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Impacts of educational mismatches in developing countries with a focus on Cambodia

Vichet Sam

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THÈSE

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Présentée par **Vichet Sam**

Thèse dirigée par **Mme Mareva Sabatier**

Préparée au sein du laboratoire IREGE – Université Savoie Mont Blanc
Dans l’Ecole Doctorale SISEO

Impacts des inadéquations en termes d’éducation aux pays en développement avec une attention sur le Cambodge

Thèse soutenue publiquement le **15 octobre 2018,**

Devant le jury composé de :

Mme Mareva Sabatier

Professeur, Université Savoie Mont Blanc

Directrice de thèse

M. Jean-Yves Lesueur

Professeur, Université Lumière Lyon 2

Président du jury et Rapporteur

M. Jean-François Giret

Professeur, Université de Bourgogne

Rapporteur

Mme Lisa Chauvet

Chercheuse, Institut de recherche pour le développement (IRD)

Suffragante

Mme Bérangère Legendre

Maître de conférences HDR, Université Savoie Mont Blanc

Suffragante



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Contents

List of Tables	iii
List of Figures	v
Acknowledgments	vii
Résumé	ix
Summary	xvii
Preliminary Chapter	1
1 Introduction	1
2 Literature review	5
2.1 Measures of educational mismatches	5
2.2 Determinants of educational mismatches	12
2.3 Impacts of educational mismatches	19
3 Mismatches in developing countries and their specificity	32
4 Data, research questions and methods	51
5 Thesis contributions	57
Appendices	58
I Unemployment duration and educational mismatches: A theoretical and empirical investigation among graduates in Cambodia	67
1 Introduction	68
2 Theoretical model framework	71
2.1 Value function of a vacant and a filled job	71
2.2 Value function of unemployment and employment	72

3	Data and descriptive statistics	75
4	Methods and results	79
5	Conclusion	86
	Appendices	87
II Overeducation and horizontal mismatch: A double wage penalty for graduates in Cambodia?		89
1	Introduction	90
2	Data and descriptive statistics	94
	2.1 Measuring educational mismatches	94
	2.2 Descriptive statistics	97
3	Method and results	99
4	Conclusion	106
	Appendices	107
III Overeducation among graduates in developing countries: What impact on economic growth?		109
1	Introduction	110
2	Data	114
	2.1 Macro data	116
	2.2 Micro data	117
3	Descriptive statistics	120
4	Method and Results	123
	4.1 Method	123
	4.2 Results	127
5	Conclusion	130
	Appendices	133
General Conclusion		135
References		141

List of Tables

I.1	Association of unemployment duration and educational mismatches	74
I.2	Correspondence between occupational class and educational level	76
I.3	Description of educational level required for each skill level	76
I.4	Unemployment duration and educational mismatches	77
I.5	Unemployment duration by graduates' attributes	78
I.6	Results	81
I.7	Educational mismatches and unemployment hazards	83
I.8	Field of education and matching jobs	88
II.1	Incidence of educational mismatches	95
II.2	Descriptive statistics	97
II.3	Results	101
II.4	Observed and estimated wages (logarithms)	104
II.5	Correspondence between occupational class and educational level	107
II.6	Description of educational level required for each skill level	107
III.1	Variables and data sources	118
III.2	Descriptive statistics	120
III.3	Test for endogeneity of overeducation	124
III.4	Test for the quality of instrument	125
III.5	Variance inflation factor	125
III.6	Test for time effects	126
III.7	Impact of graduates' overeducation on economic growth	127
III.8	Percentage of overeducated graduates by regions, countries and years	131
III.9	Correspondence between occupational class and educational level	133
III.10	Description of educational level required for each skill level	133

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List of Figures

1	School life expectancy* (number of years) in selected regions	1
2	Gross enrollment ratio in tertiary education (%) in selected regions .	2
3	GDP growth (annual %) in selected regions	2
4	Average incidence of overeducation (%) in selected developed countries	10
5	Average incidence of horizontal mismatches (%) in selected developed countries	10
6	Evolution of average overeducation rate (%) in European countries (job analysis measure)	11
7	Evolution of average overeducation rate (%) in European countries (statistical analysis measure)	11
8	Compared average incidence of overeducation (worker-self-assessment) (%)	33
9	Incidence of overeducation (worker-self-assessment) in developing countries (%)	33
10	Incidence of overeducation among youth (job analysis) in developing countries (%)	34
11	Incidence of horizontal mismatches (worker-self-assessment) in developing countries (%)	35
12	Compared average incidence of horizontal mismatches (worker-self-assessment) (%)	35
13	Cambodia: Key economic indicators 2015	40
14	Number of HEI in Cambodia	41
15	Number and ratio (%) of enrollment in tertiary education in Cambodia	41
16	Unemployment rate (%) by level of education in 2012*	43
17	Government expenditure on education (% GDP)	44

18	Number of researchers per million people and Research & Development expenditure (% of GDP) in 2013/2015*	44
19	Dissatisfaction of employers with the skills of college graduates (%)	46
20	Student enrollment by fields of education in Cambodia in 2011	46
21	Evolution of Cambodia's economic sectors, value added (% of GDP)	47
22	Graduates by fields of education (%) in Cambodia and in some ASEAN countries in 2015*	47
23	Manufacturing sector (% of GDP) and Graduates in Engineering, Manufacturing & Construction (%) in 2015*	48
24	Corruption Perceptions Index in ASEAN countries in 2017	49
25	Structure of the thesis	56
III.1	Overeducation rate among tertiary graduates across regions	119
III.2	Relation between overeducation and economic growth	121

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Résumé

La théorie de la croissance endogène (Lucas, 1988) mentionne l'éducation comme un facteur clé dans la stimulation du développement économique. La vision de cette théorie influence tous les pays du monde à investir dans l'éducation. En conséquence, tous les niveaux d'éducation, y compris l'enseignement supérieur, ont connu une augmentation rapide de taux de scolarisation au cours des dernières décennies. Dans les pays en développement par exemple, le taux brut de scolarisation dans l'enseignement supérieur est passé de seulement 6% en 1970 à 31% en 2016 (Banque Mondiale¹).

Le Cambodge, un pays en Asie du Sud-Est et qui vient de passer son statut d'un pays à faible revenu au pays à revenu intermédiaire inférieur en 2016, n'est pas exceptionnel : son taux de scolarisation dans l'enseignement supérieur est rapidement passé de 2,5% en 2000 à 15,9% en 2011 (Banque Mondiale²). Cependant, il existe des inquiétudes sur l'employabilité des diplômés qui semblent avoir de plus en plus des peines à trouver des emplois correspondant à leur niveau et domaine d'études, ce que l'on appelle les **inadéquations verticales et horizontales**.

Le Cambodge représente, en effet, un cas d'étude intéressant compte tenu de son histoire tragique : durant le régime des Khmers rouges entre 1975 et 1979, 1,7 million d'habitants, surtout des personnes éduquées, sur 7,3 millions de population étaient morts,³ et le pays vient de pouvoir commencer à reconstruire son système éducatif en 1998 après trois décennies de guerre civile. En outre, aucune étude antérieure sur les inadéquations entre l'éducation et l'emploi n'a analysé un pays à faible revenu comme le Cambodge.

¹Source : <https://data.worldbank.org/indicator/SE.TER.ENRR?locations=XO>

²Source : <https://data.worldbank.org/indicator/SE.TER.ENRR?locations=KH>

³Source : https://en.wikipedia.org/wiki/Khmer_Rouge_Killing_Fields

Cette thèse, qui s'inscrit dans le champ de l'économie du travail et de l'éducation, vise à examiner **l'impact des inadéquations éducatives au sein des diplômés universitaires dans les pays en développement, avec une attention spéciale sur le cas du Cambodge.**

Trois articles, qui constituent trois chapitres de cette thèse, cherchent à répondre à trois questions. Deux chapitres sont analysés au niveau **microéconomique** sur la relation entre **la durée du chômage et les inadéquations éducatives** (chapitre 1), et **l'impact des inadéquations sur le salaire** (chapitre 2) avec le cas du Cambodge. Le dernier chapitre, qui s'ouvre au niveau plus international et **macroéconomique**, analyse **l'impact des inadéquations éducatives sur la croissance économique** dans trente-huit pays en développement. Chaque chapitre est brièvement décrit ci-dessous :

Le chapitre 1 examine si les risques des inadéquations entre l'éducation et l'emploi augmentent ou diminuent la durée du chômage des diplômés universitaires au Cambodge. Ce chapitre étudie aussi les facteurs qui influencent la durée du chômage en tenant compte de différents types d'emplois (l'emploi associé à une adéquation d'éducation, celui associé à une inadéquation verticale ou horizontale, ou avec une double inadéquation).

Théoriquement, l'analyse de l'impact des inadéquations éducatives sur la durée du chômage n'aboutit pas à un consensus. Plusieurs théories s'affrontent :

- La théorie de la recherche d'emploi (Jovanovic, 1979) suppose que les chercheurs d'emploi ne peuvent accéder qu'à des informations imparfaites sur les offres d'emploi disponibles. Il leur faut donc du temps pour trouver un bon emploi. Ainsi, ils font face à deux choix alternatifs : accepter la première offre d'emploi qui pourrait être inadéquate à leur qualification ou continuer à trouver un emploi plus adéquat, et subir des coûts de recherche.

De même, dans la théorie de la mobilité de carrière (Sicherman & Galor, 1990), certains demandeurs d'emploi, en particulier les jeunes, pourraient préférer un emploi initialement inadéquat pour acquérir des compétences spécifiques liées à l'emploi, afin d'obtenir une meilleure évolution de carrière plus tard.

Par conséquent, en basant sur ces deux théories, les risques d'inadéquation éducative devraient diminuer la durée du chômage.

