



HAL
open science

Education-job mismatches and their impacts on job satisfaction: An analysis among university graduates in Cambodia

Vichet Sam

► **To cite this version:**

Vichet Sam. Education-job mismatches and their impacts on job satisfaction: An analysis among university graduates in Cambodia. 2018. hal-01839463

HAL Id: hal-01839463

<https://hal.science/hal-01839463>

Preprint submitted on 15 Jul 2018

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Education-job mismatches and their impacts on job satisfaction:

An analysis among university graduates in Cambodia.

Vichet Sam*

July 15, 2018

Abstract

Education-job mismatches, especially overeducation or vertical mismatch, are generally found to lower the worker's job satisfaction, which may generate the counter-productive behaviors such as high rates of absenteeism and turnover in developed countries. The purpose of this article is to examine the impacts of educational mismatches from their both forms and dimensions (match, overeducation, horizontal mismatch and double mismatch) on the job satisfaction among university graduates in Cambodia. To deal with the sample selection bias owing to the unobserved job satisfaction of unemployed graduates, this study applies the Heckman probit model on a survey conducted with nineteen higher education institutions in Cambodia. Results indicate that the both forms of mismatches adversely affect the job satisfaction and the consequence is stronger if graduates suffer both vertical and horizontal mismatches. This suggests that the literature has to focus on all forms and dimensions of mismatches when examining their impacts on the individual outcomes in the labor market. The findings also underline the importance of improvement in the quality of education-job matching in Cambodia because the possible counter-productive behaviors due to inadequate education-employment may affect the firm productivity and thus limit their development.

Keywords: vertical and horizontal educational mismatches, job satisfaction, sample selection bias, Heckman probit regression, higher education.

JEL Codes: I23, I25, J24, J28.

*Universite Savoie Mont Blanc, IREGE. Email: samvichet77@gmail.com

1 Introduction

The average level of education has risen successively and considerably worldwide during the past several decades (Barro & Lee, 2001 ; OECD, 2014). This increase in educational levels has positively contributed to individual earnings and economic growth as predicted by the human capital theory (Becker, 1964) and endogenous growth theory (Lucas, 1988), yet vertical educational mismatch or overeducation also has emerged as a serious concern, particularly in developed countries. Overeducation refers to an excess of education, beyond the level needed to perform a certain job (Rumberger, 1981 ; Hartog, 2000). Besides overeducation, horizontal mismatch also exists when people's occupations do not match their fields of education (Robst, 2007). The existence of these mismatches raise questions on their effects on individual outcomes in the labor market such as the job satisfaction.

From the sociological perspective, education-job mismatches adversely affect job satisfaction because the worker's expectations on the social position and type of work are not fulfilled like they thought when they invested in their higher education (Capsada-Munsech, 2017).

Indeed, there exist empirical evidences on the negative impacts of overeducation on job satisfaction, which can reduce the workers' productivity. Tsang (1987) finds that one additional unit in mean years of overeducation decreases the job satisfaction by 3.3%, and one percent decrease in the value of job satisfaction is associated with a 2.5% decrease in the level of the Bell firms' output in the United States. The negative impacts of mismatches on job satisfaction also exist in different European countries (Battu et al., 1999; Verhofstadt et al., 2003; Verhaest & Omey, 2006; Fleming & Kler, 2008 Diem, 2015; Congregado et al., 2016), yet several limits remain in the literature. First, there is no consensus given that some researches such as Badillo Amador et al. (2008), Green & Zhu (2010), Sloane (2014) do not find any impacts. Indeed, some workers may prefer that type of job in compensation for other job attributes such as less job pressure for which they may have stronger preferences (McGuinness & Sloane, 2011). Second, less researches analyze the case of horizontal mismatches even though their effects appear to be comparable to the vertical form (Domadenik et al., 2013). For instance, Béduwé & Giret (2011) find that horizontal mismatch decreases the job satisfaction among French vocational graduates and the effect is stronger if graduates are also overeducated. Third, most of studies seem to ignore the selection bias problem owing to the non-employed graduates sample that could be mismatched if they chose to work (Caroleo & Pastore, 2013). Fourth, less researches focus on developing countries where mismatches seem to be higher (McGuinness et al., 2017). For instance, we only find Zakariya & Battu (2013) who examine the impacts of overeducation on job satisfaction among graduates in Malaysia and report negative impacts.

