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The Egyptian Labour Market, Determinants of Employment and Wage Estimation

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Abstract
This study empirically evaluates the factors influencing employment in Egypt by using the recently published cross-sectional Egyptian Labour Force Survey, 2019. The logistic regression analysis revealed that being older, male, married, and living in a rural region increased the probability of an individual being employed. Contrary to the assumption of the human capital theory, the attainment of all education levels appeared to reduce the likelihood of attaining employment in the Egyptian labour market. Moreover, the multiple linear regression reveals significant factors influencing wage estimation in the Egyptian labour market. Some of those factors were related to individual characteristics, while others related to employer characteristics, emphasising the critical role of both sides of the labour market in estimating wages. However, other socioeconomic factors should be determined in order to increase the overall model interpretation.

Keywords: Egyptian labour market; Employment Determinants; Human capital theory; Logistic regression; Multiple linear regression.

1. Background

Since the turn of the twenty-first century, Egypt's labour market has encountered several challenges (Ragui Assaad, Krafft, & Keo, 2019). In the 1990s, with a noticeable decline in mortality, followed by a delayed decline in fertility, the economy struggled with a significant labour supply pressure related to 'youth-bulge'(Ragui Assaad, 2014; Krafft, Asʿad, & Rahman, 2019). In the 2000s, while the labour market conditions began to recover, the global financial crisis and subsequent worldwide economic downturn were a burden for Egypt. Moreover, the 2011 revolution known as the 'Arab Spring' caused a time of significant political and economic instability. Economic development has rebounded in recent years, due to a series of economic reforms and political stability. However, Egypt still faces long-term problems providing enough productive jobs for its increasingly educated workforce (Youssef, Alnashar, Erian, Elshawarby, & Zaki, 2019).
Job creation is one of the critical problems facing the Egyptian labour market and one of the top policy concerns (R. Assaad et al., 2019). Past demographic growth and educational expansion have resulted in increasing youth unemployment (Ragui Assaad & Krafft, 2016). Although new entrants to the labour market are better educated than older generations, it is challenging for them to capitalise on their knowledge in a labour market that is becoming increasingly privatised (Ragu Assaad, El-Hamidi, & Ahmed, 2000). In Egypt, university-

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educated youth are disproportionately affected by unemployment: 36% of graduates are currently unemployed (CAPMAS, 2019), and many more are locked in insecure, low-status, and low-paying jobs. The declining opportunity in the public sector and relatively weak private sector growth have resulted in higher unemployment among educated people and an increasing number of less-educated people employed in the informal sector (El-Kogali & Krafft, 2019).

Despite significant improvements in recent years, the gender gap in Egypt, similar to that of other countries in the Middle East and North Africa (MENA) region, remains one of the largest in the world (Mundial, 2020). According to the most recent global gender gap index report, released in 2020, which ranks nations according to the degree of severity of inequality, Egypt was placed 134th out of 153 countries. This ranking was deemed low for a country trying to promote gender equality. Moreover, as a consequence of the gender gap, female labour force participation in Egypt has considered one of the lowest in the world; only 24.7% of females are in the labour force, regardless of the fast-growing female education attainment (Assaad, Hendy, Lassassi, & Yassin, 2018). This low level of female participation in the Egyptian labour market is a substantial limitation, since women represent half of the country's population. Thus, an improvement in their conditions would enhance the country's progress towards development significantly. Furthermore, wage inequality between males and females has become a concern in the Egyptian labour market, especially since 2012 (Said, Galal, & Sami, 2019). According to the Gini coefficient, which is commonly used to measure economic inequality, income distribution, and wealth distribution among a population, there was a considerable increase in the inequality of women, less educated people, and those residing in urban areas between 2012 and 2018.

Therefore, the purpose of the present study is to review the characteristics of the Egyptian labour market by analysing one of the most recent Egypt Labour Force Surveys (ELFS), carried out in 2019 (OAMDI, 2021). The analysis seeks to identify the most important factors (determinants) of employment in the country's labour market, and estimates the wage equation of the Egyptian labour market.

The study contains the following sections: Section 2 presents the research aim and objectives, Section 3 states some theoretical discussion on the topic, Section 4 provides the research methodology and methods, Section 5 presents the results, while Section 6 discusses the main findings, and Section 8 concludes the study.

2. Research Aim Objectives

2.1 Research Objectives

This study aims to understand the different characteristics of the Egyptian labour market. In order to accomplish this aim, the following objectives were addressed:

1- To analyse the factors (determinants) that influence employment status in the Egyptian labour market;

2- To estimate the wage equation for the Egyptian labour market, in order to understand the relationship between wages and other factors related to the supply and demand sides of the labour market.

3. Theoretical Discussion

The relationship between education and the labour market has often been viewed from various perspectives. However, the human capital theory (HCT) early developed by (Becker, 1964) has been the focus of neo-classical labour economists for decades. The main assumption of this theory is that education increases productivity which is reflected in higher wages in the labour markets (Mincer, 1958). This assumption encourages policymakers to prioritise educational expenditure and expand education. The HCT assumes that people invest in education to maximise their utility and wages, while firms are willing to fully utilise workers' skills and knowledge to get the maximum productivity from them. This perspective assumes that only labour supply factors affect people in the labour market; this theory has viewed factors such as education, training and experience as the main determinants of employment.

Although HCT has been around for centuries and has inspired other research disciplines, it has been the subject of criticism(Capsada-Munsech, 2017; Marginson, 2019; McGuinness, 2006; Tan, 2014). First, HCT focuses on the supply side of the labour market, in which demand only affects wage differentials in the short run. Second, HCT assumes homogeneity between workers who obtain the same level of education, even though they may exhibit different productivity levels after successfully completing the same degree level from the same institution. Third, the HCT assumes that individuals use their education as a tool to maximise their income and, at the same time, that firms fully utilise workers' knowledge and skills to achieve maximum productivity. Hence, HCT unifies two heterogeneous domains, assuming homogeneity between education and labour, and eliminates many of the possible explanations for the relationship between them.