- En revanche, McCormick (1990) stipule que l'acceptation d'un emploi incompatible à la qualification est un signal négatif plus fort aux employeurs que le chômage concernant la productivité des travailleurs. Ainsi, les individus peuvent préférer rester au chômage et attendent un emploi correspondant à leur qualification. Cependant, si les opportunités d'emplois sont limitées et les travailleurs sont hétérogènes selon le modèle de concurrence d'emploi de Thurow (1976), il est possible que certains travailleurs ne parviennent pas à trouver une position adéquate et restent au chômage pour une durée plus longue. Cela concerne particulièrement les travailleurs moins compétents qui restent probablement plus longtemps dans la file d'attente d'un emploi et sont affectés à un emploi plus indésirable (ou plus inadéquat) que les travailleurs plus compétents.

Donc, le risque des inadéquations éducatives pourrait s'associer aussi à une durée du chômage plus longue.

L'incertitude théorique quant à l'effet des inadéquations sur la durée du chômage n'est pas levée par les études empiriques. Pendant que Cuesta (2005) et Pollmann-Schult & Büchel (2005) trouvent que les risques d'inadéquation verticale (suréducation) diminuent la durée du chômage pour les cas d'Espagne et d'Allemagne, Rose & Ordine (2010), Barros et al. (2011) et Lin & Hsu (2013) trouvent que les risques de suréducation augmentent respectivement la durée du chômage en Italie, en France et au Taiwan. En outre, aucune étude empirique n'a donné d'éclairage sur le cas des pays en développement.

Ainsi, ce chapitre contribue à la littérature sur trois points principaux :

- Premièrement, nous étendons la recherche à un pays en développement, à savoir le Cambodge, qui semble faire face à une préoccupation majeure concernant les inadéquations d'éducation et les risques au chômage des diplômés universitaires. En effet, en 2012, le taux de chômage des diplômés universitaires était de 7,7% contre 2,7% des personnes n'ayant qu'un niveau d'éducation secondaire (NIS, 2012).

- Deuxièmement, nous tenons compte l'endogénéité des inadéquations éducatives et considérons ces inadéquations dans les deux formes et toutes les dimensions (verticales ou horizontales, une seule ou une double inadéquation).
- Troisièmement, nous proposons une analyse sous deux angles : 1- un modèle théorique reliant les inadéquations éducatives et la durée du chômage, et 2- un modèle empirique testant la prédiction théorique en utilisant un modèle de durée à des risques concurrents indépendants, appliqué sur une enquête en 2011, provenant de dix-neuf universités au Cambodge.

Les résultats économétriques, en tenant compte l'endogénéité des inadéquations, soulignent que les risques d'inadéquations éducatives augmentent la durée du chômage. Ceci suggère que les diplômés préfèrent attendre un travail plus adéquat mais n'arrivent pas à le trouver, probablement en raison du manque d'offre d'emplois qualifiés, et de l'inefficacité du système de l'éducation qui ne développe pas bien les compétences professionnelles des diplômés, exigées par le marché du travail. Les résultats mettent aussi en évidence les facteurs qui influencent la durée du chômage : le genre, les domaines d'études, le stage, l'utilisation du réseau d'emplois informel, le niveau d'éducation des parents et les préférences des diplômés pour les différentes caractéristiques d'emplois. Pourtant, ces déterminants affectent la durée du chômage de manière différente en fonction du type d'emploi (l'emploi associé à une adéquation d'éducation, à une inadéquation verticale ou horizontale, ou avec une double inadéquation).

Ayant observé que la durée du chômage n'est pas une seule conséquence possible, il est intéressant pour le prochain chapitre d'analyser aussi l'impact des inadéquations d'éducation sur le salaire des diplômés.

Le chapitre 2 examine si les inadéquations éducatives diminuent les salaires individuels et si l'impact est plus fort lorsque les diplômés souffrent des deux types d'inadéquations (verticales et horizontales).

Du point de vue théorique, il existe un consensus sur l'impact négatif des inadéquations sur le salaire. Deux mécanismes théoriques expliquent cet impact selon que les diplômés travaillent dans un emploi inadéquat en raison de leurs préférences d'une part ou du manque d'opportunités d'emploi dans le marché du travail d'autre part :

- Premièrement, les travailleurs préféreraient un emploi inadéquat avec des salaires offerts plus bas en compensation pour les autres attributs d'emploi tels que les perspectives de carrière et la promotion (Sicherman & Galor, 1990) ou moins de pressions et de stress dans le travail (McGuinness & Sloane, 2011).
- Deuxièmement, les travailleurs acceptent un travail incompatible parce qu'ils n'ont pas d'autres choix car les opportunités d'emploi sont limitées (Thurow, 1976 ; Sattinger, 1993). En outre, ce type d'emploi ne leur permet pas d'exploiter leurs compétences potentielles, et par conséquent, ils seraient moins productifs et gagneraient moins que s'ils étaient employés dans une occupation appariée à leur qualification (Thurow, 1976 ; Sattinger, 1993).

Pourtant, trois limites existent dans les études empiriques. D'abord, il n'existe pas de consensus même si la plupart des recherches trouvent une pénalité salariale en conséquence du travail dans un emploi incompatible (voir les revues de littérature de Leuven et al., 2011 et McGuinness et al., 2017). Deuxièmement, peu de recherches sur les pays en développement : les études existantes sur les effets des inadéquations sur les salaires dans les pays en développement peuvent se référer à Quinn & Rubb (2006), Filiztekin (2011), Herrera-Idárraga et al. (2015), Reis (2017) et Pholphirul (2017) qui trouvent des pénalités salariales d'inadéquations éducatives au Mexique, en Turquie, en Colombie, au Brésil et en Thaïlande, respectivement.⁴ Troisièmement, il n'existe pas encore dans la littérature la prise en compte de l'endogénéité dans la combinaison des deux types d'inadéquations.

Ainsi, ce chapitre contribue à la littérature en trois points principaux :

- Premièrement, il analyse un autre cas de pays en développement, le Cambodge, qui vient de passer d'un pays à faible revenu à un pays à revenu moyen inférieur, alors que les études existantes concernent des pays relativement plus avancés.
- Deuxièmement, il analyse les effets combinés des inadéquations verticales et horizontales que les recherches précédentes dans les pays en développement n'ont pas encore traités.

⁴Seulement Pholphirul (2017) qui étudie également les effets des inadéquations horizontales, mais sans combiner les deux formes d'inadéquations (le cas d'une double inadéquation). Les autres se concentrent uniquement sur la forme verticale.

- Troisièmement, pendant que la plupart des recherches précédentes supposent que les inadéquations soient exogènes (Tsai, 2010), nous prenons en compte le problème du biais de sélection en proposant un modèle de Heckman ordonné. Ce modèle de régression est appliqué sur des données d'enquêtes financées par la Banque Mondiale, dans lesquelles l'auteur de cette thèse a été impliqué en tant que chef d'équipe dans la collecte de données de huit établissements d'enseignement supérieur au Cambodge en 2014.

Les résultats économétriques nous permettent de conclure que le niveau des inadéquations éducatives⁵ dépend des attributs individuels, des caractéristiques de l'étude et de l'éducation des parents. Une pénalité salariale persiste pour les diplômés qui souffrent des inadéquations éducatives même en tenant compte de ce processus de sélectivité. Cette pénalité est beaucoup plus forte lorsque les inadéquations verticales et horizontales sont combinées. Ce résultat est cohérent avec l'étude de Robst (2008) qui trouve également qu'une pénalité salariale importante existe parmi les diplômés qui subissent une double inadéquation aux États-Unis.

Après avoir analysé les impacts microéconomiques des inadéquations éducatives au Cambodge, nous proposons d'étudier ces impacts à un niveau macroéconomique et plus international.

Le chapitre 3 examine l'impact de la suréducation sur la croissance économique à court terme d'un an et à moyen terme de cinq ans au sein de trente-huit pays en développement.

D'un point de vue théorique, deux approches s'affrontent:

- Le modèle de *Job Assignment* (Sattinger, 1993) établit que la productivité d'un travailleur dépend à la fois des attributs du travail et des caractéristiques de l'individu. Par conséquent, les travailleurs suréduqués sont plus productifs que leurs collègues dans le même emploi. En outre, un nombre important des travailleurs suréduqués dans le marché du travail pourrait inciter les employeurs à créer des emplois plus qualifiés afin d'exploiter les compétences de ces travailleurs (Acemoglu, 1999). Donc, toutes ces conséquences contribuent positivement à la

⁵Le niveau est divisé en trois : 1- une adéquation, 2- une inadéquation verticale ou horizontale, et 3- une double inadéquation.

croissance économique.

- En revanche, Tsang & Levin (1985) stipulent que les travailleurs suréduqués peuvent être insatisfaits de leur travail, ce qui induit des comportements contre-productifs tels que des taux élevés d’absentéisme et de roulement. En outre, le manque de plaisir dans le travail peut également détériorer la santé mentale des travailleurs (Kornhauser, 1965 ; Artés et al., 2014). Par conséquent, ces problèmes peuvent limiter le développement de l’entreprise, et donc cela est négatif pour la croissance économique.

Il n’existe que quelques articles qui analysent empiriquement les impacts de la suréducation sur la croissance économique, et ces articles n’aboutissent à aucun consensus. Ainsi, pendant que Guironnet & Jaoul-Grammare (2009) trouvent un effet négatif de la suréducation des diplômés universitaires sur la croissance économique à court terme en France, Ramos et al. (2012) trouvent un impact positif de la suréducation sur la croissance économique à moyen terme dans neuf pays européens.⁶

Le manque d’analyse des inadéquations éducatives au niveau macroéconomique peut être lié au manque de données sur les inadéquations au niveau agrégé. Pour pallier à cette difficulté, nous avons créé une base de données en associant des données micro et macro. Les données de l’enquête *“Integrated Public Use Microdata Series International”* (IPUMSI) ont été utilisées pour calculer le taux de suréducation par pays. Ensuite, ces données ont été couplées avec des données macro de la Banque Mondiale.

