

Research Article

Modelling the Transition Process from Higher Education to Employment: The Case of Undergraduates from Debre Markos University

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This study aimed to identify the factors that influence Debre Markos University bachelor degree graduates' transition duration from higher education to employment. A retrospective study design and a total of 1448 undergraduates were considered in this study. Kaplan-Meier, Cox proportional hazard, and parametric accelerated failure time survival analysis were used to identify the factors that influence the duration of the job search of graduates. The best parametric model that could describe the duration of the job search to obtain the first job was chosen using the Akaike information criterion. As per the study, 50% of graduates were able to get their first employment 18 months after graduation. The Weibull parametric accelerated failure time model performed better in predicting the time it takes for graduates to find their first job. College, cumulative grade point average, father education, graduate region, public advertisement, starting own business, and doing an internship during the study were found to be statistically significant indicators of the transition duration of the graduates to obtain the first job. Debre Markos University 2019 graduates had a longer period of unemployment. The institution should have a fully functioning career service office that provides job search training and connects students with employers.

1. Introduction

The unemployment rate is the number of people unemployed as a percentage of the total workforce. The general decline in young people's labor force participation has continued over the last two years. Around 497 million young people are employed, accounting for approximately 41% of the worldwide youth population. Nearly 429 million were employed, with 68 million (13.6%) looking for and available for work. In sub-Saharan Africa, 8.7% were unemployed, of which 8.2% were male and 9.2% were females in 2019 [1]. According to the World Bank, wage employment increased marginally to 13.7% in 2019. Wage employment is strongly dependent on educational attainment. Therefore, persons

with less education will be forced to work as self-employed farmers [2]. In 2018, the overall unemployment rate in urban areas was 19%. Unemployment rates differed by education level, with 20% of people with a tertiary education experiencing joblessness [3].

Higher education sustainability is measured using the structured framework of temporal and spatial measures [4]. Graduation is one of the most important contributors to the development of a more sustainable society. Higher education sustainability addresses the limits mentioned regarding infrastructure improvement and the development of new capabilities in their graduates [5, 6]. The contributions of graduates to the economy, efficiency, and equality have a significant impact on the country's development.

When university graduates are unemployed for a long duration, they lose the human capital they obtained during their studies [7, 8]. One of the obstacles that many new university graduates experience following graduation is the transition from higher education to employment [7, 9, 10]. To determine the transition process, policymakers first should understand how higher education and labor markets interact [7, 11].

The graduate unemployment rate is one of the current issues discussed by higher education scholars [6]. Students pursue higher education for various purposes, and they choose institutions for different reasons as well. Among these various graduate purposes were economic perspectives and the importance of educational outcomes after graduation based on future income [8–10]. Undergraduate employment delays are attributed to a lack of graduates' abilities, entrepreneurial ability, and limitations of financial resources to start their business [6, 12–14]. In addition, graduates' employment is influenced by mismatches between their talents and employer demands, study sector, accomplishment of graduation, residence, and graduates' job-seeking ability [14–16]. If a person is involved in the labor market, he or she may become at least one day unemployed [17]. Because there is an imbalance between supply and demand in the labor market, graduates with higher competencies are more likely to be absorbed into the labor market quickly than others [18].

The Ethiopian higher education sector has experienced a remarkable expansion in the past two decades. However, the accompanying trend of growing graduate unemployment appears to have been overlooked [19]. Ethiopia's unemployment rate has risen because the country's labor market can only accept a limited number of graduates; the majority of recent graduates remain unemployed [12, 20]. Overall, unemployment has decreased in Ethiopia; the percentage of graduate unemployment relative to total unemployment has increased [19].

The Ministry of Education is responsible for the Graduate Tracer Study [21]. It keeps tracking the standing of the students of higher education bodies 12 months after graduation to determine if they are working or continuing their studies or still looking for employment. Tracer studies can be used to collect data on how well graduates are performing on the job market, to get input from graduates to improve and update educational institutions, to satisfy the demands of employers, to conduct tracer studies as part of a labor market information system, and to use labor market data to aid policy planners.

As a result, researchers from Ethiopian public universities such as Addis Ababa University [20], Debre Berhan University [22], Debre Markos University [16], and Bahir Dar University [23] investigated the prevalence of unemployment and associated factors. Besides, Batu [12] studied the determinants of youth unemployment in urban areas of Ethiopia, and Reda and Gebre-Eyesus [19] investigated graduates and their implications for unemployment in Ethiopia. However, the previously stated research was either attributed to graduates in a particular field of study, which lacked inclusiveness, repeatability, and worldwide events

(COVID-19) in previous studies to investigate the aspects that contributed to graduate unemployment [24].

As a result, this study aimed to determine the predictors that influence graduates' duration of transition from higher education to employment in Debre Markos University bachelor's degree 2019 graduates using the parametric survival model. In this study, we test the association between doing an internship during the study and transition duration to employment, and compare the efficiency of survival regression models.

2. Methodology

2.1. Study Design, Population, and Period. In this study, a retrospective survey design was employed. The study population was all Debre Markos University undergraduates who graduated in 2019. A total of 2,637 students graduated from 40 bachelor's degree regular programs in the 2019 academic year from Debre Markos University. The survey was conducted from November to December in the year 2020.

2.2. Sampling Procedure. A simple random sampling technique was applied to select the sample of undergraduates. A total of 1,221 graduates were determined using the Cochran formula [25]. Due to political instability in Tigray and Benshangule Gumez regions, 73 (5.9%) of those samples were not interviewed. A total of 1,148 undergraduates were utilized in the analysis.

