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MLA Citation

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THE AMERICAN UNIVERSITY IN CAIRO

الجامعة الأمريكية بالقاهرة

Graduate Studies

**Education-Occupation Mismatch among University
Graduates in Egypt:
Determinants and Consequences**

A Thesis Submitted by
Nouran Ayman Hamed ElKhouly

to the
**Master of Arts (MA) in Economics
Graduate Program**

June 2022

In partial fulfillment of the requirements for the degree of

The Degree of Master of Arts (MA)

Abstract

This thesis reviews the literature on the education-occupation mismatch. The thesis focuses on Egyptian university graduates and postgraduates in 2018. It studies the determinants of the education-occupation mismatch, and its effect on earnings and workers' job satisfaction using the 2018 wave of the Egyptian Labor Market Survey (ELMPS). Ordinary least squares (OLS) and probit models were used to investigate the determinants of the education-occupation mismatch, and an OLS and a two-stage least square (2SLS) regressions were estimated with the use of the father's education and father's employment status as instrumental variables to determine the effect of the mismatch on labors' earnings which has shown to be a strong Instrumental variable. The results showed that educational mismatch in the Egyptian labor market is high, overeducated individuals comprise 20.1% of university and above graduates, well-matched individuals comprise 81.1%, while undereducated individuals are minimal constituting only 0.7%. The mismatch is more prevalent among males with 23.4% for overeducation and 0.9% for undereducation compared to 12.9% for overeducated females and 0.3% for undereducated females, while females are more adequately matched constituting 86.4% than their male peers constituting 76.3%. Based on our regression models for the determinants of the mismatch, we found that gender, working experience, region of residency, job characteristics such as the sector of employment including the formality of the job, the economic activity of the job, as well as, the firm size all are significant determinants of the overeducation phenomena. While the significance of marital status changes with the different measurements.

While based on our wage models, the results suggest that overeducated individuals are provided with a wage premium; however, with a smaller magnitude than that of their well-matched counterparts. Gender with females having a wage penalty compared to their male peers, working experience, region of residency, and the sector of employment including the formality of the job are shown to be statistically significant. Finally, the job satisfaction model shows that overeducation decreases the probability of job satisfaction, and it shows that sex, region, employment sector including the formality of the job, and economic activities are all significant factors.

Keywords

Education-Occupation Mismatch, Skills, Egyptian labor market, Wages, Employability, Instrumental Variable

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I. Introduction

One of the main labor market failures around the world is the mismatch between education and occupation. According to the latest data available by the Organization of Economic Cooperation and Development (OECD) (2016), 32.2% of the total number of laborers aged between 15-64 years are mismatched, of which 18.9% are underqualified and 16.8% are overqualified in 2016. The concept of Education-occupation mismatch has been a pillar of development dialogue in countries all over the world; particularly, the mismatch among university graduates is a predicament facing youth worldwide with the global increasing competition and demographic and rapid technological changes.

Education-occupation mismatch is important to tackle because it causes economic and social costs on both the individual and the macro levels. OECD (2017) argues that the mismatch can cause skill depreciation and slower adaptation to technological progress. It can also cause wage disparities and lower job satisfaction in comparison to those with the same educational level (McGuinness et al., 2018). If an individual is classified as overeducated, his or her human capital affects earnings which can lead to wage penalty or wage premium depending on the context (Dolton & Vignoles, 2000). The Over-education, required education, under-education (ORU) model developed by Duncan and Hoffman (1981) states that overeducated labor receive lower returns than those who have the same required years of education, as well as, labor benefit more from being undereducated in the job, but those benefits offset the negative effects to be undereducated.

It is also important to tackle the mismatch because it may preclude job satisfaction which is vital for productivity, and which lowers the probability of absenteeism and turnover rates (Haorei, 2012). Overeducation often increases the probability of resigning and becoming out of the labor force (Mont, 2015; Clark, et al., 2014). However, there are contradictory findings regarding the relationship between resigning and the mismatch. Most previous research suggests a positive relationship between resigning and education-occupation mismatch. Mont (2015) found a significant positive relationship between unemployment and previously mismatched labor in 17 out of 23 countries including Italy, Korea, Spain, Sweden, and the United States.

Furthermore, at the macro level, the low-and middle-income countries (LMICs) can be trapped in a low-skills equilibrium in which the whole country becomes adapted to a low-skills level (Palmer, 2017). A surplus of education could reflect the inefficient allocation of human resources (Clark et al, 2014). For instance, the Middle East and North Africa (MENA) region only utilize 62% of the total human capital compared to a world average of 65% showing a higher gap between the labor force and the labor market (Adely et al, 2021). Overeducation is a waste of resources whether for individuals or for the government, such that investing in education infrastructure is an investment that does not yield sufficient profits since there is no demand for it (Caroleo & Pastore, 2015). Although the theory of Human Capital argued that the development of human capital positively affects productivity and earnings (Sen, 1999), Russell and O'connell (2001) confirm what Sen says in which they show in several European countries that better and higher levels of education mean better chances to land a job and exit the waitness. Mismatch implies higher unemployment rates and fewer incentives for investors; thus, hindering the economic growth of the nation due to the lower productivity.

Although unemployment can be considered a type of mismatch, it is not considered in the literature in that context; therefore, when labor is referred to as mismatched, he or she must be employed. However, one approach to reducing high unemployment rates is to combat the mismatch between education and the needs of the labor market. These mismatches are driven by two main factors: the growing intricacy of the industrial structure, and the lack of coordination between educational institutions and the labor market evolution where students lack awareness of potential fields of studies that would enhance their employability once they graduate (Robst, 2007; Nordin et al., 2010). Also, unemployment might be another triggering factor for workers to accept a well-matched job (Clark et al., 2014). This information asymmetry between the employers and the new entrants causes search frictions; thus, from a dynamic labor market perspective, there will always be a degree of mismatch in the market. Literature has shown that these mismatches occur early in an individual's professional career (Jovanovic, 1979; Perry A. et al., 2014; Lu, 2017).

The research question of this thesis intends to shed light on the incidence and consequences of the education-occupation mismatch affecting the employability of university and above graduates in Egypt using the 2018 Egypt Labor Market Panel Survey (ELMPS) data. This thesis adds to the literature on the education-occupation mismatch in Egypt by analyzing the determinants of the

mismatch affecting the employability of university and above graduates in the Egyptian labor market, measuring the effect of the mismatch on the earnings of those graduates, and the effect of the mismatch on job satisfaction.

The thesis proceeds as follows; Section Two provides a brief background on the Egyptian higher education system and the Egyptian labor market. Section Three presents the conceptual framework, while Section Four reviews the literature on education-occupation mismatch. Section Five presents the data used in the study and Section Six includes a brief descriptive analysis. Section Seven presents the econometrics methodology, and Section Eight presents the empirical findings. The limitation of the study is discussed in Section Nine, and Section Ten concludes and provides policy recommendations.

II. Contextual Background

This section gives a brief overview of the higher education system in Egypt, in addition to, the Egyptian labor market which is characterized by a declining labor force participation, high youth unemployment rate, especially among graduates, low female labor force participation, and large discrimination in wages against women.

A. The Egyptian Higher Educational System

Focusing on education, the higher education admission system is based on general secondary school exams' grades and administered by a centralized placement office. The system consists of around 23 public institutions which account for 76% of all students in 4-years degree programs, 5-years programs for engineering and dentistry students, and 6-years degree programs for medical institutions, and 19 private universities enroll around 4% of the Egyptian students (Barsoum, 2014). Also, Egypt has 131 specialized private institutes that offer 4-year bachelor's degrees enrolling around 14% of all students with the same number of years in degree programs (Barsoum, 2014). The total number of higher institutes and academies is 6558 (Barsoum, 2014). The Ministry of Higher Education and Scientific Research oversees, directs, and has almost total control over the public university operations, finance, curriculum designs, degrees offered, the allocation of staff, and the number of staff and takes any strategic decision concerning the universities (Barsoum

2014). However, private universities, academies, and institutions have autonomy, but they are also closely monitored by the ministry of education and follow all regulations set by the ministry. Private universities were only legalized during the 1990s with the first university-operated (October 6 university) in 1996. Private universities absorb the surplus demand of public institutions (Barsoum, 2014). The number of students enrolled in private universities in 2018-2019 are 194,659 thousand students, 54.5% of which are males, and 45.45 % are females (CAPMAS, 2018a) (see Figure 1 in the appendix).

In 2018, the most common highest level of educational attainment was secondary education level among Egyptian youth aged 15-34 of around 40%, while the percentage of youth who attained university and above degrees are only 14.4% of total youth within the same age group, with a higher percentage among females (15.3%) than males (13.5%) attained a university or postgraduate degrees, in 2018, according to the ELMPS (Amer & Attalah, 2019) (see Figure 2 in the appendix).

It is pertinent to note that Egypt suffers from low-quality education due to the low government expenditures on education in which the Global Competitiveness report by the World Economic Forum ranked Egypt the 99th among 137 countries in the year 2018 in the skills pillar, which measures the general level of skills of the labor force, quantity and quality of education that reflect the productivity and the ability to adopt to new technologies, and the skillset of graduates scored 2.9 out of 7 (Schwab, 2018). The Global Competitiveness report measures 12 pillars that drive the productivity of nations focusing on human capital, agility, resilience and innovation; the scores are normalized based on min-max approach, then combined to yield the pillar and index scores. The low quality of education is seen in both public and private universities in Egypt (Barsoum, 2017). The quality of education provided at private and public universities is not of a high quality that leads to proper transition to the labor market (Barsoum, 2014).

The government spending on education as a percentage of the GDP is low compared to other developing countries. In 2015, for example, Egypt spent 3.9% of the GDP on education, while the government expenditure on education of other developing countries with similar characteristics such Tunisia 6.6% (World Bank, 2021). The minimal spending can explain the low quality of students who are not well equipped with a suitable skill set with which to enter the labor market

(Bedir, 2014). However, the government declared new reforms regarding education, and the labor market mismatch, but despite the largescale active labor market policies (ALMPs) and programs that have been introduced by many governmental institutions, local NGOs, and international development agencies, they have not been lucrative as they depend highly on donors' money (Selwanes & Roushdy, 2019).

B. The Egyptian Labor Market

The Egyptian labor market is plagued with several issues in which it was ranked the 130th out of 137 countries with a score of 46.4 out of 100 in the labor market efficiency pillar of the Global Competitiveness report issued by the World Economic Forum in 2018 (Schwab, 2018). The labor market efficiency pillar captures the flexibility, talent management, workers' rights protection in the labor market, as well as, the proper allocation of labor signaling the productivity of the nation. Although the quality in terms of education level of new entrants in the labor market increased since 1965 (Assaad et al., 2014), the labor force participation rate from 1988 to 2018 has seen a downward trend with a greater decline between 2012 and 2018 for those aged between 20-24 years old and among the most educated, and women in particular (Amer & Attallah, 2019). The increase in unemployment in that period was one of the byproducts of the 2011 revolution (Bedir, 2014). The labor market in Egypt faces a problem of absorbing new entrants to the market due to two major challenges. The first challenge comes from the demographic structure of the labor market in Egypt, as it is characterized by a youth bulge posing a burden on the labor market whether in the private or the public sectors (Assaad & Roudi-Fahimi, 2007). The size of the youth population in 2018 is 27.6 million, accounting for 31.2% of the total population, (Amer & Atallah, 2019) (see Figures 3 and 4 in the appendix). The second challenge is the mismatch between those graduates and the labor market needs. Not only the Egyptian graduates suffer from the mismatch, but also a study conducted on the Arab Mediterranean countries (AMCs) by the European Commission (2015) has found that those countries suffer from an educational skill mismatch as well.

Historically, the public sector dominates the Egyptian graduate labor market; however, in recent years it has been losing its dominance (Assaad et al., 2014). There was a policy that guaranteed employment in the public sector to all new entrants in the 1960s, but it was later ceased in the 1990s as the policy distorted the forces of supply and demand for graduates in the Egyptian labor

market (Hassan & Sassanpour, 2008). The policy has indeed caused a decline in unemployment to reach low levels of around 2%; however, it caused inefficiencies in the market (Hassan & Sassanpour, 2008). This supremacy of the public sector in Egypt has driven the credentials' demand causing low incentives for skill acquisition and "Credentialist Equilibrium" which refers to the education focusing on acquiring the degree rather than those that are demanded by the public sector and is obsolete for the private sectors (Salehi-Isfahani, 2012).

The problem of unemployment arises from the difficulty of finding the first job which is severely prevalent among youth and those with higher education in Egypt, having one of the highest youth unemployment rates and gender gaps in youth unemployment (Tansel et al., 2020). The total unemployment rate in 2018 in Egypt was 9.9% of which females comprising larger shares than males (CAPMAS, 2018b). In 2018, the unemployment rate among females aged between 15-34 is 32.1% while males' unemployment rate is only 7.7% (CAPMAS, 2018b). Moreover, the unemployment rate increases with education and is also high among the highly educated both males and females (Assaad & Kraft, 2015). The low participation rate of females in Egypt is another main issue that worsens over time since early 1990s, due to the private sector not being able to attract educated Egyptian females making unemployment or staying out of the labor force the most viable option (Assaad & Kraft, 2015; Hendy 2015).

Angel-Urdinola and Semlali (2010) studied World Bank Micro-data and found that although unemployment among Egyptian youth is high, education attainment is improving in Egypt; however, it did not translate into decreasing the unemployment rates among youth, indicating the persistent education-skill mismatch crisis. Assaad and Krafft (2021) have, like Angel-Urdinola and Semlali (2010), found that youth face weaker chances to land on a high-quality-well matched job.