Moreover, the emergence of behavioural economic science and institutional theories has challenged the validation of HCT. The traditional concept that assumes people rationally acquire education mainly to increase their productivity and increase their earnings has been challenged. This rationality assumed by the neo-classical economic models was disputed by behavioural economists, claiming that individuals' preferences are not necessarily always consistent or well-identified (Camerer & Loewenstein, 2003). Institutional theories also highlight the chartering function of educational credentials (Al-Harthi, 2011; Meyer, 1977). According to this notion, schools generate social categories, many of which are manifested through educational credentials. The content of education matter less than the legitimised function of credentials.

One of the most telling theoretical challenges to HCT comes from the credentials theory (Walters, 2004). This theory disagrees with the prevailing notion that education equips people with skills needed at work and that industrial economies need even higher proportions of highly educated workers (Collins, 1979). According to Collin, there is a weak connection between what schools teach and what the labour market essentially needs. The credential theory argues that employers use credentials to assign more educated individuals to better jobs, not necessarily because they are more skilled, but simply because they have more education. Collins contends that as long as employers continue to assign better jobs to highly educated people, there will be growing pressure on the system to produce individuals with higher education, regardless of the skills required. This is typically

the case in many Arab countries, which have been described in several contexts as credential labour markets (El-Kogali & Krafft, 2019).
Credentialism in Arab labour markets was rooted in the government's traditional role as the primary employer of graduates. The emphasis on credentials in government recruiting has caused public higher education institutions to focus on the development of credentials rather than the balance of skills required in a competitive private-sector-driven economy (Salehi-Isfahani, 2012; Worldbank, 2013). Public sector employers rely mainly on credentials as criteria for hiring and promotions decisions. This can partly be due to the labour regulations restricting employers from firing employees after observing their work abilities. Therefore, employers tend to rely on credentials as ex-ante indicators of productivity, encouraging credentials.
Regardless of the various challenges to the HCT, most developing countries, including the Arab region, have designed their educational policy around the principles of human capital (Al-Harthi, 2011); this can be observed in their committing the most considerable portion of their national budgets to education and in their provision of free public education to all citizens.Therefore, this study's main focus was on factors related to HCT when determining employment in Egypt. These factors mainly consider supply-related factors such as educational level as well as other important demographic factors such as gender and experience (proxied by age).

4. Research Methodology and Methods

This study emphasised quantifiable observations that are suitable for statistical analysis. Various statistical analyses were conducted to test the study's hypotheses and to accomplish the study's aim of understanding the characteristics of the ELFS. The following sections discuss the dataset, sample characteristics, questionnaire design, and data analysis methods employed.

4.1 Overview of the Dataset

The analysis presented in this study employed secondary data gathered from the recently published ELFS, 2019 (OAMDI, 2021). This survey was conducted by the Economic Research Forum (ERF), in cooperation with the Central Agency for Public Mobilization and Statistics (CAPMAS). The ELFS is a cross-sectional dataset and a nationally representative survey of 32,2957 individuals, with detailed information regarding the demographic, employment, education, and job characteristics of all individuals within each household involved.

4.2 Sample Characteristics

The ELFS provided a representative sample of the Egyptian population, equally divided between males (50.5%) and females (49.5%). The sample included a significant proportion of waged workers, who were categorised according to the International Standard Classification of Occupation (ISCO-08, 2008). The sample included all age groups from 6 to 60+ years. However, in order to serve the purpose of this study, only employed and unemployed individuals in the age group 20–64 years were included. The rationale for including individuals aged between 20 and 25 years in this sample was to capture early-career status data; in other words, youth employment/unemployment. Both sexes were included, in order to compare between males and females.

4.3 Questionnaire Design

The questionnaire used by the ELFS includes a range of individual-level variables and indicators. Specifically, the questionnaire includes the following ten sections: (1) File identification and information, (2) Demographics, (3) Education, (4) Current labour status, (5) Employment in main job, (6) Wages and incomes, (7) Employment in secondary job, (8) Last held job characteristics, (9) Unemployment characteristics, (10) Inactivity reason(s).

4.4 Data Analysis Methods

Several crosstabulations and tests of independence, such as the Pearson chi-squared, were conducted to understand the significance of the association of the sample's demographic characteristics, such as age, gender, marital status, residence, and education level, with main activity status in the labour market, including for those both employed and unemployed. In addition, regression analyses were conducted to identify the determinants of employment, and to estimate the wage equation. All of the statistical analyses were conducted using Statistical Package for the Social Sciences (SPSS) version 26. The next section presents in detail the statistical analysis methods used in this study.

4.5 Cross-tabulations Analysis

Statistical analyses of the association between main activity status in the labour market and certain demographic characteristics were conducted using the chi-squared test of independence (Table 1). The crosstabulations illustrated that males dominated the labour market, with 78% of those employed in the sample being male, and only around 16% female. Moreover, married individuals constituted almost 70% of those employed. The highest proportion of employed people (about 25%) was among the 40-49 age group, indicating the presence of low employment rates for youths, aged 20-29. Employment rates were highest among those who held a secondary degree (33%) and those who did not hold a degree (29%). Regarding residence, 58% of employed people were from rural regions, whereas only 36% were from urban areas. All the relationships were found to be significant: main activity status in the labour market was significantly associated with gender $(X^2 = 4610.230, df = 1, sig = .000 < .05)$; marital status $(X^2 = 4121.711, df = 3, sig = .000 < .05)$; age $(X^2 = 5393.986, df = 5, sig = .000 < .05)$; education level $(X^2 = 2675.769, df = 6, sig = .000 < .05)$; and residence $(X^2 = 668.866, df = 1, sig = .000 < .05)$.