2.3. Data Collection Tools and Procedures. In this study, a semistructured questionnaire was used. The questionnaire is prepared by the Ministry of Science Higher Education (MOSHE), which is drafted in both English and Amharic (local) languages. Graduates were contacted on their phones using baseline information recorded before leaving the university. They asked about the current situation of employment status and other related variables of undergraduates over 18 months. Departments were selected and trained instructors to collect the data. The data obtained from telephone interviews were entered into Excel and transferred to R software for analysis.

2.4. Data Quality Control. Pre-testing of the questionnaire was done on the year 2018 tracer study. The training was given to the data collectors and supervisor before the data collection. The training is about the aim of the study procedure, data collection techniques going through the questionnaires, one by one, the art of interviewing, a mode of collecting the data, data entry, coding of a questionnaire, and clarification. Moreover, during data collection, the supervisors (department head and college/institute/school institutional quality assurance coordinator) checked how is going on the data collection process and validated some of the random samples. Before data entry, the college/institute/school institutional quality assurance coordinator checked every questionnaire. Data collectors or teachers enter data into Excel to better understand, recall, reorganize, edit, and fill information from the questionnaire.

2.5. *Variables.* The outcome variable was the time spent from the graduation date to first employment of graduates (in months) and employment status, which employed=1 and unemployed=0. The independent variables were expected as potential determinants of graduate transition duration to employment. The following were some considered variables based on the literature review.

- (i) *Gender:* A categorical variable, which is either male =1 or female=0. Previous studies indicated that male graduate is advantageous to get the first job compared to females [7, 16, 26].
- (ii) *Age:* It is a continuous variable that measures the graduate's age in years at the time of interview. Ages previously reported having older age shortened the transition duration to employment [16].
- (iii) *College:* A categorical variable, which labels Health Science College=1, Natural and Computational Science College=2, Institute of Technology=3, Agriculture and Natural Resource College=4, Institute of Education and Behavioral Science=5, Social Science and Humanity College=6, College of Business and Economics =7, Law school=8, Medical school=9, and Burie Campus=10. A previous study found that the length of time it takes to get your first job varies by college (study field) [7, 16].
- (iv) *Region:* It is a categorical variable, which graduate origin location labels Addis Ababa=1, Amhara=2, Oromia=3, SNNP=4, Tigray=5, and others=6. Graduate location is significantly different in the duration of the first job search [7, 16].
- (v) *Cumulative grade point average (CGPA):* CGPA means the weighted average of grades in all semesters at the end of the course completion of graduation. It is a continuous variable (range 2.00-4.00) that graduates obtained in the study period. It categorizes based on the study in the analysis. High CGPA graduates shorten the time length of unemployment [16].
- (vi) *Family education:* It is a categorical variable referring to the highest grade obtained by both mother and father. These categories are not educated =1, primary education=2, and secondary education and above=3. Previous studies found that high parent education levels shorten the transition period to the first job [7, 26, 27].
- (vii) *Field preference:* A categorical variable is that graduate choice of the field he/she studied, which either yes=0 or no=1. The preference field reduces the unemployment duration of graduates [16].
- (viii) *Job searching methods:* It is multiple answer variables such as public advertisement, contacting companies directly through the internet, contacted by the company, commercial working agency,

relations, and own business. In the analysis, each choice of job search method is used as an independent variable by the categories yes=1 and no=0. According to the study [27], job-seeking activities positively affected escaping unemployment.

- (ix) *University preference:* A categorical variable, which is the graduate first preference of Debre Markos University labeled as yes=1 and no=0.
- (x) *Done internship during study:* Categorical, which is either yes=0 or no=1.

2.6. *Data Analysis Methods.* The basic information of the study sample was reported by using descriptive statistics such as percentage, frequency, and mean. The Kaplan-Meier method was used to estimate the unemployment curve. After examining different model assumptions, survival regression models such as Cox proportional hazard (pH) and parametric AFT were applied to assess the relationship between independent variables and duration of graduation from employment.

2.6.1. *Survival Analysis.* Time to an event is at the core of survival analysis. Analysis of survival data is based on the following the subject over time until a change in the state of the subject of interest is observed during the observation period. If the subject's condition does not change during the study period, the data is considered right-censored data [16, 28].

Let T be a nonnegative random variable that describes the time it takes to get a job after graduating. In this study, T corresponds to the time that it takes the graduate to transition from higher education to secure the first job, which would begin when the graduate starts on the date of graduation ($T=0$) and end when the graduate finds the first job (event time, $T=t$).

T has a probability distribution with an underlying probability density function of $f(t)$. It refers to the probability that the survival time is less than the value t . The cumulative density function of T is then defined as follows:

$$F(t) = P(\leq t) = \int_0^t f(x) dx. \quad (1)$$

The survival function is defined as the probability of an individual being event-free/unemployed after time t . The survival function is formulated as:

$$S(t) = P(T > t) = 1 - F(t) \quad (2)$$

The hazard function is used in survival analysis to express the instantaneous risk that an event occurs at time t or the hazard of leaving at some time t . In this particular case, it is derived from the probability that a graduate gets the job at time t , conditional on the graduate being unemployed until time t and is given by:

$$h(t) = \frac{f(t)}{S(t)} \quad (3)$$

2.6.2. Kaplan-Meier Estimate Survival Curve. The Kaplan-Meier (KM) survival curve estimate is an empirical or non-parametric method of estimating $S(t)$ from none or right-censored data [29, 30]. It is used to estimate the unemployment curve of graduates. The KM estimator directly generates the duration of job search from the first employment curve from the data as follows:

$$\widehat{S}(t) = \prod_{t(r) \leq t} \frac{(n-r)}{(n-r+1)}, \quad (4)$$

where n = total number of graduates in the considered sample, $t(r) \leq t$ = all uncensored $t(r)$ less than or equal t , r = positive integers for which $t(r) \leq t$, and $t(r)$ = time of event occurrence.