Ainsi, ce chapitre contribue à la littérature en trois points principaux :

- Premièrement, ce chapitre contribue en termes de données sur le taux de suréducation dans des différents pays en développement.
- Deuxièmement, grâce à ces données calculées, cet article peut étendre l’analyse des impacts de la suréducation au niveau macroéconomique sur des pays en développement.
- Troisièmement, ce chapitre traite également l’hétérogénéité non observée des pays et l’endogénéité de la suréducation qui n’ont pas été entièrement résolues

⁶Ces pays sont: l’Autriche, la France, la Grèce, l’Italie, le Portugal, la Roumanie, la Slovénie, l’Espagne et le Royaume-Uni.

dans la littérature antérieure, en employant la méthode des moindres carrés en deux étapes (*two-stage least squares regression*) avec des effets fixes.

Les résultats économétriques indiquent que la suréducation a des effets négatifs sur la croissance économique à court et moyen termes. Ce résultat est plus conforme à "l'approche de la satisfaction au travail" qu'à "l'approche du capital humain", suggérant que l'expansion du secteur de l'enseignement supérieur dans les pays en développement doit prendre en compte le processus des inadéquations d'éducation-emploi pour bien exploiter les bénéfices de l'éducation tertiaire.

Mots clés:

Chapitre 1: Inadéquations verticales et horizontales, durée du chômage, modèle d'appariement d'emploi, modèle de durée à des risques concurrentes indépendantes.

Codes JEL: I23, J24, J64.

Chapitre 2: Inadéquations verticales et horizontales, écarts de salaires, modèle Heckman ordonné.

Codes JEL: I23, I26, J24, J31.

Chapitre 3: Suréducation, croissance économique, régression par les moindres carrés en deux étapes avec des effets fixes.

Codes JEL: I23, I25, J24.

Summary

The endogenous growth theory (Lucas, 1988) mentions education as a key factor in boosting economic development. This view influences all countries across the world to invest in education sector. As a result, all educational levels including tertiary education, have known a rapid increase in enrollment rate in the last few decades. For instance, in developing countries, the gross enrollment ratio in tertiary education has increased from just 6% in 1970 to 31% in 2016 (World Bank's website⁷).

Cambodia, a country in Southeast-Asia that has just moved from the low-income status to lower middle income country at mid-2016, is not exceptional: The enrollment rate in higher education has risen rapidly from 2.5% in 2000 to 15.9% in 2011 (World Bank's website⁸). Nevertheless, concerns on the graduates' employability exist: University graduates seem to be more and more struggled to find jobs, which corresponds to their level and field of education, the so-called **vertical and horizontal mismatches**.

Cambodia represents an interesting study case given his tragic history in which 1.7 million, mostly educated people, out of 7.3 million population were died during the Khmer rouge regime from 1975 to 1979,⁹ and the country has just been able to fully focus on rebuilding its education system since 1998 after the end of three decades civil war. Additionally, no previous study on education-job mismatches has analyzed a low-income country yet.

This thesis, written in the field of **labor and education economics**, aims at examining the **impacts of educational mismatches among graduates in developing countries with a special attention to the Cambodia's case**.

⁷Data link: <https://data.worldbank.org/indicator/SE.TER.ENRR?locations=XO>

⁸Data link: <https://data.worldbank.org/indicator/SE.TER.ENRR?locations=KH>

⁹Data source: https://en.wikipedia.org/wiki/Khmer_Rouge_Killing_Fields

In this thesis, three articles, constituting three chapters, seek to answer three research questions. Two chapters examine, at **microeconomics level**, the relation between **unemployment duration and educational mismatches** (chapter 1), and the **impact of mismatches on wages** (chapter 2) within the context of Cambodia. The last chapter, which opens to more international and **macroeconomics level**, analyzes the **impact of vertical mismatch (overeducation) on economic growth** in thirty-eight developing countries. Each chapter is briefly described below:

Chapter 1 examines whether education-job mismatches increase or decrease unemployment duration among graduates in Cambodia. We also investigate what are the factors that influence the unemployment duration when we take into account different types of job (match, vertical mismatch, horizontal mismatch or double mismatches).

Theoretically, the analysis of the mismatches impacts on the unemployment duration does not result in a consensus. Several theories challenge each other:

- The job search theory (Jovanovic, 1979) assumes that job seekers can only access to limited information about the available job opportunities. They must thus spend certain time to find a decent job. Therefore, they face two alternative choices between accepting the first job offer that can be mismatched to their qualification or continuing to find a better suitable job, which is costly in terms of foregone income for staying unemployed and searching costs.

Similarly, in the career mobility theory (Sicherman & Galor, 1990), some job seekers, especially the young persons, may prefer to work in an initially mismatched occupation to learn some specific skills related to the job, necessary for a better career promotion in the future.

Consequently, educational mismatches should decrease unemployment duration based on these two theories.

- In contrast, McCormick (1990) stipulates that accepting a mismatched job can be a stronger negative signal to employers than unemployment regarding a worker's productivity. Thus, individuals may prefer to stay unemployed and wait for a job that matches their qualification. However, as assumed by the

job competition model (Thurow, 1976) that workers are heterogeneous and the job opportunities are limited, it is possible that some workers may fail to find a matched position and stay unemployed for a longer duration. This notably concerns the less competent workers, staying at the end of the labor's queue, who will be the last persons to be assigned to a job (longer unemployment duration) that is also more likely undesirable (higher risks of mismatches) than the job assigned to competent workers at the top of the queue.

Consequently, educational mismatches can also be positively correlated with unemployment duration in this case.

The theoretical uncertainty on the effects of mismatches on the unemployment duration is not resolved by the empirical studies. While Cuesta (2005) and Pollmann-Schult & Büchel (2005) find that vertical mismatch (overeducation) decreases the unemployment duration in Spain and Germany, Rose & Ordine (2010), Barros et al. (2011) and Lin & Hsu (2013) find that overeducation increases the unemployment duration in Italy, France and Taiwan, respectively.

Hence, this first chapter contributes to the literature in three main points:

- First, we extend the research into a developing country, namely Cambodia, that seems to face a serious concern of educational mismatches and unemployment risks among university graduates. For instance, in 2012, the unemployment rate among university graduates was 7.7% against 2.7% of people with only secondary education (NIS, 2012).
- Second, we take into account the endogeneity of educational mismatches and consider them in their both forms and all dimensions: Vertical or horizontal, single or double mismatches.
- Third, we propose an analysis from two angles: 1- A theoretical model linking educational mismatches and unemployment duration, and 2- an empirical model allows testing the theoretical prediction by using the independent-competing risks duration model, applied on a survey data in 2011 from nineteen higher education institutions (HEI) in Cambodia.

The econometric results, by considering the endogeneity of mismatches, highlight that unemployment duration is positively associated with the risks of educational mismatches. This suggests that graduates might prefer to wait for a well 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. The results also underline the factors that can impact the length of unemployment duration: Genre, fields of study, internship, using informal job network, parents' education and graduates' preferences on the various job attributes. However, these determinants affect unemployment duration differently according to the state of issues whether graduates exit unemployment toward a right matched, a vertical mismatched, a horizontal mismatched or a both mismatched job.

Having observed that unemployment duration is not the unique possible output, we propose, for the next chapter, to analyze what is the impact of educational mismatches on earnings.

Chapter 2 examines whether education-job mismatches lower individual wages in Cambodia and if the impact is stronger when graduates suffer both vertical and horizontal mismatches.

From the theoretical point of view, there is a consensus on the negative impact of mismatches on wages. Two theoretical mechanisms explain this impact according to whether graduates work in an inadequate job because of their preferences or due to the lack of job opportunities in the labor market:

- First, workers may prefer a mismatched job to their qualification with lower wages offered, in compensation for other job attributes such as career promotion and perspectives (Sicherman & Galor, 1990) or less job pressures and stress for which they may have stronger preferences (McGuinness & Sloane, 2011).
- Second, workers accept a mismatched job because they do not have other choices as the job opportunities are limited, but working in this unfit job would not allow them to exploit their potential skills, and consequently they would be less productive and earn less than if they were employed in a matched occupation (Thurow, 1976 ; Sattinger, 1993).

Yet, three limits exist in empirical studies. First, there is no consensus even though most research finds a wage penalty as a consequence of working in a mismatched job (see literature reviews of Leuven et al., 2011 and McGuinness et al., 2017). Second, little researches exist on developing countries: The existing studies can refer to Quinn & Rubb (2006), Filiztekin (2011), Herrera-Idárraga et al. (2015), Reis (2017) and Pholphirul (2017) who find wage penalties of educational mismatches in Mexico, Turkey, Columbia, Brazil and Thailand, respectively.¹⁰ Third, the endogeneity of educational mismatches in the combination of their two forms was not yet considered in the literature.

Hence, this chapter contributes to the literature in three main points:

- First, it analyzes another case of developing country that has just recently upgraded from low income status, while the existing studies focus on relatively more advanced economies.
- Second, it analyzes the combination effects of vertical and horizontal mismatches that previous researches in developing countries have not done yet.
- Third, while the majority of researches assume that mismatches are exogenous (Tsai, 2010), we also take into account the selection bias problem by proposing an ordered Heckman model. This regression model is applied on a survey data financed by the World Bank, in which the thesis's author was involved as the team leader in data collection from eight HEI in Cambodia in 2014.

The econometric results allow to conclude that the level of educational mismatches¹¹ depends on individual attributes, study characteristics and the parents' education. Even though controlling for this selectivity process, a wage penalty still persists for graduates who suffer from educational mismatches. This penalty is much stronger when vertical and horizontal mismatches are combined. This result is consistent with the study of Robst (2008) who also finds that a substantial wage penalty exists among graduates who endure the both forms of mismatches in the United States.