The objective of this article is accordingly to investigate if the vertical and horizontal mismatches decrease the job satisfaction among Cambodian university graduates by also considering the possible selection bias problem.

Thus, this research contributes to the literature on three main points:

First, we examine the effects of education-job mismatches from their both forms (vertical and horizontal) and also the combination of these two forms (a double mismatch) in a developing country, namely Cambodia, that has just moved from a low income to a lower middle income status in 2016, while other previous researches focus mostly on overeducation and more advanced economies. Cambodia represents indeed an interesting case to consider given its remarkable rise in the enrollment rate in higher education but with an increasing concerns on unemployment and education-job mismatches. For instance, the enrollment rate in higher education has increased from just 2.5% in 2000 to 15.9% in 2011 (World Bank's website¹) with the number of students rises from 20,000 in 2001 to 250,000 in 2014 (Un, 2015). Nevertheless, the unemployment rate of graduates is much higher, 7.7% in 2012, than people with only secondary education, 2.7% (NIS, 2012). Furthermore, around 50% of students are enrolled in economics, management and law majors, while Cambodia is lacking of graduates in engineering (Madhur, 2014).

Second, besides the typical variables controlled in the previous literature, we will also control the match between the graduates' evaluation on the importance and the real implications of several job attributes in their current occupations such as job autonomy, job stability, job salary, job challenge, career opportunities, chances to learn new things, reconciliation between working and family time, social status, job leisure and doing useful things for society. Being able to control these variables that may have strong impacts on the overall job satisfaction should make our results more robust.

Third, it is possible that we confront the selection bias problem. Indeed, according to the job competition (Thurow, 1976) and the assignment models (Sattinger, 1993) that suppose the high-skilled job opportunities are limited and there exists a skill heterogeneity among graduates, sample selection bias may arise because of the fact that the educational mismatch appears first of all in the form of a higher probability of non-employment among some graduates and only at a later stage it takes the form of a penalty on individual outcomes in the labor market (Caroleo & Pastore, 2013). Consequently, we will use the Heckman probit model to deal with this issue, applied on a survey data financed by the French-speaking University Agency, known as AUF, and conducted by the French cooperation at the Royal University of Law and Economics among nineteen higher education institutions in Cambodia in 2011.

¹Data link: <https://data.worldbank.org/indicator/SE.TER.ENRR?locations=KH>

2 Data

The French cooperation at the Royal University of Law and Economics in Cambodia conducted the survey that informs this research by phone in 2011, among Cambodian graduates who had received their bachelor's degrees in 2008. The 4,025 observations are randomly selected and representative of nineteen higher education institutions in Phnom Penh, capital of Cambodia. The current study excludes self-employed people from the initial data set, because there are no detailed information available to evaluate the required schooling for their jobs, and thus impossible to define their education-job match status. Observations that offered no information on occupation and other key variables were also dropped. The final sample thus contains 3,211 university graduates who are representative of the study population, and in which 92 graduates are unemployed at the moment of survey.²

To measure the incidence of mismatches, we employ the job analysis (JA) that is known as an objective measure. Based on the JA measure, each occupation classified by the International Standard Classification of Occupations Code (1-digit) is assigned to the required level of education mentioned in the International Standard Classification of Education (ISCED). For example, graduates working in the positions classified as managers, professionals, and technicians/associate professionals, are considered as matched workers because these positions require tertiary education. Other occupational levels such as clerical support workers and elementary occupations do not require higher education. Consequently, graduates in these occupations will be considered as overeducated.³

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 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.⁴

