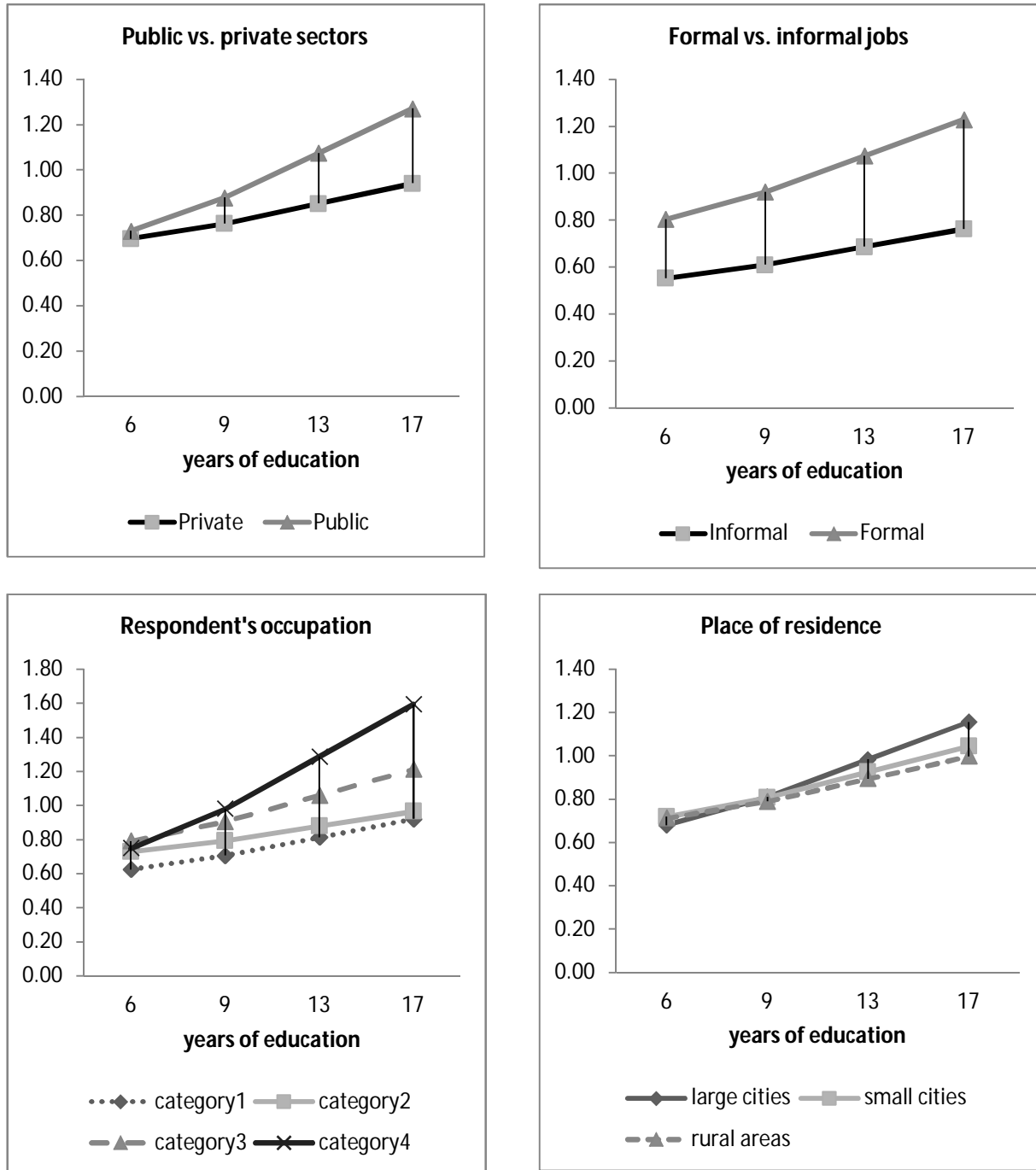
Source: Constructed by authors using TLMPS (2014).