¹⁰Only Pholphirul (2017) who also studies the effects of horizontal mismatches, but does not combine the two forms of mismatches (the case of a double mismatch). Other researches only focus on overeducation.

¹¹The level of mismatches is divided in three: Match, single mismatch and double mismatches.

After analyzing the microeconomics impacts of educational mismatches in Cambodia, we propose to study these impacts at a more international and macroeconomics level.

Chapter 3 examines the impacts of overeducation on economics growth in thirty-eight developing countries at both short-term of one year and medium-term of five years.

Two theoretical approaches confront each another:

- The assignment model (Sattinger, 1993) finds that the worker's productivity depends on both the job attributes and individual characteristics. Thus, overeducated workers are more productive than their counterparts in the same job. In addition, the presence of many overeducated workers in the labor market may incite employers to create more high skilled jobs to exploit the human capital of those overeducated persons (Acemoglu, 1999). These consequences can thus positively contribute to economic growth.
- In contrast, Tsang & Levin (1985) stipulate that overeducated workers may be dissatisfied with their jobs, which induces to counterproductive behaviors such as high rates of absenteeism and turnover. Additionally, the lack of pleasure in the job may also deteriorate the workers' mental health (Kornhauser, 1965 ; Artés et al., 2014). Consequently, these problems can limit firm's development and thus it is negative for economic growth.

Only few papers empirically analyze the impacts of overeducation on economic growth and these articles do not result in a consensus. Indeed, while Guironnet & Jaoul-Grammare (2009) find a negative effect of overeducation among graduates on the short-term economic growth in France, Ramos et al. (2012) find a positive impact of overeducation for economic growth at medium-term in nine European countries.¹²

The lack of analysis of educational mismatches at the macroeconomic level may be related to the lack of data on mismatches at the aggregate level. To overcome this difficulty, we create a database by combining micro and macro data. The data from the Integrated Public Use International Microdata Series (IPUMSI) survey were used

¹²Those countries are Austria, France, Greece, Italy, Portugal, Romania, Slovenia, Spain and United Kingdom.

to calculate the overeducation rate by country. Then these data were coupled with macro data from the World Bank.

Hence, this chapter contributes to the literature in three main points:

- First, this chapter contributes in terms of data on the rate of overeducation across several different developing countries.
- Second, thanks to these calculated data, this chapter extends the analysis of the overeducation impacts at macroeconomics level to developing countries.
- Third, this chapter also deals with unobserved heterogeneity and endogeneity of overeducation that have not been fully resolved in the prior literature by employing two-stage least squares regression with country fixed-effects.

The regression findings indicate that overeducation has negative impacts on economic growth at both short and medium terms. This result is more conforming to the "job satisfaction approach" than the "human capital approach", suggesting that the expansion of higher education sector in developing countries may not really provide benefits to the countries if they do not pay attention to the education-job mismatches process.

Key words:

Chapter 1: Vertical and horizontal education-job mismatches, the unemployment duration, the job matching model, the independent competing risks duration model.
JEL codes: I23, J24, J64.

Chapter 2: Vertical and horizontal educational mismatches, wage differentials, the ordered Heckman model.
JEL codes: I23, I26, J24, J31.

Chapter 3: Overeducation, economic growth, two-stage least square and country fixed-effects regressions.
JEL codes: I23, I25, J24.

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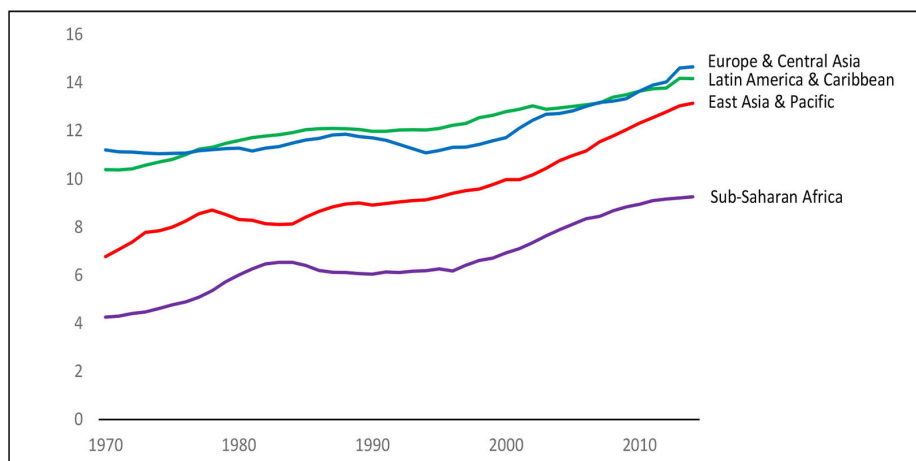
Preliminary Chapter

1 Introduction

The economics literature recognizes the importance of human capital at both individual and macroeconomics levels. At microeconomics level, the human capital theory (Becker, 1964) praises education as an investment in knowledge, which raises individual productivity and thus earnings. At macroeconomics level, the endogenous growth theory (Lucas, 1988) also recommends education for increasing the innovative capacity of a country, which may strongly support the economic growth.

These theoretical predictions on the positive impact of education encourage all countries around the world to promote education in their public policies, which leads to a significant increase in enrollment ratio in all educational levels (Barro & Lee, 2001 ; OECD, 2014) as illustrated by the Figures 1 and 2 below.

Figure 1: School life expectancy* (number of years) in selected regions

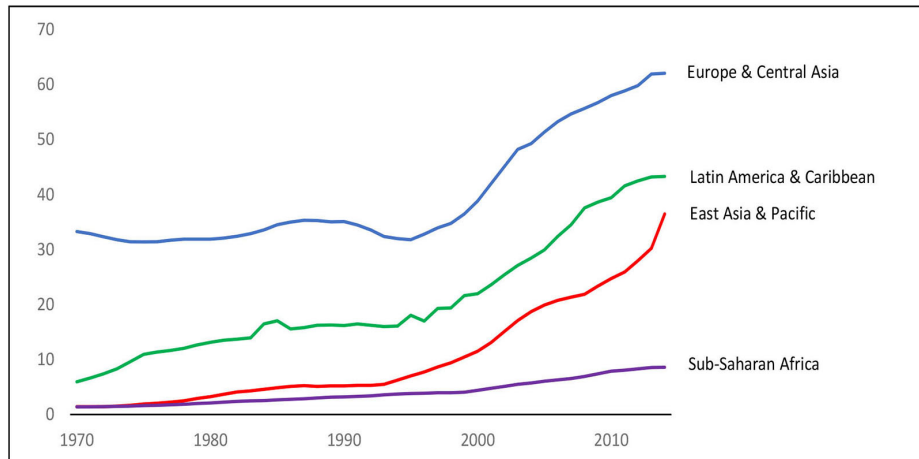


*School life expectancy is the expected average schooling years per person.

Data source: Our World in Data.

Data link: <https://ourworldindata.org/tertiary-education>

Figure 2: Gross enrollment ratio in tertiary education (%) in selected regions

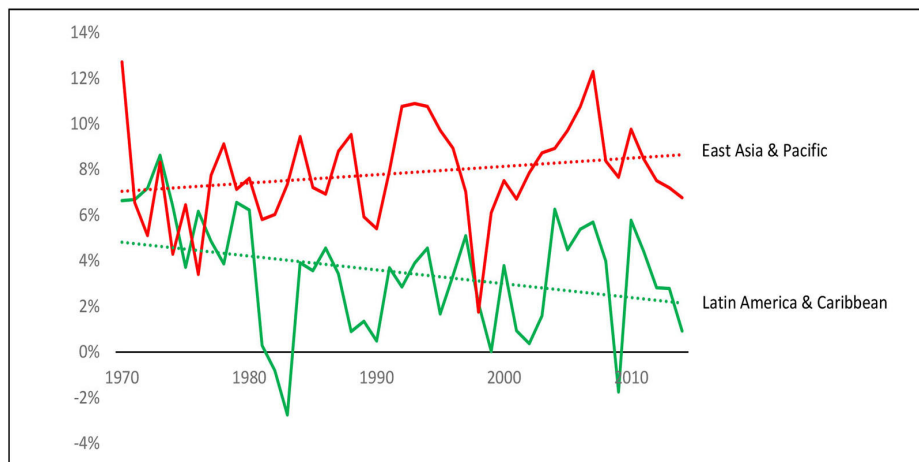


Data source: World Bank's website.

Data link: <https://data.worldbank.org/indicator/SE.TER.ENRR>

Nevertheless, the ambiguity exists in the empirical studies regarding the positive effects of this global rise in education on individual earnings (Tzannatos et al., 2016) and economic improvement (Pritchett, 2006). For instance, the individual rates of return to education considerably differ across the globe: The rates of return to tertiary education only adds 8.9% to individual earnings in the Middle East and North Africa region, a half lower than a world average of 16.8% (Montenegro & Patrinos, 2014). Similarly, despite higher level of school attainments, Latin American economies have known a much slower economic growth and development than the East Asia & Pacific region (Hanushek & Woessmann, 2012) as highlighted in the Figure 3.

Figure 3: GDP growth (annual %) in selected regions



Data source: World Bank's website.

Data link: <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>

The fact that higher level of educational attainments do not necessarily lead to higher economic growth as predicted by the theoretical perspectives, shifts researchers' attention to the issues of schooling quality.

