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Unemployment duration and educational mismatches: A theoretical and empirical investigation among graduates in Cambodia.

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1 Introduction

In developed countries, education plays a key role against unemployment: the higher educational levels, the lower risks of unemployment (Mincer, 1991). In developing countries, this role is more questionable as unemployment risks can be quite higher among well-educated job seekers because of the insufficient demand for college graduates (Tansel & Taşçi, 2010). This excessive supply of graduates and the inefficiency of education system also raise concerns of educational mismatches in developing countries. Two types of educational mismatches can occur. First, overeducation, or vertical educational mismatch, refers to an excess of education, beyond the level needed to perform a certain job (Hartog, 2000; McGuinness, 2006). Second, horizontal mismatch also exists and implies that people's occupations do not match their fields of education (Sloane, 2003; Robst, 2007a,b). The issues of high unemployment risks or long unemployment duration and the concerns of educational mismatches among high-educated persons would discourage people from investing in their own human capital. As a result, this will have a negative impact on society and hinder the capacity of developing economies to catch up developed nations. Analysis of unemployment duration and educational mismatches among graduates represents thus a critical research need for developing countries.

Surprisingly, little studies examine the link between unemployment duration and educational mismatches in the previous literature. From the theoretical perspective, some graduates prefer to leave unemployment as fast as possible, even though the job requirements are mismatched to their education. First, according to the job search theory, because of labor market frictions, particularly imperfect information, it takes time to find a suitable job (Jovanovic, 1979). Graduates who face a financial constraint must tend to accept a job quickly although the job match quality is poor. Another reason can be found in the stepping stone hypothesis (Sicherman & Galor, 1990): overeducation is an investment in work experience, which enhances promotion opportunities. Hence, educational mismatches can decrease unemployment duration. However, according to McCormick (1990), accepting a mismatched job can be a stronger negative signal to employers than unemployment. Thus, there are also graduates who prefer to stay longer on unemployment to queue for a matched job. Nevertheless, these graduates may still fail to find a better matched job if the skilled job opportunities are limited in the labor market (Thurow, 1976 ; Sattinger, 1993). In that situation, educational mismatches can be also associated with a long unemployment duration. The uncertainty exists, and this needs empirical investigations.

Cuesta (2005) uses a simultaneous equations' procedure and finds that there are unobserved factors that increase unemployment duration and reduce the probability of being overeducated in the first job for Spanish youths. Similarly, Pollmann-Schult & Büchel (2005),

who use a data from the West German, find that job-seekers with receipt of unemployment benefits stay unemployed with the length of unemployment spell 40% longer than those without unemployment benefits, but they face lower risks of exit to overeducated jobs by 74%. Pollmann-Schult & Büchel (2005) explains that the lack of unemployment benefits presses some workers to quickly accept a poor matched job, resulting in shorter unemployment duration, which is consistent with the job search theory (Jovanovic, 1979). Nevertheless, Rose & Ordine (2010) also use competing risks models applied to a survey carried out by the Italian Institute for Vocational Training of Workers and demonstrate that overeducation is an occurrence that follows long periods of unemployment. Barros, Guironnet, & Peypoch (2011) find that overeducation reduces the probability to find a job by around 10% in France. More importantly, in Taiwan, Lin & Hsu (2013) find that the overeducated graduates endure unemployment period for a 79% longer than graduates in a matched job. They explain these findings as the fact that overeducated workers may have lesser academic results, and in the context of limited job opportunities, employers seem to pay a strong attention to the schooling results rather than only the educational level attainment. Hence, they struggle to find a decent job and also must be unemployed for a longer period, which is aligned with the views from the job competition (Thurow, 1976) and assignment models (Sattinger, 1993). Thus, the link between unemployment duration and educational mismatches has not been resolved. Furthermore, previous literature focuses solely on developed countries and overeducation, it is worth to extend this research into developing countries and study educational mismatches in all their forms (vertical and horizontal) and dimensions (a single or a double mismatch).

The objective of this article is thus to investigate the relation between unemployment duration and educational mismatches among graduates in Cambodia from both theoretical and empirical angles. First, the theoretical model uses the job matching model to explain the mechanism that links unemployment duration and educational mismatches. Second, the empirical analysis using the independent competing risks regression, makes it possible to test the likelihood of the established theoretical model.

Cambodia offers indeed an interesting case to illustrate the contextual issues regarding unemployment risks and educational mismatches among university graduates in developing countries. For instance, the unemployment rate in Cambodia among university graduates was 7.7% against 2.7% of people with only secondary education in 2012 (NIS, 2012). Between 2000 and 2014, the number of higher education institutions (HEI) in Cambodia massively increased from 14 to 105 (Un, 2015). This expansion raises questions about the quality of HEI because 73% of employers reported that university graduates did not have the right skills for the jobs for which they were applying (World Bank, 2012, p.8). Furthermore, there are high mismatches

between the skills demanded by employers and the skills produced by the HEI. Indeed, between 2009 and 2014, almost 50% of total students were being enrolled in management and related fields, and only around 3% were pursuing engineering or mechanical degrees, while Cambodia rather needs engineers who can fill construction and manufacturing jobs (D'Amico, 2010, p.7; Madhur, 2014a, p.1). Without viable solutions for these problems, Cambodia's economy could be stuck in the middle income trap (Madhur, 2014b, p.3).

The paper is structured as follows: Section 2 defines the theoretical model. Section 3 presents the database and descriptive statistics. Section 4 describes the methods and discusses the results. Section 5 concludes.