Focusing on wages, based on the ELMPS, there has been a drop in median monthly wages by 11% in 2018 compared to 2012, specifically, in urban areas, those with post-secondary and higher education degrees, and in the private sector (Said et al., 2019) (see Figure 5 in the appendix). The annual percentage of the median monthly wage growth rate of university graduates from 2012 to 2018 declined by 2.8% (Said et al., 2019) (see Figure 6 in the appendix). Moreover, almost 40% of the labor force is in informal jobs which denotes that they neither have formal contracts nor

social insurance, and they are highly susceptible to negative working conditions; such as, longer working hours, unstable income, and most notably lower median real wages (Said et al., 2019).

III. Conceptual Framework

A broad definition of education-occupation is that educational qualifications of labor do not match those required for the job (Mahuteau, et al., 2015). There are two types of mismatches, vertical and horizontal mismatches. The vertical mismatch happens when the education level of the employee is not needed by the market, and the horizontal mismatch happens when the type or field of education or skills is inappropriate for the job (McGuinness et al., 2018).

A. Theoretical Considerations

The Human Capital, Job-Matching, Job Competition model, Assignment theory, Screening theory, Career Mobility theory, and Technological theory are the main principles in the literature that explain the mismatch phenomena. Human capital theory (Becker, 1964), the initial theory explaining the mismatch phenomena, tackles the value of education by studying the relationship between education and the growth of the economies via wages and GDP growth rates. The theory posits that investing in human capital in the sense of acquiring more education accrues higher productivity and more returns in order to use them in the job market; however, labor wage is determined by the supply of labor (Becker, 1964). Moreover, humans are not only defined by their education, but also by the skills they acquire at work, or in specific the skills that could have been acquired through a relevant work experience (Becker, 1964). Therefore, overeducation is a result of a lack of counterfactual skills and the individual is responsible for the mismatch (Becker, 1964). The theory looks at the mismatch from a supply-side perspective, and it does not account for heterogeneous preferences. Becker (1964) further explains that overeducation is a temporary phenomenon, and it is due to the asymmetric information between labor and the job market.

Job-Matching theory, developed by Burdett (1978) and Jovanovic (1979), which is an extension of the human capital theory, studies the phenomenon from both the supply and the demand side unlike the human capital theory. It suggests that educated labor is also skilled labor and should be well matched in his occupation in terms of both his skills and education (Jovanovic, 1979). It further

posits that proper matching is beneficial for both the employer and the employee as higher returns increase the labor's loyalty; consequently, maximizing the firm's productivity (Jovanovic, 1979). The theory delates both the individual and the firms to the mismatch. Similar to the human capital theory, it assumes homogenous preferences of the labor, and the phenomenon is temporary (Jovanic, 1979).

The job competition model formulated by Lester C. Throw (1975); however, explains that wages are determined by the skills needed for the job and not the overall education attained by the person; thus, the mismatch occurs due to the misallocation of human capital resources of attaining excess education than what is required for the job, and hence the problem of being underpaid. It also shows that there is a fixed number of occupations in the labor market and individuals are hired based on their hierarchy and their attained education; nevertheless, labor might be allocated to occupations with less education required than those they attained, ergo, overeducation is a result of the competition in the labor market (Throw, 1975). Also, the theory imposes that individuals queue up for a job, with those with higher education in the front but for jobs that underutilize their education and skills and offer wage rates less than those given to their well-matched peers (Throw, 1975). Unlike the human capital theory, this theory adopts a demand-side perspective.

Corollary to the human capital theory and the job competition model is the Assignment theory that combines both the Human Capital and the Job-Matching theories by Sattinger (1993). It is based on the heterogeneity of laborers' skills among those with the same level of education with different wage maximization; the theory further explains that if an overly educated labor works in a job that requires fewer skills are often less productive as low skills limits their productivity, thus implying overeducation is interchangeable with over-skilling (Sattinger, 1993). In conformity with the job competition model, it states that due to the limited endowment of occupations in the market, the remuneration is exclusive to each job and independent of the endowment of human capital and to study the wage penalty resulting from the mismatch, controlling for market externalities is vital (Sattinger, 1993). Unlike the aforementioned theories, the assignment theory can either be temporary or persistent. However, Allen and van der Velden (2001) and Green and McIntosh (2007) reject the assignment theory showing a weak correlation between over-skilling and overeducation (Nieto, 2014).

The screening theory (also called signaling theory), initially developed by Spence (1973), proposes that education is considered a *signal* for employers to allocate labor due to the asymmetry of information in the labor market. Therefore, individuals need to invest in their education to be able to land a well-matched job; hence, implying that overeducated laborers will be preferred more than undereducated ones (Spence, 1973).

The career mobility theory, developed by Sicherman and Galor (1990), considers the supply side of the mismatch and it has two different explanations for the overeducation phenomena. The first explanation is that laborers accept a job mismatching with their education to gain experience for the probability of getting promoted in the future; therefore, it can be implied that the nature of the overeducation phenomena is a transitory phase. In consistent with the theory, Robst (2005) and Diem and Wolter (2014) prove that over-educated individuals have a higher probability to be promoted than their well-matched counterparts within a year. While the second explanation is that if experience and on-job-training are accounted for, the overeducated laborers may not be classified as overly qualified (Sicherman & Galor, 1990).

The technological theory, on the other hand, assumes that the presence of over-and under-education phenomena is due to changes in technology, in which employers look for overeducated labor as they can adapt to the technological changes faster and more efficiently than their under-educated counterparts who will be confined to low-skilled jobs (Tandrayen-Ragoobur, 2020).

B. Persistence of the Education Occupation Mismatch

Understanding the persistence of the mismatch is also key to further comprehending the mismatch phenomena. The literature has given mixed signals regarding the length of the mismatch. The length of the incidence differs depending on several factors such as the reason for the mismatch, the region, the social group, etc. Rubb (2003) argues that if the mismatch is a temporary decision, to develop the human capital the mismatch will only be long-termed. The author provides evidence from the Current Population Survey (CPS) showing persistence in overeducation, with one in five individuals finding a well-matched job in a year, as they gained experience from their previous unmatched job. Clark et al. (2014) have concluded that persistence of overeducation was found because of a long waithood for employment which lowers the probability of finding a job, and it can persist for more than 10 years after the labor market entry; however, it becomes less frequent

with time. However, they also found that the propensity to exit a mismatched job is heterogeneous among workers due to the heterogeneity of workers (Clark, et al., 2014). On the contrary, others found the persistence to be less lengthy in studying different countries, such as Frenette (2004) who studied the Canadian labor market, Dolton and Vignoles (2000) studied the British labor market, and McGuinness and Wooden (2009) studied the Australian labor market. Moreover, Frei and Sousa-Poza (2012) have shown that it is a short transitory phase where half of their sample transitioned to a well-matched job within a year in Switzerland; both results are consistent with the career mobility theory.

C. Skills and the Education-Occupation Mismatch

Many studies have considered the relationship between skills and education concluding that both phenomena are related but are not interchangeable depending on the different approaches and statistical methods used (Allen & Van der Velden, 2001; Velden, 2001). There are mixed signals concerning the relationship between skills and education mismatch. Allen and van der Velden (2001) suggest that skills mismatch is not a necessary or sufficient condition for an educational mismatch, and Green and McIntosh (2007) reported that not all those who had a skill mismatch were educationally mismatched as well. Green and McIntosh (2007) found a correlation between both of 0.2.

Skills are broadly categorized into 3 areas; foundational or basic skills including literacy, numeracy, and foreign languages, transferable skills including core work skills such as learning to learn, communicating, and teamwork skills, as well as, technical and vocational skills linked to specific occupations. According to the International Labor Organization (ILO), there are diverse types of skill mismatch; skill gap, skill obsolescence, shortage, and over or under-skilling. A skill mismatch occurs when the labor lacks the necessary skills to efficiently perform his or her job. Skill obsolescence occurs when the labor loses his or her skill due to abandoning it either because it is outdated or because the job does not require it. Skill shortage is a horizontal mismatch, and it refers to employers finding difficulty hiring skilled labor, and finally over or under skilling is a vertical mismatch, and it refers to those sets of skills more or less than the required sets needed for the job. Skill Mismatch arises from the revolutionary world of technology where there are constant changes in the job market, and from the misalignment between educational institutes and the job

market, imperfect information or labor market meaning that labor cannot find a proper job matched with their skills, rigidities implying that labor could indeed find the appropriate job but will have to reject it due to other external factors such as inability to migrate due to children bearing, for instance, and heterogeneous workers in which labor can have the same qualification for the job but does not have the actual skills needed for the job (Green & McIntosh, 2009).

Almeida and Aterido (2011) argue that labor market requirements not being met by the skills of the youth curbs economic growth and productivity, as well as, increase production costs of firms that must pay for job training. On the other hand, youth can be well educated, but the market is not readily equipped to absorb such high skills. Dimova and Stephan (2020) and Chester and Baffour (2015) demonstrate that the high unemployment rates among university graduates are due to the scarcity of jobs that require high skills, as well as, the surplus of graduates with academic degrees in certain areas. Therefore, youth tend to be either self-employed or informally employed (Dimova & Stephan, 2020; Amer, 2015). However, the self-employed market is stationary and insignificant in the MENA region (Dimova & Stephan, 2020). Dimova and Stephan (2020), furtherly, show that the labor market values practical experience more than training. Manacorda et al. (2017) also show that educational training increases the probability for youth to have a successful well-matched school-to-work transition.

D. Measurements of Education-Occupation Mismatch

Measuring education-occupation mismatch is challenging as there is not one defined proxy agreed upon in the literature. Duncan and Hoffman (1981) developed the over-education, required education, under-education (ORU) Model. It is constructed by setting a reference level of the required education for each job and dividing laborers' years of education attained into the required level, then identifying the level of shortage or surplus in years of education (Dockey & Miller, 2012). Those with more education are referred to as overeducated (O), the reference level is referred to as "Required", and those with less education than the reference level is referred to as undereducated (U). Then, three separate variables for years of over-education (O), years of reference or required education (R), and years of under-education (U) are computed and included in the earnings equation in place of the conventional single years of schooling variable, and this is referred to as the ORU model (Dockey & Miller, 2012).

Measuring the mismatch can be conducted using either objective or subjective approaches. An example of objective approaches is measuring the level of education attained compared to peers working in the same job or utilizing the International Standard Classification of Education (ISCED) which is a statistical framework for organizing information on education by the United Nations Educational, Scientific and Cultural Organization (UNESCO). Furthermore, there are two types of objective measurement of the education mismatch, the normative job analysis method (JA) and the statistical/ realized matches method (RM) (Flisi et al., 2017). The JA method measures the required education level for a certain job based on a professional job analyst's evaluation of the match between the requirements and the labor's education categorizing them as overeducated, undereducated, or matched (Flisi et al., 2017). However, this approach imposes an unrealistic assumption in all jobs with the same title have the same educational requirements. Hartog (2000), Verhaest and Omey (2006), and Leuven E. and Oosterbeek (2011) consider the JA approach as the most desirable option assuming the continuous update of the job requirements. However, the JA method proves to be expensive and time-consuming; thus, inapplicable in emerging economies (David & Nordman, 2017).

On the other hand, the RM method infers the required education level from the distribution of the laborers' education levels using the mean or mode of the group, and they are predefined by the International Standard Classification of Occupations (ISCO) (Flisi et al, 2017). A mismatch is referred to when the mean or mode deviates by more than one standard deviation, and by two if the mismatch is severe. This method is easily quantitatively measured; however, it has its drawbacks as well. The RM method allows only one educational level to be well-matched with each job which might not reflect reality; It is also sensitive to cohort effects in which it can overestimate the phenomena by measuring the mode or median for the total labor force of a specific job without accounting for the difference in age casts the qualification of those hired at various times (Verdugo & Verdugo, 1989; Bauer 2002; Kiker et al., 1997; Mendes de Oliveira et al., 2000). Therefore, comparing it against an individual's education level might mislead the magnitude of the education mismatch. To overcome this limitation, economists have further developed the method by measuring the mean or mode of the specific cohorts with similar characteristics. This statistical approach was least preferred by Verhaest and Omey (2006) and Leuven and Oosterbeek (2011) because of the instability of the standard deviation of education levels with respect to the mean because of heterogeneous labor supply and demand that might affect the average education

level required for each vacancy. It has been further developed by allowing variation in the required education level with birth and survey years, as well as, choosing the one standard deviation threshold becomes arbitrary depending on the aggregation level to have a well-defined distribution of education for the job using the ISCO levels (Quinn & Rubb, 2006). In addition, identifying the mode is more preferred as it is less sensitive to outliers and changes in technology (Flisi et al., 2017).

On the other hand, subjective approaches are self-reported and use direct objective measures summarized by Quintini (2011) in which direct measures include comparing the employees' skills to the required skill for the job. The subjective approach has two types of methods, the direct self-assessment (DSA), and the indirect self-assessment (ISA) in which the laborers are asked about the education requirements of their current job. According to Groot and Van den Brink (2000), subjective measures of the education mismatch phenomena are found to be better than those obtained using objective measures as they are easily observable and job-specific.

The literature has also shown other hybrid approaches mixing both the subjective and objective methods conditional on the available data; for example, Chevalier and Lindley (2009) used the JA to determine the overeducation phenomena and used the subjective approach to measure the labors satisfaction with whether they are satisfied or not with the job although being classified as overly educated.

III. Literature Review

This section presents a voluminous literature review of the different approaches used to conceptualize and measure the education-occupation mismatch to provide a broader understanding of the current research on over- and under-education phenomena, and the different empirical approaches used. It is important to highlight here that there is a vast literature on measuring over- and under-education as compared to the skills required for the job, as this problem has been existing since the 1990s all over the world, and not only in Egypt; however, there is a gap in the literature when it comes to empirically estimate the determinants of education-occupation mismatch, and its effects on an individual's earnings level and job satisfaction among university graduates, particularly in Egypt.