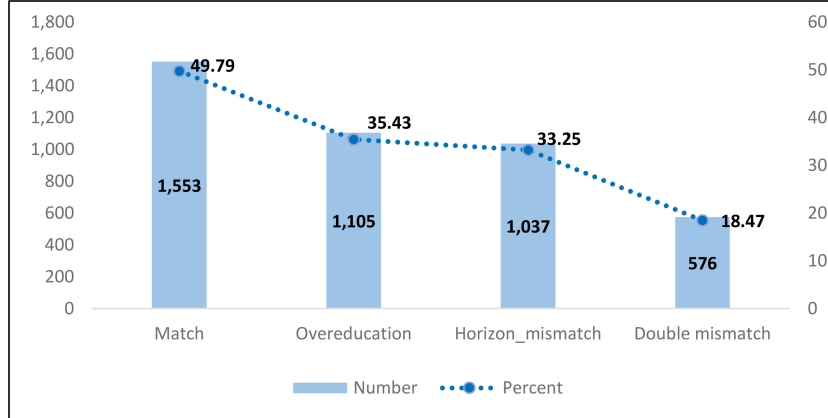
Our results indicate that 35.43% and 33.25% of graduates are overeducated and horizontally mismatched, respectively. The incidence of educational mismatches for each category of mismatch is provided in the figure 1 below.

²By 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.

³Tables that specify the process of matching the occupational class to the educational level required, are in the Appendix: A.

⁴The matching table can be found in the Appendix: B.

Figure 1: Number and percent of graduates by category of education-job mismatch



Based on the figure 1, we observe that only a half of graduates work in a matched job to their education, while the rest faces at least one type of educational mismatch. Thus, education-job mismatch could be a problem to carefully consider. Additionally, the incidence of horizontal mismatch is comparable to the vertical form, hence, the literature that focuses solely on overeducation may neglect another important source of mismatches. More importantly, 18.47% of graduates also face a double mismatch.

Next, the data also possesses information regarding the overall job satisfaction ranking from 1 (very dissatisfied) to 5 (very satisfied). We recode this variable with a dummy variable equaling 1 (satisfied) if workers indicate the value of 4 or 5, and 0 (not satisfied) if the value is from 1 to 3. It is indicated that 63.64% of graduates are overall satisfied with their jobs.

To estimate the impacts of education-job mismatches on the individual job satisfaction, several variables related to individual attributes, fields of study and firm characteristics are needed to be controlled because those variables may affect the individual job satisfaction.

More importantly, the survey questionnaire also provides information regarding the graduates' evaluations on the importance of several job attributes (evaluated from 1, not important at all, to 5, very important) such as job autonomy, job stability, opportunities to learn new things, job challenge, career perspective, high salary, good social status, possibility to do something useful for the society, possibility to reconcile working and family time, and job leisure. We consider this evaluation as the graduates' preferences on those job attributes. Next, the employed graduates also evaluate the implications of those job attributes in their current jobs (evaluated from 1, not implied, to 5, very implied in the job). These two evaluations allow

us estimating if the importance of those job attributes evaluated by graduates are realized in their current jobs or not. Indeed, if the implications of those job attributes in their current jobs equal or exceed their preferences, we consider that their expectations for each job attribute are met. Controlling these variables is necessary because they may strongly reduce the overall job satisfaction if some of these job attributes are not fulfilled as what graduates wish for.

3 Descriptive statistics

Table 1 contains the descriptive statistics for all variables included in the analysis in relation to overall job satisfaction.⁵

Table 1: Descriptive statistics

VARIABLES	Mean	Std. dev.	Mean satisfaction
<u>Dependent variable</u>			
Job satisfaction	0.64	0.48	
<u>Independent variables</u>			
No mismatch	0.50	0.50	0.67
Overeducation	0.35	0.48	0.60
Horizontal mismatch	0.33	0.47	0.61
Double mismatch	0.18	0.38	0.60
Male	0.64	0.48	0.62
Age at the end of study	21.84	3.98	0.62
Married	0.25	0.43	0.67
Being born in Phnom Penh	0.51	0.50	0.63
In charge of family	0.45	0.50	0.58
Law-Eco-Management	0.49	0.50	0.58
Social Science English	0.15	0.36	0.63
Engineering	0.05	0.21	0.73
Public sector	0.23	0.42	0.64
Fixed-terms contract	0.30	0.46	0.66
Permanent contract	0.31	0.46	0.67
Work in a small firm	0.10	0.30	0.70
Job autonomy	0.58	0.49	0.59
Job stability	0.62	0.48	0.59
Chance to learn new things	0.56	0.50	0.61
Job challenge	0.52	0.50	0.59
Career perspective	0.53	0.50	0.58
High salary	0.31	0.46	0.63
Good social status	0.56	0.50	0.57
Doing useful things for society	0.64	0.48	0.59
Having time for family	0.63	0.48	0.55
Job leisure	0.60	0.49	0.55
Observations	3211		