2 Theoretical model framework

We propose to model individual search behaviors to identify the links between unemployment duration and educational mismatches, based on the Diamond-Mortensen-Pissarides job search model in a steady state environment (Pissarides, 2000, Chapter 1, p.1-23). Our model introduces the heterogeneity of jobs and supposes that educational mismatches are the result of search and matching process of individuals and firms.

All persons are assumed to be first-time job seekers and are homogeneous in terms of their human capital level (university graduates). Two types of jobs exist and are noted by j ($j = R$ or M). The first type matches the acquired education of unemployed graduates and is represented by a letter R (for Right match), while the second job is mismatched to their education and is represented by a letter M (for Mismatch). The right matched job is more productive, hence it offers a higher wage, but more difficulty can occur to find that type of job. On the contrary, the mismatched job offers a lower wage but is less difficult to find. As a result, unemployed graduates face a trade-off. They might prefer to quit unemployment as fast as possible, even though the job is mismatched. They also might prefer to wait for a right matched job, yet if they cannot find one after a long period, they still possibly fall into a mismatched job.

2.1 Value function of a vacant and a filled job

The firm opens a job vacancy and searches for employees. The job's output is a constant: $y_j > 0$. Since the job of type R is more productive than M , hence $y_R > y_M$. When a job is vacant, the firm loses in terms of its activity at a cost $y_j c_v > 0$ per unit time (c_v is a coefficient constant for the cost of a vacant job).

Let $m(u, v) = u^n v^{1-n}$ be the matching function that gives the number of jobs m formed at any moment in time as a function of the number of unemployed workers u , and the number of vacant jobs v . All firms are small and the number of jobs is determined by a profit maximization.

Let V_j and J_j the present-discounted value of a vacant job and a filled job, respectively, r a discount rate, $q(\theta)$ ¹ the arrival rate of workers to a job, w_j the wage paid to workers, and δ an exogenous shock. V_j and J_j can be written as:

$$rV_j = q(\theta)(J_j - V_j) - y_j c_v \quad (1)$$

$$rJ_j = y_j - w_j - \delta J_j \quad (2)$$

¹ $q(\theta) = \frac{m}{v}$ and $\theta = \frac{v}{u}$ represents the market tightness

When the decision to create a vacant job is made, the firm must choose between the two types of jobs. The condition for which a firm prefers the type R than M is: $V_R > V_M$. Using the equations (1) and (2), we find that $V_R > V_M$ only if:²

$$y_R > y_M + \frac{q(\theta)(w_R - w_M)}{q(\theta) - c_v(r + \delta)} \quad (3)$$

2.2 Value function of unemployment and employment

During the job search, an unemployed graduate enjoys a return, noted b (e.g., unpaid leisure activities or home production). We assume that b is a constant and independent of market returns. An unemployed graduate also suffers a constant cost c_s for searching a job. This cost may include the time or the money spent on the job search.

Let U and W denote the present-discounted value of the expected income of being unemployed and employed, respectively, $\theta q(\theta)$ ³ the arrival rate of job offers, and $z = b - c_s$. Hence, U can be defined as:

$$rU = z + \theta q(\theta)(W - U) \quad (4)$$

We assume that α is the fraction of type R and $(1 - \alpha)$ is the fraction of type M (with $0 < \alpha < \frac{1}{2}$). A graduate's expected wage to earn w^e equals thus $\alpha w_R + (1 - \alpha)w_M$, with w_j the expected wage associated to each type of job. He may lose his job and becomes unemployed at the exogenous rate δ . Therefore, W can be defined as:

$$rW = \alpha w_R + (1 - \alpha)w_M + \delta(U - W) \quad (5)$$

Using the equations (4) and (5), we can find the reservation wage of an unemployed graduate, expressed by:⁴

$$w^* = z + \frac{\theta q(\theta)\alpha}{r + \delta + \theta q(\theta)} H(w_R) + \frac{\theta q(\theta)(1 - \alpha)}{r + \delta + \theta q(\theta)} H(w_M) \quad (6)$$

$H(w_R)$ and $H(w_M)$ represent respectively the distribution of wage offered from each type of jobs, R and M , which is greater than or at least equals z .

²See Appendix: A

³ $\theta q(\theta) = \frac{m}{u} = \frac{v}{u} \frac{m}{v}$

⁴See Appendix: B

Consider $\lambda_R = \theta q(\theta)\alpha$ the arrival rate of job offers from the type R , $\lambda_M = \theta q(\theta)(1 - \alpha)$ the arrival rate of job offers from the type M , and $[1 - F_j(w^*)]$ the probability that the wage offered from each type of job is higher than or equals the reservation wage, we can write the exit rate from unemployment (ϕ_j) to each type of job as below:

$$\phi_R = \lambda_R[1 - F_R(w^*)] \quad (7)$$

$$\phi_M = \lambda_M[1 - F_M(w^*)] \quad (8)$$

From the equations (7) and (8), the exit rate from unemployment is defined as a product of the arrival rate of job offers and the probability that the wage offered is higher than or equals the reservation wage. The arrival rate of job offers from the type R is lower than from the type M because it is more difficult to find the type R . Nevertheless, the probability that the wage offered from R exceeds or equals the reservation wage is higher than from M because the type R is more productive and associated with higher wages. In what case, ϕ_R can be higher as well as lower than ϕ_M . Our model thus leads to a theoretical indecision. Table 1 provides a comparative static exercise of ϕ_R and ϕ_M according to two different hypotheses.