Figure 8: The Effect of Pre-Market Characteristics on Log Hourly Wage
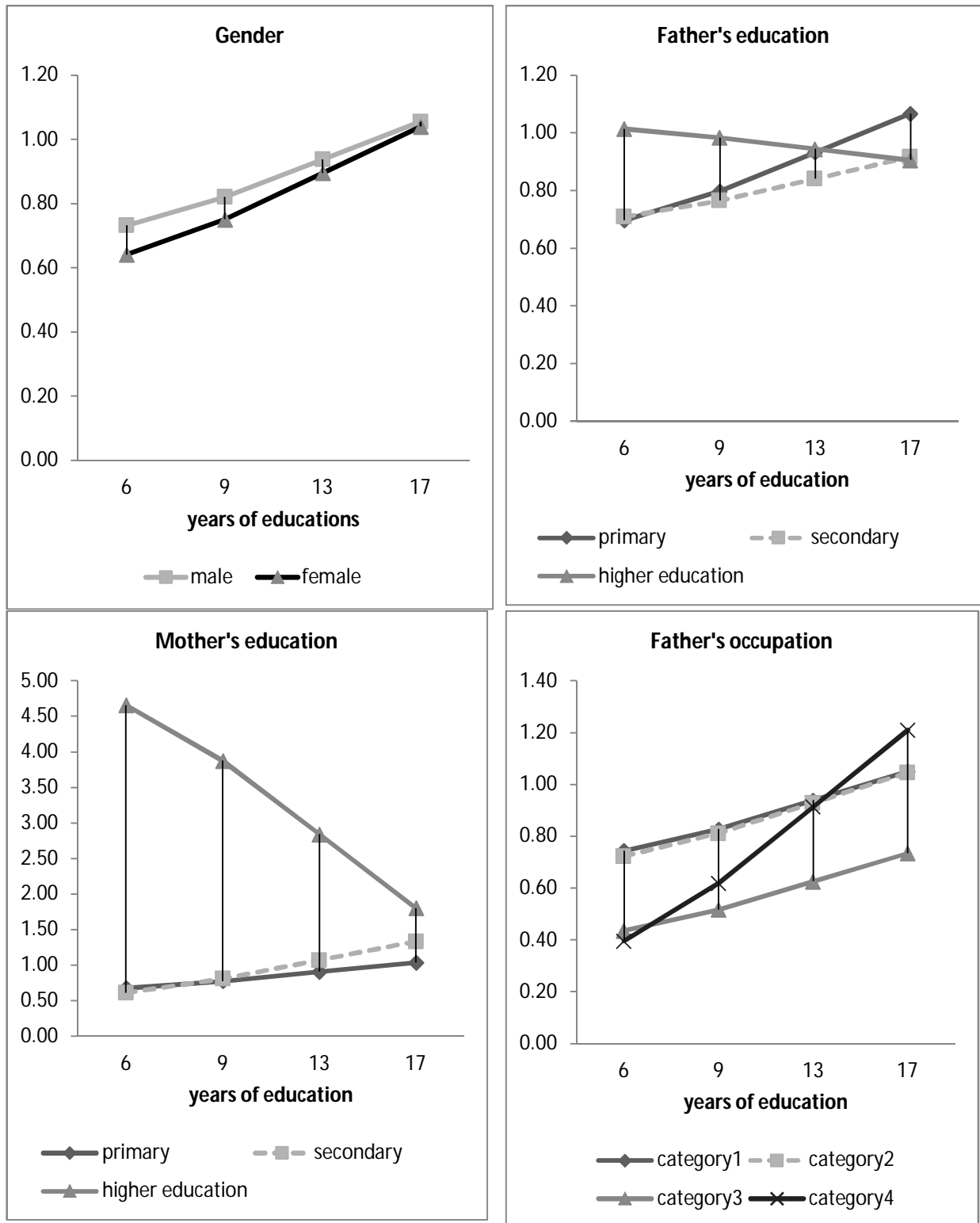
Source: Constructed by authors using TLMPS (2014).