A. Determinants of Education-Occupation Mismatch

Many works of literature focused on modeling the determinants of over- and/or under-education incidence. Leuven and Oosterbeek (2011) found that females are more susceptible to education mismatch than their male counterparts. In contrast, several other studies found that the probability of overeducation in men is more prevalent (McGoldrick and Robst, 1996; Battu et al., 1999; Groot, 2000). Tanrayen-Ragoobur (2020) used multinomial logit regression for estimating a model for the “well-matched” relative to other mismatches. The author found that gender is not related to the mismatch and that individuals aged between 16-24 years who lack working experience have a higher probability to be overeducated (Tanrayen-Ragoobur 2020).

Marital status also plays a role in determining the mismatch. Leuven and Oosterbeek (2011) suggest that unmarried cohorts have a higher probability of being overeducated. Nevertheless, Büchel and Battu (2003) found that married West German women living in rural areas experience a higher probability of being overqualified than other characteristics combinations. This can be explained by the fact that females in rural areas have fewer job opportunities, and are restricted to their family’s region of residency, while their male counterparts move more freely to other regions with a higher number of jobs where they are more likely to find a well-matching job. However, once the commuting distance is controlled for, married men in rural areas are also more likely to be over-qualified but not in the same magnitude as married women. McGoldrick and Robst (1996), on the other hand, found that marital status has no impact in the United States.

Diem and Wolter (2014) used a multinomial logistic regression model to investigate the determinants of education mismatch and unemployment among Swiss graduates in a single regression with the dependent variable having three states unmatched, unemployed, and the reference category as the well-matched. The findings also indicate that the type of the university program impacts the probability of the mismatch; an art degree was significantly associated with an increased likelihood of overeducation and lower earnings. Pollmann-Schult and Büchel (2004) and Verhaest and Omey (2006) also show that the quality of the educational program is one of the determinants of the mismatch.

Verhaest and Omey (2006) analyze the factors that impact overeducation by modeling a probit regression among Flemish school graduates. They characterize overeducation using both

subjective and objective measures. The findings suggest that the different measures of overeducation lead to different results. They showed that those with higher working years of experience value leisure less; therefore, they are more likely to accept a mismatching job with their education and qualification, marital status was insignificant, and father's education shows a negative statistically significant relationship with overeducation in which those whose fathers have higher education qualification experience a lower incidence of overeducation; however, the significance level changes with the different measures of overeducation.

Other determinants that were seen in the literature include repeating a school year which is correlated with the mismatch in which the more the delay in graduation reflects lower skills; hence, the higher the probability of being overeducated and suffering from a wage penalty matching with the screening hypothesis (Aina & Pastore, 2012).

B. Effect of education-occupation mismatch on earnings

Jacob Mincer (1974) has developed the foundation of the causal effect of education and earnings that economists have later further developed. He estimated the natural logarithm of earnings as a function of schooling and experience assuming that education affects earnings through its impact on individual productivity. One of the early literatures on measuring the mismatch was Duncan and Hoffman (1981), who estimated an earnings function for over 5000 labor in the US where the labor's educational attainment is divided into the number of years of schooling required for the job and the surplus/ deficit years of education. They estimated two separate regressions with the same dependent variable of "the log of hourly wages;" the first is having the number of completed education years, and the second was adding the surplus and deficit years of education; they also added years of labor force's experience, city size, and a dummy variable of the labor's residency in South as control variables (Duncan & Hoffman, 1981). The results suggest that overeducation was prevalent among the US labor force in the 1980s. Additionally, the earnings of an extra year of overeducation were positive and statistically significant for all geographic regions and work experience (Duncan & Hoffman, 1981). Undereducation is rewarded at a lower rate than the required education for the job with differences among job types, while overeducated workers earn more than less-educated workers in the same occupation, but less than their peers with the same level of education in occupations that do require their level of schooling (Duncan & Hoffman,

1981). Hartog (2000) also suggests that wages for overeducation are positive but with a lower magnitude for those who are adequately matched, while undereducated labor receive a wage premium compared to their well-matched peers.

McGuinness and Bennet (2007) use quantile regression to study the extent and effect of overeducation varied by skills level among graduates in Northern Ireland with relatively homogeneous characteristics including age and work experience. Their results show that the overeducation phenomenon is prevalent amongst those with a low-skilled cohort of the wage distribution with more than 20% of males and 10% of females in the top three quantiles as overeducated. Moreover, females' wage penalty was significantly larger regardless of their skills levels, and results also showed that lower and mid-skilled male graduates experienced the highest wage penalty relative to their male well-matched counterparts (McGuinness & Bennett, 2007). Both McGuinness and Bennet (2007) and Leuven and Oosterbeek (2012) show that overqualification causes a wage penalty in which those who are well-matched earn more than them, but those who are undereducated earn less than them. In addition, the authors show that the individual's educational background and the regions' characteristics are among the important determinants of earnings (McGuinness & Bennet, 2007).

Diem and Wolter (2014) study the factors of the mismatch and its consequences among Swiss graduates. The authors show that the mismatch incidence is significantly related to an annual wage penalty of about 4% to 10% and that the phenomenon persists for four years. The literature shows an average earning per required year of education of around 9%, whilst the returns per an extra year of overeducation is around 4% less than well-matching years, and 4% more for undereducation, according to Diem and Wolter (2014). Clark et al. (2014) show that overeducation is linked with lower current and future earnings among 4895 American individuals.

C. Effect of Education-Occupation on Job Satisfaction

Battu et al., (1999) are one of the primary authors who discussed job satisfaction. This paper studies two samples of graduates in the years 1985 and 1990 in the United Kingdom using an ordered probit model. They regressed job satisfaction on overeducation, well-matched and other job characteristics. The authors posited a statistically negative effect of the mismatch on the labor's occupational satisfaction with overeducated individuals showing higher dissatisfaction than their

well-matched counterparts. Piero et al. (2010) study the job satisfaction of Spanish graduates showing an inverse relationship between education surplus and job satisfaction using a hierarchical multiple regression model. However, Florit and Lladosa (2007), studying a sample of Spanish Households, suggest that the impact of education on job satisfaction is indirect and is rather reflected in the worker's health, earnings, and other characteristics. Florit and Lladosa (2007) use a variant of the logit and probit models; the single equation-ordered choice models (OCM) since job satisfaction has an ordered nature. However, the authors mention that the OCM does not account for the fact that the labor's demographics depend on the job characteristics (Florit & Lladosa, 2007). Piero et al. (2010) study Spanish employees and they show that job dissatisfaction causes disutility and is affected by a job mismatch. The authors also show that marital status, gender, and age are significant indicators for job satisfaction; however, high working experience buffers the inverse effect of surplus education on job satisfaction (Piero et al., 2010).

D. Endogeneity of Education Returns

It is well established in the econometrics literature that education and wages are potentially endogenous. Among the primary reasons for such endogeneity is the expected reverse causality between education and earnings, as it is not only that years of education may affect earnings, but also investing in education is often based on expectations of future earnings (Groot & Brink, 1997; Card, 1999). To correct for such potential endogeneity, one either need to use fixed effects panel data models to estimate the time-varying independent variables if panel data is available, or use instrumental variable approach provided that good instruments for education attainment are available (Bedir, 2014).

Nevertheless, due to limited data, only a few studies attempted to correct for this endogeneity problem using instrumental variable (IV) approach when investigating the impact of education-occupation mismatch. Several instrumental variables were employed in the literature, including the birth season, the minimum year of school leaving age, the father's education, geographic proximity to schools, and tuition costs.

Regarding birth season, Angrist and Kreuger (1999) argue that people born earlier in the year start school at an older age compared to others who are born later in the year; therefore, those who are younger drop out after completing more years of education than their older counterparts, and hence

comes the relationship between education and the season of birth. However, other studies counterargue that older individuals score higher grades encouraging them to attain more years of schooling and invest further in their education (Doornbos, 1971; Sharp, 1995). Moreover, the net effect between schooling and education differs according to the educational laws in the country. Levin et al. (1999) used the minimum year of school leaving age (MSLA) to instrument for education level, based on the argument that an increase in the MSLA triggers further education; however, several studies argue that using MSLA as an IV violates the monotonicity assumption where all individuals are required to be affected by the IV in the same direction (Adamecz-Voldyi, 2021).

On the other hand, the most often-used IV is the father's education (Bedir, 2014; Trostel et al., 2002). However, some studies also argue that a father's education may not be exogenous, and may yield biased results since earnings are heterogeneous (Wooldridge, 2016). For instance, Wooldridge (2016) suggests that using father's education as an IV is controversial since it can be correlated with the worker's ability, and, Clark et al. (2014) highlighted that controlling for the correlation between ability and education is challenging. Nevertheless, parent's education became increasingly important to determine the offspring's earnings as it shows a positive correlation in Egypt (Assaad, et al., 2018; El Enbaby & Galal, 2015; Said et al., 2019). Also, a mother's education is positively correlated with her offspring's wages; the higher the mother's education, the higher her offspring's wages, with a stronger correlation among mothers with post-secondary education and above (Said et al., 2019).

E. Literature on Egypt

In Egypt, few papers quantitatively examined the education-occupation phenomena. El-Hamidi (2005) studies the phenomena within the private sector of the Egyptian labor market and evaluated the incidence and magnitude of the mismatch by gender and by occupational categories over the period 1998 to 2006 using the ELMPS data, but did not model the determinants of the mismatch. The author used Duncan and Hoffman's ORU specification to estimate the effect of schooling on wages with a focus on blue collars, white collars, and professionals. All three coefficients were insignificant. This paper estimates the wage equation using the OLS regression techniques; hence not controlling for potential endogeneity of education. Following El-Hamidi (2010), Bedir (2014)

also studies the mismatch in Egypt; the author examined the effect of the mismatch on wages using the 2012 ELMPS. Bedir (2014) uses two different models based on the classical Mincer equation. The first model is the ORU model based on Duncan and Hoffman (1998), and the second one uses a 2SLS regression model primarily introduced by Verdugo & Verdugo (1989) that uses father education as an instrumental variable to avoid the endogeneity between education and wages. The findings show a positive effect of overeducation on earnings, a trade-off exists between experience and overeducation, females earn less than males, married individuals earn more, and working in the public sector provides fewer earnings than working in a public sector, and firm size also significantly affects the wage.

Furthermore, David and Nordman (2017) estimate the effect of migration on the education-occupation mismatch in Egypt and Tunisia. They used multinomial logistic regression to capture the effect of each explanatory variable on overeducation and undereducation separately (David & Nordman, 2017). They found significant and positive effects of return migration on the probability of being overeducated. He also found that male return migrants are more likely to experience the mismatch and that working experience has a positive effect on the likelihood of being undereducated, and a negative effect on the likelihood of being overeducated (David & Nordman). They also show that the sector and the economic activity of the job determine the impact of the mismatch (David & Nordman, 2017). Morsy and Mukasa (2019) contributed to the literature on Egypt; the authors use multinomial logit and instrument for education using parent's education and probit model to estimate the effect of the mismatch on wages and on job satisfaction, respectively. The authors do not focus solely on Egypt but rather they study a sample of 10 African countries including Egypt using the cross-sectional datasets from the School-To-Work Transition Surveys (SWTS) conducted by the International Labor Organization (ILO). The results show that Egypt has a high incidence of overeducation and has the largest gender gap among the studied countries in which females are more likely to be overeducated by 2.9%, and job satisfaction has a negative relationship with overeducation.

Accordingly, based on the aforementioned literature, the main contribution of this thesis is to contribute to the limited literature on the education-occupation mismatch among university and above graduates in Egypt. Our analysis focuses on university and above graduates as they are the most impacted by the adverse employability characteristics in Egypt as discussed above. More

specifically, using the most recently available data and accounting for the potential endogeneity of education attainment, this thesis tests the following three hypotheses among university and above graduates in Egypt:

- 1) Sociodemographic characteristics significantly determine the extent of the mismatch, as well as the economic activity, and sector of employment;
- 2) Earnings from overeducation is positive but with a lesser magnitude than those from a well-matched job that also has positive earnings, while undereducation provides fewer earnings than a well-matched job (Bedir, 2014; Rubb, 2003);
- 3) The education-occupation mismatch significantly affects job satisfaction.

V. Data

The data used in this research is from the most recent wave of the Egyptian Labor Market Panel Survey (ELMPS), the 2018 wave. The ELMPS was conducted by the Economic Research Forum in partnership with the Egyptian Central Agency for Public Mobilization and Statistics. The first ELMPS was conducted in 1998 on a sample of 4816 households nationwide, then 3 follow-up waves were carried out in 2006, and 2012, and the last one was in 2018. The survey is representative of the nation.

This longitudinal survey (panel data) includes prolific data on individuals' education, employment, and social characteristics.

In this study, we will focus on the most recent wave of the ELMPS, 2018. This latest wave includes households interviewed in the 1998 wave with an additional fresh sample. The 2018 survey wave interviewed a total of 61,231 individuals (30,542 males, and 30,688 females)¹ from 15,746 households. Since this research only focuses on university and above graduates, the sample under study consists of 5,332 individuals who have university and above degrees. Almost half of the sample are males (2,835 individuals), and the other half are females (2,497 individuals).

¹ Gender is missing in the data for one observation.

The main variables of interest included in the data are the highest level of education attained, education level required by the job based on the question “What is the highest level of education required for your current job?”, the hourly wage, and job satisfaction and other control variables such as years of working experience, gender, geographical location (divided into the main five regions of Egypt), father’s education, marital status, the economic activity of the current job, economic sector of the current occupation, wealth quantiles, firm size.