Table 1: Association of unemployment duration and educational mismatches

Hypotheses	Exit rate	Interpretations
$\frac{\lambda_M}{\lambda_R} > \frac{1 - F_R(w^*)}{1 - F_M(w^*)}$	$\phi_M > \phi_R$	Shorter unemployment duration is associated with higher educational mismatches.
$\frac{\lambda_M}{\lambda_R} < \frac{1 - F_R(w^*)}{1 - F_M(w^*)}$	$\phi_M < \phi_R$	Longer unemployment duration is associated with higher educational mismatches.

3 Data and descriptive statistics

Since our model does not lead to an analytic solution, we propose to overcome the uncertainty by estimating ϕ_R and ϕ_M with a reduced-form model from a survey of graduates in Cambodia.

The University Research Center in Economics and Management at the Royal University of Law and Economics in Cambodia conducted the survey that informs this research by phone between January and April 2011, among Cambodian graduates who had received their bachelor's degrees in 2008, around 33 months after their graduation. The 4,025 graduates⁵ are randomly selected and representative of nineteen HEI in Phnom Penh, the capital of Cambodia. The current study excludes self-employed people from the initial data set, because there is no detailed information available to evaluate if they require a university degree for their business or not. Observations that offered no information about the occupations or the duration of unemployment also were dropped. The final sample thus contains 3,211 graduates. Note that our final sample still represents the study population.⁶

This survey records the total unemployment spell that graduates had faced since their graduation and if some graduates were still unemployed at the moment of interview that we can code these observations as censored data. The survey also informs us several observed graduates' characteristics such as genre, age, marital status, parents' educational levels, birthplace, types of university, internship, and graduates' preferences for different job characteristics. Furthermore, the sample provides information about graduates' fields of study and occupations allowing us thus to calculate the incidence of educational mismatches.

To measure the mismatch incidences, the job analysis (JA) method, which offers an objective measure, is employed. The International Standard Classification of Occupations Code (ISCO-08) and the International Standard Classification of Education published (ISCED-97) conform with this objective measure to help define who is overeducated or not. Graduates working in jobs that require skill levels of 3 or 4, which correspond to the occupational levels 1 (managers), 2 (professionals), and 3 (technicians or associate professionals), are classified as matched workers. Other occupational levels that demand skill levels lower than 3 signal graduates who are overeducated.⁷

The data also include information about the specialty of each bachelor's degree acquired from the different universities, which supports an objective determination of the presence of a

⁵The average response rate was 80%, and the majority of no responses were due to the fact that graduates had changed their phone numbers, making interviewers impossible to contact them.

⁶By comparing the means and standard deviations of all variables used in our analysis before and after the eliminations of those observations, we do not remark any important gaps to consider.

⁷Two tables specify the process for matching the occupational class to the educational level required are in the Appendix: C.

horizontal mismatch. By reviewing the study program and job prospect of each specialty offered by each university, the author compares these descriptions with each individual occupation to discern if each graduate’s job corresponds with his or her field of study.⁸

Based on these objective measures, 35% and 33% of graduates are overeducated and horizontally mismatched, respectively. Some graduates can also be double mismatched, it is thus interesting to construct a variable that represents the overall level of mismatch. This variable indicates that 32% and 18% of graduates are single (either vertical or horizontal mismatches only) and double mismatched, respectively. The incidence of educational mismatches for each category is provided in Table 2 with the relation to unemployment duration.

Table 2: Unemployment duration and educational mismatches

Variables	Percentage	Unemployment duration (Days)	
		Mean	Std. Dev.
Overeducation	35.43%	42.33	129.74
Horizontal mismatch	33.25%	38.23	119.72
Overeducation only	16.96%	38.41	110.77
Horizontal mismatch only	14.78%	28.60	76.36
No mismatch	49.79%	34.67	102.33
Single mismatch	31.74%	33.84	96.37
Double mismatch	18.47%	45.93	145.00
Observations	3,119 ⁹	36.49	109.80

From Table 2, graduates without any mismatches and graduates with a single mismatch have experienced a similar unemployment duration. Nevertheless, graduates with a double mismatch is observed to have experienced the longest unemployment duration on average. This may indicate that there are graduates who stay longer on unemployment to search for a better job match quality but cannot find. These observed statistics may support the second result in Table 1 of our theoretical model ($\phi_M < \phi_R$) that a longer unemployment duration is associated with higher educational mismatches.

Besides educational mismatches, there exists other observable factors that can also influence the unemployment duration such as genre, age, marital status, fields of study, internship, parents’ educational levels, job networks, job characteristic preferences, etc. Table 3 provides a description of unemployment duration by graduates’ attributes.

⁸The matching table can be found in the Appendix: D.

⁹There are 92 censored observations that we cannot determine if they work in a mismatched job or not because they still stay unemployed.