Interestingly, by cross-tabulating employed people with occupation classification (Table 2 and Figure 1), it was evident that the highest percentage of workers were employed in craft and trades, with 18% in the former and 17% in skilled agriculture. According to the ISCO, these occupations require a medium to low level of skill. These results explained the high rate of employment among individuals with no education and those with a secondary level of education, as the jobs available in the economy did not require a high level of skill. These results raised crucial questions: Is the Egyptian labour market unable to offer highly skilled jobs? and, Do graduates from university lack the skills required by the labour market?

Table 1: Crosstabulations of Demographic Characteristics and Main Activity Status in the Labour Market

		Employed		Unemployed	
		Frequency	%	Frequency	%
Gender	Male	70679	78.09%	2623	2.90%
	Female	14202	15.69%	3006	3.32%
Marital Status	Single	18163	20.55%	3300	3.73%
	Married	61672	69.79%	2049	2.32%
	Divorced/separated	1175	1.33%	138	0.16%
	Widowed	1823	2.06%	51	0.06%
	Not stated	0	0.00%	0	0.00%
Age Group	20-24	3840	4.24%	501	0.55%
	25-29	7537	8.33%	1760	1.94%
	30-39	9783	10.81%	1473	1.63%
	40-49	22437	24.79%	1288	1.42%
	50-59	20200	22.32%	445	0.49%
	60-64	16100	17.79%	140	0.15%
Education Level	None	26646	29.4%	534	0.6%
	Primary	9842	11%	347	0.4%
	Secondary	30204	33.4%	2101	2.3%
	Post-secondary	3168	3.5%	279	0.3%
	University	14531	16.1%	2329	2.6%
	Postgraduate	466	0.5%	39	0.0%
	Not stated	0	0%	1	0%
Residence	Urban	32413	35.8%	3128	3.5%
	Rural	52468	58.0%	2501	2.8%

Table 2: Occupation Classification of Employed Individuals

Occupation Classification of the Main Job	Count	% of Total
Legislators	9659	11.4%
Professionals	9978	11.8%
Technicians	6782	8.0%
Clerks	2526	3.0%
Service workers and shop and market sales workers	9355	11.0%
Skilled agricultural and fishery workers	14329	16.9%
Craft and related trades workers	15390	18.1%
Plant and machine operators, and assemblers	9357	11.0%
Elementary occupations	7344	8.7%
Others	161	0.2%

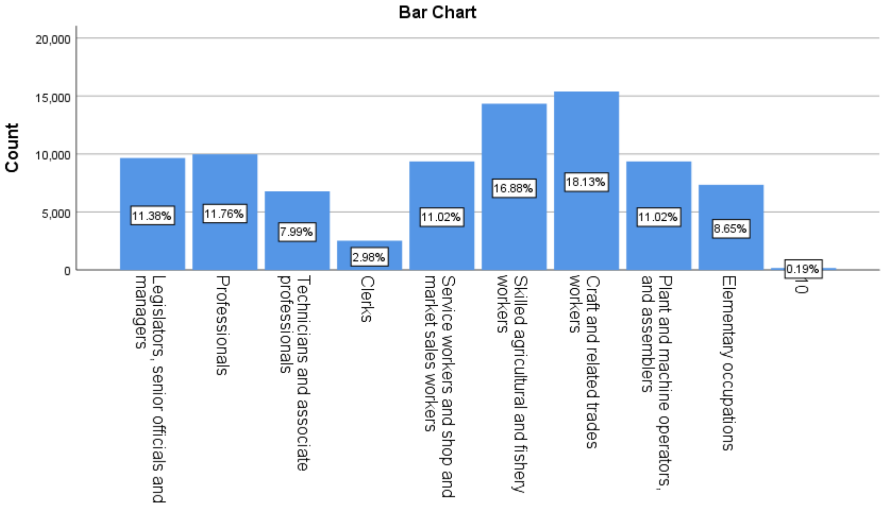

Figure 1: Occupation Classification of Employed Individuals

4.6 Regression Analyses

4.6.1 Determinants of Employment

This section presents the factors that influenced employment status in the Egyptian labour market. A binary logistic regression was conducted to specify which variable, or set of variables, significantly predicted employment status (Peng, Lee, & Ingersoll, 2002). In general, logistic regressions help to predict the *probability* of the dependent variable, given known values of the independent variables (Field, 2009, 2013). A binary logistic regression was used in this instance, due to the nature of the dependent variable, namely main activity status in the labour market. This variable was a dichotomous variable that was 1 if an individual was employed, or 0 if they were unemployed. In this case, it was inappropriate to use linear regressions, as they require a dependent variable to be measured on a scale ratio (continuous), as well as there to be a linear relationship between the variables. These assumptions were violated, as the outcome variable in this case was categorical, therefore the binary logistic regression was deemed to be appropriate. Logistic regressions employ a different method for estimating models' parameters (Field, 2013), using the 'maximum likelihood' (ML) approach to estimate parameters, while linear regressions use ordinary least squares (OLS). The ML method selects the values of the coefficients that make the observed outcomes most likely. Therefore, logistic regression coefficients are expressed as odds ratios (Expβ), reflecting the probability of a change in the dependent variable for a unit change in the independent variable.

The dependent variable used in the binary logistic regression in this study was the main activity status in the labour market (employed versus unemployed). The predictors (independent variables) were the variables related to individual characteristics, such as age, gender, marital status, and education level. Table 3 shows the variables used in the binary logistic model with the associated hypotheses. It should be noted that the hypotheses were mainly derived from the neo-classical labour market theories, namely the HCT, that primarily focused on the supply-related factors of the labour market.