⁵For the continuous variables (age at the end of study), the observed mean satisfaction is evaluated for the two last quartiles. Then, the job satisfaction, firm characteristics and the implications of job attributes (in the second row of table) are only observed among the employed graduates (3,119 observations).

Based on the descriptive statistics, we observe that graduates working in a matched job tend to be much more satisfied than other graduates. Nevertheless, we observe that other variables may affect the job satisfaction as well. Thus, an econometric estimation is needed to estimate the real impacts of education-job mismatches on job satisfaction.

4 Method

The descriptive statistics have shown that many variables, besides mismatches, may affect the job satisfaction. Furthermore, there also exist graduates who are unemployed at the moment of survey, and consequently, we cannot observe their job satisfaction. Thus, to identify the impacts of mismatches on job satisfaction with a possible sample selection bias, we propose the Heckman probit model (Van de Ven & Van Praag, 1981) with the following estimation:

$$y_j^* = x_j\alpha + mismatch_j\beta + u_{1j} \quad \textit{latent equation} \quad (1)$$

Such that y_j^* defines the job satisfaction, x_j is a vector of independent variables (including individual attributes, fields of study, firms characteristics and implications of other job attributes relative to graduates' expectations), $mismatch_j$ reflects the observed categorical variable of educational mismatches, u_{1j} defines the error term, and α and β are unknown parameters, such that β represents the estimated effect of educational mismatches on job satisfaction, *ceteris paribus*.

Nevertheless, we observe only the binary outcome in case:

$$y_j^{probit} = (y_j^* > 0) \quad \textit{probit equation} \quad (2)$$

Thus, the dependent variable is not always observed. Rather, the dependent variable for observation j is only observed if:

$$y_j^{select} = (z_j^*\gamma + mismatch_j^*\beta + u_{2j} > 0) \quad \textit{selection equation} \quad (3)$$

where

$$u_1 \rightarrow N(0, 1)$$

$$u_2 \rightarrow N(0, 1)$$

$$corr(u_1, u_2) = \rho$$

When $\rho \neq 0$, standard probit techniques applied to the first equation yield biased results, while the Heckman probit model provides consistent, asymptotically efficient estimates for all the parameters in such models. However, for the model to be well identified, the selection equation should have at least one variable that is not in the probit equation. Otherwise, the model is identified only by functional form, and the coefficients have no structural interpretation.

Thus, besides individual attributes and fields of study, in the selection equation, we add other variables such as type of university, scholarship status, double training, internship during study, and previous monthly job experiences that may affect the probability of being employed.

4.1 Results

Table 2 presents the regression results. Models 1, 2, 3 and 4 examine the impacts on job satisfaction from working in a matched, vertical mismatched, horizontal mismatched and double mismatched job, respectively. Only significant variables are reported in the Table 2, while all control variables can be found in the Appendix: C and Appendix: D.