To take into account the quality issues of education, international agencies such as the UNESCO¹³ and World Bank, have developed measures of quality, for instance, the pupils to teacher ratio, percent of trained teachers and government expenditure on education as percent of GDP¹⁴. However, these measures still look incomplete to measure the human capital development and thus insufficient to explain the gap of economic outcome between countries (Hanushek, 2013). Cognitive skills based on the Program for International Student Assessment (PISA) and other standardized tests are found to provide a better picture on the role of education in earnings and economic growth, but not fully enough (Vessman & Hanushek, 2007).

In fact, without consideration on other factors, especially on **how education acquired through schooling match labor market's demand**, education may not have the desired impact on economic outcomes. For example, if many university graduates are employed in jobs that do not require tertiary education or that are outside their fields of education, a portion of their schooling could be wasted and have less impacts on the economy and society. Therefore, to better understand the role of education in promoting economic development, educational mismatches emerge as an indicator that should be taken into account carefully.

What is educational mismatch?

Educational mismatch is a concept that focuses on the interaction between the supply of graduates from the education system and the demand for educated workers in the labor market (Eurostat, 2016).

By definition, educational mismatches refer to a situation in which the workers' education does not match what is required by their job (Quintini, 2011a). Two types of educational mismatches exist: 1- A mismatch between the educational levels, called **vertical mismatch** and 2- A mismatch between the fields of study, called **horizontal mismatch**.

¹³UNESCO: United Nations Educational, Scientific and Cultural Organization.

¹⁴GDP: Gross Domestic Product.

The starting point in the academic literature on education-job mismatches can refer to the analysis by Freeman (1976) in his book 'The Overeducated Americans', which examines the decreased wage returns of college graduates in the United States (Quintini, 2011a). Freeman (1976) links these falling rates to an excessive supply of graduates, generating a phenomenon called **overeducation** (vertical mismatch¹⁵).

Overeducation is defined as an excess of education, beyond the level needed to perform a certain job (Rumberger, 1981 ; Tsang & Levin, 1985 ; Hartog, 2000), and the research on this mismatch has mushroomed in the United States and other developed countries since the late of 1980s (Farooq, 2011).

Two decades later after the concerns of Freeman (1976) on overeducation, the concept of educational mismatches has been broadened to include **horizontal mismatches**, firstly coined by Witte & Kalleberg (1995) when they study the match between vocational education and employment in Germany.

Horizontal mismatches imply that people's occupations do not match their fields of education. Compared to overeducation, the horizontal mismatch is still, however, recent in the literature because researchers have just paid much attention on this mismatch in the last ten years since the publication of Robst (2007a) on the mismatches between college major and occupations among graduates in the United States (Domadenik et al., 2013).

Since the development of academic literature on educational mismatches, **three challenges** are encountered and needed to be resolved:

- (1) First, how to measure educational mismatches at the individual and aggregated levels?
- (2) Second, what are the factors to explain educational mismatches at both levels?
- (3) Third, what are the impacts of educational mismatches at microeconomics and also macroeconomics levels?

Concerning these challenges, the literature has already shed lights, but no consensus has been reached to settle the debates that still exist on these three questions.

¹⁵Vertical mismatch may also refer to undereducation, but in this thesis, we only focus on overeducation for this type of mismatch.

2 Literature review

With respect to the existing literature, the vast majority of studies focus on the determinants and impacts of overeducation at individual level (McGuinness et al., 2017). Nevertheless, the surplus education may also be related to the horizontal mismatch. In addition, mismatches can also exist at macroeconomics level.

Thus, in this literature review, we will discuss about **measures** of vertical and horizontal mismatches (section 2.1), followed by their **determinants** (section 2.2) and **impacts** (section 2.3) at both individual and macroeconomics levels.

2.1 Measures of educational mismatches

Obtaining consistent estimates of the incidence of educational mismatches is necessary for being able to examine their determinants and impacts as well as for informing policy makers on how to deal with the mismatches problem. Nevertheless, this is difficult for a number of reasons.

The main difficulty is the fact that mismatches, in particular the **required schooling** for a job, can be determined from **different angles** (McGuinness et al., 2017). For instance, a graduate who works in a managerial position may perceive he is overeducated if he feels that his occupation does not require his tertiary qualification, while from a normative angle, he would be classified as a matched worker within this job position.

Consequently, various approaches exist to measure educational mismatches, yet results are often **poorly correlated** and substantially vary depending on the measure used (McGuinness et al., 2017). This problem draws attention of the literature to discuss about the **advantages** and **disadvantages** of each measure.

2.1.1 Measures of vertical mismatch at microeconomics level

Three popular alternative approaches are used to measure vertical mismatches at the individual level: **Worker self-assessment**, **job analysis** and **realized match** (McGuinness, 2006 ; Sala et al., 2011).

- (i) In the **worker self-assessment method (WSA)**, workers are asked to specify the education required for the job. If an individual education acquired is above what is required, he is defined as overeducated (McGuinness & Pouliakas, 2017). Because vertical mismatch is defined by each employee's opinion, this method is known as **a subjective measure**.

The main advantage of this method is the explicit specification of the tasks and the level of schooling required from each worker (Sala et al., 2011). This measure presents, however, several drawbacks. First, workers in less structured organizations may not have a good insight about the required level, especially when the requirements of the job have changed over time and the employee hired before the change is not affected by such a change (Cohn & Khan, 1995). Second, workers may inflate the status of their position (Sloane, 2003). Third, respondents may also apply different criteria for job requirements: The actual level of education required to do the job or the formal educational requirements necessary to get the job (McGuinness, 2006). Fourth, a worker's impression on his education-job matching might be also impacted by comparing himself to other workers in similar jobs, which may introduce a bias perception (Maltarich et al., 2011).

- (ii) **The job analysis (JA)** measure, known as **a normative approach**, is a systematic evaluation on the required education for specific job titles (Sala et al., 2011). Indeed, it identifies vertical mismatches by using the International Standard Classification of Occupations (ISCO), which categorizes the major occupational groups by level of education in accordance with the International Standard Classification of Education (ISCED) (McGuinness et al., 2017). For instance, jobs in the "legislators, senior officials and managers" category are presumed to require a tertiary qualification, while jobs in the "clerical support workers" do not require. Consequently, tertiary graduates who are employed in this latter position are defined as overeducated.

The main advantage of using this method compared to the WSA is that the JA is **conceptually objective**, which avoids the subjective bias due to the different perceptions of people when asking about the match of their education-

occupation. Nevertheless, having 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 (McGuinness, 2006).

- (iii) The third approach, namely the **realized match (RM)**, estimates the overeducation status by two variables: Years of schooling and occupational group of a job holder. The distribution of education is calculated for each occupation. Employees with years of education above the mean by more than one standard deviation are classified as overeducated workers. Another approach differs from the first one in that it uses the mode of level of schooling instead of the mean. Workers with educational levels above the group modal value are considered as overeducated (Cohn & Khan, 1995 ; Kiker et al., 1997). This method is called **statistical approach** since it uses the statistics mean or mode of years or level of education, calculated from the peers working in the same occupation, as the required schooling (Flisi et al., 2017).

Compared to other methods, this approach is **inferior** and only used when there is no data to conduct the WSA or JA measures (Leuven et al., 2011). Indeed, one main drawback of the statistical method is related to the fact that if there is an excess supply of graduates in a given occupation, it will underestimate the level of overeducation and will overestimate in case of excess demand (de Oliveira et al., 2000). For example, if a particular occupation contains a high proportion of overeducated workers (suppose that many tertiary graduates work as street vendors), this will raise the occupational average number of years of education and corresponding cut-off point of required educational years for that occupation, thus likely underestimating the true level of overeducation (McGuinness, 2006).

2.1.2 Measures of horizontal mismatch at microeconomics level

Relative to the vertical mismatch, there are much fewer published studies of the horizontal mismatch (McGuinness et al., 2017), and based on the survey of Somers et al. (2018), only two alternatives measures are mainly used in the literature: **The worker self-assessment** and **job analysis** methods. These measures possess the same advantages and disadvantages as mentioned above:

- (i) In the **WSA**, employees are asked to assess the degree to which their current job is related to the study field of their highest qualification (McGuinness et al., 2017). For example: 'Thinking about the relationship between your work and your education, to what extent is your work related to your doctoral degree? Was it closely related (match), somewhat related (partly mismatch), or not related (fully mismatch)?' (Robst, 2007a ; Robst, 2007b).
- (ii) The **JA method**, on the other hand, determines the educational requirements for an occupation by assigning occupational codes to educational fields (Somers et al., 2018). For example, Wolbers (2003) uses the International Standard Classification of Occupations (ISCO-88 with 3 digits code) to assign different occupations to a field of study. Accordingly, a discrepancy between the skills obtained from a particular field of education and what needed in a job is defined as horizontal mismatch.

2.1.3 Measures of vertical and horizontal mismatches at macroeconomics level

In contrast to a lively discussion about the measures of educational mismatches at microeconomics level, less attention has been paid to macroeconomics level, perhaps due to a lack of data for analysis at the aggregated level in most countries.

Two main approaches are used in the literature (Sala et al., 2011):

- (i) First, in the **Manpower Requirements Approach (MRA)**, they estimate the demand and supply of educated manpower in different levels and fields of education, then they balance that supply and demand to draw the incidence of mismatches (Dougherty, 1985).

For instance, the aggregated labor demand can be approximated by the available job openings in the economy (both new jobs and replacement ones) for different sectors and occupations, reflecting the needs of diverse skills and education in the labor market (Pouliakas et al., 2012). On the other side, the size of labor force with different educational backgrounds can be used as a proxy for the aggregated labor supply (Pouliakas et al., 2012). The discrepancies between

the labor needs of the economy and the available supply of manpower generate aggregated mismatches.

Nevertheless, by simply matching the overall demand and supply, this mismatch indicator does not consider whether each worker is really in a job that matches or does not match his education (European Commission, 2015). Thus, the absence of mismatches at the aggregated level does not imply that mismatches do not arise at the individual level (Sattinger et al., 2012).