Table 3: Unemployment duration by graduates' attributes

VARIABLES	TOTAL		
	Mean	Std. dev.	Unemployment Duration (Days)
<u>Dependent variable</u>			
Unemployment Duration (Days)	53.2	155.5	
Male	0.64	0.48	54.01
Age at the end of the study	21.85	3.98	49.13
Square of age at the end of the study	493.08	224.78	49.13
Married	0.25	0.43	38.63
Engineering Sciences	0.05	0.21	80.50
Law-Eco-Management	0.49	0.50	63.93
Social Sciences Khmer	0.06	0.24	34.04
Social Sciences English	0.15	0.36	26.00
Scholarship status	0.02	0.14	27.76
Double university degree	0.57	0.49	53.48
Internet training	0.15	0.36	34.46
Study in a private university	0.55	0.50	54.98
Internship during study	0.51	0.50	52.07
Birthplace in Phnom Penh	0.51	0.50	45.84
High level education of parents	0.34	0.47	43.69
Informal job networks	0.36	0.48	33.43
Expect for a good career development	0.77	0.42	48.48
Expect for a good salary	0.84	0.36	54.54
Expect for a job security or stability	0.65	0.48	41.82
Expect for a job with leisure	0.81	0.39	51.13
Expect for an enough time with family	0.80	0.40	50.47
Observations			3,211

From Table 3, we observe that unemployment duration can be influenced by several variables, yet the effects might be different depending on whether graduates are mismatched or not. It is thus necessary to conduct an econometric analysis to identify the impact of educational mismatches and the effects of graduates' attributes on their unemployment duration.

4 Methods and results

The descriptive analysis shows that educational mismatches and graduates' attributes can affect unemployment duration. To identify these impacts, two econometric methods are proposed. First, a single risk regression¹⁰ does not take into account different types of job. Second, an independent competing risk regression considers different job types. Four models are introduced: First, we divide jobs into the matched and mismatched jobs (all forms of mismatches); second, we differentiate between the transition to overeducation and to horizontal mismatch; third, we focus on the transition to overeducation only and horizontal mismatch only; and fourth, we analyze the overall level of mismatches (no mismatch, single mismatch and double mismatch).

In time-to-event data, the underlying time scale is generally supposed to be continuous and indexed by $t \in R$. With the presence of competing risks, graduates are assumed to enter unemployment at time $t = 0$ and leave this unemployment spell either to enter one among N types of jobs. Graduates are treated as censored observations if they are still unemployed at the time of survey. Let T_k^* be the latent duration associated with a transition from unemployment to work in a job of type k ($k = 1, 2, \dots, N$). We assume that the latent durations are independently distributed conditionally on the observable covariates X .

$$(T_j^* \Pi T_k^*) | X, \quad \forall j \neq k, \quad j, k = 1, 2, \dots, N \quad (9)$$

The rate of transition from unemployment to work in a job of type k at a moment in time is supposed to have the following form with a proportional hazard specification:

$$\bar{h}_k(t|X) = \bar{h}_{k,0}(t)exp(X\beta_k) \quad (10)$$

where $\bar{h}_k(t)$ is the subdistribution hazard or the instantaneous rate of transition from unemployment to work in a job of type k , $\bar{h}_{k,0}$ is the baseline hazard of the subdistribution and left unspecified, X are observable covariates, and β_k are unknown coefficients. Table 4 presents the results.

¹⁰The test of Schoenfeld residuals proves that the hazards are proportional; therefore, the Cox duration model fits our data well. However, this model does not consider the possible existence of unobserved heterogeneity. We propose thus a Weibull regression that takes into account the unobserved heterogeneity but cannot allow for different competing risks. We observe that there is a presence of unobserved heterogeneity, yet we are not able to tell if this presence is due to the fact that we assume the hazards are not proportional, but it is false, or that we assume there are no competing risks, but it is also false.

Table 4: Results

VARIABLES	Weibull regression	Competing risks regression								
	Model 1 All issues	Model 2 Match Mismatch		Model 3 Overeducation Horiz. Mis.		Model 4 Over. Only Horiz. Mis. Only		Model 5 No Mis. Single Mis. Double Mis.		
Male	-0.093 (0.067)	0.289*** (0.049)	-0.261*** (0.042)	-0.398*** (0.052)	-0.120** (0.058)	-0.447*** (0.081)	0.162 (0.101)	0.289*** (0.049)	-0.190*** (0.058)	-0.303*** (0.080)
Age at the end of the study	0.084** (0.039)	0.045* (0.027)	-0.022 (0.040)	-0.104** (0.046)	0.021 (0.050)	-0.066 (0.082)	0.166 (0.106)	0.045* (0.027)	0.032 (0.061)	-0.090 (0.060)
Square of age at the end of the study	-0.001 (0.001)	-0.0004 (0.0004)	-0.0001 (0.0007)	0.0011 (0.0008)	-0.0007 (0.0009)	0.0001 (0.0016)	-0.0029 (0.0020)	-0.0004 (0.0004)	-0.0009 (0.0012)	0.0010 (0.0010)
Married	0.179** (0.079)	0.133** (0.052)	-0.085 (0.053)	-0.074 (0.066)	0.028 (0.068)	-0.350*** (0.111)	-0.128 (0.112)	0.133** (0.052)	-0.218*** (0.075)	0.144 (0.096)
Engineering Sciences	-0.558*** (0.162)	0.454*** (0.075)	-1.019*** (0.188)	-1.771*** (0.378)	-0.905*** (0.192)	-2.127** (1.012)	-0.419* (0.233)	0.454*** (0.075)	-0.620*** (0.221)	-1.679*** (0.410)
Law - Economics - Management	-0.124 (0.080)	-0.144*** (0.053)	0.105** (0.052)	0.549*** (0.073)	-0.424*** (0.065)	1.453*** (0.158)	-0.918*** (0.115)	-0.144*** (0.053)	0.200*** (0.075)	-0.051 (0.093)
Social Sciences Khmer	0.293** (0.131)	0.216*** (0.080)	-0.214* (0.114)	-0.246 (0.166)	-0.128 (0.120)	-0.987* (0.518)	-0.132 (0.179)	0.216*** (0.080)	-0.274 (0.168)	-0.089 (0.181)
Social Sciences English	0.347*** (0.099)	-0.055 (0.068)	0.103 (0.071)	0.151 (0.103)	-0.137 (0.086)	0.991*** (0.191)	0.045 (0.124)	-0.055 (0.068)	0.333*** (0.095)	-0.341** (0.143)
Scholarship status	0.495** (0.209)	0.020 (0.138)	0.031 (0.150)	-0.261 (0.227)	0.001 (0.207)	0.083 (0.300)	0.433* (0.260)	0.020 (0.138)	0.271 (0.179)	-0.644 (0.412)
Double university degree	0.016 (0.070)	0.080* (0.046)	-0.070 (0.045)	-0.090 (0.057)	-0.165*** (0.061)	0.119 (0.091)	-0.038 (0.099)	0.080* (0.046)	0.060 (0.064)	-0.260*** (0.087)
Internet training	0.322*** (0.087)	0.047 (0.060)	0.077 (0.059)	0.104 (0.073)	-0.014 (0.085)	0.175 (0.112)	-0.022 (0.135)	0.047 (0.060)	0.105 (0.080)	-0.010 (0.119)
Study in a private university	-0.005 (0.067)	-0.032 (0.045)	0.018 (0.045)	-0.077 (0.056)	0.174*** (0.061)	-0.277*** (0.089)	0.231** (0.098)	-0.032 (0.045)	-0.049 (0.062)	0.107 (0.088)
Internship during study	0.033 (0.064)	0.072* (0.043)	-0.047 (0.042)	0.015 (0.052)	0.014 (0.056)	-0.061 (0.085)	-0.124 (0.092)	0.072* (0.043)	-0.146** (0.059)	0.124 (0.078)