Table 2: Impact of education-job mismatches on job satisfaction

VARIABLES	Model 1	Model 2	Model 3	Model 4
No Mismatch	0.123** (0.048)			
Overeducation		-0.120** (0.052)		
Horiz. Mismatch			-0.107** (0.050)	
Double Mismatch				-0.131** (0.062)
Male	-0.107** (0.051)	-0.110** (0.051)	-0.097* (0.050)	-0.101** (0.050)
Age at the end of study	0.031*** (0.007)	0.031*** (0.007)	0.032*** (0.007)	0.031*** (0.007)
In charge of family	-0.183*** (0.050)	-0.186*** (0.050)	-0.187*** (0.050)	-0.190*** (0.050)
Law-Eco-Management	-0.191*** (0.058)	-0.177*** (0.058)	-0.212*** (0.058)	-0.201*** (0.058)
Engineering	0.229* (0.132)	0.239* (0.132)	0.237* (0.132)	0.241* (0.132)
Public sector	0.116* (0.067)	0.122* (0.067)	0.124* (0.067)	0.126* (0.066)
Fixed-terms contract	0.272*** (0.061)	0.268*** (0.061)	0.273*** (0.061)	0.268*** (0.061)
Permanent contract	0.249*** (0.060)	0.249*** (0.060)	0.248*** (0.060)	0.247*** (0.060)
Work in a small firm	0.322*** (0.086)	0.329*** (0.086)	0.312*** (0.085)	0.322*** (0.086)
Chance to learn new things	0.110** (0.053)	0.112** (0.053)	0.108** (0.053)	0.110** (0.053)
High salary	0.312*** (0.056)	0.312*** (0.056)	0.312*** (0.056)	0.312*** (0.056)

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

Notes: Robust standard errors are in brackets.

Table 2: Impact of education-job mismatches on job satisfaction-continued

VARIABLES	Model 1	Model 2	Model 2	Model 4
Having time for family	-0.183** (0.075)	-0.183** (0.075)	-0.189** (0.075)	-0.190** (0.075)
Job leisure	-0.266*** (0.074)	-0.269*** (0.074)	-0.264*** (0.074)	-0.266*** (0.074)
Selection equation: Being employed				
Previous monthly job experiences	0.081*** (0.005)	0.081*** (0.005)	0.081*** (0.005)	0.081*** (0.005)
Internship	0.338*** (0.125)	0.337*** (0.125)	0.337*** (0.125)	0.336*** (0.125)
Public university	0.430*** (0.154)	0.429*** (0.154)	0.432*** (0.154)	0.432*** (0.153)
Observation	3,211	3,211	3,211	3,211
Censored	92	92	92	92
Log pseudolikelihood	-2155.58	-2156.17	-2156.49	-2156.55
Wald test of indep. eqns. (chi2 value)	8.10***	8.09***	8.23***	8.19***
$(H_0 : \rho = 0)$				

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

Notes: Robust standard errors are in brackets.

Looking at the Wald test result in Table 2, we see that the test value is highly significant, which rejects the null hypothesis of $\rho = 0$. Consequently, using the standard probit model can yield bias results owing to the sample selection bias, and the Heckman probit model is consistent and more efficient in this case.

Indeed, being employed is not a random process. In the selection equation estimation, we observe that graduates who used to intern during their studies and have longer previous job experiences are more likely to be employed. In the context of low quality in education and limited skilled-job opportunities, typically found in developing countries, employers may stress more importance on the professional background of graduates, rather than just rely on their diplomas. This suggests that university students should look for volunteer jobs, and internship should be compulsory, so that graduates can acquire professional knowledge, useful for finding a job when they finish their studies. We also notice that graduates from the public universities are less likely unemployed. In fact, many private higher education institutions (HEI) in Cambodia gained official recognition without following a clearly defined process (Ford, 2015). By international comparison, many of those HEI are very small with narrow academic and resource bases (Mak, 2005). Additionally, the competition among those private institutions led to the

lowering of fees, followed by the reduced revenue, and coupled with the inattention to support quality, results in weak HEI and expressed in high graduates' unemployment rate (Ford, 2015). Thus, a choice of university seems to be crucial in Cambodia.

Next, from the main equation, we observe that several individual attributes affect the job satisfaction such as men and persons that need to be in charge of their family tend to be less satisfied. According to a research, women are happier at work because they tend to choose more fulfilling work, more enthusiastic, lower aspiration and expectations,⁶ while the responsibility on their family may put more pressure on workers to expect more from their jobs, making them less satisfied. Older workers are found to be happier as found by Lee & Wilbur (1985). Perhaps, thanks to their maturity, older workers adapt to the lifework better than young persons. Fields of study also impact job satisfaction such as graduates in management and related-fields are less satisfied, while graduates in engineering are happier. As there are too many graduates in management related fields, this may put them under some pressures of keeping their jobs or positions. Firms characteristics and sector of activity also affect job satisfaction. Indeed, workers with fixed or permanent work contracts are more satisfied than worker without work contract. Given that 73% of employment in Cambodia were accounted for by micro, small, and medium-sized enterprises (MSMEs), and most of them (about 95%) are in the informal sector (ADB and ILO, 2015), we have reasons to believe that workers without contract might be in the informal sector that is characterized by poor working conditions. Working in the public sector increases job satisfaction because it is known that in Cambodia, the job pressures in public sector is generally much lower than in private sector. Surprisingly, graduates working in a small firm less than ten staff are more satisfied. Perhaps, in bigger firms, graduates face more pressures and the tasks might be more specialized, while in small firms, graduates might be able to learn various skills from management to operation, which may positively affect their job satisfaction.