The log-rank test is used to compare two or more survival curves and determine whether there is a statistically significant difference between the curves. As a result, we were able to identify potential factors related to their time to obtain the first job, and those variables were taken into account in the advanced analysis.

2.6.3. Cox Proportional Hazard (pH). The Cox proportional hazards regression model was first developed by Cox in 1972, also known as the semi-parametric model. It is a statistical method for investigating the effect of several variables on the period a specified event takes to happen [7, 16, 30]. The hazard rate (or function) is specified as a function of two components:

$$h(t | X) = h_0(t) \exp(X\beta), \quad (5)$$

where $h_0(t)$ is the baseline hazard, X is the covariate vector, and β denotes the regression coefficient vector, estimated using the partial likelihood method. The nice thing about the Cox pH model is that the baseline hazard is given no particular parameterization. The model makes no assumptions about the shape of the hazard over time and either increases or decreases, but what has been assumed the baseline function shape is at a constant rate for everyone [7].

2.6.4. Accelerated Failure Time Regression (AFT). The accelerated failure time model is the alternative of pH model; we can estimate the AFT model by the formula:

$$h(t | X) = h_0(t\varnothing(X, \beta))\varnothing(X, \beta), \quad (6)$$

where we assume the shape of the baseline hazard $h_0(\cdot)$. In the parametric method, a functional form for $h_0(\cdot)$ is specified [7, 16]. Here, a covariate is either accelerated or decelerates the time to failure. The AFT model requires a choice of the parametric distribution of $h_0(\cdot)$ [7]. This parametric model assumed exponential, Weibull, log-normal, log-logistic, etc. For example, the exponential model assumes that the baseline hazard is constant over time. It has been implied that the probability of becoming employed at any point in time is a constant for everyone.

2.7. Model Adequacy Checking. The pH assumption for all covariates was assessed to confirm if the ratio of hazard functions was the same at all time points. In this study, scaled Schoenfeld residuals were analyzed to validate the proportional hazards assumption. Model selection was checked by Akaike's information criterion (AIC) to select relatively efficient models [31]. The model with a smaller AIC fits the data better than the model with a large AIC value.

$$\text{AIC} = 2(K + m + 1) - 2 * \log L, \quad (7)$$

where L is the likelihood, K is the number of covariates of the model, and m is the number of model-specific distributional parameters, such that in the model, $m=1$ for exponential and $m=2$ for Weibull and lognormal models. It can be used to compare the adequacy of multiple and probably non-nested models. R statistical software version 3.6.3 for Windows was employed to carry out the statistical analysis.

3. Results

3.1. Demographic Characteristics. In total, 50.5% of 1148 undergraduates were employed, while 49.5% remained unemployed for about 18 months after graduation. The mean age of employed undergraduates was 24.54 ± 2.37 years, and for unemployed, the mean age was 24.6 years with a standard deviation of 1.83 years. From the total sample of graduates, 36.1% were females and 63.9% were males, of which 50.4% were females and 50.6% were males employed. The employment rate of Health Science and Medicine College, Natural and Computational Science College, Institute of Technology, Agriculture and Natural Resource College, Institute of Education and Behavioral Science, Social Science and Humanity College, College of Business and Economics, and Burie Campus were 84.4%, 57.5%, 31.3%, 43%, 72.5%, 55.8%, 46.3%, and 66.2%, respectively. This result showed that the least employment rate is Institute of Technology and Health Science and Medicine College had the highest 2019 graduated employment rate (Table 1).

The total graduated mean cumulative grade point average (CGPA) for employed and unemployed were 2.86 ± 0.33 and 3.06 ± 0.47 , respectively. This result indicates that college graduates having higher scores had a better employability rate. Among undergraduates, the lowest and highest employability regions were Amhara (45.2%) and Addis Ababa (81.6%), respectively. Among the undergraduates, 58.9% did not find work because they may do not like their field. Starting own business (74.9%) and connecting company (68.7%), job searching methods were better employability of graduates. Doing internship during the study time of the graduates was 60.3% employment (Table 1).

3.2. Kaplan-Meier Survival Curve. The median time to first employment of graduates was 18 months, which indicates that 50% of the graduates managed to find their first job by 18 months after their graduation date (Figure 1). The employability of graduates slower changes before eight months.

TABLE 1: Employment status of Debre Markos University 2019 graduates by their characteristics and the log-rank test of equality of survivor function *p*-values.