Figure 9: Predicted Probability of Work State by Years of Education
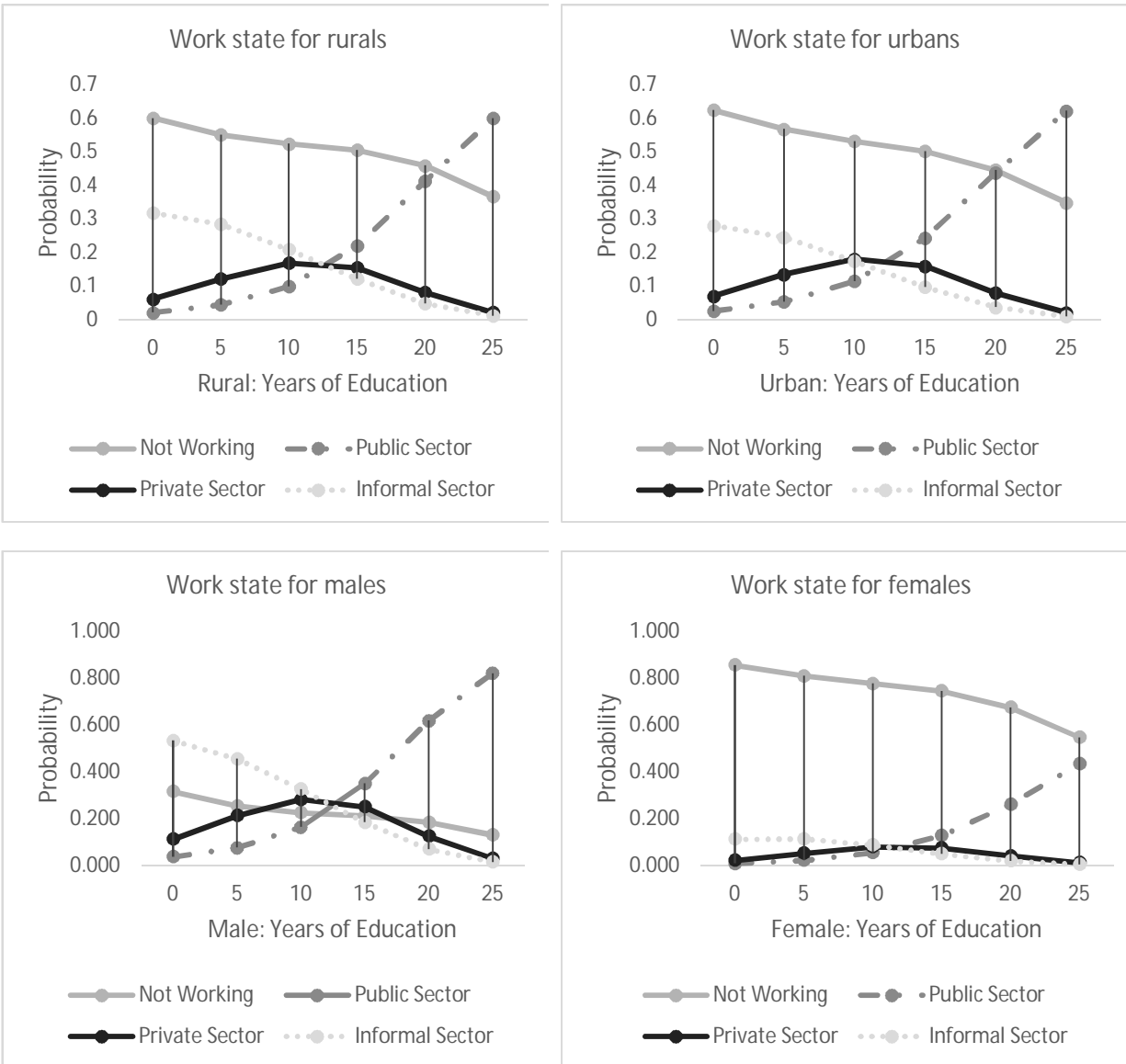
Source: Constructed by authors using TLMPS (2014).