Regarding the match between the implications of several job attributes relatively to what expected by graduates, we clearly see that the jobs that provide chances for graduates to learn new things/skills, and especially good salary, do increase their job satisfaction. Nevertheless, it is surprising that graduates who report to have a great time for leisure and family tend to be less satisfied. Perhaps, those jobs might provide too much free time beyond what graduates wish for, making graduates feel that they are unproductive, and thus not satisfied.

⁶<https://www.nafe.com/8-surprising-reasons-women-are-actually-happier-at-work-than-men>

Finally, after controlling many variables and sample selection bias, we still observe the negative impacts of education-job mismatches on job satisfaction. Indeed, graduates who work in a matched position are more satisfied, while working in a mismatched job, either vertical or horizontal, can lower job satisfaction, especially the case of a double mismatch. Table 3 below estimates the marginal effects of the impacts of education-job mismatches on graduates' job satisfaction:

Table 3: Impacts of education-job mismatches on job satisfaction (Marginal effects)

Variables	Impacts	Compared to
No mismatch	+4.66%**	Mismatched workers
Overeducation	-4.53%**	Non-overeducated workers
Horizontal mismatch	-4.07%**	Non-horizontal mismatched workers
Double mismatch	-4.98%**	Non-double mismatched workers
Overeducation	-4.74%**	Workers with an education-job match
Horizontal mismatch	-4.69%**	Workers with an education-job match
Double mismatch	-5.34%**	Workers with an education-job match

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

From the Table 3, graduates with an education-job match are 4.66% more satisfied than other graduates who face at least one type of educational mismatch. Similarly, vertical and horizontal mismatches reduce the job satisfaction with similar impacts, by 4.74% and 4.69%, compared to matched graduates. Thus, the literature that neglects the horizontal mismatch case ignores an important source of problem. Furthermore, when graduates suffer both forms of mismatches, the negative impacts also increase up to 5.34%, which is conformed to what found by Bédoué & Giret (2011) that a double mismatch has a stronger effect on job satisfaction among vocational graduates in France. This signifies that the education-job mismatches is also a main issue that we need to carefully consider in Cambodia.

5 Conclusion

This article examines the impacts of education-job mismatches from their both forms and dimension (vertical, horizontal and double mismatches) on the job satisfaction among university graduates in Cambodia. To deal with the sample selection bias, we employed the Heckman probit model, and the regression results show that education-job mismatches adversely affect the job satisfaction with the strongest impact from a double mismatch, followed by vertical and horizontal mismatches, despite several variables related to individual attributes, fields of study, firm characteristics and implications of job attributes are controlled for.

This article contributes to the literature in several ways. Indeed, we examine the case of a developing country that has just upgraded to a lower-middle income status and consider the both forms of mismatches together with the possible sample selection bias. Too little studies have analyzed the impacts of mismatches in developing countries, and only a little of researches in developed countries have considered the horizontal form and the combination effect of their both forms as well as the sample selection bias, owing to non-employed graduates, when they examined the impacts of mismatches on individual outcomes in the labor market.

Our results suggest that Cambodia has to be more attentive on the expansion of its higher education sector. Indeed, the negative impacts of educational mismatches on the graduates' job satisfaction, may generate counter-productive behaviors such as high rates of absenteeism and turnover that were actually already observed and reported by many employers in Cambodia. These behaviors can surely cost firms in terms of a limited productivity and subsequently the firm expansion, which can be bad for the economic growth and development.