Characteristics	Categories	Employed status		<i>P</i> -value
		Unemployed, <i>n</i> (%)	Employed, <i>n</i> (%)	
Age, mean (SD)		24.60 (1.83)	24.54 (2.37)	
Gender	Female	206 (49.6)	209 (50.4)	0.54
	Male	362 (49.4)	371 (50.6)	
Colleges	Health science	19 (15.6)	103 (84.4)	<0.001
	NCS	45 (42.5)	61 (57.5)	
	Technology	255 (68.7)	116 (31.3)	
	Agriculture	45 (57.0)	34 (43.0)	
	IEBS	11 (27.5)	29 (72.5)	
	SSH	42 (44.2)	53 (55.8)	
	BE	102 (53.7)	88 (46.3)	
	Burie Campus	49 (33.8)	96 (66.2)	
Region	Addis Ababa	13 (18.6)	57 (81.4)	<0.001
	Amhara	395 (54.8)	326 (45.2)	
	Oromia	77 (50.7)	75 (49.3)	
	SNNP	64 (39.4)	98 (60.5)	
	Tigray	11 (52.4)	10 (47.6)	
	Others	8 (36.4)	14 (63.6)	
Father education	Not educated	397 (53.5)	345 (46.5)	<0.001
	Primary	84 (42.9)	112 (57.1)	
Mother education	Secondary and above	87 (41.4)	123 (58.6)	<0.001
	Not educated	450 (52.3)	410 (47.7)	
CGPA, mean (SD)	Primary	73 (44.0)	93 (56.0)	
	Secondary and above	45 (36.9)	77 (63.1)	
Preferred field	Yes	2.86 (0.33)	3.06 (0.47)	
	No	515 (50.5)	504 (49.5)	0.054
Preferred university	Yes	53 (41.1)	76 (58.9)	
	No	417 (51.7)	390 (48.3)	0.024
Public advertisement	No	151 (44.3)	190 (55.7)	
	Yes	146 (36.3)	256 (63.7)	<0.001
Contacting companies directly	Yes	422 (56.6)	324 (43.4)	
	No	410 (47.6)	451 (52.4)	0.091
Connected the company	Yes	158 (55.1)	129 (44.9)	
	No	527 (51.8)	490 (48.2)	<0.001
Working agency	Yes	41 (31.3)	90 (68.7)	
	No	550 (49.5)	562 (50.5)	0.85
Through relations	Yes	18 (50.0)	18 (50.0)	
	No	423 (46.7)	482 (53.3)	<0.001
Own business	Yes	145 (59.7)	98 (40.3)	
	No	559 (50.1)	557 (49.9)	<0.001
Other	Yes	9 (28.1)	23 (74.9)	
	No	559 (50.5)	549 (49.5)	0.087
Done internship during studies	Yes	9 (22.5)	31 (77.5)	
	No	203 (39.7)	308 (60.3)	<0.001
		365 (57.3)	272 (42.7)	

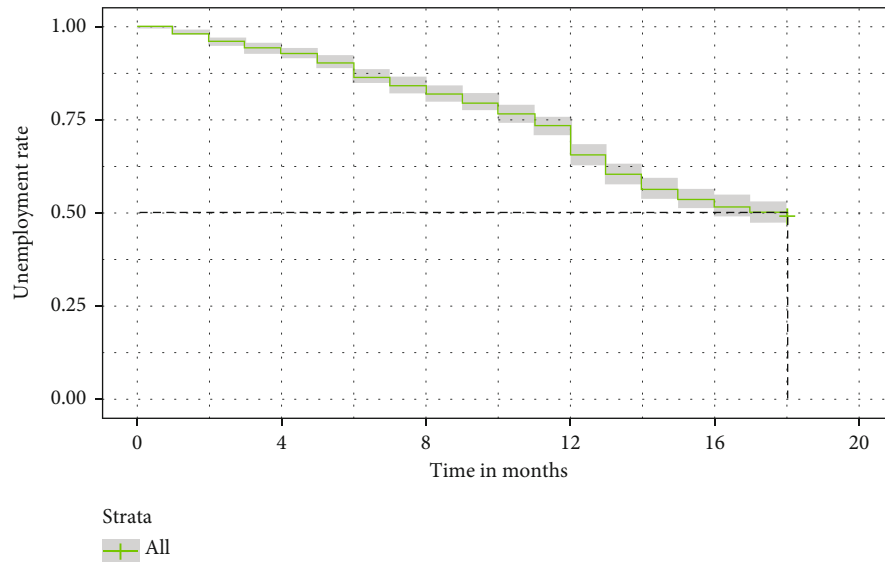


FIGURE 1: Unemployment time of graduate.

Kaplan-Meier curve shows factors such as gender, college, CGPA, graduate region, and mother and father education of the graduates as presented in Figures 2(a)–2(f). Accordingly, graduates' colleges, cumulative grade point average (CGPA), graduate region, and father and mother education showed considerable differences with the unemployment curves for each category of covariates, revealing that these covariates show significant differences regarding employment graduates. In addition, the covariate age, preferred field, preferred university, public advertisement, contacting companies, directly connecting the company, through relations, starting own business, and doing an internship during the study were significant differences between the categories at 10% level of significance (Table 1). Therefore, we took these variables into account for further analysis.

Female gender, health science, CGPA between 2.75 and 4.00, other graduate regions (Benshangul Gumuz, Derie Dawa, Hareri, Somali, and Afar), and secondary and above education level of the mother and father of graduates were less job search time relative to others categories of covariate.

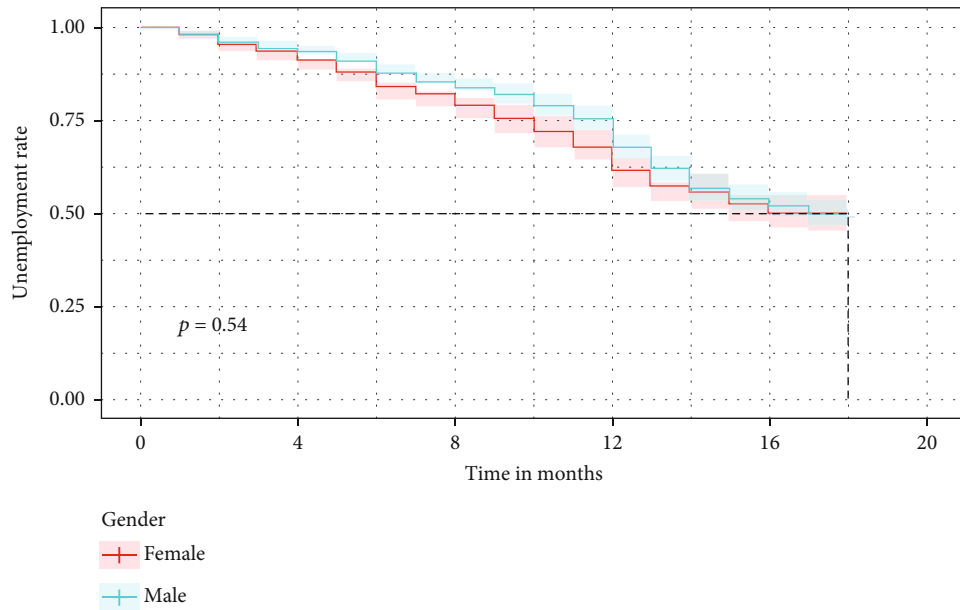
3.3. Modelling of the Transition Time of Undergraduate. The 14 variables were assessed using a log-rank test to match the Cox pH model for the transition time for the first job. As part of the stepwise selection procedure, the final model was chosen using the AICcmodavg package aictab () function in R. The best model was selected as the one with the lowest AIC, and it comes in the first. That means variables such as age, college, graduate region, CGPA, father's education, preferred field, advertisements, through relations, owning a business, and doing an internship during the study are all included in the better fit model (Table 2). The pH assumption was checked using Schoenfeld residuals, but the `cox.zph` function in R was used to verify the pH assumption for each covariate. According to Table 3, some covariates are significant, indicating a rejecting of the pH