Besides the available variables in the data, we divided the marital status into two categories; ever married including those who are divorced, or widowed, and those who have been contractually married as well, and never married. We also created a new variable for economic activity, combining the economic activity that consisted of 18 different categories into the 3 main categories: Agriculture, industry and construction, and services and others. Additionally, we classified the employment sector based on sector of employment and formality status into three categories: government or public sector workers, working formally in the private sector (including private, International, Investment and Others sectors), working informally in the private sector. Regarding the firm’s size, we combined it into 3 categories: small (1-9 workers), medium (10-49 worker) and large firms (50+ workers)².

Regarding our main variables of interest, the education-occupation mismatch variables, we developed two sets of variables: (1) developed three dummy variables for well-matched, over- and under- education by directly comparing the categories of the education required for the job variable and the categories of the education attained variable included in the data. The dummy variable “overeducated” takes the value 1 for individuals who attained more years of schooling than those required by their current job and zero otherwise; and “undereducated” takes the value 1 for individuals who attained fewer years of schooling than those required by their current occupation and zero otherwise, and “well-matched” taking the value 1 for individuals who attained an equal number of years of schooling as those required by their current occupation and zero otherwise. (2) developed three discrete variables for years of education required for the job, years of overeducation and years of undereducation, through transforming the level of education required for the job into number of years rather than categories of education and compared it to years of

² The classification is based on the International Labour Organization (ILO) (2019) classification of business size of Enterprises.

education attained variable included in the data. We transformed the categories of the highest level of education required for current job into the years required for the job by assigning 0, 6, 9, 12, 16, 18 years for no formal schooling, primary, preparatory, secondary, university and above university degrees, respectively. Similarly, the years of schooling is assumed to be 16 (regardless of the level reported), if the individual reported a university or equivalent degree and are assumed to be equal to 18, if a higher than university education is reported. We chose 18 years because 18 is the average years of schooling among those reporting post-graduate studies in the ELMPS 2018 sample. It is also important to note that we treated illiteracy certificates as equivalent to primary education in accordance with the Ministerial decree no. 353 for 2015 on the equivalence of the literacy certificate to a primary certificate.

Moreover, following Verdugo and Verdugo (1989), the final variable of interest is a response to the question “Are you satisfied with your current job?” with responses of either “rather satisfied, fully satisfied, neither satisfied nor dissatisfied, rather dissatisfied and fully dissatisfied”. We created a dummy variable for being “Satisfied” if the individual reported being “fully satisfied” or “rather satisfied” with his/her job and zero otherwise.

VI. Stylized Facts

Table 1 summarizes the characteristics of individuals with university and above education from the sample of the 2018 ELMPS. Overeducated individuals comprise 20.1% of our sample, well-matched individuals comprise 81.1% of our sample, while undereducated individuals are minimal constituting 0.7% of our sample. Since the incidence of undereducation is minimal, in the analysis section we will primarily focus on overeducation. The mismatch is more prevalent among males, with 23.4% for overeducation and 0.9% for undereducation compared to 12.9% overeducated females and 0.3% undereducated females; hence, females are more adequately matched constituting 86.4% than their male peers constituting 76.3%. Consistent with the literature, the mismatch is more prevalent among those aged between 29-45, with 5-10 years of experience suggesting the persistence of the mismatch furtherly curbing those individual’s productivity, not married, live in rural upper Egypt, the poorest, work in informal private sector, work in agricultural sector, and work in small firms among our total sample.

With a focus on overeducation since it's our main variable of interest, males ages 15-29 encounter the highest overeducation (33.1%), those with 5-10 years of experience (39.1%), are ever married (29.6%), live in rural upper Egypt (32.7%), within the poorest wealth quantile (39.9%), works in private informal sector (53.6%), works in agriculture (69.%), and work in small firms (46.4%).

Similar to males, the highest overeducation phenomenon exists among females who are 15-29 years (16.2%), with 5-10 years of experience (20.7%), are married (17.1%), live in Alex and Suez Canal governorates (16.3%), the poorest (26.7%), work in the agricultural sector (26.7%) and finally those work in private informal sector (21.6%).

Table 1 Prevalence of Over-education (O), well-matched (M), and Under-education (U) among university graduates, by main background characteristics, 2018 (%)

	Male			Female			Total		
	O	M	U	O	M	U	O	M	U
Age Group									
15-29	0.331	0.662	0.007	0.162	0.832	0.006	0.277	0.717	0.006
29-45	0.236	0.756	0.008	0.14	0.859	0.001	0.206	0.788	0.006
45 +	0.073	0.92	0.007	0.057	0.94	0.003	0.067	0.928	0.006
Work Experience									
<2 years	0.213	0.787	0	0.104	0.887	0.01	0.161	0.835	0.005
2-5	0.265	0.715	0.02	0.204	0.793	0.002	0.246	0.739	0.015
5-10	0.391	0.609	0	0.207	0.787	0.006	0.318	0.679	0.002
10+	0.189	0.802	0.01	0.125	0.873	0.002	0.169	0.824	0.007
Marital status									
Never Married	0.213	0.78	0.008	0.118	0.881	0.002	0.182	0.813	0.006
Ever Married	0.296	0.697	0.007	0.171	0.824	0.005	0.256	0.738	0.006
Region of residence									
Greater Cairo	0.149	0.848	0.003	0.132	0.867	0	0.144	0.854	0.002

Alx. Sz C.	0.216	0.776	0.008	0.163	0.837	0	0.196	0.799	0.005
Urb. Lwr.	0.234	0.741	0.026	0.132	0.866	0.002	0.196	0.788	0.017
Urb. Upp.	0.236	0.758	0.006	0.105	0.88	0.014	0.184	0.806	0.009
Rur. Lwr.	0.268	0.726	0.006	0.087	0.913	0	0.216	0.78	0.004
Rur. Upp.	0.327	0.667	0.006	0.211	0.789	0	0.3	0.696	0.004
Household wealth									
First	0.399	0.601	0	0.267	0.733	0	0.368	0.632	0
Second	0.296	0.694	0.01	0.21	0.79	0	0.277	0.715	0.008
Third	0.306	0.694	0	0.137	0.863	0	0.263	0.737	0
Fourth	0.255	0.742	0.003	0.189	0.811	0	0.234	0.763	0.002
Fifth	0.174	0.814	0.012	0.093	0.903	0.004	0.145	0.846	0.009
Employment Sector									
Public	0.138	0.852	0.01	0.113	0.885	0.002	0.128	0.866	0.006
Private formal	0.137	0.859	0.004	0.143	0.857	0	0.138	0.859	0.003
Private informal	0.536	0.458	0.007	0.216	0.777	0.008	0.473	0.52	0.007
Economic activity									
Agriculture	0.69	0.31	0	0.812	0.188	0	0.697	0.797	0.006
Industry/Construction	0.289	0.705	0.006	0.178	0.822	0	0.277	0.303	0
Services and Others	0.2	0.791	0.008	0.123	0.874	0.002	0.172	0.718	0.005
						0.002	0.822	0.006	
Firm Size									
Small (< 10)	0.464	0.528	0.007	0.202	0.79		0.414	0.797	0.006
Medium (10-	0.202	0.797	0.001	0.092	0.905	0.009	0.161	0.578	0.008
Large	0.153	0.837	0.009	0.131	0.868	0.003	0.145	0.837	0.002
Total	0.234	0.763	0.009	0.129	0.864	0.003	0.20	0.811	0.007

Furthermore, before constructing the models, we estimated a correlation matrix to understand the relationship between variables, as seen in Table (2) in the appendix. The correlation matrix shows that all variables are not highly correlated; therefore, correlation does not impose any problem in order to estimate our model.

VII. Methodology

This section outlines the econometrics model that will be estimated in this thesis to understand the determinants of education-mismatch and investigate its effect on graduates' earnings and job satisfaction. We estimate all models by clustering the sample according to the region.

To investigate the determinants of the education-occupation mismatch, following Battu et al. (1999), we first estimate the following probit regression to model the likelihood of being overeducated:

$$Pr(X_i) = \Phi(\delta X_i + e_i) \quad (1)$$

Where Y_i is the observed outcome which is equal 1 is the individual in overeducated (undereducated) and zero otherwise. X is a vector of individual's own characteristics outlined below. To further investigate the determinants of overeducation, we also estimate an OLS model using the years of overeducation as the dependent variable. A modified version of the standard Mincer equation of human capital earnings function may be written as follows

$$\log(w) = \beta_0 + \beta_1 E + \beta_2 wexp + \beta_3 wexp^2 + \beta_4 X + \varepsilon_i \quad (1)$$

where X is a vector of explanatory variables that may impact the wage, including gender, region of residence, marital status, and firm size. E is the years of attained education, while $wexp$ and $wexp^2$ are working experience and its square.

Following Duncan and Hoffman (1981), Hartog (2000), Bauer(2000) and El Hamidi (2010), the education variable (E) is decomposed into “years required by the worker's job”, denoted by “ E_r ”; “years of overeducation”, denoted by “ E_o ”; and “years of undereducation”, denoted by “ E_u ”. Hence, E will yield a positive value in case of attained education is more than the required and 0 otherwise in the case of overeducation; and a positive variable if required education is more than

the attained education and 0 otherwise in the case of undereducation. More specifically, we can define an E_o and E_u as follows:

$$E_o = \begin{cases} E - E_r; & \text{if } E > E_r \\ 0 & ; \text{ otherwise} \end{cases} \quad (2)$$

$$E_u = \begin{cases} E_r - E; & \text{if } E_r > E \\ 0 & ; \text{ otherwise} \end{cases}$$

Following from (1) and (2), Hartog (2000), modified the earnings functions by including separate E as separate variables, yielding the following equation

$$\log(w) = \beta_0 + \beta_1 E_r + \beta_2 E_o + \beta_3 E_u + \beta_4 wexp + \beta_5 wexp^2 + \beta_6 X + \varepsilon_i \quad (3)$$

If the years required for the job are the only determinants of the job, β_2 and β_3 will be equal to zero meaning that earnings to surplus or shortage years of education relative to the level of education required for a specific occupation is zero, in which the job competition model shall hold true. However, if productivity is positively related to education level, then a positive β_2 and a negative β_3 is expected following the assignment theory. If β_1 is significant, but β_2 and β_3 are not significant, then the required education for the job is the sole determinant for wages, consistent with the job competition model (Bedir, 2014). Lastly, the Human Capital theory shall hold if all betas are not significantly different from zero.

Since, education level may be endogenous as discussed above, we use two stage least square 2SLS instrumental variables technique to estimate our wage equation (equation 3). Following Bedir (2014), in the first stage of the estimation, we instrument individual education by the father's education and father's job employment status.

We performed the Hausman and Durbin-Wu Hausman tests to test for endogeneity of individual education. The Hausman test compares the OLS and the instrumental estimates to check for significant differences (Hausman, 1978). If there are significant differences between them, then the regressors are endogenous, and if there are no significant differences, then the regressors are exogenous; thus, using an IV approach is useless. So, we observe the p-value and either reject or fail to reject the null hypothesis to decide upon the existence of endogenous regressors. Additionally, to test for the strength of our IVs, we checked the F-test of the first stage equation to

confirm that it is not less than the rule of thumb value of 10 or the needed thresholds to ensure that we are not employing weak instruments.

Finally, a probit model similar to equation 1 is also estimated to model the determinants of job satisfaction.

VIII. Empirical Results

A. Determinants of Overeducation

Table 3 below shows the regression results. We first estimate the determinants of over-education in columns 1 and 2. Model (1) uses a probit model to estimate the probability of being overeducated, i.e. using the overeducation dummy variable as the dependent variable, which takes the value 1 if the individual is over educated and 0 otherwise. The second model specification uses OLS techniques and the years of overeducation as the dependent variable. The results are within expectation.

Model (1) reports the average marginal effects of the probit models for the likelihood to be overeducated.³ The estimation results show that all covariates have significant effects except for the wealth quantiles, and marital status consistent with McGoldrick and Robst's (1996), who show no impact of marital status. Similar to McGoldrick and Robst (1996), Battu et al., (2000) and Groot (1997), and contrary to Leuven and Oosterbeek (2012) and Morsi and Mukasa (2019) females are less likely to be overeducated than their male peers by 7.1% at a 10 % significance level. Working experience increases the probability of overeducation by 0.6% at a 10% significance level; however, its effect diminishes over time at a 5 % significance level, similar to Tanrayen-Ragoobur (2020) and Verhaest and Omey's (2010) results. The significant positive relation can be explained as those with higher working years of experience value leisure less; therefore, they are more likely to accept a mismatching job with their education and qualification (Tanrayen-Ragoobur, 2020; Verhaest & Omey, 2010). Living in Alex and Suez Canal governorates and in Rural Upper Egypt increases the probability of overeducation compared to the reference region (Greater Cairo) at a 5% significance level by 12.1% and 11.1%, respectively, similar to Lu (2017), and Büchel and

³ Similar results are also obtained when we focused only on the university graduate sample, rather than the university and above education sample.

Battu (2003). Büchel and Battu (2003) argue that rural regions have fewer job opportunities, and females are restricted to their family's region of residency and are not able to move freely to other regions with a higher number of jobs with more well-matched jobs. Working in the formal and informal private sectors significantly increase the likelihood of overeducation as compared to working in the public sector by 6.8% and 34.9% at 5% and 1% significance levels compared to working in the public sector, respectively. A higher probability of overeducation is seen in the informal sector as expected because the informal sector is not governed by the government; thus, having several talent management issues. While working outside the agricultural sector significantly decreases years of over-education by 15.5% and 26.3% at a 1% significance level, respectively. These results are also similar to Lu (2017) and Caroleo and Pastore (2011) who show that job characteristics such as the sector significantly impact the likelihood of overeducation. Finally, the bigger the firm size, the less likely it is to encounter overeducation as compared to small-sized firms by around 15% at a 1% significance level. Similar results are observed by Tanrayen-Ragoobur (2020) and Zakariya and Noor (2014), while the results contradict Johnes' (2018) results who argues that the larger the firm, the more efficient the human resources management.