Thus, Cambodia should improve the quality in education and create programs allowing students doing more internship to apply their theoretical knowledge in the real practices. Evaluation on each university performance should be conducted and results should be disseminated to public, so that students can make a better choice, and universities will compete more in terms of quality. Job opportunities and economic rewards related to each study program should be widely communicated so that students can rely on those information to decide which program to pursue at higher education.

References

- Asian Development Bank (ADB) and International Labour Organisation (ILO). (2015). *Cambodia: Addressing the skills gap: Employment diagnostic study* (Tech. Rep.).
- Badillo Amador, M. L., López Nicolás, Á., Vila Lladosa, L. E., et al. (2008). Education and competence mismatches: Job satisfaction consequences for workers.
- Barro, R. J., & Lee, J.-W. (2001). International data on educational attainment: Updates and implications. *Oxford Economic Papers*, 53(3), 541–563.
- Battu, H., Belfield, C. R., & Sloane, P. J. (1999). Overeducation among graduates: A cohort view. *Education economics*, 7(1), 21–38.
- Becker, G. S. (1964). *Human capital: A theoretical and empirical analysis, with special reference to education*.
- Bédoué, C., & Giret, J.-F. (2011). Mismatch of vocational graduates: What penalty on French labour market? *Journal of vocational behavior*, 78(1), 68–79.
- Capsada-Munsech, Q. (2017). Overeducation: Concept, theories, and empirical evidence. *Sociology Compass*, 11(10).
- Caroleo, F. E., & Pastore, F. (2013). Overeducation at a glance: Determinants and wage effects of the educational mismatch, looking at the AlmaLaurea data.
- Congregado, E., Iglesias, J., Millan, J. M., & Roman, C. (2016). Incidence, effects, dynamics and routes out of overqualification in Europe: A comprehensive analysis distinguishing by employment status. *Applied Economics*, 48(5), 411–445.
- Diem, A. (2015). Overeducation among graduates from universities of applied sciences: Determinants and consequences. *Journal of Economic & Financial Studies*, 3(02), 63–77.
- Domadenik, P., Farcnik, D., & Pastore, F. (2013). Horizontal mismatch in the labour market of graduates: The role of signalling. *IZA Discussion Paper(7527)*, 1–24.
- Fleming, C. M., & Kler, P. (2008). I'm too clever for this job: A bivariate probit analysis on overeducation and job satisfaction in Australia. *Applied Economics*, 40(9), 1123–1138.
- Ford, D. (2015). Cambodian accreditation: An uncertain beginning. *International Higher Education(33)*.