assumption. Furthermore, the overall test, denoted as GLOBAL, is significantly different at 5%, meaning that the pH assumption fails.

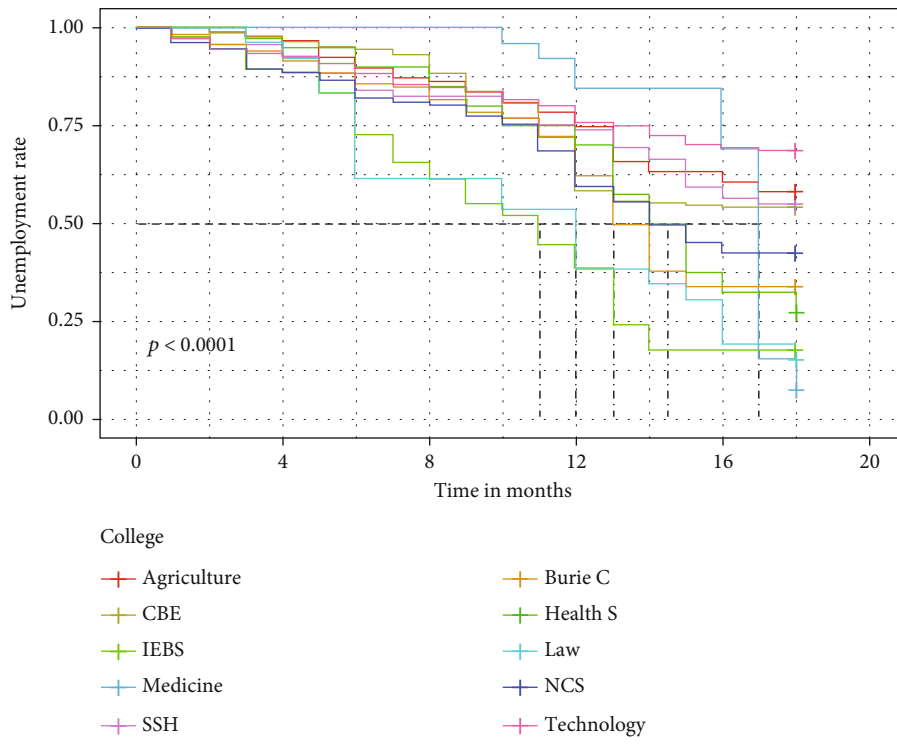
As a result, an AFT model develops to simulate graduates' first job transition duration. AFT models (exponential, Weibull, lognormal, and log-logistic) fitted using the survreg function in the Survival package. The AFT model used the same variables found immensely important in the Cox proportional model. The final ART model chosen by the AICcmodavg package and the `aictab ()` function. The Weibull AFT model was selected as the best model with the lowest AIC. Table 4 summarizes the AIC statistics for parametric and semi-parametric survival models. The AIC statistics for Weibull, log-logistic, lognormal, and exponential models were 4634.12, 4694.91, 4759.36, and 4810.04, respectively.

Table 2 shows the estimated value of the coefficients, the time ratio (TR), and its 95% confidence interval, and significance for the Weibull model, which is a comparatively efficient model. The variables college, region, CGPA, father education, public advertisement, starting own business, and doing an internship during the study were significant at 5% in the model.

The estimate of the shape parameter in the Weibull with gamma was 0.582, which is less than unity, suggesting that the probability of getting a job decreases monotonically with time. According to the estimate, the acceleration factor for Burie Campus of Agriculture College is 0.561. As a result, the median time of graduates to obtain the first job, Burie Campus, is 0.561, college of business and economics is 0.696, health science is 0.543, IEBS is 0.711, law school is 0.603, medical school is 0.627, and NCS is 0.666 times shorter than that of Agriculture College. When considering the CGPA of graduates, the CGPA between 3.25 and 2.74, and 3.75 and 4.00 have to obtain the first job 0.762 and 0.715 times shorter than the CGPA between 2.00 and 2.74 graduates to find their employment, respectively. Graduates from all regions took longer to find their first job than those