Table 4: Results-continued

VARIABLES	Weibull regression	Competing risks regression								
	Model 1 All issues	Model 2 Match Mismatch		Model 3 Overeducation Horiz. Mis.		Model 4 Over. Only Horiz. Mis. Only		Model 5 No Mis. Single Mis. Double Mis.		
Birthplace in Phnom Penh	0.092 (0.064)	-0.063 (0.042)	0.078* (0.042)	0.065 (0.052)	0.116** (0.056)	-0.016 (0.083)	0.077 (0.090)	-0.063 (0.042)	0.036 (0.058)	0.134* (0.079)
High level education of parents	0.148** (0.066)	0.172*** 0.043 (0.046)	-0.153*** (0.046)	-0.165*** (0.057)	-0.194*** (0.061)	-0.046 (0.087)	-0.094 (0.097)	0.172*** (0.043)	-0.073 (0.062)	-0.266*** (0.088)
Informal job networks	0.374*** (0.068)	-0.114** (0.046)	0.197*** (0.045)	0.254*** (0.057)	0.119** (0.060)	0.268*** (0.091)	-0.016 (0.099)	-0.114** (0.046)	0.157** (0.064)	0.202** (0.085)
Expect for a good career development	0.278*** (0.087)	0.053 (0.054)	-0.031 (0.053)	-0.040 (0.067)	-0.112 (0.072)	0.096 (0.112)	-0.036 (0.118)	0.053 (0.054)	0.055 (0.077)	-0.174* (0.102)
Expect for a good salary	-0.275*** (0.091)	-0.122** (0.058)	0.067 (0.062)	0.212** (0.084)	-0.032 (0.079)	0.278** (0.137)	-0.235** (0.118)	-0.122** (0.058)	0.016 (0.085)	0.152 (0.122)
Expect for a job security or stability	0.365*** (0.076)	0.172*** (0.050)	-0.114** (0.048)	-0.171*** (0.060)	-0.033 (0.065)	-0.217** (0.094)	0.051 (0.106)	0.172*** (0.050)	-0.112* (0.066)	-0.101 (0.091)
Expect for a job with leisure	0.110 (0.208)	0.365*** (0.110)	-0.379*** (0.129)	-0.326* (0.166)	-0.401** (0.184)	-0.321 (0.273)	-0.507* (0.262)	0.365*** (0.110)	-0.367** (0.185)	-0.308 (0.270)
Expect for an enough time with family	0.163 (0.203)	-0.285*** (0.103)	0.315** (0.129)	0.338** (0.165)	0.355* (0.183)	0.169 (0.267)	0.215 (0.259)	-0.285*** (0.103)	0.192 (0.183)	0.459* (0.268)
Constant	-2.839*** (0.566)									
ln_p	-0.443*** (0.010)									
ln_θ	0.609*** (0.024)									
No. of Occurrence	3,119	1,566	1,533	1,105	1,037	529	461	1,566	990	576
No. of Censored observations	92	92	92	92	92	92	92	92	92	92
No. of Competing observations	0	1,553	1,566	2,014	2,082	2,590	2,658	1,553	2,129	2,543
No. of Total observations	3,211	3,211	3,211	3,211	3,211	3,211	3,211	3,211	3,211	3,211

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Notes: Robust standard errors are in brackets.

The competing risks duration models allows us to predict the effect of educational mismatches on unemployment hazards (see Table 5).