Figure 10: Returns to Education by Work State
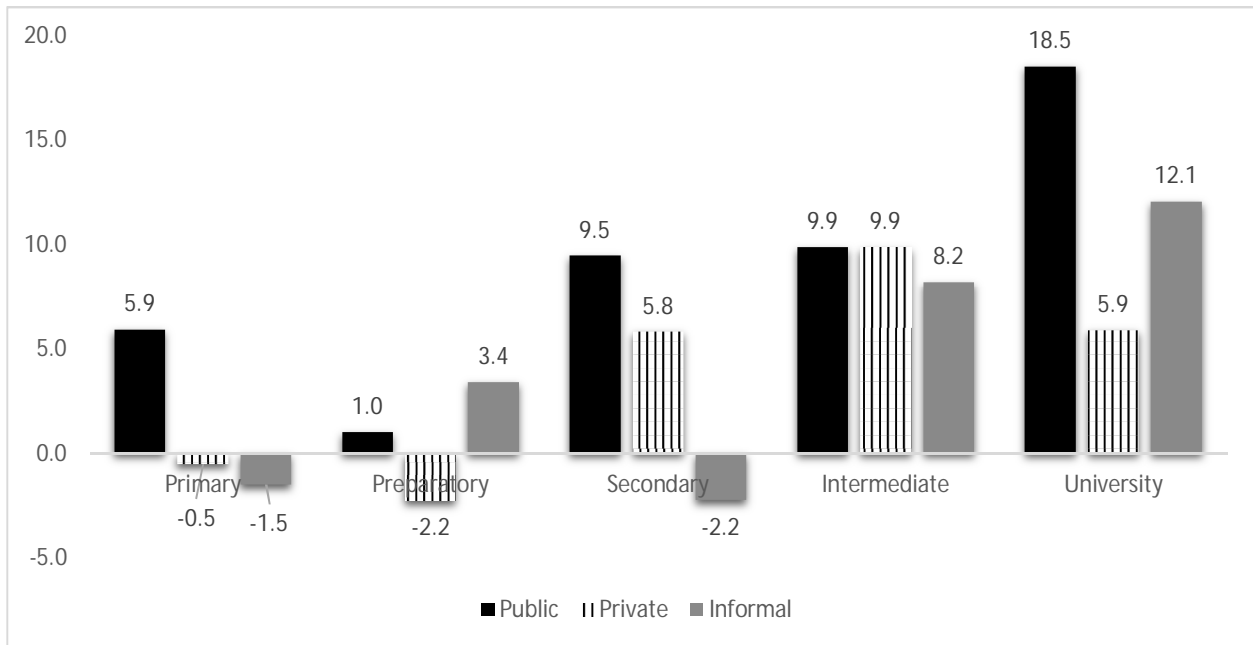
Source: Constructed by authors using TLMPS (2014).

Table 1: Educational Attainment versus Educational Requirement of Occupational Categories* (percent)

Minimum Educational Level required by Occupation	Educational attainment (8 categories age 6+)								
	Illiterate	Read and write	Primary	Preparatory	Secondary	University-short	University-long	Post-graduate	Total
Category 1: No specific education level required	43.40	19.74	20.98	9.76	4.83	1.02	0.27	0.00	100.00
Category 2: Secondary education required	14.01	22.26	28.94	16.56	13.03	3.04	2.06	0.11	100.00
Category 3: post-secondary education required	3.10	5.43	13.18	17.83	27.13	26.36	6.20	0.78	100.00
Category 4: higher education required	1.27	1.59	5.71	6.03	23.49	15.56	37.46	8.89	100.00
Total	25.90	19.04	23.11	12.75	10.58	3.81	4.07	0.75	100.00

*The nine occupational categories of primary jobs (3-month reference period before the survey) were aggregated into four categories as follows: category 1: elementary occupations and skilled agricultural, forestry and fish; category 2: clerical support, service and sales, craft and related trades, plant and machine operators, and assembly workers; category 3: technicians and associate professionals; category 4: managers and professionals. This is a common classification that is widely used in studying education-occupation mismatch, which is based on the International Standard Classification of Occupations (ISCO). See for instance, Kyui (2010).
Source: Constructed by authors using TLMPS (2014).