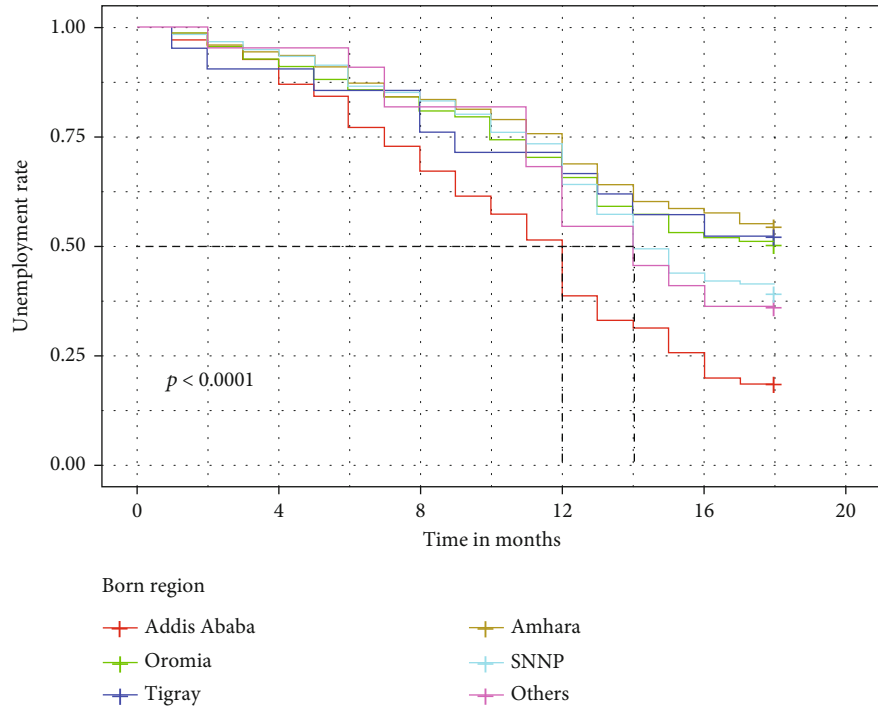


(a)

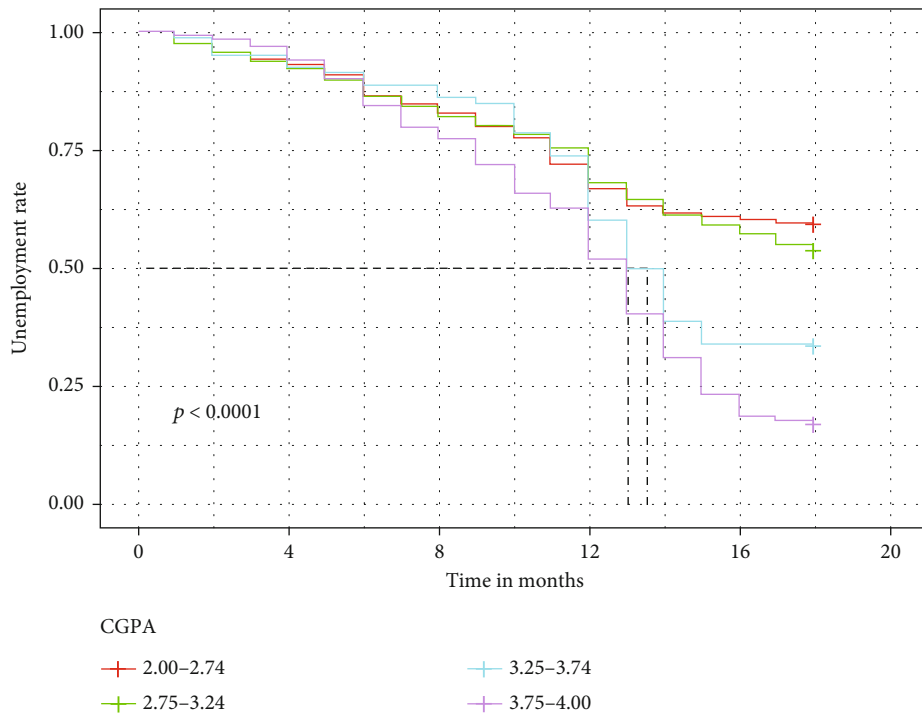


(b)

FIGURE 2: Continued.

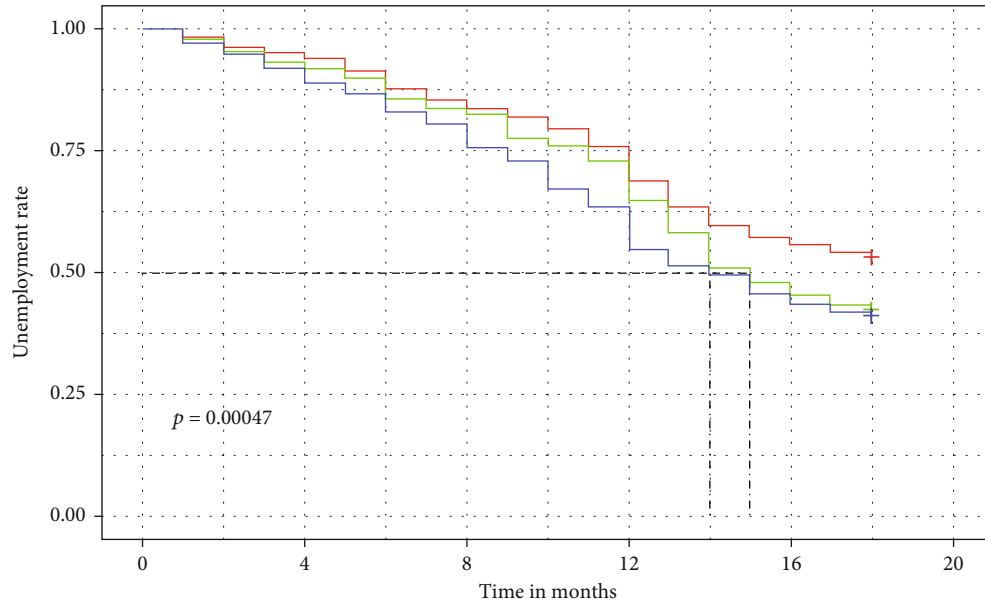


(c)