Model (2) reveals that 42.1% of the variability observed in the target variable is explained by the regression model. The estimation results show almost the same results as the probit model except for it shows a negative and significant effect of marital status. Unmarried cohorts experience about half a year of overeducation as compared to their ever-married counterparts, as they have a chance to wait till they find a well-matched, unlike the married cohorts who are obliged to accept any job regardless of their qualification match. Similarly, Leuven and Oosterbeek (2011) and Büchel and Battu (2003) showed a higher probability for married cohorts to be overeducated. Unlike, the probit model (model 1), all regions show significantly and positive effect on years of overeducation, as compared to Greater Cairo. It is expected that outside the metropolitan region of Greater Cairo, fewer jobs are available for the highly educated labor market entrants; causing higher competition and a higher probability of being mismatched. This is consistent with the job competition model developed by Throw (1975) which states that the mismatch is due to the competition in the labor market. Also, the impact of the most affluent (falling in the fifth wealth quantile) shows that they on average experience 1.1 fewer years of overeducation, compared to their poorest counterparts, at a 1% significant level.

Table 3: Determinants of Over Education		
	(1)	(2)
VARIABLES	Probit	OLS
Sex	-0.071*** (0.024)	-0.491*** (0.147)
Experience	0.006* (0.003)	0.052** (0.022)
Experience^2	-0.000** (0.000)	-0.001** (0.001)
Never Married	-0.011 (0.027)	-0.480** (0.244)
Alex and Sz C.	0.121** (0.056)	0.768** (0.327)
Urb. Lwr.	0.054 (0.043)	0.928*** (0.304)
Urb. Upp.	0.052 (0.046)	0.940*** (0.297)
Rur. Lwr.	0.065 (0.042)	0.893*** (0.289)
Rur. Upp.	0.111** (0.048)	1.508*** (0.323)
Wealth Quantiles		
Second	0.022 (0.061)	0.187 (0.626)
Third	0.050 (0.062)	-0.108 (0.575)
Fourth	-0.020 (0.056)	-0.586 (0.583)
Fifth	-0.058 (0.056)	-1.108* (0.578)
Private Formal Sector	0.068** (0.031)	0.872*** (0.242)
Private Informal Sector	0.349*** (0.033)	4.319*** (0.365)
Economic Activity		
Industry/ Construction	-0.155*** (0.033)	-4.772*** (0.607)
Services and Other	-0.263*** (0.055)	-6.195*** (0.579)
Firm Size		
Medium	-0.148*** (0.021)	-2.352*** (0.351)
Large	-0.149***	-2.326***

	(0.026)	(0.322)
Constant		8.798***
		(0.940)
Observations	2,810	2,810
R-squared		0.421
Wald chi2(26)	633.6	
Prob > chi2	0	
Pseudo R-squared	0.227	
log pseudolikelihood	-1269	

Average marginal effects are reported for the probit model.

Robust standard errors in parentheses

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

B. Effect of Overeducation on Earnings

In Table 4, Model (3) estimates the Mincer wage equation using OLS regression to investigate the effect of education-mismatch on earnings, among all university graduates, without correcting for potential endogeneity of education and work characteristics. In Model (4), we apply Verdugo and Verdugo's (1989) specification using an IV for the total sample, similar to the work of Bedir (2014). We instrument the individual's education by the father's education and father's employment characteristics, respectively. In models (5) and (6), we restrict the sample once for males and once for females, respectively.

In all model specifications, with or without correcting for endogeneity, the coefficients of years of overeducation and years required by the job are positive and significant except in the last model which can be explained due to the lower number of observations by almost half the male sample; hence matching with the job competition model where job requirements are the only factors that determine wages. Moreover, consistent with Duncan and Hoffman (1981), Lu (2017), and Slonimczyk (2008), the results show that overeducation is associated with a wage premium with a lesser magnitude than that of being well-matched for all models except for the model that is restricted to females.

Focusing on Model (3), with or without correcting for endogeneity, females show to have a wage penalty compared to their male counterparts with an extra year of overeducation by 16.3%, consistent with McGuinness and Bennet's (2007) regardless of the female's skill level. Similar to Duncan and Hoffman (1981), Lu (2017), and Slonimczyk (2008), the earnings of an extra year of

overeducation were positive and statistically significant for work experience, and all regions compared to Greater Cairo show a wage penalty with an extra year of overeducation except for Rural Upper Egypt. The Rural Lower area has the highest magnitude of 17.6% at a 1% significance level. Living in Alex and Suez Canal causes a wage penalty of 13.1% at a 5% significance level, urban lower cause a wage penalty of 16.4% at a 1% significance level, and urban upper region causes a wage penalty of 12.5% at a 5% significance level. The sector of the job is also significant and causes wages to decline by 13.8% for the private formal sector, and 30.7% for the informal sector at a 1% significance level penalty compared to working in the public sector. Firm size, marital status, and economic activities were all insignificant.

Model (4), which is for the total sample and uses the father's education and employment status as IVs, shows similar results to that of the OLS that does not account for endogeneity consistent with the literature. Being a female and having higher working experience cause a wage penalty of 15% at the 1% significance level, respectively similar to model (3). Also, regions results were similar to that of the OLS model. However, unlike the OLS model results, marital status is significant with not being married decreases wages by 10.3% at a 10% significance level, and the sector, economic activity, and the firm size were all insignificant.

Model (5), restricting the sample to males only, suggests again that working experience is associated with a wage premium of around 1.7% at a 5% significance level, and the effect diminishes over time. Regions show the same results as that in the previous model.

Finally, Model (6), restricting the sample to females, shows insignificant results for all variables except for working in the private formal sector with a wage penalty of 32.1% at a 5% significance level. This could be caused by the small sample of females.

Table 4: Regression Results of the wage equation

Variables	(3) OLS Total	(4) IV 1 Total	(5) IV 1 Males	(6) IV 1 Females
Sex	-0.163*** (0.029)	-0.150*** (0.045)		
Experience	0.017*** (0.005)	0.018** (0.007)	0.017** (0.007)	0.010 (0.015)
Experience^2	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)

Never Married	-0.044 (0.045)	-0.103* (0.055)	-0.061 (0.065)	-0.077 (0.113)
Alex and Sz C.	-0.131** (0.063)	-0.121* (0.068)	-0.117 (0.076)	0.010 (0.182)
Urb. Lwr.	-0.164*** (0.059)	-0.179** (0.071)	-0.191*** (0.071)	-0.143 (0.137)
Urb. Upp.	-0.125** (0.052)	-0.132* (0.069)	-0.187** (0.078)	-0.135 (0.123)
Rur. Lwr.	-0.176*** (0.056)	-0.173*** (0.064)	-0.213*** (0.073)	-0.159 (0.133)
Rur. Upp.	-0.084 (0.060)	-0.098 (0.103)	-0.072 (0.096)	-0.046 (0.181)
Private Formal Sector	-0.138*** (0.041)	-0.054 (0.063)	-0.027 (0.064)	-0.321** (0.153)
Private Informal Sector	-0.307*** (0.055)	-0.248 (0.194)	-0.264 (0.181)	-0.364 (0.257)
Economic Activity				
Industry/ Construction	0.105 (0.086)	0.128 (0.194)	0.170 (0.151)	0.373 (0.384)
Services and Other	-0.069 (0.083)	-0.106 (0.241)	-0.033 (0.186)	0.111 (0.343)
Firm Size				
Medium	-0.032 (0.050)	0.023 (0.152)	0.034 (0.127)	-0.405 (0.282)
Large	0.027 (0.049)	0.006 (0.129)	0.024 (0.113)	-0.305 (0.249)
Yearsovereducated	0.101*** (0.028)	0.838* (0.463)	0.736** (0.371)	-0.780 (0.730)
Yearsrequired	0.116*** (0.028)	0.846** (0.429)	0.739** (0.350)	-0.595 (0.672)
Constant	0.998** (0.458)	-10.807 (7.156)	-9.296 (5.768)	12.371 (10.770)
Observations	1,978	1,970	1,338	632
R-squared	0.190			

Robust standard errors in parentheses

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

Furthermore, we test for the endogeneity of education using the Durbin and Wu-Hausman Test. As Table 5 shows, the null hypothesis is that the variables are exogenous. Since the p-value of both tests is equal to 0.0307 then we can reject the null hypothesis at a 5% significance level. Hence, the education variables are endogenous and the OLS model would produce biased results. Accordingly, in the following, we will focus on the IV model results.

Table 5: Test of endogeneity for model 2

Ho: variables are exogenous

Robust score chi2(2)	=	6.96986	(p = 0.0307)
Robust regression F(2,1950)	=	3.5845	(p = 0.0279)

We also test whether the chosen instruments are weak or not using the partial F-test, as shown below in table (6). Since the partial F-test value is higher than the rule of thumb of 10, then we conclude that our instruments are not weak.

Table 6: First Stage Regression (F-Test Results)

Source	SS	df	MS	Number of obs=
F(23, 1702) = 51.08				
Model	14152.86	23	615.342	Prob > F = 0.000
Residual	20505.25	1,702	12.048	R-squared = 0.4084
Total	34658.107		Root MSE = 3.471	Adj. R-Squared = 0.4004

Source: Author's calculation using the ELMPS 2018

C. Effect of Overeducation on the Job Satisfaction Model

Finally, we estimate a model, shown in table (7) to measure the probability of satisfaction due to the mismatch using two different measurements for overeducation for robustness check. Similar results are obtained when including an undereducation dummy (years of undereducation) or excluding it. Therefore, we exclude the undereducation from all models due to its small sample

size and only focus on the overeducation dummy, where well-matching and undereducation is the reference category.⁴

The first specification uses the dummy variable of overeducation, and the second uses the years of overeducation. Both specifications show that overeducation decreases the probability of satisfaction by 4.4% and 0.4% at a 1% significance level, respectively. These similar results were also concluded by Pietro (2010), Battu et al.(1999) and Florit and Lladosa's (2007) results. For the control variables, both specifications showed the same impact except for the economic activity was significant in model (7) in which working in the industry, construction, services and other sectors decreases the probability of satisfaction by 2.6% and 0.6% at 10% and 5% significance levels, respectively. In both models (7) and (8), A female is more likely to encounter dissatisfaction compared to males by around 2% at a 10% significance level. While living in Alex and Suez Canal governorates compared to living in Greater Cairo decreases the probability of satisfaction by 0.5% at a 10% significance level. Also, both models show that working in the private sector in both the formal and informal sector decreases the likelihood of satisfaction by 0.67% and 1.4% at a 1% significance level, respectively.

Table 7: Determinants of Job Satisfaction

VARIABLES	(7) Satisfied (dummy)	(8) Satisfied (years)
Sex	0.022*	0.020*
	(0.012)	(0.012)
Experience	0.001	0.001
	(0.002)	(0.002)
Experience²	0.000	0.000
	(0.000)	(0.000)
Never Married	-0.019	-0.021
	(0.014)	(0.014)
Alex and Sz C.	-0.054*	-0.054*
	(0.033)	(0.032)
Urb. Lwr.	-0.030	-0.027
	(0.024)	(0.023)
Urb. Upp.	-0.032	-0.029
	(0.027)	(0.026)
Rur. Lwr.	-0.006	-0.004
	(0.020)	(0.020)

⁴ Results are once again similar whether focusing on the university only or university and above graduates.

Rur. Upp.	-0.033 (0.027)	-0.028 (0.026)
Wealth Quantiles		
Second	-0.045 (0.040)	-0.044 (0.040)
Third	-0.040 (0.039)	-0.045 (0.041)
Fourth	-0.029 (0.034)	-0.033 (0.035)
Fifth	-0.016 (0.029)	-0.021 (0.029)
Private Formal Sector	-0.067*** (0.022)	-0.064*** (0.021)
Private Informal Sector	-0.140*** (0.026)	-0.131*** (0.026)
Economic Activity		
Industry/ Construction	0.026* (0.016)	0.018 (0.017)
Services and Other	0.060** (0.027)	0.036 (0.024)
Firm Size		
Medium	0.016 (0.012)	0.013 (0.013)
Large	0.019 (0.014)	0.014 (0.015)
overeducated	-0.044*** (0.014)	
yearsovereducated		-0.004*** (0.001)
Observations	2,810	2,810
Wald chi2(26)	270.5	280.2
Prob > chi2	0	0
Pseudo R-squared	0.200	0.205
log pseudolikelihood	-729.3	-724.7

Robust standard errors in parentheses

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

Source: Author's calculation using the ELMPS 2018

IX. Limitations

Among the limitations of this study is the lack of available data that solely focuses on skills of labor in Egypt which restricts the possibility to carry an in-depth analysis of the Egyptian labor market such as the International Adult Literacy Survey (IALS), the Adult Literacy and Life Skills Survey (ALLS), and the most recent Survey on Adult Skills (PIAAC) that have paved the way for an international analysis of skill mismatch in Europe and the US. Moreover, the available data that offers insights into undereducation and overeducation in university graduates are limited in that the only available data is for 4976 university graduates which are only 0.87% of the total 569,000 university graduates in Egypt in 2018, according to CAPMAS (2018a). The limited data on private graduates makes it not possible to state with any degree of certainty whether these effects are seen among the private university graduates as well. The main variable of interest in this thesis, the required education for the job, may be vulnerable to measurement errors as it is based on the respondents' answers which can be overstated to inflate their position status, or it can be understated if the hiring criteria have changed by the employer with the rapid market advancements without the respondents' knowledge. Also, it is necessary to note that all individuals with the same qualifications are heterogenous, and acknowledge that skills and abilities are not observed by the researcher due to the limitation of the available data, in addition to other aspects of human capital. Sample selection bias was not controlled for due to limitations of data; therefore, it is advised for future studies. A sample selection bias arises in this study as it only focuses on university graduates, as well as return to education does not represent the population wage function but a sample of the population because wages are only given to employed individuals (Card, 1999).⁵

⁵ To address the selection bias that might impose biased estimates, the authors should follow Heckman (1979) by estimating a Probit model with a dependent dummy variable of the employment status of an individual, and calculate Mills ratio, assuming that the error term follows a standard normal distribution to calculate the inverse Mills ratio which proxies for the omitted variables. Then the second stage, the calculated inverse Mills ratio is included as an explanatory variable.