Table 5: Educational mismatches and unemployment hazards

Educational mismatches	Non parametric model: Estimates of unemployment hazards	Competing risks duration models: Predicted unemployment hazards
Match	0.813	0.121
Mismatch	0.815	0.406
Overeducation	0.815	0.246
Horizontal mismatch	0.814	0.311
Overeducation only	0.815	0.214
Horizontal mismatch only	0.813	0.182
No mismatch	0.813	0.121
Single mismatch	0.814	0.215
Double mismatch	0.815	0.540

From the non parametric Kaplan Meier estimates, it seems that there is no relation between unemployment hazards and educational mismatches. Nevertheless, with the prediction from the competing risks duration models, we clearly see that unemployment hazards increase with educational mismatches. In other words, graduates who are educational mismatched, stay longer on unemployment duration; hence a double penalty. This result supports the second hypothesis of our theoretical model ($\phi_M < \phi_R$) where graduates prefer to queue for a right match job but fail to find, probably due to the lack of demand for college graduates in Cambodia, and the inefficiency of education system that fails to develop students' professional skills required by the labor market.

Our results also show that the determinants of unemployment duration are different according to the issues. For example, in the Model 1 of Table 4, genre has no influence on the transition from school to work. Nevertheless, when we distinguish the types of job, we can see that being a male has clearly an advantage in finding a job that matches his level and field of education, and also reduces the risk of being mismatched as also noted by McGoldrick & Robst (1996). These two effects are compensated each other in the Model 1. The fact that women have lower opportunities than their male counterparts in terms of finding a matched job, maybe because of the tendency of women to rather select management and related majors that offer poorer employment prospects in Cambodia. Based on the results found by Dolton & Vignoles (2000) and Green & McIntosh (2007), graduates in more scientific majors such as engineering are less prone to be mismatched. Indeed, despite graduates in engineering sciences stay longer on unemployment due to the world economic crisis in 2008 that hits the construction sector in Cambodia in 2008 and 2009, this degree does have a strong impact on finding a well-suited job. Graduating from a private university appears to face a higher

incidence of horizontal mismatch, but surprisingly, it reduces the risk of being overeducated when we consider the exit rate among graduates to overeducation only. This might suggest that the educational quality of some private universities, especially the big ones, is not really worse than public universities. Among graduates who have completed an internship might profit this first professional experience as a chance to get a proper job after their study. On the contrary, using an informal job network increases the risk of being mismatched as also found by Meliciani & Radicchia (2014), though it might help to find a job faster. Parents' education plays a significant role to assist their children getting a job faster and increases the graduates' chance of finding a right matched job. As Hansen & Mastekaasa (2006), Torche (2011), and Capsada-Munsech (2015) suggest, educated parents are likely better informed and share more knowledge with their children.

Regarding the preferences of graduates, we find that graduates who expect for a good career development face lower risks of exit to a double mismatched job. Indeed, graduates might believe that accepting a job that does not match both their educational field and level is a strong negative signal to employers as well as being unemployed, and this would limit their future career development, similar to what McCormick (1990) and Pissarides (1992) suggest. Graduates who expect for a job security or stability rather transit to a right matched job and they are less overeducated. Indeed, following the career mobility theory (Sicherman & Galor, 1990), a mismatched job is likely unstable because most people who accept that type of job might consider it as just a temporary job to move up later. Graduates who hope for a job with leisure also tend to reject the mismatched jobs. This indicates that working in a job that does not fit their competences can be more boring since their skills acquired at schools cannot be well-used, and they have to learn new skills. Expectations for a high salary does prolong the unemployment duration. This preference also increases the risk of being overeducated but decreases the risk of horizontal mismatches. Graduates might consider that accepting a job that is vertically mismatched is not a serious problem since after years, they can challenge to be promoted to a higher position level. On the other hand, accepting a job that is horizontally mismatched can be a bad decision because the skills that they learned at school related to a particular field might not be re-utilized at all in the future, which can strongly limit their career perspective or their future salary increase. Finally, graduates who valorize their time for family tend to be more double mismatched. Perhaps, their family tasks constraint them to have a limit of available occupational choices.

5 Conclusion

This article investigates whether there exists a relation between unemployment duration and educational mismatches among university graduates in Cambodia. We use a survey, driven in nineteen Cambodian higher education institutions (HEI), that provides precise insights into the jobs obtained by university graduates and supports measures of the potential mismatches between educational endowments and job characteristics. The survey also informs us the total unemployment duration that graduates had faced since their graduation and several observed graduates' attributes. Our paper contributes to literature on two main points. First, given the specific contextual issues in developing countries, we analyze the case of Cambodia, where the HEI have been expanding widely and rapidly, but with an increasing trend of unemployment risks and educational mismatches among university graduates. Second, our paper analyzes from both theoretical and empirical angles. In the theoretical part, we use the job matching model to explain the mechanism that links unemployment duration and educational mismatches. In the empirical analysis, we use the independent competing risks duration model by proposing several different configurations that capture educational mismatches in all their dimensions, especially the Model 5 that allows us finding that unemployment duration increases with the level of educational mismatches.

Therefore, the Cambodian education system needs to improve its quality to respond to the labor market's demands. This requires a close working relationship between Ministries, private sector and HEI. The HEI need to recruit more highly qualified teachers and update their teaching methodologies to improve the students' professional skills, including cross-cutting knowledge like computer and English skills. Internships should be set as a compulsory requirement by the HEI because students can acquire the practical experiences and create their professional networks. Evaluations of different universities' performance in terms of students' employability must be developed to help families make more informed educational choices based on the available opportunities in the labor market, and the reporting evaluations would also provide valuable signals to the government for consideration in their education policies. Financial incentives might be an effective way to guide students toward the training courses that the companies need. Finally, programs focused specially on young female students should be established, to overcome the gender differences in the Cambodian labor market.