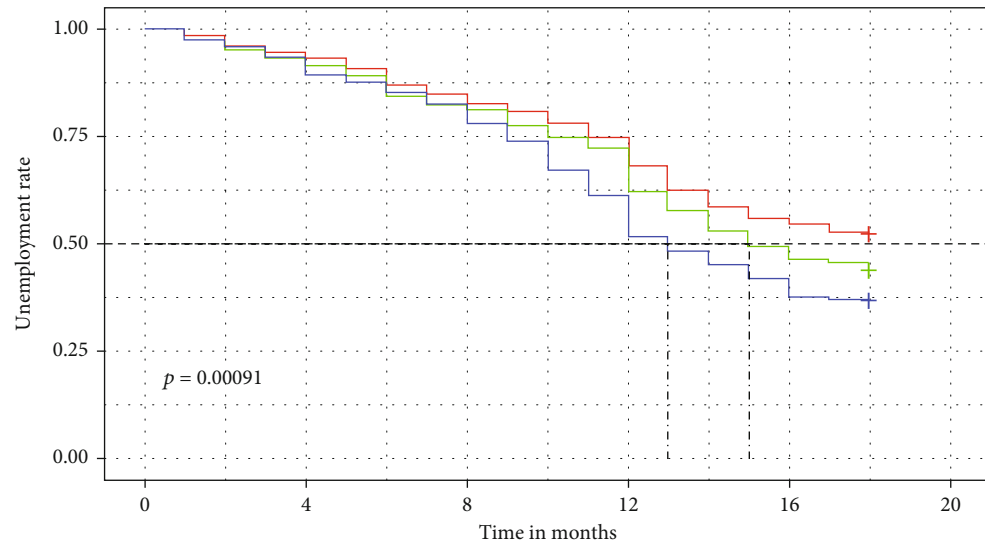


(d)

FIGURE 2: Continued.



(e)



(f)

FIGURE 2: Job search time of graduates with covariates.

from Addis Ababa. Secondary and above father education level were 0.857 times shorter median duration of the job search for employment graduates than not educated fathers.

Graduates who were public advertisement job searching method to obtain the first job were 1.157 times longer than

those who did not use public advertisement. At a 10% level of significance, graduates who used the relation to find a job had an unemployment period that was 1.127 times longer than those who did not use the relation to find a job. The median duration of the job search until first employment for

TABLE 2: Results of fitting the Cox pH model and the Weibull AFT model for graduates 2019.

Variables	Cox pH ($n=1148$)	Weibull AFT ($n=1148$)
	HR (95% CI)	TR (95% CI)
Age	0.970 (0.916, 1.027)	1.016 (0.983, 1.050)
College (reference: agriculture)		
Burie Campus	2.720*** (1.735, 4.264)	0.561*** (0.432, 0.729)
BE	1.916** (1.122, 3.010)	0.696*** (0.536, 0.905)
Health science	2.922*** (1.850, 4.614)	0.543*** (0.416, 0.708)
IEBS	1.771** (1.031, 3.041)	0.711** (0.519, 0.974)
Law	2.406*** (1.330, 4.351)	0.603*** (0.427, 0.852)
Medicine	2.254** (1.063, 4.783)	0.627** (0.404, 0.972)
NCS	2.019*** (1.257, 3.243)	0.666*** (0.505, 0.877)
SSH	1.524 (0.903, 2.571)	0.779 (0.575, 1.056)
Technology	0.951 (0.617, 1.466)	1.039 (0.808, 1.336)
CGPA (reference: 2.00-2.74)		
2.75-3.24	1.118 (0.887,1.410)	0.930 (0.813, 1.064)
3.25-3.74	1.571** (1.080, 2.286)	0.762** (0.613, 0.948)
3.75-4.00	1.718*** (1.277, 2.310)	0.715*** (0.601, 0.850)
Region (reference: Addis Ababa)		
Amhara	0.439*** (0.317, 0.608)	1.611*** (1.333, 1.947)
Oromia	0.477 *** (0.331, 0.687)	1.535*** (1.242, 1.898)
SNNP	0.533*** (0.373, 0.760)	1.430*** (1.163, 1.757)
Tigray	0.491** (0.244, 0.986)	1.503** (1.003, 2.255)
Other	0.536** (0.295, 0.973)	1.416** (1.001, 2.002)
Father education (reference: not educated)		
Primary education	1.070 (0.857, 1.336)	0.958 (0.842, 1.090)
Secondary and above	1.305** (1.037, 1.643)	0.857** (0.750, 0.980)
Preferred field (reference: yes)		
No	1.175 (0.893, 1.546)	0.923 (0.787, 1.082)
Public advertisement (reference: no)		
Yes	0.773** (0.630, 0.949)	1.157** (1.027, 1.304)
Through relation (reference: no)		
Yes	0.813* (0.642, 1.029)	1.127* (0.982, 1.293)
Own business (reference: no)		
Yes	2.128*** (1.374, 3.295)	0.652*** (0.505, 0.842)
The internship did (reference: yes)		
No	0.511*** (0.415, 0.629)	1.476*** (1.306, 1.669)
Constant		11.106*** (4.906, 25.141)
Scale		0.582
Chi2		273.269***
Likelihood ratio test	268.9***	
Wald test	277.8***	
Score (log-rank) test	305.1***	

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; HR = hazard ratio; TR = time ratio; CI = confidence interval.

graduates who started their own business was 0.652 times shorter than that of graduates who did not start their own business. When comparing doing an internship during the studies graduate to those who did not do an internship during the study, those not doing the internship during the study had 1.476 times longer to obtain the first job.

4. Discussion

The main objective of this study was to identify associated factors with the transition duration from higher education to employment in 2019 graduates of Debre Markos University. The median time of graduate employability was

TABLE 3: The goodness of fit test based on Schoenfeld residual for sample graduate 2019.