X. Concluding Remarks

Education-occupation mismatch is a complex phenomenon that involves a plethora of classical labor economics theories, and that depends on the measurement of the incidence. Our results show that males encounter the mismatch more than their female peers with the determinants of the mismatch showing that gender, working experience, region of residency, job characteristics such as the sector of employment including the formality of the job, the economic activity of the job in addition to the firm size are significant determinants of the overeducation phenomena. While the significance of marital status changes with the different measurements. While our wage models suggest that overeducated individuals have a wage premium; however, with a smaller magnitude than that of their well-matched peers. Moreover, females have a wage penalty compared to their male counterparts, and working experience, region of residency, and the sector of employment including the formality of the job also show a statistically significant relationship. Finally, the job satisfaction model shows that overeducation decreases the likelihood of job satisfaction, and it shows that sex, region, employment sector including the formality of the job whether informal or formal private sector, and economic activities are all significant factors. Further primary quantitative studies should be implemented that focus solely on the Egyptian context on a much broader national scale that quantifies the mismatch on a national level and its economic impact, and the possible policy implications.

Several policies should be taken into consideration in order to increase the labor market efficiency and avoid a widening gap between education and employers' requirements through the following; development of a new dynamic and hybrid curricula that focuses not only on theory but also on practical knowledge, new recruitment policies and legislations that match with the government's vision of high well-matched employment, high participation rate, and high productivity, in addition to, setting strict educational and occupational standards, and developing existing employment offices in collaboration with both public and private employers; such as regular curricula development with the latest technological changes and trends.

Also, considering career guidance as a pivotal component of the education system starting from high school. The government could offer incentives to employers who proffer active assistance to undergraduates, and those who provide good working conditions and technical support to their

existing employees. Moreover, national campaigns should be spread across high schools by employers for career advice, to disseminate proper information, and raise awareness of the market needs. Women Empowerment campaigns should be implemented to raise awareness of the wage penalty compared to males and to be conducted specifically in regions other than greater Cairo where the probability of overeducation increases. As well as, raising awareness of the adverse characteristics linked to the informal sector where the magnitude of the probability to be mismatched is higher while aiming to formalize the sector.

Regular tracer studies that focus on the mismatch should be conducted in Egypt in order to be able to evaluate the problem effectively, and for the government to react properly. Also, impact evaluation should be taken into consideration while implementing those developmental strategies for further enhancement of the system in terms of shorter waithood, higher job retention and satisfaction rates, better social inclusion, and higher labor market competencies.

XI. References

- Adamecz-Völgyi, A. (2021). Is raising the school leaving age enough to decrease dropping out? (No. 985). GLO Discussion Paper.
- Adamecz-Völgyi, A. (2021). Is raising the school leaving age enough to decrease dropping out?. GLO Discussion Paper (985). *Global Labor Organization (GLO)*.
- Adely, F. I. J., Mitra, A., Mohamed, M., & Shaham, A. (2021). Poor education, unemployment and the promise of skills: The hegemony of the “skills mismatch” discourse. *International Journal of Educational Development*, 82, 102381.
- Aina, C., & Pastore, F. (2012). Delayed graduation and overeducation: A test of the human capital model versus the screening hypothesis.
- Alba-Ramirez, A. (1993). Mismatch in the Spanish labor market: overeducation?. *Journal of Human Resources*, 259-278.
- Allen, J., & Van der Velden, R. (2001). Educational Mismatches versus Skill Mismatches: Effects on Wages, Job Satisfaction, and On-the-Job Search. *Oxford Economic Papers*, 53(3), 434–452. <http://www.jstor.org/stable/3488627>
- Al-Harhi, H. K. (2011). University student perceptions of the relationship between university education and the labor market in Egypt and Oman. *Prospects*, 41(4), 535-551.
- Almeida, R. K., & Aterido, R. (2011). On-the-job training and rigidity of employment protection in the developing world: Evidence from differential enforcement. *labor Economics*, 18, S71-S82.
- Amer, M. (2007, September). The Egyptian youth labor market school-to-work transition 1998-2006. *Economic Research Forum*, 7(2).
- Amer, M. (2015). Patterns of labor market insertion in Egypt, 1998–2012. *The Egyptian Labor Market in an Era of Revolution*. Oxford University Press, Oxford, 70-89.
- Amer, M. and Atallah, M. (2019). The school to work transition and youth economic vulnerability in Egypt. *Economic Research Forum*
- Angel-Urdinola, D., & Senglali, A. (2010). Labor markets and school-to-work transition in Egypt: diagnostics, constraints, and policy framework.
- Angrist, J. D. & Krueger, A. B. (1991). Does Compulsory School Attendance Affect Schooling and Earnings?. *Quarterly Journal of Economics*. 106(4): 979–1014
- Assaad, R., Krafft, C., & Salehi-Isfahani, D. (2014). Does the type of higher education affect

- labor market outcomes? Evidence from Egypt and Jordan. *Higher Education*, 75(6), 945-995.
- Assaad, R., & Roudi-Fahimi, F. (2007). Youth in the Middle East and North Africa: Demographic opportunity or challenge? (p. 3). Washington, DC: Population Reference Bureau.
- Assaad, R., & Krafft, C. (2015). Is free basic education in Egypt a reality or a myth?. *International Journal of Educational Development*, 45, 16-30.
- Assaad, R., & Krafft, C. (2021). Excluded generation: The growing challenges of labor market insertion for Egyptian youth. *Journal of Youth Studies*, 24(2), 186-212.
- Assaad, R., Krafft, C., Roemer, J., & Salehi-Isfahani, D. (2018). Inequality of opportunity in wages and consumption in Egypt. *Review of Income and Wealth*, 64, S26-S54.
- Barsoum, G. (2014, May). Aligning incentives to reforming higher education in Egypt: The Role of private institutions. In *Economic Research Forum Working Paper Series* (No. 833).
- Barsoum, G. (2017). Quality, pedagogy and governance in private Higher Education Institutions in Egypt. *Africa Education Review*, 14(1), 193-211.
- Basmann, R. L. 1960. "On Finite-Sample Distributions of Generalized Classical Linear Identifiability Test Statistics,". *Journal of the Americal Statistical Association*, 55: 650–659.
- Battu, H., Belfield, C. R., & Sloane, P. J. (1999). Overeducation among graduates: a cohort view. *Education economics*, 7(1), 21-38.
- Bauer, T. K. (2002). Education mismatch and wages: A panel analysis. *Economics of Education Review*, 21(3), 221–229.
- Becker, G. (1964). *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education*. Chicago, IL: University of Chicago Press
- Bedir, N. (2014). The impact of Over-education and Under-education on Earnings: Egypt in a Post-Revolutionary Era.
- Betts, J., C. Ferrall, & R. Finnie. (2000). The Transition to Work for Canadian University Graduates- Time to First Job, 1982–1990. *Business and labor Market Analysis*, Statistics Canada. Research Paper (141).
- Büchel, F. & Battu, H. (2003) The theory of differential overeducation: does it work?, *Scottish Journal of Political Economy*, 50, 1–16.
- Burdett, K. (1962). Employee Search and Quits. *American Economic Review*, 68, 212-220.

- Card, D. (2001). Estimating the return to schooling: Progress on some persistent econometric problems. *Econometrica*, 69(5), 1127-1160.
- Carreras, M., Sumberg, J., & Saha, A. (2020). Work and rural livelihoods: The Micro Dynamics of Africa's 'youth employment crisis.' *The European Journal of Development Research*.
- Caroleo, F. E., & Pastore, F. (2015). Overeducation: A disease of the school-to-work transition system. Available at SSRN 2606902.
- Central Agency for Public Mobilization and Statistics CAPMAS (2018a). Statistical Yearbook-Education.
- Central Agency for Public Mobilization and Statistics CAPMAS (2018b). Statistical Yearbook-labor 2021.
- Chester, J., & Baffour, B. (2015). School-to-work transitions during volatile economic times. *Australian Journal of Labor Economics*, 18(3), 307-327.
- Chevalier, A., & Lindley, J. (2009). Overeducation and the skills of UK graduates. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, 172(2), 307-337.
- Chevalier, A. (2003). Measuring over-education. *Economica*, 70(279), 509-531.
- Clark, B., Joubert, C. & Maurel, A. (2014). The career prospects of overeducated Americans. *IZA J Labor Econ*, 6 (3).
- Cohn, E., & Khan, P. (1995). The wage effects of overschooling revisited. *Labor Economics* 2.1, 67-76.
- David, A., & Nordman, J. (2017). Education Mismatch and Return Migration in Egypt and Tunisia.
- Dhillon, N., Yousef, T., & ProQuest (Firm). (2009). Generation in waiting: The unfulfilled The promise of young people in the middle east. Brookings Institution Press.
- Dibeh, G., Fakh, A., & Marrouch, W. (2019). Employment and skill mismatch among youth in Lebanon. *International Journal of Manpower*.
- Diem, A., and Wolter, S. C. (2014). Overeducation among Swiss university graduates: determinants and consequences. *J labor Market Res.* 47, 313–328.
- Dimova, R., & Stephan, K. (2020). Inequality of opportunity and (unequal) opportunities in the youth labor market: How is the Arab world different? *International labor Review*, 159(2), 217-242.
- Di Pietro, G., & Urwin, P. (2006). Education and skills mismatch in the Italian graduate labor

- market. *Applied Economics*, 38(1), 79-93.
- Dockey, A., M. & Miller, P., W. (2012). Overeducation, undereducation, and credentialism in the Australian labor market. *Department of Industry, Innovation Science, Research and Tertiary Education. Australian Government.*
- Dolton, P., & Vignoles, A. (2000). The incidence and effects of overeducation in the UK graduate labor market. *Economics of education review*, 19(2), 179-198.
- Dolton, P., & Silles, M. (2003). The determinants and consequences of graduate overeducation. *Overeducation in Europe: Current issues in theory and policy.*
- Doornbos, K. (1971). *Geboortemaand en schoolsucces*. Rijksuniversiteit te Utrecht.
- Duncan, G. J., and Hoffman, S. D. (1981). The incidence and wage effects of overeducation. *Economics of education review*, 1(1), 75-86.
- El Enbaby, H., & Galal, R. (2015). Inequality of Opportunity in Individuals' Wages and Households' Assets in Egypt. In *Economic Research Forum Working Paper Series No 942*
- El-Hamidi, F. (2010). Education-occupation mismatch and the effect on wages of Egyptian workers. *Handbook on international studies in education*, 123-138.
- El-Hamidi, F., & Wahba, J. (2005). The effects of structural adjustment on youth unemployment in Egypt.
- Elman, C., & O'Rand, A. M. (2004). The race is to the swift: Socioeconomic origins, adult education, and wage attainment. *American Journal of Sociology*, 110(1), 123-160. Green et al., 2002).
- European Union (2015). The challenge of youth Employability in Arab Mediterranean countries; The role of active labour market Programmes. *Publications Office of the European Union*. Luxembourg
- Flisi, S., Goglio, V., Meroni, E. C., Rodrigues, M., & Vera-toscano, E. (2017). Measuring occupational mismatch: Overeducation and over skill in Europe--Evidence from PIAAC. *Social Indicators Research*, 131(3), 1211-1249.
- Florit, E., & Lladosa, L. E. (2007). Evaluation of the effects of education on job satisfaction: Independent single-equation vs. structural equation models. *International Advances in Economic Research*, 13(2), 157-170.
- Frei, Ch., Sousa-Poza, A., (2012). Overqualification: permanent or transitory? *Applied Economics*, 44, 1837–1847.