- Green, F., & Zhu, Y. (2010). Overqualification, job dissatisfaction, and increasing dispersion in the returns to graduate education. *Oxford Economic Papers*, 62(4), 740–763.
- Hartog, J. (2000). Over-education and earnings: Where are we, where should we go? *Economics of Education Review*, 19(2), 131–147.
- Lee, R., & Wilbur, E. R. (1985). Age, education, job tenure, salary, job characteristics, and job satisfaction: A multivariate analysis. *Human Relations*, 38(8), 781–791.
- Lucas, R. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, 22, 3–42.
- Madhur, S. (2014). Cambodia’s skill gap: An anatomy of issues and policy options. *CDRI Working Paper Series*(98), 1–37.
- Mak, N. (2005). A current update of higher education in Southeast Asian countries: The case of Cambodia. In *Regional Seminar on Higher Education in Southeast Asian Countries: A Current Update*.
- McGuinness, S. (2006). Overeducation in the labour market. *Journal of Economic Surveys*, 20(3), 387–418.
- McGuinness, S., Pouliakas, K., & Redmond, P. (2017). *How useful is the concept of skills mismatch?* (Tech. Rep.).
- McGuinness, S., & Sloane, P. J. (2011). Labour market mismatch among UK graduates: An analysis using REFLEX data. *Economics of Education Review*, 30(1), 130–145.
- National Institute of Statistics (NIS) of Cambodia. (2012). *Cambodia Labour Force and Child Labour Survey* (Tech. Rep.).
- Organisation for Economic Co-operation and Development (OECD). (2014). *Education at a glance 2014: OECD indicators* (Tech. Rep.).
- Robst, J. (2007). Education and job match: The relatedness of college major and work. *Economics of Education Review*, 26(4), 397–407.
- Rumberger, R. W. (1981). The rising incidence of overeducation in the US labor market. *Economics of Education Review*, 1(3), 293–314.
- 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.
- Sloane, P. J. (2014). Overeducation, skill mismatches, and labor market outcomes for college graduates. *IZA World of Labor*.
- Sparreboom, T., & Staneva, A. (2014). Is education the solution to decent work for youth in developing economies. *Work4Youth Publication Series*, 23.
- Thurow, L. C. (1976). *Generating inequality*. Macmillan London.
- Tsang, M. C. (1987). The impact of underutilization of education on productivity: A case study of the US bell companies. *Economics of Education Review*, 6(3), 239–254.
- Un, L. (2015). *Cambodian Higher Education Vision 2030*. http://www.ehef.asia/images/Cambodia/presentations/Dr_Un_Leang_MoEYS.pdf.
- Van de Ven, W. P., & Van Praag, B. M. (1981). The demand for deductibles in private health insurance: A probit model with sample selection. *Journal of econometrics*, 17(2), 229–252.
- Verhaest, D., & Omeij, E. (2006). The impact of overeducation and its measurement. *Social Indicators Research*, 77(3), 419–448.
- Verhofstadt, E., Omeij, E., et al. (2003). The impact of education on job satisfaction in the first job. *Faculteit Economie En Bedrijfskunde Working Paper*.
- Zakariya, Z., & Battu, H. (2013). The effects of overeducation on multiple job satisfaction towards enhancing individuals' well-being in Malaysia. *Business and Management Quarterly Review*, 4, 38–51.

Appendix: A

Table 4: 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 5: 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)
	4	Post-secondary, non-tertiary education
2	3	Upper secondary level of education
	2	Lower secondary level of education
	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).

Appendix: B

Table 6: 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.

Appendix: C

Table 7: Controlling variables for main equation

Variables	Description
<u>Individual attributes</u>	
Men	1 if men, 0 otherwise.
Married	1 if married, 0 otherwise.
Age at the end of study	continuous variable.
Birthplace	1 if in Phnom Penh or Kandal, 0 otherwise.
In charge of family	1 if having members in family to be in charge, 0 otherwise.
<u>Fields of study</u>	
Law-Economics-Management	1 if graduated in management and related fields, 0 otherwise.
Social sciences in English	1 if graduated in social sciences in English, 0 otherwise.
Engineering	1 if graduated in engineering or related fields, 0 otherwise.
<u>Firms characteristics</u>	
Public sector	1 if working in the public sector, 0 otherwise.
Fixed-term contract	1 if having a fixed-term contract, 0 otherwise.
Permanent work contract	1 if having a permanent work contract, 0 otherwise.
Small firms	1 if working in a small firm less than 10 staff, 0 otherwise.
<u>Implications of job attributes</u> (relative to graduates' expectations)	
Job autonomy	
Job stability	
Chances to learn new things	
High salary	
Job challenge	
Career development	
Social status	
Doing useful for societies	
Reconciliation working and family time	
Job leisure	

Appendix: D

Table 8: Controlling variables for selection equation

Variables	Description
<u>Individual attributes</u>	
Men	1 if men, 0 otherwise.
Married	1 if married, 0 otherwise.
Age at the end of study	continuous variable.
Birthplace	1 if in Phnom Penh or Kandal, 0 otherwise.
In charge of family	1 if having members in family to be in charge, 0 otherwise.
<u>Educational and professional background</u>	
Public university	1 if graduated from public universities, 0 otherwise.
Study scholarship	1 if got scholarship for their studies, 0 otherwise.
Double training	1 if graduates from two disciplines, 0 otherwise.
Law-Economics-Management	1 if graduated in management and related fields, 0 otherwise.
Social sciences in English	1 if graduated in social sciences in English, otherwise.
Engineering	1 if graduated in engineering or related fields, otherwise.
Internship during studies	1 if interned during studies, 0 otherwise.
Previous monthly job experiences	continuous variables