Covariate	Chi-square	df	P-value	pH assumption holds?
Age	9.248	1	0.002	No
College	97.166	9	< 0.001	No
CGPA	46.624	3	<0.001	No
Region	9.180	5	0.102	Yes
Father education	3.819	2	0.148	Yes
Preferred field	0.942	1	0.331	Yes
Public advertisements	0.054	1	0.816	Yes
Relations	1.371	1	0.241	Yes
Own business	4.012	1	0.045	No
Done internship during studies	2.606	1	0.106	Yes
GLOBAL	151.435	25	< 0.001	No

TABLE 4: Comparison of the pH model and the AFT models using AIC criteria.

Model	AIC value
CPH	7522.17
Weibull	4634.12
Log logistic	4694.91
Lognormal	4759.36
Exponential	4810.04

18 months. The unemployment status of graduates in this study was higher than the study conducted in Debre Markos University in Ethiopia was 15 months [16], Sri Lanka [9] was 12 months, Europe [7] was 6 months, and Croatia [32] was less than 12 months. This variation would have happened due to the differences in the study areas, years of graduation, and the COVID-19 pandemic. According to the findings, the probability of obtaining a job drops monotonically over time. This result is consistent with research undertaken in Ethiopia [16] and Croatia [32]. The relationship between job search intensity and the probability of accepting a job offer determines the university-to-work transition. In this analysis, we assume that the job search intensity of graduates remains constant throughout the spell [7].

The study revealed that Burie Campus, College of Business and Economics, College of Health Science, Institute of Education and Behavioral Science, School of Law, School of Medicine, Natural and Computational College, Social Science, and Humanities College had shorter unemployment spells, but the Institute of Technology had a longer length of the first unemployment spell than that of Agriculture and Natural Resource College. This result is consistent with the study conducted in Debre Markos University in Ethiopia [16], Finnish and Portuguese [33], and Sri Lanka [30].

The results also showed that graduates with a higher CGPA category had a shorter duration to transit the first job. This result is similar to the tracer study results of Bahir Dar University [34], Debre Markos University undergraduates in Ethiopia [16], Sri Lanka [9], Korea [27], and a study conducted in China [14, 35]. The explanation for this could

be that in Ethiopia, the number of job applicants is usually significantly more than the number of vacancies, and companies utilize academic grade as an exclusion criterion, so graduates with a higher score have a better chance of being selected as potential candidates.

This study has shown that secondary and above father education graduates had a shorter duration of job search to obtain their first job than not educated father graduates. This result agrees with the study conducted in others [7, 34, 36]. One possible reason is that educated parents share their own experiences with the curriculum via writing, examinations, method presentation, digital skill [37], and workplace skills (communication, negotiation, etc.). Graduates from out of the capital city (Amhara, Tigray, Oromia, SNNP, and others) had a longer time of job search for employment than the capital city (Addis Ababa) of Ethiopia. This result contradicts the findings of an Ethiopian study [16, 34], which found that the region did not affect graduate employment. Graduates living outside Addis Ababa may not have engaged in the COVID-19 pandemic lockdown because the capital city is home to different government and nongovernment institutions.

Job searching with public advertising resulted in an extended first unemployment spell compared to not using public advertising. This may be public advertising involving many jobseeker graduates and mostly employer screening based on experience, graduate scores, and institution of graduation. Graduates starting their own business had a shorter length of the first unemployment spell than graduates who did not start their jobs. This finding, which is consistent with the result of a Korean study [27], indicates that job-seeking activities have a positive effect on avoiding unemployment. A graduate who did not do internships during their studies has a longer transition period to employment than a graduate who did an internship before graduation. This result is inconsistent with the study conducted in Bahir Dar University, Ethiopia [34], which found that graduates doing internships before graduation had not significantly influenced employment status. This may be the exposure of undergraduates to the work environment and the characteristics of curriculum development to improve graduate employability [38].

5. Conclusion

This study showed a longer transition duration of graduate unemployment in Debre Markos University in 2019 undergraduates. Crudely, only 50% of the graduates transitioned to employment 18 months after their graduation. Weibull's accelerated failure time model fits the data best. Based on the Weibull parametric model, variables' college, cumulative grade point average, father education, graduate region, public advertisement, starting own business, and doing an internship during the study were significantly associated with transition duration to employment of undergraduates. Medicine and Health Science College and the College of Business and Economics shortened the first job searching time of unemployment significantly. The undergraduate who started their own business had a higher possibility of obtaining the first job and minimized the transition duration of the first job search. Internships done in the studies reduce the unemployment duration of undergraduates, considering it in the education curriculum able to increase the awareness of the working environment.

6. Recommendation

The university should have a fully operational career service office that offers training on job-seeking techniques and connects students with employers. It should integrate the teaching-learning process with real practices and produce job-creator graduates. The university should strengthen university-industry linkages by reviewing the curriculum, internship programs, and externship programs and launching collaborative research and projects. Debre Markos University and the Ethiopian Ministry of Science and Higher Education should collaborate with the Ministry of Labor and Social Affairs and other stakeholder organizations to match education programs to labor market needs.

7. Limitation

Employers' data was not included in this study. The study was conducted only in Debre Markos University 2019 undergraduates. Therefore, it did not represent a graduate transition to employment in Ethiopia. In addition, the study did not show the trend of employability rate and heterogeneity of employability in different places of the country.

Abbreviations

AFT: Accelerated failure time
 AIC: Akaike information criterion
 CGPA: Cumulative grade point average
 DMU: Debre Markos University
 HR: Hazard ratio
 IEBS: Institute of Education and Behavioral Science
 ILO: International Labor Organization
 NCS: Natural and Computational Science
 pH: Proportional hazard
 SNNP: South Nation, Nationalities and People
 SSH: Social Science and Humanities

TR: Time ratio.

Data Availability

The datasets used to support this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

All authors declare that there is no conflict of interest.

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