- Frenette, M. (2004). The overqualified Canadian graduate: the role of the academic program in the incidence, persistence, and economic returns to overqualification. *Economics of Education Review*, 23(1), 29-45.
- Garcia-Espejo, I., & Ibanez, M. (2006). Educational-skill matches and labor achievements among graduates in Spain. *European Sociological Review*, 22(2), 141-156.
- Green, F., & McIntosh, S. (2007). Is there a genuine under-utilization of skills amongst the over-qualified?. *Applied Economics*, 39(4), 427-439.
- Groot, W., & Van den Brink, H. M. (2000). Over-Education in the Labor Market: A Meta-Analysis. *Economics of Education Review*, 19, 149-158.
- Haorei, W. (2012). A study on job satisfaction and its consequences on work productivity in textile mills. *Journal of Business Management and Social Sciences Research*, 1(3), 50-56.
- Hartog, J. (2000). Over-education and earnings: where are we, where should we go?. *Economics of education review*, 19(2), 131-147.
- Hassan, M., & Sassanpour, C. (2008). Labor market pressures in Egypt: why is the unemployment rate stubbornly high?. *Journal of Development and Economic Policies*, 10(2), 79-115.
- Hausman, J. A. (1978). Specification Tests in Econometrics. *Econometrica*, 46(6), 1251–1271.
- Hnedý (2015). Women’s Participation in the Egyptian Labor Market: 1998-2012.” In *The Egyptian Labor Market in an Era of Revolution*, edited by Ragui Assaad and Caroline Krafft. Oxford University Press.
- Honwana, A. M. (2012). *The time of youth: Work, social change, and politics in Africa*. Sterling: Kumarian Press.
- International Labour Organization (2019). *Small matters: Global evidence on the contribution to employment by the self-employed, micro-enterprises and SMEs*.
- Jovanovic, B. (1979). Job matching and the theory of turnover. *The Journal of Political Economy* 87: 972–990.
- Kabbani, N., & Kothari, E. (2005). Youth employment in the MENA region: A situational assessment. World Bank, Social Protection Discussion Paper, 534.
- Kiker, B. F., Santos, M. C., & Mendes De Oliveira, M. (1997). Overeducation and undereducation: Evidence for Portugal. *Economics of Education Review*, 16(2), 111–125.
- Kler, P. (2007). A panel data investigation into over-education among tertiary educated

- Australian immigrants. *Journal of Economic Studies*, 34(3), 179-193
- Leavy, J. & Smith, S. (2010). Future Farmers: Youth Aspirations, Expectations and Life Choices. FAC Discussion Paper 013, Brighton, UK, Future Agricultures Consortium.
- Levin J & Plug, EJS (1999). Instrumenting education and the returns to schooling in the Netherlands, *Labor Economics*, 6(4), 521—34.
- Leuven E., & Oosterbeek H., (2011). Overeducation and mismatch in the labor market. In *Handbook of the Economics of Education*. 4: 283-326
- Lu, M. (2017). A Study on the Phenomenon of Overeducation in China and Its Trend Analysis. *Open Journal of Social Sciences*, 5(1).
- Mahuteau, S., Mavromaras, K., Sloane, P., & Wei, Z. (2015). Horizontal and vertical educational mismatch and wages.
- Manacorda, M., Rosati, F. C., Ranzani, M., & Dachille, G. (2017). Pathways from school to work in the developing world. *IZA Journal of Labor and Development*, 6(1), 1-40.
- Matsumoto, M., & Elder, S. (2010). Characterizing the school-to-work transitions of young men and women: Evidence from the ILO school-to-work transition surveys. *International Labor Organization*.
- Mazzotta, F. (2008). The effect of parents' background on youth unemployment duration.
- McGuinness, S., & Bennett, J. (2007). Overeducation in the graduate labor market: A quantile regression approach. *Economics of Education Review*, 26(5), 521-531
- McGuinness, S., Pouliakas, K., & Redmond, P. (2018). Skills mismatch: Concepts, measurement and policy approaches. *Journal of Economic Surveys*, 32(4), 985-1015.
- McGoldrick, K. M. & Robst, J. (1996) Gender differences in over-education. A test of the theory of differential overqualification, *American Economic Review*, 86, 280–4.
- Mendes de Oliveira, M., Santos, M. C., & Kiker, B. F. (2000). The role of human capital and technological change in overeducation. *Economics of Education Review*, 19, 199–206.
- Ministry of Planning and Economic Development (2021). Unemployment Rate Slightly Inched Up in Q1 2021 Amid Second Wave of COVID-19. *Macro-Note Series; Unemployment Note*.
- Mincer, J. A. (1974). The human capital earnings function. In *Schooling, experience, and earnings*. 83-96.
- Mont, G. (2015). The cause and consequences of field-of-study mismatch: An analysis using

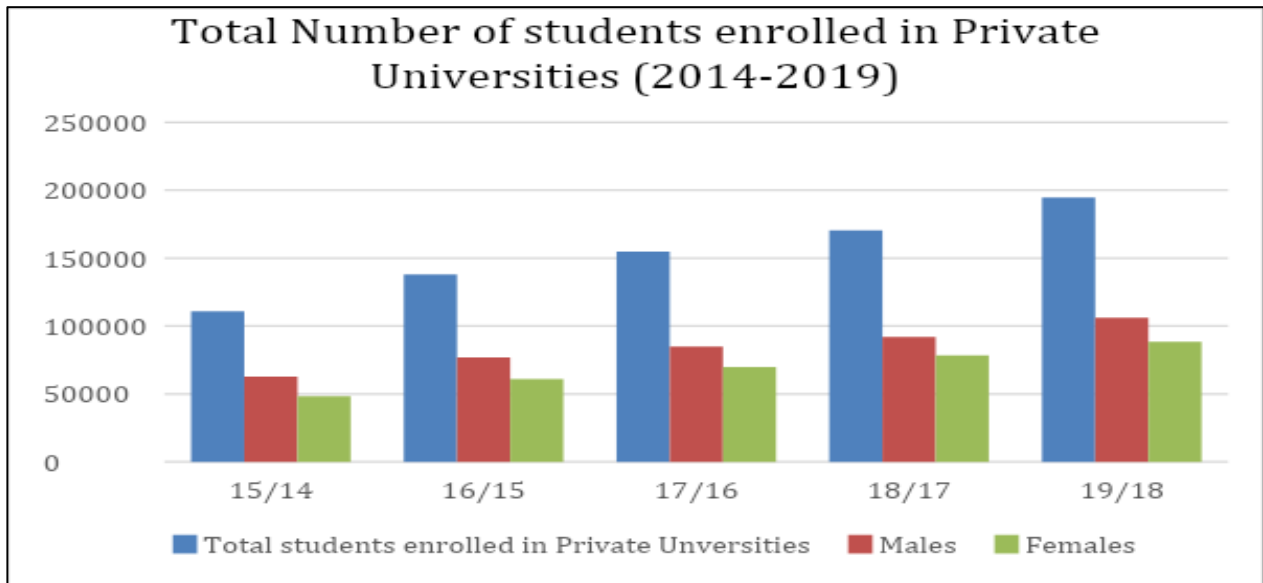
- PIACC. OECD Social, Employment and Migration Working Papers. 167
- Morsy, H. & Mukasa, A. N. (2019). Youth jobs, skill and educational mismatches in Africa. African Development Bank Group 326.
- Nieto, S. (2014). Overeducation, skills and wage penalty: Evidence for Spain using PIAAC data. Institut de Recerca en Economia Aplicada Regional i Pblica. Document de Treball, 6.
- Nordin, M., Persson, I., & Rooth, D. (2010). Education–occupation mismatch: is there an income penalty? *Economics of Education Review* 29(6): 1047–1059.
- OECD (2017), *Getting Skills Right: The OECD Skills for Jobs Indicators*, OECD Publishing, Paris. Skills and Work website
- Palmer, R. (2017). Jobs and Skills Mismatch Informal Economy May 2018. *International Labor Organization*.
- Perry, A., Wiederhold, S., & Ackermann-Piek, D. (2014). How can skill mismatch be measured? New approaches with PIAAC. *Methods, data, analyses*, 8(2), 38.
- Pollmann-Schult, M., & Büchel, F. (2004). Career prospects of overeducated workers in West Germany. *European Sociological Review*, 20(4), 321-331.
- Piero, J. M., S. Agut & R. Grau (2010), “The Relationship Between Overeducation and Job Satisfaction Among Young Spanish Workers: The Role of Salary, Contract of Employment, and Work Experience”, *Journal of Applied Social Psychology*, 40 (3): 666–68
- Quinn, M. A., & Rubb, S. (2006). Mexico's labor market: The importance of education-occupation matching on wages and productivity in developing countries. *Economics of education review*, 25(2), 147-156.
- Quintini, G. (2011). Over-qualified or under-skilled: A review of existing literature OECD Social, Employment, and Migration Working Papers. Paris: OECD.
- Robst, J. (2007). Education and job match: the relatedness of college major and work. *Economics of Education Review* 26(4): 397–407.
- Rubb, S. (2003). Overeducation in the labor market: a comment and re-analysis of a meta-analysis. *Economics of Education review*, 22(6), 621-629.
- Russell, H., & O'Connell, P. J. (2001). Getting a job in Europe: The transition from

- unemployment to work among young people in nine European countries. *Work, Employment and Society*, 15(1), 1–24.
- Said, M., Galal, R., & Sami, M. (2019, November). Inequality and income mobility in Egypt. *Economic Research Forum (ERF)*.
- Salehi-Isfahani, D. (2012). Education, jobs, and equity in the Middle East and North Africa. *Comparative Economic Studies*, 54(4), 843-861.
- Sargan, J. D. (1958). The estimation of economic relationships using instrumental variables. *Econometrica: Journal of the Econometric Society*, 393-415.
- Sattinger, M. (1993) Assignment Models of the Distribution of Earnings. *Journal of Economic Literature*, 31, 831-880.
- Sayre, E. (2017), The school-to-work transition in Palestine: the role of education and family background, *The Muslim World*, 107 (1), 65-82.
- Savic, M., Vecchi, M., and Lewis, A. (2017) Overeducation and hourly wages in the UK labor market; 2006 to 2017. *Office for National Statistics*. Sen, A. (1999). *Development as Freedom* (New York: Anchor). South Indian ICT Clusters, 227.
- Schwab, K. (2018, November). The global competitiveness report 2018. In *World Economic Forum* (Vol. 671).
- Sen, A. (1999). *Development as Freedom* (New York: Anchor). South Indian ICT Clusters, 227.
- Selwaness, I., & Roushdy, R. (2019). Young people school-to-work transition in the aftermath of the Arab spring: Early evidence from Egypt. *International Journal of Manpower*, 40(3), 398-432.
- Sharp, C., 1995. A study of patterns of school entry and the impact of season of birth on school attainment. *Education Research* 37, 251–265.
- Sicherman, N. (1991). " Overeducation" in the labor market. *Journal of labor Economics*, 9(2), 101-122.
- Sicherman, N., and Galor, O. (1990). A theory of career mobility. *Journal of political economy*, 98(1), 169-19
- Singerman, D. (2007). The economic imperatives of marriage: Emerging practices and identities among youth in the Middle East. *Middle East Youth Initiative Working Paper*, (6).
- Sloane, P. J. M. (2020). Overeducation, skill mismatches, and labor market outcomes for college graduates. *IZA World of Labor*.
- Spence, M. (1973). Job market signaling. *The Quarterly Journal of Economics*, 87(3), 355-374.

- Tandrayen-Ragoobur, V. (2020). Addressing the Education and Skills Mismatch in the Mauritian Economy.
- Tansel, A., Keskin, H. I., & Ozdemir, Z. A. (2020). Public-private sector wage gap by gender in egypt: Evidence from quantile regression on panel data, 1998–2018. *World Development*, 135, 105060.
- Trostel, P., Walker, I., & Woolley, P. (2002). Estimates of the economic return to schooling for 28 countries. *Labor Economics*, 9(1), 1-16.
- Tsang, M. C., Rumberger, R. W., & Levin, H. M. (1991). The impact of surplus schooling on worker productivity. *Industrial relations: a journal of economy and society*, 30(2), 209-228.
- Thurow, L. C. (1975), *Generating Inequality*, Basic Books: New York.
- Verdugo, R. R., & Verdugo, N. T. (1989). The impact of surplus schooling on earnings: Some additional findings. *Journal of human resources*, 629-643.
- Verhaest, D., & Omeij, E. (2006). The impact of overeducation and its measurement. *Social Indicators Research*, 77(3), 419-448.
- World Bank (2021). World Bank Open Data. *Government expenditure on education, total (% of GDP) - Egypt, Arab Rep.* [Data File]. Retrieved from: Government expenditure on education, total (% of GDP) - Egypt, Arab Rep. | Data (worldbank.org).
- World Bank (2021). World Bank Open Data. *Government expenditure on education, total (% of GDP) – Tunisia..* [Data File]. Retrieved from: Government expenditure on education, total (% of GDP) - Tunisia | Data (worldbank.org)
- Wooldridge, J. (2016). Should instrumental variables be used as matching variables. *Michigan State University, MI.*

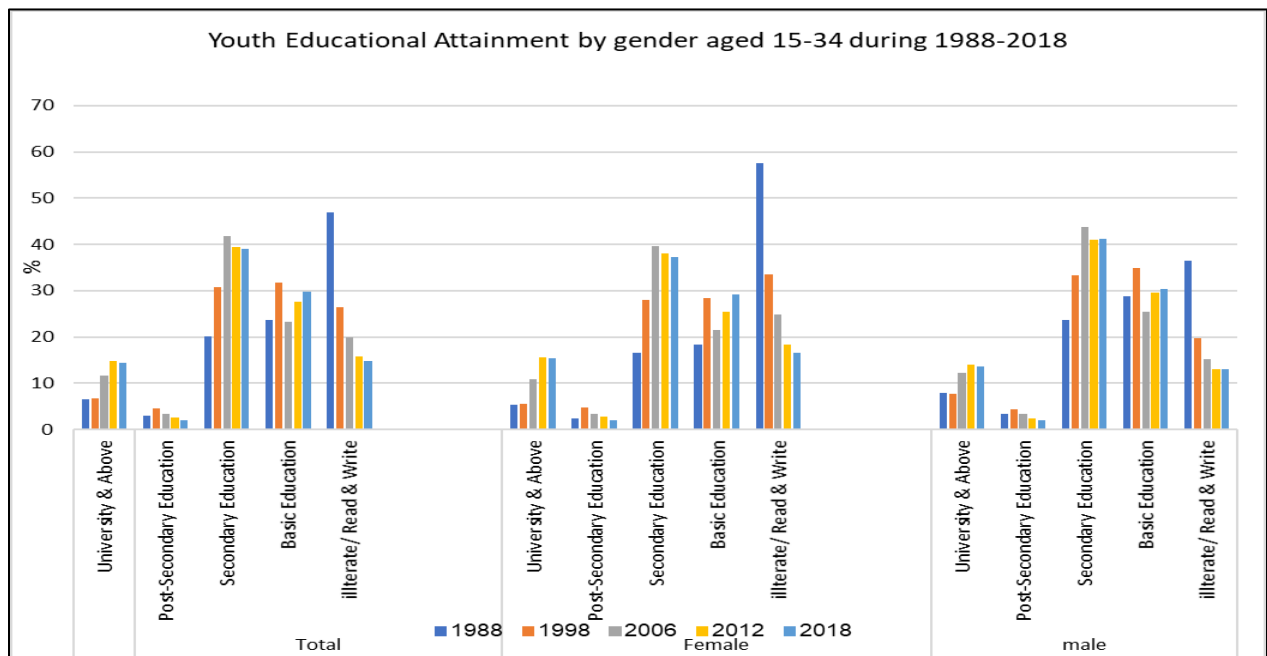
XIII. APPENDIX

Figure 1: Total Number of students enrolled in Private Universities, by year (2014-2019)