- (ii) Another main approach, called **the Rate of Return (RoR)**, calculates the increase in net income that an individual will be able to command throughout his life compared with the income he would have received if he had not reached a given educational program (ILO, 1984). Thus, the rate of returns can be estimated for each educational program. The programs that show positive or high net returns should be promoted, while those showing low net present value, perhaps indicating a surplus of graduates, should be reduced (Sala et al., 2011).

For example, the decreasing wage returns for cohorts of university graduates in Ireland between 1994 and 2001 (McGuinness et al., 2009) may indicate a faster rising in the supply of higher-educated labor than demand during that period, reflecting a possible mismatch problem (Pouliakas et al., 2012).

However, a weakness of this mismatch indicator includes the fact that wage is also a function of other several factors apart from the imbalance between supply and demand (Sattinger et al., 2012).

It seems that mismatches at macroeconomic level is a very different concept to mismatches at microeconomic level, and the interpretation of the macroeconomic measures should be therefore cautious (McGuinness et al., 2017).

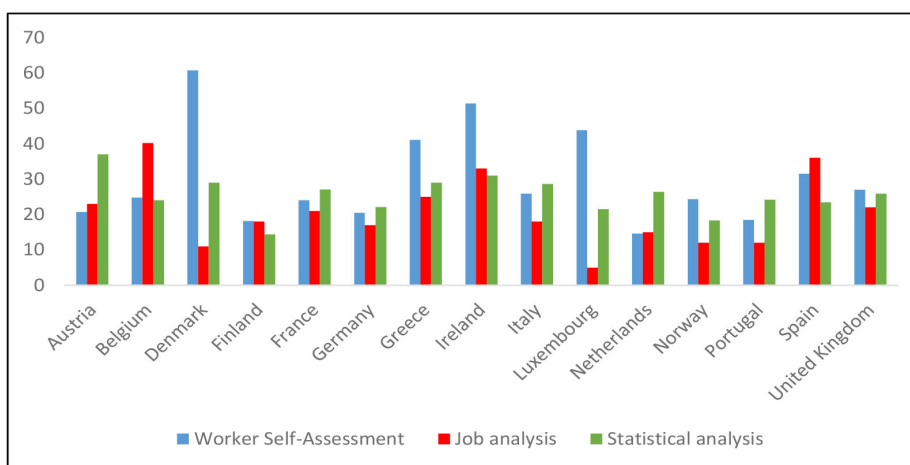
2.1.4 Incidence and some evolution of educational mismatches

Concerns linked to the incidence of mismatches lie in the fact that **different measures** generally yield important **different incidences**, making researchers and policy makers hard to interpret the results and address the problem (Barone & Ortiz, 2011 ; Flisi et al., 2017).

For example, McGoldrick & Robst (1996) find 50% of male workers in the the United States are overeducated under the normative approach, 30% under the subjective measure and just 16% under the statistical terms.

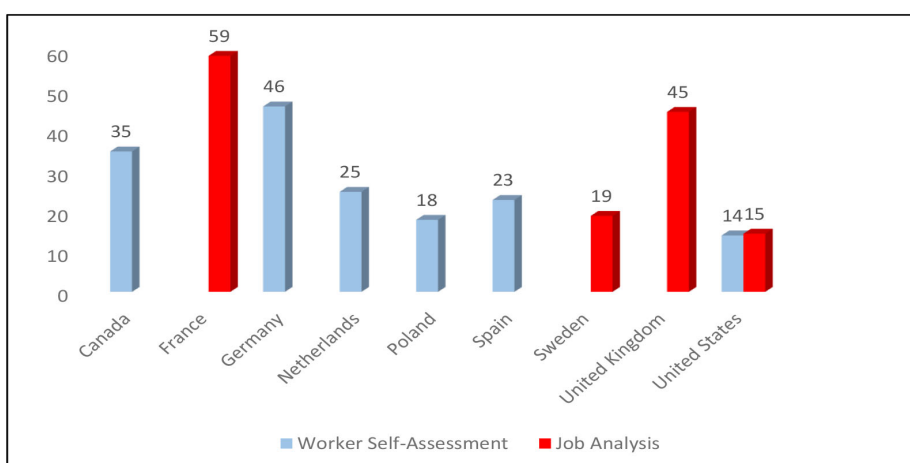
The incidence of horizontal mismatch also varies considerably. Somers et al. (2018) conduct a literature survey on papers published between 1995 and 2015 and find that the overall average prevalence of workers with fully horizontal mismatches are estimated to be 23% and 35% for subjective and objective measures, respectively.

Figure 4: Average incidence of overeducation (%) in selected developed countries



Source: Author's graphic based on data in Table 2 of McGuinness et al. (2017).
 Note: These results are calculated based on papers published between 2006 and 2016.

Figure 5: Average incidence of horizontal mismatches (%) in selected developed countries



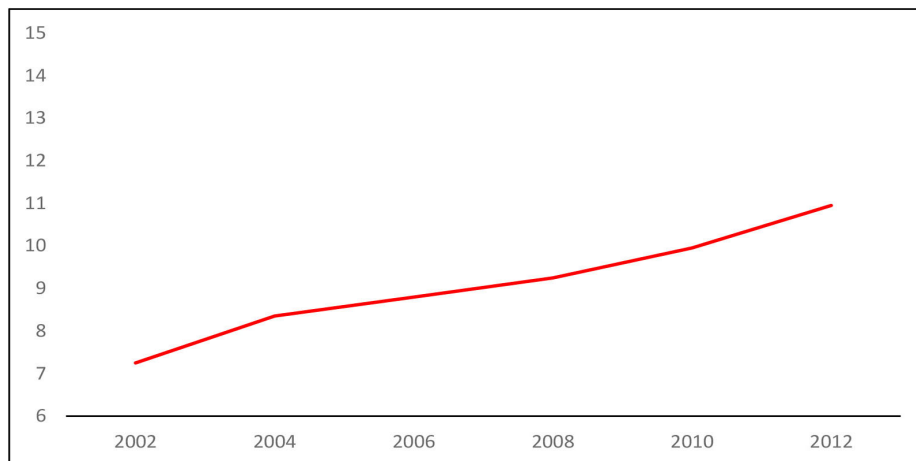
Source: Author's graphic based on data in Table 2 of Somers et al. (2018).
 Note: These results are calculated based on papers published between 1995 and 2015.

Looking at the **evolution**, the incidence of educational mismatches seem to **increase** over time, between 2002 and 2012, for several countries in Europe if we

rely on the job analysis measure. Nevertheless, it is more stable according to the mean-based method.¹⁶

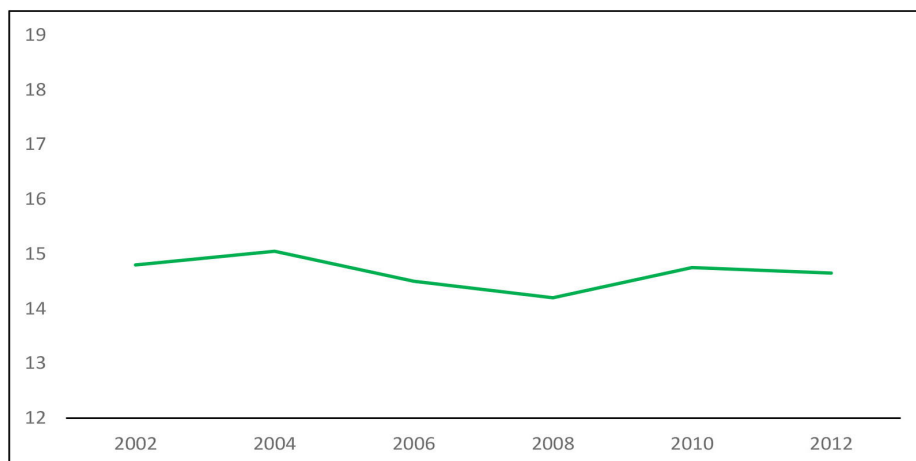
This increasing rate attracts attention in advanced economies to the **quality of education** and emphasizes a necessity to examine the **responsiveness of education system** to labor market's needs (Pouliakas et al., 2012 ; ILO, 2014).

Figure 6: Evolution of average overeducation rate (%) in European countries (job analysis measure)



Source: (ILO, 2014).

Figure 7: Evolution of average overeducation rate (%) in European countries (statistical analysis measure)



Source: (ILO, 2014).

Beyond the question on how to measure educational mismatches, the literature also endeavors to evaluate their determinants.

¹⁶Note: The figure shows unweighted averages based on data from the following countries: Belgium, Denmark, Finland, Germany, Hungary, the Netherlands, Norway, Poland, Slovenia, Spain, Sweden and the United Kingdom (ILO, 2014).

2.2 Determinants of educational mismatches

The determinants of education-job mismatches can be divided in two levels: Individual and aggregated levels.

2.2.1 Determinants at microeconomics level

The theoretical background for the relation between education and occupation can be started with the **human capital theory** of Becker (1964) who is the first to analyze how individuals decide to invest in education.

Becker (1964) develops, within the classical framework, a model in which he considers education as an individual investment, allowing to increase the global stock of knowledge, called human capital. In this model, each individual faces a trade-off between costs and benefits generated by the investment on education beyond the compulsory schooling level. His decision to determine the duration of his educational investment is guided by the rationality assumption in a market characterized by **pure and perfect competition**.

This implies that there is no rigidity in the labor market, **neither shortages or surplus** of workers in different training fields, and firms will always adapt their production process to fully utilize the skills of their workers. As a result, from a strict point of view of this model, **educational mismatches do not exist**.

How can educational mismatches exist?

Educational mismatches exist only when we go beyond the classical analysis framework by rejecting certain hypotheses of the pure and perfect competitive market such as: **1- Perfect information** and **2- Homogeneity of economic agents**.