Table 3: Variables in the Logistic Regression and Associated Hypotheses

Dependent Variable	Main activity status in the labour market (employed=1, unemployed=0)
Independent Variables	Hypotheses
Age	H1: older people have more probability of employment than younger people.
Gender	H2: males have more probability of employment than females.
Residence	H3: living in an urban region increases the probability of employment.
Married	H4: married individuals have more probability of employment than single individuals.
Widowed	H5: widowed individuals have more probability of employment than single individuals.
Education level	H6: the higher the education level, the greater the likelihood of being employed.

4.6.2 Estimating the Wage Equation

This section presents the estimation of the wage equation for the Egyptian labour market. The statistical analysis concerned provided estimates of monthly wages, in terms of different individual characteristics, such as gender, marital status, education level, and residence, and also of employer characteristics, namely the sector of employment, stability of employment, and occupation classification. The analysis identified a number of factors that affected earnings, for example the differences in mean wage between private and public sectors, and between males and females.

A multiple linear regression (MLR) was conducted to understand the relationship between monthly wages (dependent variable) and other factors related to the supply and demand sides of the labour market (independent variables). An MLR was considered to be more applicable for this analysis than a simple linear regression (SLR) that explains the dependent variable as a function of a single independent variable. While drawing ceteris paribus inferences regarding how x influences y is challenging when using an SLR, the use of an MLR is more appropriate for ceteris paribus analysis, since it accounts for additional factors that impact the dependent variable simultaneously (Wooldridge, 2010). However, in order to run an MLR, several assumptions are required (Wooldridge, 2015);

- A linear relationship should exist between the dependent variable and the independent variables;
- No multicollinearity, namely independent variables, should be highly correlated;
- Independent errors and residuals should be uncorrelated;
- Homoscedasticity, the variance of the error term, should be constant;
- Residuals should be normally distributed.

The dependent variable used for the MLR, in this case, was the natural logarithm of monthly wages. The predictors (independent variables) were the variables concerning individual characteristics, such as age, gender, residence, and education level, as well as employer characteristics, such as classification of occupation, employment sector, and employment stability. Table 4 shows the variables used in the model, together with associated hypotheses;

Table 4: Variables in the MLR and the Associated Hypotheses

Dependent Variable	Log Monthly Wage
Independent Variables	Hypotheses
Gender	H1: males are predicted to earn higher wages than females.
Education Level	H2: people with a high level of education are predicted to earn higher wages than people with a low level of education.
Occupation Classification	H3: people who work in occupations that require a high level of skill are predicted to earn higher wages than people who work in low skilled occupations.
Residence	H4: people who live in urban regions are predicted to earn higher wages than people who live in rural regions.
Employment Stability	H5: full-time workers are predicted to earn more than part-time workers.
Employment Sector	H6: people who work in the public sector are predicted to earn higher wages than people who work in the private sector.
Tenure	H7: people with more years of experience are predicted to earn more than people with less experience.
Age	H8: older people are predicted to earn higher wages than younger people.
Total Weekly Hours	H9: people who work more hours are predicted to earn more than people who work fewer hours.

5. Results

5.1 Determinants of Employment

This section presents the determinants of employment in the Egyptian labour market. The probability of main activity status in the reference period (2019), by employed or unemployed, was predicted based on (a) age, (b) gender, (c) residence, (d) marital status, and (e) education level. Accordingly, the following hypotheses were formulated:
The null hypothesis, namely when all the coefficients in the regression equation equalled zero:
$H_0 = \beta_1 = \beta_2 = \beta_3 = \cdots = \beta_k = 0$
The alternative hypothesis for when the model predictors differed significantly from zero:
$H_1 = \beta_i \neq 0$
The dependent variable was encoded as (0= unemployed, 1=employed). The output of the binary logistic model was presented under two models, the null model and the full model, as shown in the following two sections.

5.1.1 The Null Model

Table 5: Null Model Classification Table[a,B]

		Predicted: Main Activity Status in 2019		Percentage Correct
Observed		Unemployed	Employed	
Main Activity Status in 2019	Unemployed	0	5538	.0
	Employed	0	82832	100
Overall Percentage				93.7

Note: The cut-off point is .93

The results in Table 5 reflect an unconditional model, referred to as a null model, in which no predictors were included as predictors of the probability of a main activity status in 2019. The percentage of participants in the sample identified as being employed was 82,832/88,370*100% = 93.7%, which meant that, without knowing anything more about the individuals in the study, the expectation that any individual participant was employed was 93.7%.

Table 6: Variables in the Equation

	B	S.E.	Wald	df	Sig.	Exp(B)
Constant	2.705	.014	37987.343	1	.000	14.957

The regression equation for the null model can be expressed in (table 6):

$$odds(employed) = e^{logit} = e^{2.705} = 14.9543$$

The expectation was that the probability of a participant being employed was about 15 times that of the probability of them being unemployed.

5.1.2 The Full Model

Table 7 shows the frequencies and percentages that reflected the degree to which the model correctly or incorrectly predicted the dependent variable, demonstrating that 4,510/ (4510+1028) *100= 81.4% of the unemployed observed cases were correctly predicted to be unemployed. Meanwhile, of the 82,833 cases observed to be employed, 6,4301/ (18531+64301) *100= 77.6% were correctly predicted by the model to be employed. The overall classification accuracy based on the model was 77.9%.