Appendix
Methodological Background: The Mincerian Earnings Equation
The earnings equation developed by Mincer (1974) consists of a semi-logarithmic regression equation of individual wage rates or earnings on years of education and a set of other relevant covariates influencing wage. The canonical earnings equation, which represents the workhorse of most empirical studies, has the following specification:

$$InW_i = \alpha + \beta S_i + \gamma_1 EXP_i + \gamma_2 EXP_i^2 + \epsilon_i \tag{1}$$

where: InW refers to the log of gross hourly wages, S is the years of schooling, EXP is the years of experience as a proxy for on the job training, and the ϵ is the error term. This specification may be extended by adding a host of variables which account for earnings variability, including family background, ability, school quality and early life conditions. The parameter β measures the rate of return to the marginal year of schooling, or simply the increase in wages that a worker would receive for each additional year of schooling. It should be mentioned that since Mincer's model does not account for the direct costs of schooling, β may be interpreted as the wage premium due to education and not its entire return.

Equation (1) is rooted in the theory of human capital notably, the path breaking works of Becker (1964, and 1975) and Mincer (1958, 1962 and 1974). They have established that education is an investment decision where the optimal number of years of schooling is determined based on the comparison of the cost of education including the foregone income during schooling years, and the discounted stream of expected future benefits. At the margin, individuals will invest in an additional year of schooling as long as the additional expected future return is higher than the incremental cost. From this premise, years of education are positively correlated with wage and education is one the most important factors explaining wage differentials due to its productivity-enhancing effect. Better-educated individuals are more likely to earn higher wages, and less likely to be unemployed than their less-educated peers.

The accumulated evidence since the late 1950's, overwhelmingly supports the positive relationship between education and earnings. However, the theory of signaling developed by Spence (1973 and 1974), while agreeing on the positive relationship between wage and education, argues that the higher earnings received by the more educated workers reflect the ability that education tends to signal rather than the higher productivity it is supposed to impart. In other words, education acts as a signal of productivity. This is what is often dubbed "credentialism" or "sheepskin effect", which is often measured by the wage premium of diploma years in comparison with regular years (Hungerford and Solon, 1987).

The estimation of the Mincerian earnings function has been plagued by a number of flaws including, the omitted variable problem especially, "ability", the possible endogeneity of some of the covariates, the measurement error in the explanatory variables included in the equation, the heterogeneity of returns to education and the self-selectivity problem. Discussing these issues is beyond the scope of this paper. However, we refer to them and mention their implications when applicable in the analysis of the estimation results.

Table A1: Summary Statistics and Description of The Main Variables Used in Regressions

Variable description	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Log of hourly wage	1561	0.748169	0.733245	-5.3	4.6
Number of years of completed education	8249	6.30234	5.061144	0.0	29.0
Years of education squared/100	8249	0.653315	0.8244422	0.0	8.41
Experience	8615	9.867905	13.44861	0.0	56.0
Experience squared/100	8615	2.782196	4.995581	0.0	31.4
Occupation	4018	1.754853	0.8443062	1.0	4.0
Sex	8509	1.540369	0.498397	1.0	2.0
Gender (=1 for female)	8509	0.459631	0.498397	0.0	1.0
Number of siblings	8565	5.40899	2.819005	0.0	29
Formality of primary job	3558	0.495503	0.50005	0.0	1.0
Category of city/town	8615	2.458503	0.682879	1.0	3.0
Urban	8615	0.4341265	0.4956705	0.0	1.0
Trade union membership	3539	1.955637	0.205929	1.0	2.0
Father education (3 levels)	8187	1.076218	0.300346	1.0	3.0
Mother education (3 levels)	8251	1.0263	0.178646	1.0	3.0
Currently married	8615	0.644109	0.47881	0.0	1.0
Public sector	4035	0.194052	0.395518	0.0	1.0
Rank among siblings at birth	8471	3.395231	2.244836	1.0	43.0
Rank among siblings of the same sex	8414	2.328144	1.557526	1.0	39.0
Mother working when respondent was 15	7747	0.09565	0.29413	0.0	1.0
Father occupation when respondent was 15 (4 categories)	6845	1.531045	0.68193	1.0	4.0
Age	8615	40.27847	13.09688	15.0	64.0
Age squared	8615	1793.863	1072.555	225	4096
Born in rural area	7950	0.582767	0.493133	0.0	1.0
Aggregate years of education of parents	8019	2.951366	1.717409	2.0	15.0
Youth unemployment rate by governorate in 2010	8615	27.53233	8.997528	9.1	52.8