(i) **Imperfect information**

Due to the informational deficits in the labor market, it is possible that education-job mismatches exist at a certain moment. Two theories are in line with this concept:

- In the **job search theory** (Jovanovic, 1979), labor market is assumed to face search friction problems, thus, job-seekers need to spend time and money to search for a job that corresponds to their education. Hence, they

confront a trade-off between accepting a mismatched job or continuing the job search to find a better suitable job. In response to this, they determine a **reservation wage** and accept the first job offer with wage equaling or exceeding the reservation wage. Thus, unemployed workers who have **low reservation wages**, would tend to accept the first job offer, and consequently they are **more likely to be mismatched**.

- Similarly, in the **career mobility theory** (Sicherman & Galor, 1990), due to the asymmetry of information, it may take time for employers to learn about a worker's productivity. Hence, some workers, particularly young persons, are likely to be proposed and accept an **initially mismatched position**, but this enables them to achieve a **rapid career progression** later.

Alternatively to the career mobility theory, other authors hypothesize that mismatch may be a consequence of **individual preferences** for other job attributes, besides career perspective, such as job security, flexible working time and other working conditions (McGuinness & Sloane, 2011).

(ii) **Heterogeneity of agents**

By also assuming that workers and job structures are **heterogeneous**, mismatches exist because the assignment process is too complex in matching the heterogeneous workers to corresponding jobs. Three theories illustrate this point of view:

- In the **signaling theory** (Spence, 1973), educational attainments can be correlated with individual unobservable characteristics such as the capacity and willingness to acquire new skills. Consequently, education can be used as a **signal** to identify more able and motivated individuals to employers. In order to acquire more of the signal to distinguish themselves from others, individuals are incited to invest more in education even though the human capital acquired is **not fully utilized** in the jobs.
- As part of this signaling framework, the **job competition model** proposed by Thurow (1976) describes the allocation of job seekers to vacant jobs as a **double queuing process**. The first queue is formed by jobs ranked

from those requiring the highest qualification to the least demanding. The second queue is formed by workers, and the relative position of a worker in the queue depends on the level of educational attainment. Therefore, to reach the top of the queue that is necessary to be assigned to the best job available in the market, individuals will invest more in education hoping that an additional amount of education will enhance their chance of getting a good job relative to others. Therefore, **mismatches** probably exist as the skill requirements of the assigned position may not fit well those acquired by workers.

- The **assignment theory** (Sattinger, 1993) also assumes that there is an allocation problem in assigning **heterogeneous** workers to jobs. Nevertheless, the job allocation process is not simply a lottery as suggested by the job competition model (Thurow, 1976) because workers may choose particular jobs over others based on their utility maximization function. Anyways, this model reaches the same conclusion regarding the mismatch problem: The job structure is complex and less likely responsive to adapt the change in relative supplies of educated labor, and as a result, **mismatches** are expected to exist.

Based on those theoretical models, it is possible for **empirical studies** to identify factors that are likely to increase or decrease the risks of mismatches.

In his analysis of mismatches among graduates in the United States, Robst (2007b) classifies the reasons for accepting a mismatched job in two categories: Supply related and demand related factors.

(i) **Supply side related factors**

Following the job search and career mobility theories, factors that improve the **job search information** or variables related to **individual constraints and preferences** should affect the probability of being mismatched (McGuinness & Pouliakas, 2017).

For instance, job search methods could influence the occurrence of mismatches. Indeed, using universities' career offices as a job search channel can reduce the

probability of vertical mismatch among Australian graduates, thanks to the career information and orientation services (Carroll & Tani, 2015). In contrast, using an informal job search network increases the risk of being mismatched in Italy (Meliciani & Radicchia, 2016). The authors argue that using the family and friends limits the extent of job search, thus reducing spatial flexibility to find a better job. Then, living with a couple may also constraint the job search because the choice of job location can be limited by the decision or the labor market prospects of another member in the couple, making married people more likely to be mismatched (Frank, 1978 ; Morano, 2014). Next, in developed countries, workers' ages are found to be negatively correlated with the probability of being mismatched, suggesting that young workers face higher risks of mismatches (Morano, 2014 ; Kupets, 2015). Hence, this seems to confirm the career mobility theory in which it might be strategic for young workers to accept a mismatched position before moving later into a better job.

Individual preferences also influence the likelihood of being mismatched. Indeed, in the study of Robst (2007b) on the relation between college majors and job mismatch among graduates in the United States, there exist individuals who prefer a job that does not match their fields of education. Their justifications are owing to family related reasons such as on-site child care or their preferences on other job attributes such as job location, change in career interest, career promotion and other working conditions.

(ii) **Demand side related factors**

The job competition and assignment theories stress the demand side regarding the **job opportunities** as potential factors to explain educational mismatches (McGuinness & Pouliakas, 2017). **Labor market discrimination** may also play a role due to the heterogeneity of workers (Quintini, 2011a).

For instance, in the analysis of Robst (2007b) mentioned earlier, some graduates also accept a mismatched occupation by cause of being unable to find a job in their fields. Then, there is evidence suggesting that mismatch is more prevalent among graduates of social sciences, arts and humanities due to a possible lack of demand for graduates in those majors (Ortiz & Kucel, 2008).

Next, employers may rank workers based on their study grade as a signal of their ability. Indeed, studies that include variables as proxies for individual ability, such as study scores or graduating from a famous university, find a negative correlation between these variables with vertical mismatches (Allen & Van der Velden, 2001 ; Green & McIntosh, 2007 ; Chevalier & Lindley, 2009). Female and ethnic minority workers also confront higher risks of mismatches (Morano, 2014) that might be the result of labor market discrimination, viewing them as less productive (Altonji & Blank, 1999). Alternatively, it is also possible that women are likely to be mismatched because their job choices are constrained by their husband's labor market prospects (Frank, 1978), and ethnic minority workers are exposed to mismatches by reason of the lack of proficiency in the country's language (Battu & Sloane, 2004).

2.2.2 Determinants at macroeconomics level

Despite various models exist to explain why educational mismatches occur at microeconomics level, less attention has been paid to analyze whether overall macroeconomics conditions influence the occurrence of mismatches (Morano, 2014).

For instance, the **labor market tightness** during the economic recession, the **skill-bias technical change** and the **economic structural change**, can perhaps affect the risks of education-job mismatches in an economy. Three theoretical models illustrate these concepts:

- Pissarides (1994) develops, in line with the job search theory, a **matching model** by taking firms into consideration in the search process. He views a labor market where workers and jobs are **heterogeneous** in quality and where many attributes of one are not easily observable to the other, caused by the **asymmetric information**. Therefore, a period of search is required by both employees and employers before job offers are made and accepted.

Thus, **education-job matching** is a result of simultaneous interaction between individuals and firms in their process of looking for job-worker matches. This matching process depends on the **labor market tightness** defined as the ratio of job vacancies to job seekers, and also the efficiency of the search processes in the economy. Consequently, during the negative labor market conditions,

which provokes a restrict number of job opportunities and thus a **high level of unemployment rates**, employers may increase the skills requirements and workers may be also incited to rather accept a job that does not match their education than to stay unemployed.

- Acemoglu (1999) builds upon the job matching model by also assuming that the labor market is characterized by search frictions and the interaction between employers and employees. However, his approach differs by assuming that the **heterogeneity** of firms is **not exogenous** but is derived from their investment decisions. Indeed, he supposes that firms have to choose what type of job to open before finding a worker, and this decision depends on the **skill composition** of the labor force.

When the supply of skills is limited, it is not profitable to create high skilled jobs because it is difficult and costly to find skilled workers. As a result, the economy is in a pooling equilibrium where firms create only a single type of job, called "**middling**" jobs, for both skilled and unskilled workers. Thus, skilled workers are **overeducated**. Starting from this pooling equilibrium, an increase in the proportion of skilled workers beyond a **critical threshold**, will encourage firms to upgrade their technologies and create **high skilled jobs**, leading to a separating equilibrium. In other words, an increase in the supply of skills creates its own demand or even more, reducing thus the **mismatch** incidence.

- The existence of educational mismatches in the economy can be also linked to the "**creative destruction**" process of Schumpeter (2010 [1942]). This process consists of revolutionizing the economic structure from incessantly destroying the old one to incessantly creating a new one. This economic progress is not gradual and peaceful, but rather disjointed and sometimes unpleasant.

Thus, whenever there is a disruption of an existing industry, it is likely that workers who were trained to work in this industry would lose the jobs because the rapid **structural change** may obsolete their human capital formation acquired in the past. These people have to move to a new sector and face high risks of finding new jobs that are **mismatched** to their previous training.

Some **empirical studies** are conducted to test those theoretical predictions on the relation between mismatches and certain **macroeconomics variables**.

- For example, Groot & Van Den Brink (2000), in a meta-analysis, find evidence of a relationship between overeducation and the rate of labor force growth. Their argument is that a rapid growth of labor force may increase the **labor market tightness** mentioned by Pissarides (1994), which makes workers have to accept a job for which they are overeducated. Then, the findings of Quintini (2011b) on a panel of European countries show that workers losing their job during a recession face a higher probability of being overeducated in their subsequent employment. Similarly, Croce & Ghignoni (2012), Verhaest & Van der Velden (2012) and Hagedorn & Manovskii (2013) who find that people graduated during the period of economic decline are more likely to be mismatched because the **labor market is tighter**.

Next, the results from Italy (Morano, 2014), show that the likelihood of being overeducated significantly differs across economic sectors because some sectors, for example the agriculture, relatively possess little skilled jobs. Verhaest & Van der Velden (2012) and Davia et al. (2017), using aggregated data from several countries in Europe, also find that major factors to explain cross-country differences are the relative oversupply of educated labor to professional level jobs and the imbalance between the demanded and supplied fields of study, making graduates in some fields hard to find a job.