Table 7: Full Model Classification Table

<table>
<tr><td colspan="2" rowspan="2"></td><td colspan="2">Predicted</td><td rowspan="3">Percentage Correct</td></tr>
<tr><td colspan="2">Main Activity Status in (2019)</td></tr>
<tr><td colspan="2">Observed</td><td>Unemployed</td><td>Employed</td></tr>
<tr><td rowspan="2">Main Activity Status in (2019)</td><td>Unemployed</td><td>4510</td><td>1028</td><td>81.4</td></tr>
<tr><td>Employed</td><td>18531</td><td>64301</td><td>77.6</td></tr>
<tr><td colspan="2">Overall Percentage</td><td></td><td></td><td>77.9</td></tr>
</table>

Table 8 shows the Chi-square test for the logistic regression model, indicating that the model represented a significant improvement in fit (χ^2 = 10993.040, df=11, p=.000). The results confirmed that the model significantly fit the data.

Table 8: Omnibus Tests of Model Coefficients

	Chi-squared	df	Sig.
Step	10993.040	11	.000
Block	10993.040	11	.000
Model	10993.040	11	.000

5.1.3 Full Model Coefficients

Table 9: Logistic Regression Coefficients

Model	B	S.E.	Wald	df	Sig.	Exp(B)
Constant	.831	.077	115.500	1	.000	2.296
Age	.093	.002	1518.614	1	.000	1.098
Gender (1)	-1.897	.034	3087.017	1	.000	.150
Residence (1)	-.447	.032	192.037	1	.000	.639
Marital Status			236.932	3	.000	
Marital Status (1)	.633	.042	228.420	1	.000	1.883
Marital Status (2)	.145	.105	1.901	1	.168	1.156
Marital Status (3)	.760	.157	23.345	1	.000	2.138
Education Level			718.698	5	.000	
Education Level (1)	-.091	.077	1.390	1	.238	.913
Education Level (2)	-.802	.053	225.071	1	.000	.448
Education Level (3)	-.988	.085	136.383	1	.000	.372
Education Level (4)	-1.292	.055	544.198	1	.000	.275
Education Level (5)	-.627	.190	10.835	1	.001	.534

The regression prediction equation employed in table 9, namely predicting logits, was:

$$logit(Y=1) = b_{intercept} + b_{age}X_{age} + b_{gender}X_{gender} + b_{residence}X_{residence} + b_{Married\ monogamous}X_{Married\ monogamous} + b_{divorced}X_{divorced} + b_{widowed}X_{widowed} + b_{primary}X_{primary} + b_{secondary}X_{secondary} + b_{post\ secondary}X_{post\ secondary} + b_{university}X_{university} + b_{post\ graduate}X_{post\ graduate}$$

$$logit(Y=1) = .831 + .093X_{age} - 1.897X_{gender} - .447X_{residence} + .633X_{Married} + .145X_{divorced} + .760X_{widowed} - .091X_{primary} - .802X_{secondary} - .988X_{post\ secondary} - 1.292X_{university} - .627X_{post\ graduate}$$

Age: The regression slope was positive and significant (b=.093, p=.000), indicating that for every one-year increase, the odds of gaining employment changed by a factor of 1.098 (meaning that the odds Exp(B) were increasing) (H1 accepted).

Gender (female): The regression slope for gender was negative and significant (b=-1.897, p=.000), indicating that a female (coded 1) was *less likely* to be employed than a male (H2 accepted).

Residence (urban): The regression slope for residence was negative and significant (b=-.447, p=.000), indicating that a participant who lived in an urban area (coded 1) was *less likely* to be employed than a participant who lived in a rural area (H3 rejected).

Marital status (married): The regression slope for married participants was positive and significant (b=.633, p=.000), indicating that a married participant (coded 1) was *more likely* to be employed than a participant who was unmarried (H4 accepted).

Marital status (widowed): The regression slope for widowed participants was positive and significant (b=.760, p=.000), indicating that a widowed participant (coded 1) was *more likely* to be employed than a participant who was unmarried (H5 accepted).

Education level (secondary): The regression slope for secondary level educated participants was negative and significant, (b=-.802, p=.000), indicating that a secondary level educated participant (coded 1) was *less likely* to be employed than a participant with no formal education (H6 rejected).

Education level (post-secondary): The regression slope for the participants educated to post-secondary level was negative and significant (b=-.988, p=.000), indicating that a post-secondary level educated participant (coded 1) was *less likely* to be employed than a participant with no formal education.

Education level (university): The regression slope for university-level educated participants was negative and significant, (b=-1.292, p=.000), indicating that a university-level educated participant (coded 1) was *less likely* to be employed than a participant with no formal education.

Education level (post-graduate): The regression slope for post-graduate level educated participants was negative and significant, (b=-.627, p=.001), indicating that a post-graduate level educated participant (coded 1) was *less likely* to be employed than a participant with no formal education.

In summary, the logistic regression analysis revealed that being older, male, married or widowed, and living in a rural region increased the probability of an individual being employed. Surprisingly, the attainment of all education levels appeared to reduce the likelihood of attaining employment in the Egyptian labour market. These results contradict the assumption of the HCT while confirming the view of credential theory.

5.2 Estimating the Wage Equation

This section estimates the wage equation for the Egyptian labour market in 2019. The MLR was used to examine the factors that influence individuals' monthly wages. Therefore, the dependent variable was the log of monthly wages, a continuous variable measured in terms of a scale, and the independent variables were the factors related to individual characteristics, such as gender, education level, and residence, and factors related to the labour market, such as employment stability, employment sector, tenure, occupation classification, and weekly working hours.