Table A2: Parsimonious Mincer's Models - Dependent Variable: Log Hourly Wage

	(1)	(2)	(3)	(4)
years of education (S)	0.0729**	-0.0245*	0.0243**	
	(15.1783)	(-1.9620)	(3.1509)	
experience	0.0391**	0.0417**	0.0413**	0.0417**
	(5.4326)	(5.9394)	(6.0294)	(6.2392)
experience squared/100	-0.0629**	-0.0704**	-0.0694**	-0.0694**
	(-3.6160)	(-4.1590)	(-4.1837)	(-4.3518)
education squared/100		0.5257**		
		(7.4868)		
$(S \geq 13)$			0.3916**	
			(4.3472)	
$(S \geq 13)*(S-13)$			0.0228	
			(0.9108)	
$(S \geq 17)$			0.5702**	
			(4.1303)	
Primary				0.1019
				(1.6115)
Preparatory				0.1016
				(1.1110)
Secondary				0.5152**
				(8.2410)
Intermediate				0.8481**
				(12.5762)
University				1.3106**
				(14.2669)
constant	-0.1652*	0.1411*	0.0844	0.1560*
	(-2.2855)	(1.9925)	(1.1460)	(2.4134)
N	1517	1517	1517	1522
Adjusted R^2	0.2194	0.2579	0.2827	0.2668

t statistics in parentheses. *Significant at 5 percent; **significant at 1 percent.

Note: Estimations were conducted using sample weights and robust standard errors. Reference groups are mentioned in the text.

Table A3: Earnings and Returns to Education Differentials by Location – Dependent Variable: Log Hourly Wage

	(1) Pooled	(2) Urban	(3) Rural
Primary	0.0626	0.0190	0.1135*
	(0.9537)	(0.1960)	(1.7004)
Preparatory	0.0941	0.0441	0.1702***
	(1.1430)	(0.3777)	(2.7646)
Secondary	0.4793***	0.4781***	0.3972***
	(7.1037)	(6.1542)	(2.6060)
Intermediate	0.7990***	0.7729***	0.8903***
	(11.3588)	(8.8429)	(7.8591)
University	1.2889***	1.3061***	1.1406***
	(13.0374)	(11.4847)	(7.6437)
experience	0.0423***	0.0465***	0.0307***
	(6.7895)	(5.4456)	(4.4590)
experience squared/100	-0.0715***	-0.0798***	-0.0473***
	(-4.6868)	(-3.6791)	(-2.8762)
born in rural area	0.0063	0.0141	-0.0357
	(0.0925)	(0.1815)	(-0.2913)
small cities	-0.0156		
	(-0.1804)		
rural areas	-0.0462		
	(-0.4535)		
north east	0.0267	0.0172	-0.0732
	(0.2994)	(0.1669)	(-0.6809)
north west	-0.2753***	-0.3011**	-0.3587***
	(-2.8717)	(-2.5515)	(-3.1470)
center east	-0.0044	0.0045	-0.1371
	(-0.0507)	(0.0464)	(-1.2763)
center west	-0.0196	0.0218	-0.1605
	(-0.2048)	(0.1818)	(-1.2993)
south east	0.0999	0.1526	-0.1830
	(1.0077)	(1.5292)	(-0.9697)
south west	-0.0385	-0.1312	0.0717
	(-0.3457)	(-1.0273)	(0.5343)
constant	0.2236**	0.1939**	0.4084**
	(2.2201)	(2.0497)	(2.1768)
N	1463	665	798
adj. R^2	0.2852	0.3047	0.1734

Notes: t statistics in parentheses. *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. Note: Estimations were conducted using sample weights and robust standard errors. Reference groups are mentioned in the text.