References

- Asian Development Bank (ADB) and International Labour Organisation (ILO). (2015). *Cambodia: Addressing the skills gap: Employment diagnostic study* (Tech. Rep.).
- Barros, C. P., Guironnet, J.-P., & Peypoch, N. (2011). How to quickly get a job? The transition from higher education to French labour market by a survival model. *Applied Economics*, *43*(4), 439–448.
- Capsada-Munsech, Q. (2015). The role of social origin and field of study on graduates' overeducation: The case of Italy. *Higher Education*, *69*(5), 779–807.
- Cuesta, M. B. (2005). Youth labour market integration in Spain: Search time, job duration and skill mismatch. *Spanish Economic Review*, *7*(3), 191–208.
- D'Amico, S. (2010). *Higher education and skills for the labor market in Cambodia* (Tech. Rep.). HRINC.
- Dolton, P., & Vignoles, A. (2000). The incidence and effects of overeducation in the UK graduate labour market. *Economics of Education Review*, *19*(2), 179–198.
- Green, F., & McIntosh, S. (2007). Is there a genuine under-utilization of skills amongst the over-qualified? *Applied Economics*, *39*(4), 427–439.
- Hansen, M. N., & Mastekaasa, A. (2006). Social origins and academic performance at university. *European Sociological Review*, *22*(3), 277–291.
- Hartog, J. (2000). Over-education and earnings: Where are we, where should we go? *Economics of Education Review*, *19*(2), 131–147.
- Jovanovic, B. (1979). Job matching and the theory of turnover. *Journal of political economy*, *87*(5, Part 1), 972–990.
- Lin, Y.-L., & Hsu, C.-J. (2013). The effects of over-education on unemployment duration: Evidence from Taiwan. *Journal of Emerging Issues in Economics, Finance and Banking*, *1*(5), 430–443.
- Madhur, S. (2014a). Cambodia's skill gap: An anatomy of issues and policy options. *CDRI Working Paper Series*(98), 1–37.
- Madhur, S. (2014b). Cambodia tomorrow: Development research priorities for a middle income country. *CDRI Working Paper Series*(01), 1–12.
- McCormick, B. (1990). A theory of signalling during job search, employment efficiency, and "stigmatised" jobs. *The Review of Economic Studies*, *57*(2), 299–313.

- McGoldrick, K., & Robst, J. (1996). Gender differences in overeducation: A test of the theory of differential overqualification. *American Economic Review*, *86*(2), 280–284.
- McGuinness, S. (2006). Overeducation in the labour market. *Journal of Economic Surveys*, *20*(3), 387–418.
- Meliciani, V., & Radicchia, D. (2014). Informal networks, spatial mobility and overeducation in the Italian labour market. *Working Paper*, 1–25.
- Mincer, J. (1991). *Education and unemployment* (Tech. Rep.). National bureau of economic research.
- National Institute of Statistics (NIS) of Cambodia. (2012). *Cambodia Labour Force and Child Labour Survey* (Tech. Rep.).
- Pissarides, C. A. (1992). Loss of skill during unemployment and the persistence of employment shocks. *The Quarterly Journal of Economics*, 1371–1391.
- Pissarides, C. A. (2000). *Equilibrium unemployment theory, chapter 1*. MIT press.
- Pollmann-Schult, M., & Büchel, F. (2005). Unemployment benefits, unemployment duration and subsequent job quality evidence from West Germany. *Acta Sociologica*, *48*(1), 21–39.
- Robst, J. (2007a). Education and job match: The relatedness of college major and work. *Economics of Education Review*, *26*(4), 397–407.
- Robst, J. (2007b). Education, college major, and job match: Gender differences in reasons for mismatch. *Education Economics*, *15*(2), 159–175.
- Rose, G., & Ordine, P. (2010). Overeducation and unemployment spells' duration. *Procedia-Social and Behavioral Sciences*, *9*, 427–438.
- Sala, G., et al. (2011). Approaches to skills mismatch in the labour market: A literature review. *Papers: revista de sociologia*, *96*(4), 1025–1045.
- Sattinger, M. (1993). Assignment models of the distribution of earnings. *Journal of economic literature*, *31*(2), 831–880.
- Sicherman, N., & Galor, O. (1990). A theory of career mobility. *Journal of political economy*, 169–192.
- Sloane, P. J. (2003). Much ado about nothing? What does the overeducation literature really tell us? *Overeducation in Europe*, 11–45.
- Sparreboom, T., & Staneva, A. (2014). Is education the solution to decent work for youth in developing economies. *Work4Youth Publication Series*, *23*, 23.

- Tansel, A., & Taşçı, H. M. (2010). Hazard analysis of unemployment duration by gender in a developing country: The case of Turkey. *IZA Discussion Paper*(4844), 1–49.
- Thurow, L. C. (1976). *Generating inequality*. Macmillan London.
- Torche, F. (2011). Is a college degree still the great equalizer? Intergenerational mobility across levels of schooling in the United States. *American Journal of Sociology*, *117*(3), 763–807.
- Un, L. (2015). *Cambodian Higher Education Vision 2030*. http://www.ehef.asia/images/Cambodia/presentations/Dr_Un.Leang_MoEYS.pdf.
- World Bank. (2012). *Matching aspirations: Skills for implementing Cambodia's growth strategy* (Tech. Rep. No. 67349-KH).