The null hypothesis of the MLR is that the dependent and independent variables have no relationship, meaning that the variables do not contribute to interpreting the change in the dependent variable. Therefore, the null hypothesis was

$$H_0 = \beta_1 = \beta_2 = \beta_3 = \cdots = \beta_k = 0$$

The alternative hypothesis was that at least one of the independent variables helped to predict the dependent variable:

$$H_1 = \text{At least one } \beta_i \neq 0$$

Table 10 provides a model summary. The coefficient of R-squared revealed that 16% of the variation in wages (dependent variable) was predicted by the model/independent variables. This percentage of the R-squared is considered to be proportionally low in social sciences research. However, since the main purpose of this analysis is to understand the relationship between monthly wages and a set of demand and supply factors; the low R-squared means that the variables entered in the regression equation were unable to reveal the changes in workers' wages, suggesting that other variables of more importance played a major role in determining wages in the Egyptian labour market.

The analysis of variance (ANOVA) shown in Table 11 represented a significant model with $(F(22) = 544.107, p < .05)$, suggesting that the group of independent variables predicted the outcomes reliably. Furthermore, all the independent variables in the coefficient table (Table 12) were statistically significant, except for sector=cooperative. Therefore, it can be stated that although the R-squared was comparably low, the model was able to draw meaningful conclusions regarding the relationship between wage and other factors.

Table 10: Model Summary of the MLR

Model Summary[b]										
					Change Statistics					
Model	R	R-squared	Adjusted R-squared	Std. Error of the Estimate	R-squared Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.404[a]	.163	.163	.18412	.163	514.582	22	58171	.000	1.913
b. Dependent variable: Logwage.										

Table 11: ANOVA

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	419.808	22	19.082	544.107	.000[b]
	Residual	2151.583	61350	.035		
	Total	2571.391	61372			
a. Dependent variable: Logwage.						

Table 12 presents the coefficients of the regression model and their significance level. Moreover, by observing the tolerance and the variance inflation factor (VIF), it can be stated that the tolerance values were > 0.1, and all the VIF were <10, confirming the absence of **multicollinearity**, one of the important assumptions of the MLR. Moreover, the histogram and the P-P plot of the standardised residuals (Figure 2) supported the assumption of the **normal distribution of residuals**. Figure 3 shows the scatterplot of the variance of residuals. The MLR requires a constant variance of residuals, or what is known as '**homoscedasticity**'. The scatterplot reveals that there was slight support for the assumption, with some points deviating far away from the regression line.

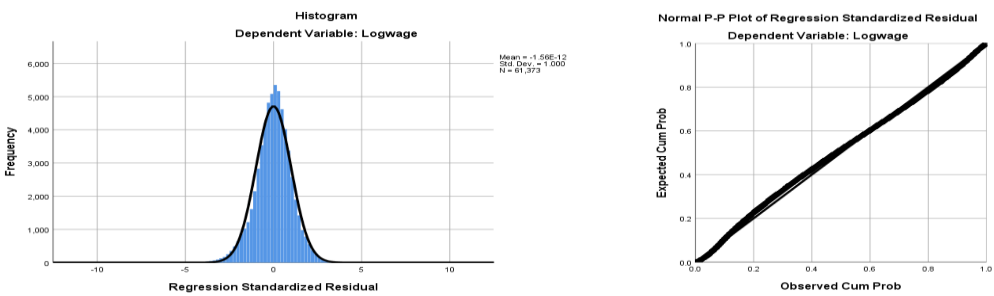

Figure 2: Histogram and P-P Plot of the Standardised Residuals

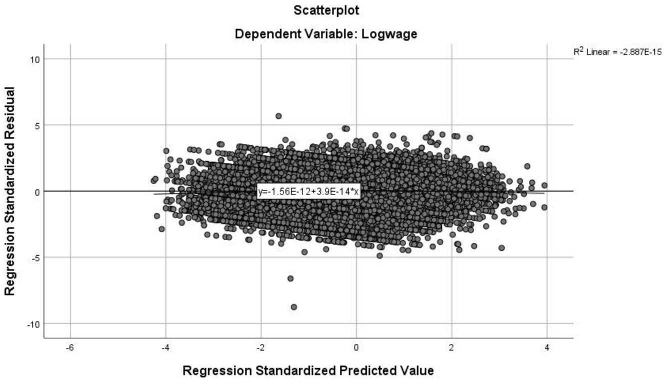

Figure 3: Scatterplot ZRESID Versus ZPRED

Table 12: Coefficients

Model		Unstandardised Coefficients B	Unstandardised Coefficients Std. error	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF
1	(Constant)	2.933	.006	476.123	.000		
	Reference: Female						
	SEX=Male	.101	.002	45.433	.000	.839	1.191
	Reference: No Education						
	EDUC=Primary/Lower Secondary	.037	.003	12.587	.000	.783	1.276
	EDUC=Secondary	.060	.002	28.118	.000	.544	1.838
	EDUC=Post-secondary or Equivalent	.080	.004	19.835	.000	.786	1.273
	EDUC=University	.120	.003	40.401	.000	.375	2.664
	EDUC=Postgraduate	.195	.009	21.166	.000	.913	1.095
	Reference: Elementary Occupation						
	OCC=Legislators	.033	.003	10.020	.000	.420	2.383
	OCC=Professionals	.039	.004	10.203	.000	.294	3.405
	OCC=Technicians	.061	.004	16.698	.000	.441	2.266
	OCC=Clerks	.053	.005	11.242	.000	.677	1.478
	OCC=Service Workers	.019	.003	5.850	.000	.473	2.116
	OCC=Skilled Agricultural	.015	.004	3.847	.000	.605	1.652
	OCC=Craft and Related Trades	.092	.003	27.958	.000	.465	2.150
	OCC=Plant and Machine	.099	.003	29.876	.000	.485	2.062
	Reference: Rural						
	RURURB=Urban	.039	.002	24.382	.000	.903	1.107
	Reference: Government						
	SECTOR=Public Sector	.064	.004	14.804	.000	.872	1.146
	SECTOR=Private Sector	-.027	.002	-12.112	.000	.505	1.979
	SECTOR=Joint/Cooperative	-.023	.036	-.627	.531	.998	1.002
	Reference: Part-time						
	EMPSTAB=Full-time/Regular	.028	.003	9.637	.000	.949	1.054
	Age	.002	.000	17.176	.000	.488	2.050
	Tenure in the Main Job	.002	.000	21.918	.000	.506	1.976
	Total Weekly Working Hours in the Main Job	.002	.000	38.595	.000	.889	1.125