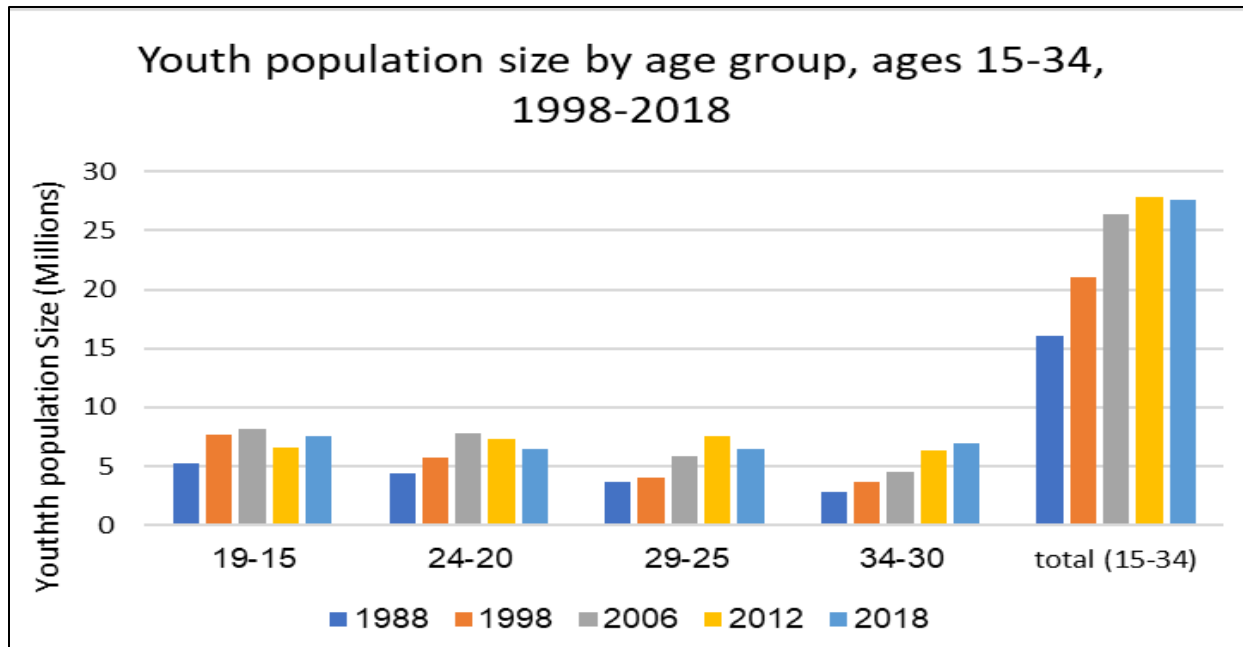
Source: CAPMAS (2018a).

Figure 2: Percentage of Youth Educational Attainment by gender aged 15-34 during 1988-2018



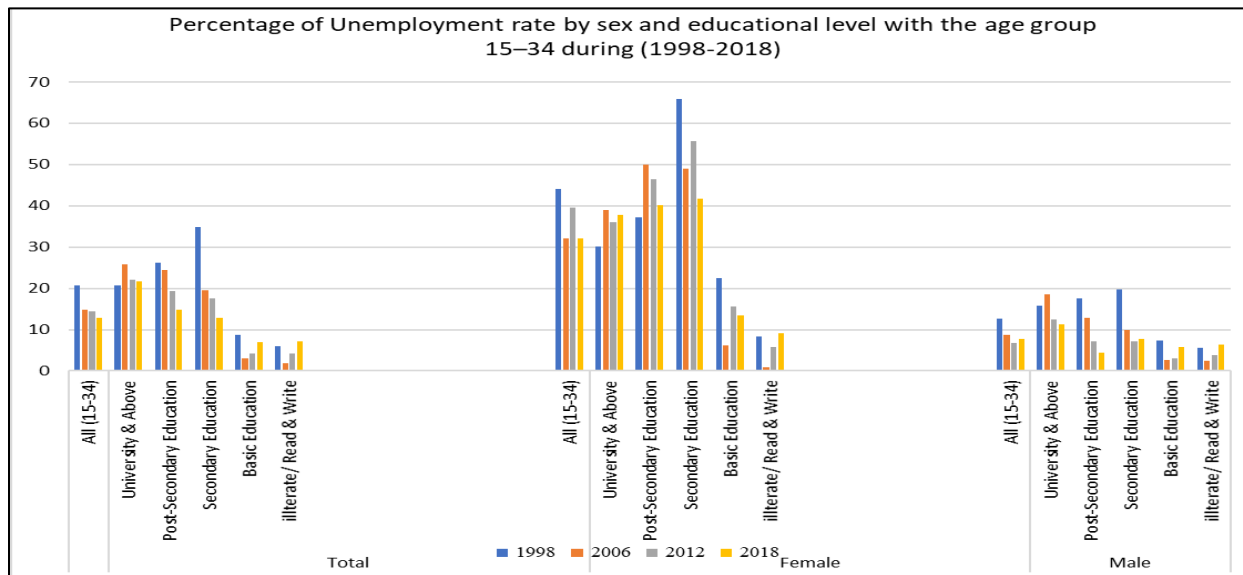
Source: Amer and Attallah (2019) based on LFS 1988, ELMPS 1998, ELMPS 2006, ELMPS 2012 and ELMPS 2018

Figure 3: Youth Population Size by Age group (15-34) during the period 1998-2018



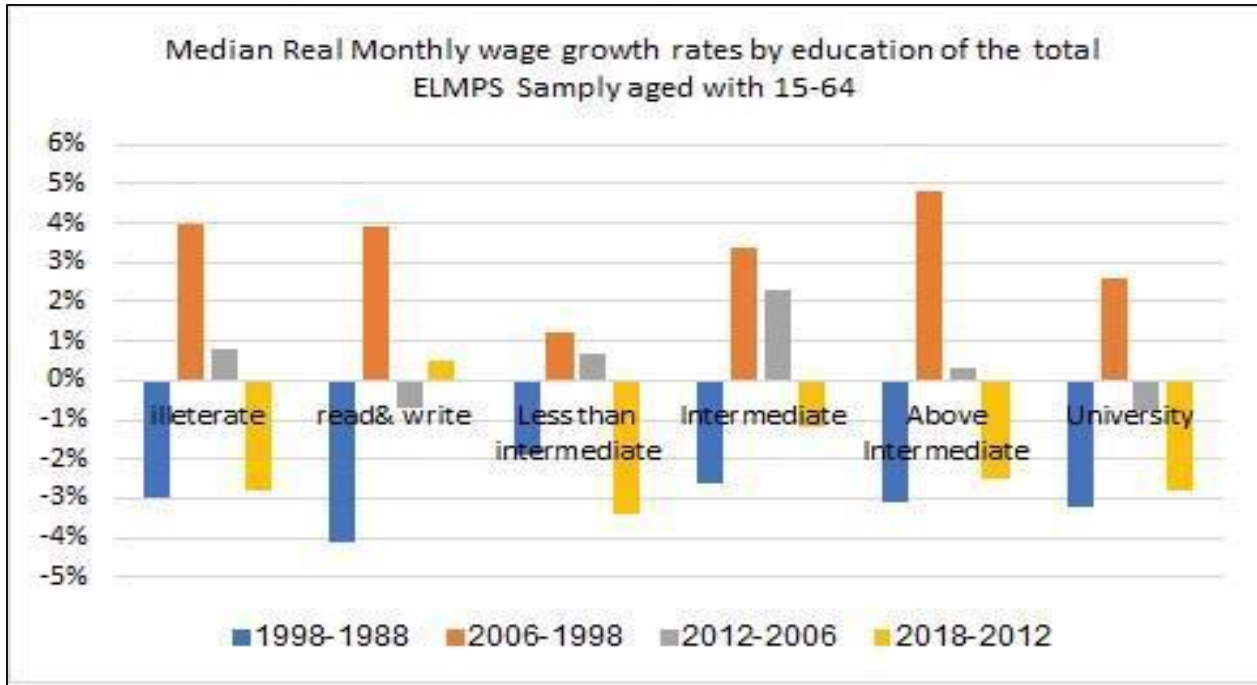
Source: Amer and Attallah (2019) based on LFS 1988, ELMPS 1998, ELMPS 2006, ELMPS 2012 and ELMPS 2018

Figure 4: Percentage of Unemployment rate by sex and educational level with the age group 15–34 during (1998-2018)



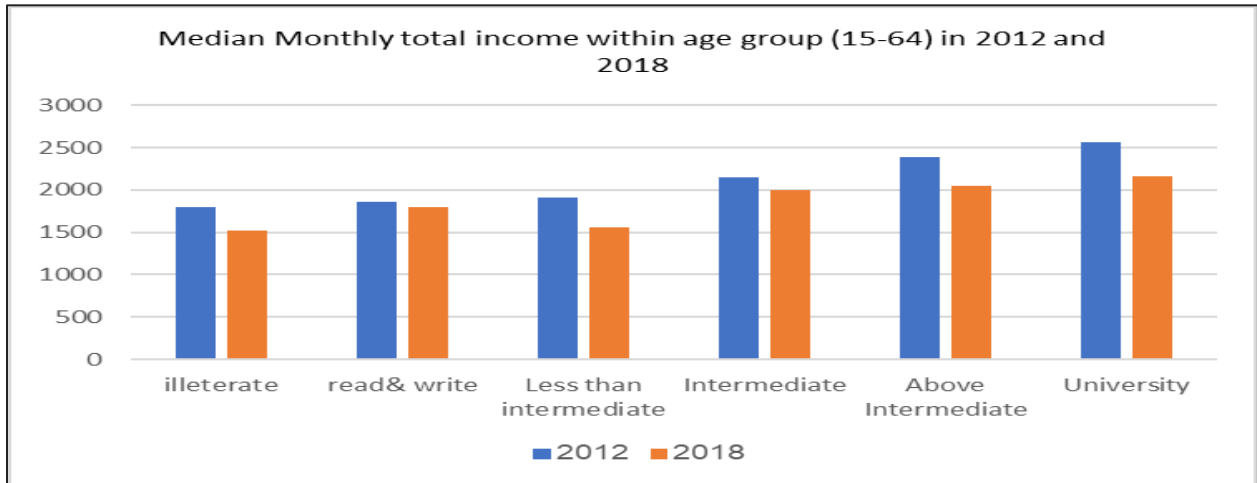
Source: Amer and Attallah (2019) based on LFS 1988, ELMPS 1998, ELMPS 2006, ELMPS 2012 and ELMPS 2018

Figure 5: Median Real Monthly wage growth rates by education of the total ELMPS Sample aged 15-64



Source: Said et al, (2019) based on LFS 1988, ELMPS 1998, ELMPS 2006, ELMPS 2012 and ELMPS 2018

Figure 6: Median Monthly total income aged 15-64 in 2012 and 2018



Source: Said et al, (2019) based on LFS 1988, ELMPS 1998, ELMPS 2006, ELMPS 2012 and ELMPS 2018

Table 2: Correlation Matrix

Variables	lhrwg	Satisfied	overeduc	undereduc	wellmatched	sex	wexp
lhrwg	1						
Satisfied	0.0564	1					
overeducated	-0.1418	-0.192	1				
undereducated	0.0016	0.0801	-0.3752	1			
wellmatched	0.1459	0.1456	-0.7864	-0.2775	1		
sex	-0.0029	0.1087	-0.2396	0.0441	0.219	1	
wexp	0.1444	0.1112	-0.1915	-0.0022	0.2	-0.0727	1
Region	-0.057	-0.0837	0.0879	-0.0466	-0.06	-0.1401	-0.0073
Qwealth	0.2097	0.1407	-0.1924	0.083	0.1441	0.19	-0.0451
EmpSect	-0.2376	-0.2861	0.4487	-0.2002	-0.3317	-0.3128	-0.2116
EconAct	0.0141	0.1569	-0.1985	0.1422	0.1109	0.2294	-0.0406
Firmsize	0.1586	0.2198	-0.3553	0.1796	0.2485	0.2248	0.081

	marital2	region	qwealth	EmpSect	EconAct	firmsize
marital2	1					
region	-0.0518	1				
qwealth	-0.1296	-0.418	1			
EmpSect	0.2471	0.1421	-0.3593	1		
EconAct	-0.0383	-0.2585	0.3118	-0.4266	1	
firmsize	-0.1371	-0.1638	0.3158	-0.6431	0.2615	1

(obs=9,084)

Source: Author's Calculations using ELMPS 2018 Data