Table A4: Returns to Education: Interactive Model

Dependent Variable: Log hourly wage	Interactive Model
Years of education	0.0006
	(0.0286)
Father's Education	
secondary	0.1004
	(0.7750)
tertiary	0.5779
	(0.8852)
secondary* years of education	-0.0147
	(-1.3488)
tertiary*years of education	-0.0435
	(-0.9402)
Mother's Education	
secondary	-0.2646
	(-0.7003)
tertiary	5.7307***
	(2.9751)
secondary*years of education	0.0332
	(1.1844)
tertiary*years of education	-0.2921***
	(-2.7284)
Gender	
Female	-0.1319
	(-0.9292)
Female*years of education	0.0068
	(0.6545)
Occupational category of father	
category 2	-0.0299
	(-0.3288)
category 3	-0.3047
	(-0.8633)
category 4	-0.6241**
	(-2.3944)
category 2 *years of education	0.0015
	(0.1495)
category 3*years of education	-0.0006
	(-0.0144)
category 4*years of education	0.0461**
	(2.3777)
Currently Married	0.1000
	(1.4309)
Rank among brothers and sisters of the same sex	-0.0129
	(-1.0867)
Experience	
work experience	0.0007
	(0.2130)
work experience*years of education	0.0010***
	(2.9522)
Formality of primary job	
formal job	0.1354
	(1.3042)
formal job*years of education	0.0195*
	(1.8582)
Public sector	
public sector	-0.1292
	(-1.2440)
public sector*years of education	0.0271***
	(2.8893)
Occupational category	
category 2	0.1353
	(1.3695)
category 3	0.0955
	(0.4814)
category 4	-0.1774
	(-0.8325)
category 2*years of education	-0.0054
	(-0.4699)
category 3*years of education	0.0115
	(0.6145)
category 4*years of education	0.0501***
	(2.8540)
Union membership	
Non-member	-0.2898***
	(-3.5413)

Category of Town

small cities	0.1202
	(0.5785)
rural areas	0.1360
	(0.7451)
small cities*years of education	-0.0137
	(-0.8220)
rural areas*years of education	-0.0174
	(-1.0747)
Region	
north east	-0.0274
	(-0.3305)
north west	-0.2929***
	(-3.1294)
center east	-0.0675
	(-0.8147)
center west	-0.0176
	(-0.1864)
south east	0.0248
	(0.2338)
south west	-0.2012
	(-1.5059)
constant	0.6384**
	(2.5643)
Number of Observations	1166
Adjusted R^2	0.4217

Notes: t statistics in parentheses. *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. Note: Estimations were conducted using sample weights and robust standard errors. Reference groups are mentioned in the text.