According to the coefficient table (Table 12), the regression equation can be presented as follows:

$$log(\widehat{wage}_i) = b_{0\ intercept} + b_{male}X_{male} + b_{\text{Educ\_primary}}X_{\text{Educ\_primary}} + b_{\text{Educ\_Secondary}}X_{\text{Educ\_Secondary}} + b_{\text{Educ\_postsecondary}}X_{\text{duc\_postsecondar}} + b_{\text{Educ\_university}}X_{\text{Educ\_university}} + b_{\text{Educ\_postgrad}}X_{\text{Educ\_postgrad}} + b_{\text{Occ\_legis}}X_{\text{Occ\_legis}} + b_{\text{Occ\_prof}}X_{\text{Occ\_prof}} + b_{Occ\_Tech}X_{Occ\_Tech} + b_{Occ\_clerck}X_{Occ\_clerck} + b_{Occ\_services}X_{Occ\_services} + b_{Occ\_agricultrue}X_{Occ\_agriculture} + b_{Occ\_craft}X_{Occ\_craft} + b_{Occ\_plant}X_{Occ\_plant} + b_{Urban}X_{Urban} + b_{public}X_{public} + b_{private}X_{private} + b_{Cooperative}X_{Cooperative} + b_{fulltime}X_{fulltime} + b_{age}X_{age} + b_{tenure}X_{tenure} + b_{workinghours}X_{workinghours} + \varepsilon_i$$

$$log(\widehat{wage}_i) = 2.933 + .101X_{male} + .037X_{\text{Educ\_primary}} + .060X_{\text{Educ\_Secondary}} + .080X_{\text{Educ\_postsecondar}} + .120X_{\text{Educ\_university}} + .195X_{\text{Educ\_postgrad}} + .033X_{\text{Occ\_legis}} + .039X_{\text{Occ\_prof}} + .061X_{Occ\_Tech} + .053X_{Occ\_clerck} + .019X_{Occ_{services}} + .015X_{Occ_{agriculture}} + .092X_{Occ_{craft}} + .099X_{Occ\_plant} + .039X_{Urban} + .064X_{public} - .027X_{private} - .023X_{Cooperative} + .028X_{fulltime} + .002X_{age} + .002X_{tenure} + .002X_{workinghours} + \varepsilon_i$$

Table 12 shows that all the variables were statistically significant predictors of wage, with $p<.05$, except the coefficient of the cooperative sector.

B0 was the (Y-intercept)= 2.933, which meant that the model predicted a monthly wage value of 3 (thousands), when all other factors (X_S) were zero.

Gender (male) was a dummy variable coded as male=1 (female was the reference group). The regression slope for gender was positive and significant (b=.101, p=.000), indicating that males were predicted to earn more than females by 10% (H1 accepted).

Education level was a dummy variable coded under five categories: primary education, secondary education, post-secondary education, university, and post-graduate (no education was the reference group). The regression slope for all education levels was positive and significant, therefore wage was predicted to increase as education level increased. For example, compared with those who had no education, the wages of workers with primary-level education were predicted to increase by 4%, those with secondary-level education by 6%, post-secondary education by 8%, university education by 12%, and post-graduate education by 19.5% (H2 accepted).

Occupation classification was a dummy variable that fell under eight categories: legislators, professional, technicians, clerks, services, skilled agricultural, craft, and plant (elementary occupation was the reference group). The regression slope for all of the occupation classifications was positive and significant. Hence, compared to the wages of people in elementary occupations, those in other occupations earned more, which was reasonable since according to the ISCO people in other occupations should have higher skills than those in elementary occupations. The coefficients of occupations revealed that, compared with those of elementary occupations, wages were predicted to increase in legislator occupations by 3.3%, in professional occupations by 4%, for technicians by 6%, clerks by 5%, services by 2%, agriculture by 1.5%, craft by 9%, and plant by 10% (H3

accepted).
Residence (Urban) was a dummy variable coded as urban=1 (rural region was the reference group). The regression slope for residence was positive and significant (b=.039, p=.000), therefore residing in an urban region was predicted to increase the wage earned by 4% (H4 accepted).
Employment sector was a dummy variable with three categories: public sector, private sector, and joint/cooperative sector (government sector was the reference group). The coefficients of both the public and the private sector were significant (p=.000). However, the coefficient of the public sector had a positive sign (b=.064), indicating that working in the public sector was predicted to increase wages by 6.4%, whereas working in the private sector (b=-.027) was predicted to reduce wages by 2.7% (H5 accepted).
Employment stability (full-time) was a dummy variable coded as full-time=1 (part-time was the reference group). The regression slope for employment stability was positive and significant (b=.028, p=.000), hence full-time workers were predicted to earn 2.8% more than part-time workers (H6 accepted).
Tenure was a continuous variable measured on a scale. The regression slope for tenure was positive and significant (b=.002, p=.000), therefore for every one year increase in job experience, wages were predicted to increase by .02% (H7 accepted).
Age was a continuous variable measured on a scale. The regression slope for age was positive and significant (b=.002, p=.000), therefore a one-year increase in age was predicted to increase the wage by .02% (H8 accepted).
Total weekly working hours was a continuous variable measured on a scale. The regression slope for weekly working hours was positive and significant (b=.002, p=.000). Therefore, for a one hour increase in working, the wages were predicted to increase by .02% (H9 accepted).
In summary, several factors influenced wage estimation in the Egyptian labour market significantly. Some of those factors were related to individual characteristics, namely the supply side of the labour market, while others were related to employer characteristics, namely the demand side of the labour market. The regression analyses confirmed that being male, older, possessing a higher level of education, and living in an urban region was predicted to increase the monthly wage. Furthermore, working in occupations that require a high skill-level, in full-time employment, in the public sector, or having more years of experience were predicted to increase the monthly wage.