Appendices

A Appendix: A

From the equations (1) and (2), we can write:

$$V_j = \frac{q(\theta)J_j - y_j c}{r + q(\theta)} \quad (11)$$

$$J_j = \frac{y_j - w_j}{r + \delta} \quad (12)$$

Replacing (12) into (11), we get:

$$V_j = \frac{q(\theta)(y_j - w_j) - y_j c_v(r + \delta)}{[r + q(\theta)](r + \delta)} \quad (13)$$

From the equation (13), we can write V_R and V_M ; then the condition for $V_R > V_M$ implies that:

$$q(\theta)(y_R - w_R) - y_R c_v(r + \delta) > q(\theta)(y_M - w_M) - y_M c_v(r + \delta) \quad (14)$$

Solving this equation, we will get the equation (3).

B Appendix: B

From the equations (4) and (5), we can write:

$$U = \frac{z + \theta q(\theta)W}{r + \theta q(\theta)} \quad (15)$$

$$W = \frac{\alpha w_R + (1 - \alpha)w_M + \delta U}{r + \delta} \quad (16)$$

Replacing (16) into (15), we will get:

$$rU = \frac{(r + \delta)z + \theta q(\theta)[\alpha w_R + (1 - \alpha)w_M]}{r + \delta + \theta q(\theta)} \quad (17)$$

Next, replacing (15) into (16), we will get:

$$rW = \frac{\delta z + [r + \theta q(\theta)][\alpha w_R + (1 - \alpha)w_M]}{r + \delta + \theta q(\theta)} \quad (18)$$

From (17) and (18), we can write:

$$W - U = \frac{\alpha(w_R - z) + (1 - \alpha)(w_M - z)}{r + \delta + \theta q(\theta)} \quad (19)$$

Since rU is the reservation wage w^* that an unemployed worker requires to give up his job search, we can re-write the equation (4) as:

$$w^* = z + \theta q(\theta)(W - U) \quad (20)$$

Hence the reservation wage can be determined with an integration of $W - U$ from (19):

$$w^* = z + \theta q(\theta) \int_z^{+\infty} (W - U) dF(w) \quad (21)$$

$$w^* = z + \frac{\theta q(\theta)\alpha}{r + \delta + \theta q(\theta)} \int_z^\infty (w_R - z) dF(w_R) + \frac{\theta q(\theta)(1 - \alpha)}{r + \delta + \theta q(\theta)} \int_z^\infty (w_M - z) dF(w_M) \quad (22)$$

Imposing that $H(w_R) = \int_z^\infty (w_R - z) dF(w_R)$; and $H(w_M) = \int_z^\infty (w_M - z) dF(w_M)$, we can get the equation (6).

C Appendix: C

Table 6: Correspondence between occupational class and educational level

ISCO-08 occupational class	ILO skill level	ISCED-97 educational level
1. Manager	3 + 4	6, 5a and 5b
2. Professionals	4	6 and 5a
3. Technicians	3	5b
4. Clerks	2	4, 3 and 2
5. Service and sales	2	4, 3 and 2
6. Skilled agricultural	2	4, 3 and 2
7. Craft and related	2	4, 3 and 2
8. Plant and machine operators	2	4, 3 and 2
9. Elementary occupations	1	1

Source: ISCO-08, volume I

Table 7: Description of educational level required for each skill level

Skill level	Educational level	Description of educational level
4	6	Second stage of tertiary education (advanced research qualification)
	5a	First stage of tertiary education, 1st degree (medium duration)
3	5b	First stage of tertiary education (short or medium duration)
2	4	Post-secondary, non-tertiary education
	3	Upper secondary level of education
	2	Lower secondary level of education
1	1	Primary level of education

Source: ISCO-08, volume I

Notes: One limit of using this measure to estimate the rate of overeducation is that the same job title may not mean that workers are performing the same tasks, and thus workers can be required to possess different educational levels. Nevertheless, other measures of overeducation also possess other drawbacks (please see the literature review of McGuinness (2006) and Sala et al. (2011) for a further discussion on this matter). Additionally, the use of this measure is also constrained by the data availability. For instance, previous researches on this issue in developing countries, including Cambodia, conducted by the International Labour Organization and Asian Development Bank also employ this same method by assigning the ISCO with 1 digit level to the ISCED (e.g., Sparreboom & Staneva, 2014 ; ILO and ADB, 2015).

D Appendix: D

Table 8: Field of education and Matching jobs

Field of education	Matching jobs (ISCO-08 3-digit codes)
Economics and Management	134, 143, 231, 232, 241, 242, 243, 262, 263, 264, 331, 332, 333, 334, 411, 412, 413, 421, 431, 432, 522
Engineering and Architecture	132, 214, 215, 216, 231, 232, 233, 311, 312, 313, 315, 515
Social sciences in English language	111, 112, 121, 122, 133, 134, 141, 143, 216, 231, 232, 233, 241, 242, 261, 262, 263, 264, 265, 334, 341, 343, 351, 352, 411, 412, 413, 511, 521, 522, 524
Sociology, Humanities and Arts	112, 216, 231, 232, 233, 234, 262, 263, 264, 265, 341, 511
Sciences	211, 212, 231, 232, 233, 311, 331, 421, 431
Information and Computer Technologies	112, 121, 133, 134, 231, 232, 233, 251, 252, 351, 352, 524
Tourism and Hospitality	112, 122, 134, 141, 231, 232, 243, 264, 341, 343, 441, 511
Law and Public Affairs	111, 121, 231, 232, 242, 261, 262, 263, 264, 334, 335, 341

Table source: Author's estimation by reviewing the job prospects described for each specialty in each university, then comparing with individual occupation.