Table A5: Selection into Work States: Multinomial Logistic Regression

Variables	(1) Public	(2) Private	(3) Informal
years of education	1.226***	1.265***	1.046**
	(5.673)	(7.769)	(2.013)
years of education squared/100	0.999	0.991***	0.994***
	(-0.439)	(-5.555)	(-3.960)
age	1.712***	1.436***	1.256***
	(13.643)	(13.347)	(11.840)
age squared	0.994***	0.996***	0.997***
	(-13.752)	(-13.873)	(-13.028)
currently married	1.168	1.434***	0.935
	(1.106)	(3.030)	(-0.716)
number of siblings	0.990	0.952***	1.034**
	(-0.482)	(-2.818)	(2.453)
Gender (female)	0.070***	0.059***	0.061***
	(-22.485)	(-28.562)	(-35.121)
urban	1.137	1.048	0.801***
	(1.121)	(0.492)	(-2.716)
youth unemployment in governorate	0.988	0.960***	0.979***
	(-1.425)	(-5.215)	(-3.676)
parents' education	1.033	1.068**	0.994
	(1.118)	(2.512)	(-0.212)
north east	0.976	1.509***	0.841
	(-0.129)	(2.704)	(-1.170)
north west	1.372	1.478**	2.687***
	(1.616)	(2.353)	(7.166)
center east	1.109	1.078	1.701***
	(0.539)	(0.459)	(3.762)
center west	0.693*	0.542***	0.905
	(-1.791)	(-3.393)	(-0.690)
south east	1.351	0.842	1.500***
	(1.547)	(-0.927)	(2.731)
south west	3.436***	2.990***	4.016***
	(4.879)	(4.462)	(6.964)
constant	0.000***	0.001***	0.049***
	(-14.618)	(-11.598)	(-6.950)
N	7,117		
Pseudo R^2	0.249		
Model chi-square	4046	Prob > chi2=	0.000

Notes: Coefficients are odds-ratios, z-statistics in parentheses. *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. Reference groups are mentioned in the text.

Table A6: Selection-Corrected Wage Equations - Dependent Variable: Log hourly wage

	Public	Private	Informal
Primary	0.1780*	-0.0150	-0.0443
	(1.9191)	(-0.1329)	(-0.6542)
Preparatory	0.2087	-0.0824	0.0578
	(1.0417)	(-0.6477)	(0.6799)
Secondary	0.5880***	0.1506	-0.0311
	(3.3736)	(1.0930)	(-0.1533)
Intermediate	0.7858***	0.3480*	0.1329
	(3.2335)	(1.8090)	(0.4940)
University	1.1567***	0.4663**	0.3744
	(3.9559)	(2.0803)	(1.2719)
experience	0.0221**	0.0085	0.0108
	(2.2988)	(0.8486)	(0.9986)
experience squared/100	-0.0298	-0.0064	-0.0190
	(-1.2118)	(-0.2572)	(-0.6897)
gender	-0.1697	-0.3124	0.1901
	(-0.5799)	(-1.3057)	(0.9015)
non-union member	-0.3424***	-0.2935*	
	(-3.2231)	(-1.9051)	
currently married	0.1914*	-0.0371	0.1136
	(1.7962)	(-0.3729)	(1.2516)
urban	0.1012	0.0428	-0.0078
	(1.2372)	(0.7047)	(-0.0953)
north east	0.2458*	-0.1269	0.1362
	(1.6654)	(-1.0683)	(0.8865)
north west	-0.2667**	-0.3482**	-0.2532
	(-2.0841)	(-2.2661)	(-1.4247)
center east	0.0379	-0.1666	0.0946
	(0.2997)	(-1.3599)	(0.6286)
center west	-0.0075	-0.1282	0.1178
	(-0.0463)	(-0.7266)	(0.7180)
south east	-0.0845	-0.0371	0.2200
	(-0.5379)	(-0.1895)	(1.2577)
south west	-0.2355	-0.3737	0.4794**
	(-1.2989)	(-1.5932)	(2.0204)
m0	0.3277	0.5876	0.1321
	(0.6198)	(1.0708)	(0.3854)
m1	-0.2209	-0.5749	0.2462
	(-1.5272)	(-0.9727)	(0.4174)
m2	0.7648*	-0.1932	-0.3175
	(1.7398)	(-1.0769)	(-0.6392)
m3	-0.1566	-0.2507	-0.1064
	(-0.2581)	(-0.4767)	(-0.5669)
constant	1.6324**	1.8167***	0.2061
	(2.5634)	(2.6512)	(0.4954)
Adjusted R^2	0.40	0.23	0.11
N	360	409	608

Notes: t statistics in parentheses. *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. Note: Since the second stage estimates from the Bourguignon et al. (2004) have inefficient standard errors, efficient standard errors were obtained using bootstrapping.