6. Findings and Discussion

This study sought to understand the characteristics of the Egyptian labour market, utilising the recently published data of the labour force survey 2019. The descriptive statistics demonstrated that male workers dominated the Egyptian labour market. Meanwhile, females represented a minority of the labour force, and constituted the majority of unemployed people who were willing to work, but were unable to find a job. The majority of employed people were older individuals, specifically in the age group 40-45 years, indicating a low level of youth employment. Furthermore, the statistics relating to occupational classification revealed that a significant proportion of employed people were in low- to medium-skilled jobs, such as craft, trades, and agriculture. These statistics indicated the inability of the Egyptian economy to offer highly skilled jobs, and suggested that graduates of higher education institutions lacked the skills required by the labour market, namely that there was an education-job mismatch problem.

Two main regression analyses were conducted, the first of which was a binary logistic regression employed to examine the determinants of employment in the labour market from a supply-side perspective. The results revealed that males had a higher probability of finding employment than females. These findings confirmed that even recent data demonstrated the presence of a gender gap in the Egyptian labour market. The participation of females in the labour market, and their likelihood of achieving employment, were low. The results of this regression analysis also revealed that older people had a higher probability of finding employment than younger people, which also confirmed the high youth unemployment in the Egyptian labour market. Surprisingly, all education levels appeared to lower the probability of obtaining employment. Several causes contributed to this result. As shown in the descriptive statistics section, the majority of the sample is working in low- to medium-skilled occupations that may not require a degree. Thus, it is true that all educational levels do not significantly impact the probability of employment. Moreover, credential inflation may play a role. The oversupply of university graduates makes it difficult for the labour market to absorb all entrants. Several studies conducted on the Egyptian labour market have shown that the decline in the public sector and the sluggish expansion of the formal private sector have resulted in a limited supply of good jobs (Assaad, Krafft, & Salemi, 2019). These jobs are increasingly assigned according to socioeconomic status. More specifically, the quality of initial jobs deteriorated for educated new entrants, particularly among those with lower socioeconomic status, concluding that socioeconomic factors are important determinants of employment opportunities in Arab countries. Moreover, (Assaad, Krafft, & Salehi-Isfahani, 2018) approved the existence of credentialism in Arab labour markets by showing that higher education characteristics (i.e. type of higher education institution) do not significantly affect labour market outcomes, while family background has a significant effect. These findings suggest the very limited role played by innate ability and effort (i.e. education), which should be the main variables determining access in any meritocratic system (Ragui Assaad, 2013). Unfortunately, credential inflation has diminished the value of education, allowing factors such as social status and social networks to play a greater role

Second, a multiple linear regression was conducted to determine the most significant factors contributing to the wage estimation. The results revealed that being male, older, living in an urban region, having more years of employment experience, the possession of a higher level of education, working in the public sector, and working full-time were all significantly positive predictors of wage. In most Arab countries, public sector jobs are preferable, especially for women. These jobs provide higher prestige, higher-paying, better work environments and, most importantly, job security (Salehi-Isfahani, 2012) compared to the private sector. Therefore, individuals compete for public job opportunities and pursue higher education degrees in order to signal their potential productivity. However, youth unemployment has dramatically increased with the declining opportunity in the public sector and weak formal private sector growth.

The R-squared value of the model reflected the fact that important factors other than those included in the dataset affected the wage determination in the Egyptian labour market significantly. These factors are probably what the neo-classical theories failed to address. The neo-classical theories view labour market outcomes as a function of either supply-related factors or demand-related factors. However, other essential factors went unobserved from this view. Theories such as credential theory and cultural capital theory emphasise the critical role of socioeconomic factors in determining individuals' positions in the labour market. For example, coming from well-educated parents and high social status facilitates access to high-quality education and high positions in the labour market. Moreover, working parents may use their networks to secure jobs for their children (Assaad et al., 2019). As shown by (Assaad, Krafft, et al., 2018) supply-side variables and institutional incentives have little impact on workers' wages in their first job, however, family background (i.e., father's degree and career) has a substantial impact. Therefore, future research should incorporate socioeconomic factors to improve the overall interpretation of the model.

7. Conclusion

This study aimed to understand the characteristics of the Egyptian labour market, utilising the recently published data of the labour force survey 2019. Two main regression analyses were conducted. First, a binary logistic regression was applied to examine the determinants of employment in the labour market. Second, a multiple linear regression was conducted to determine the most significant factors contributing to the wage estimation. The results demonstrated that gender, age, and residence were significant determinants of employment. Furthermore, both supply and demand side factors were found to determine wages in the Egyptian labour market significantly. However, future research should incorporate socioeconomic factors to improve the overall interpretation of the model.
A fundamental conclusion of this study is that the traditional neo-classical approach proved ineffective for understanding labour market outcomes in Egypt. Other theoretical approaches have sought to highlight additional essential factors that went unobserved in the conventional view. The sociological approaches to labour markets, such as the credential theory, emphasise the critical role of socioeconomic factors in determining workers' positions in labour markets. Credential inflation has diminished the value of education, allowing factors such as social status and social networks to play a greater role.

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