- Acemoglu (1999) finds that an increase in the **proportion of skilled workers** creates a qualitative change in the composition of jobs by increasing the demand for skills, reducing thus the incidence of vertical mismatches in the United States in the early 1980s. In accordance to this ideas as well, Di Pietro (2002), in a pooled cross-national analysis of aggregate data in eleven European countries, finds that firing restrictions prevent firms from immediately taking advantage of upward changes in skilled workforce availability and hence discourage firms from creating new high skilled jobs. As a result, the mismatches are found to be more prevalent in countries with strict regulations (Di Pietro, 2002). In contrast, Davia et al. (2017) find that countries with stronger employment protection

legislation are characterized by lower levels of overeducation. They explain this finding by the fact that employers may take greater care in achieving good matches at recruitment because of higher costs of separation.

- Restrepo (2015) demonstrates that the **structural economic change** that leads to a decline in routine-cognitive jobs outside manufacturing since the late 1990s, creates a skill mismatch observed in the United States, from 2007 to 2013, during the Great Recession and its recovery. Kupets (2015) finds the same reasoning for transition economies such as Armenia, Georgia, Macedonia and Ukraine where rapid structural changes make obsolete the qualifications of the workers who were graduated under the communist economic and political systems, making them more prone to be mismatched.

With the presence of education-job mismatch problems, the impact of education on economic outcomes seems to be doubtful, perhaps less positive than it should have been. The next section will focus on the impacts of mismatches.

2.3 Impacts of educational mismatches

A growing literature has provided answers to the question on the impacts of education-job mismatches, but mostly at microeconomics level. Furthermore, while several researches find negative consequences, a common consent is not reached, in particular at macroeconomics level.

2.3.1 Impacts at microeconomics level

Several outputs can be affected by education-job mismatches. For instance, at a given point in time, **individual wages**, **job satisfaction** and **unemployment duration** are found to be influenced by educational mismatches. Some researches are also conducted to analyze the dynamic case in the context of **career mobility**.

The impacts on **wages**, and to a lesser extent the **job satisfaction**, attract the most attention from the literature to analyze the mechanism why educational mismatches may decrease individual returns to education and lower the job satisfaction.

The starting point to analyze the relation between education and earnings can refer again to the standard **human capital model** (Becker, 1964) described before. In this model, firms recognize education as an indicator of productivity, and workers are always paid at their **marginal productivity**. Thus, worker's earnings depend on the **education acquired**, and each gap observed in wage is owing to each gap in education endowment. Yet, the reality is far from this classical framework analysis as mentioned by other theories cited above. Hence, education-job mismatches exist and may have impacts on wages and job satisfaction:

(i) **Impacts of mismatches due to individual choices**

Due to the **asymmetric information**, employers cannot observe an educated worker's performance. As a result, the worker can be proposed for a position that does not match well his education acquired, and with a **lower wage offered** (Sicherman & Galor, 1990). This proposal is, however, compensated by higher probabilities of occupational upgrading, especially after they acquire specific job-related skills through on-the-job training. Thus, a part of returns to education of mismatched workers, is in the form of **training** provided by employers and **better career promotions** in the future.

Alternatively, it is argued that, besides career progression, certain workers may prefer a job requiring a lower educational level and **paying them less** because it is compensated by other job attributes, such as **less pressure**, for which they may have a stronger preference (McGuinness & Sloane, 2011).

From the perspective of these concepts, education-job mismatches are a **choice of workers**. Consequently, the mismatch problem should not negatively affect the **individual job satisfaction**.

(ii) **Impacts of mismatches due to the lack of high skilled jobs**

Due to the existence of **heterogeneity** between workers, each individual may try to invest more in education to distinguish or signal their higher productivity relative to others, leading to a situation where the education acquired can be beyond the education required for a given job (Spence, 1973). Then, with the assumption that the **output** of a job solely depends on the **education required** for performing the job (Thurow, 1976), the surplus of acquired education is not

rewarded. Consequently, mismatched workers would earn less than if they were in a matched occupation in which they could use all their potential qualifications.

With the same assumption of **heterogeneous** workers but the **output** of a job depends on both the **education acquired** and those **required** in the job, Sattinger (1993) suggests that overeducated workers are more productive and earn more than matched workers in the same job thanks to their more years of education acquired, yet they are less productive and earn less than workers of the same education who work in a matched occupation due to the **job ceiling productivity** that limits them to fully exploit their qualifications.

Because mismatches are caused by **labor market's demand**, thus not only earnings that are predicted to be lower, but also the **job satisfaction** that might be positive correlated with wages in such circumstances (Robst, 2008). Furthermore, from the sociological perspective, educational mismatches could adversely affect individual 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).

Besides wages and job satisfaction, the consequences of educational mismatches on **unemployment duration** and **career mobility** of mismatched workers also draw attention from the literature, yet two concepts differ:

- Owing to the fact that job-seekers only have access to **imperfect information** about the available job opportunities, workers face a trade-off between quitting unemployment as soon as possible even though the job is mismatched to their qualification or continuing to find a better matched job (Jovanovic, 1979).

Similarly, working in a mismatched job can be supposed as an investment in specific skills related to the job, and thus some workers, especially young persons, may possess a **strategic behavior** by selecting a mismatched job than spending more time to look for a matched job (Sicherman & Galor, 1990).

Within these points of view, working in a mismatched job can be result in **shorter unemployment duration**. In addition, these theoretical mechanisms also predict that mismatched workers will have higher probabilities of **upward**

career mobility. Indeed, through **repeated job search** and/or after after acquiring necessary specific skills, mismatched workers would be promoted to a matched position within or across firms. Thus, educational mismatches are just a **temporary** phenomenon.

- In contrast, McCormick (1990) stipulates that accepting a mismatched job is a stronger negative signal to employers than unemployment regarding a worker's productivity. Thus, individuals may prefer to stay unemployed and wait for a job that matches their qualification. Nevertheless, as a result of heterogeneous workers and the complexity of job structure with **limited job opportunities** (Thurow, 1976 ; Sattinger, 1993), there is no promise that workers will finally end up in a matched position.

Thus, education-job mismatches and unemployment duration might be also **positively related**, especially for the less competent workers. Furthermore, those mismatched workers are also more likely to be stuck in such jobs for a long time without any upward mobility, and thus, educational mismatch is rather a **persistent** problem.

The same conclusion but with an alternative explanation that is not serious: If workers prefer a mismatched job to compensate for other job attributes, there is no reason to observe an upward mobility for those workers.

Regarding the **empirical researches** on the impacts of educational mismatches, the majority of studies focuses on the impacts of overeducation on the wage effects.

Across literature, we can classify the impact of vertical mismatch on earnings in two groups. The first group supposes that education-job mismatches are an **exogenous** phenomenon, but this seems to be not true providing that individuals who work in mismatched jobs may have chosen those jobs based on characteristics, as we have identified in the **section 2.2**, that may also influence wages. Hence, the second group analyzes the impacts on earnings by taking into account the **endogeneity** of education-job mismatches:

(i) **Education-job mismatch is exogenous**

Duncan & Hoffman (1981) is the first to empirically investigate the effect of vertical mismatches on earnings in the United States by extending the **Mincerian wage equation** (Mincer, 1974)¹⁷ to include years of Over-, Required and Under- education, called **ORU specification**. Later, instead of using ORU, Verdugo & Verdugo (1989) employ **dummy variables** for being overeducated and undereducated in linear regressions.

Across literature, under the ORU specification, overeducation years return is positive but lower than required years of education, with the estimated coefficient on years of surplus education is generally found to be nearly a half of the coefficient on required years of education (Leuven et al., 2011). This signifies that overeducated individuals gain less than people with the same education and possess a matched job, yet earn more than their colleagues in the same job but not overeducated (Leuven et al., 2011). This evidence on the returns to overeducation is consistent with the assignment model where wages are determined by both workers and job characteristics (Sattinger, 1993). Under the dummy variable approach, overeducated workers also earn less than workers who have the same level of education but are adequately matched (Quintini, 2011a). The penalty associated with being overeducated is estimated to lie within a range of 8% to 27% with a mean penalty of 15.3% (McGuinness, 2006).

(ii) **Education-job mismatch is endogenous**

Since the early of 2000s, several articles have started to be aware of possible **bias estimation** by the reason of **endogenous status** of education-job mismatches. Consequently, several studies such as Dolton & Vignoles (2000) ; Bauer (2002) ; Dolton & Silles (2008) ; Lindley & McIntosh (2009) ; Korpi & Tählin (2009) ; Tsai (2010) have applied fixed effects and instrumental variable techniques to address the endogeneity problem. Another approach, called the propensity score matching, is also employed by McGuinness (2008).

Taking into account the endogenous issue of overeducation makes the findings **mixed**: Even though several results still report negative effects on earnings by

¹⁷The Mincer earnings function is a single equation model that explains wage income as a function of schooling and experience.

being overeducated, some papers such as Bauer (2002) and Tsai (2010) find that the wage penalty becomes smaller or disappears. Indeed, using a German panel data, Bauer (2002) finds a wage penalty for overeducated workers drops from 10.6%, when using Ordinary Least Square regression, to only 1.7% when he accounts for time-constant individual characteristics, while Tsai (2010) does not find a wage penalty when he employs the fixed-effects regression applied on a panel data concerning the United States. He argues that the observed wages difference between overeducated and well-matched workers is rather owing to **individual unobserved heterogeneity** such as poor innate ability.

Beyond wage penalties, several empirical studies also devote attention to the effects on **job satisfaction**, and again a consensus is not reached:

- First, Tsang (1987) analyzes the impacts of overeducation on job satisfaction among the Bell employees in the United States, and finds one additional year of overeducation leads to a drop of 0.116 in the level of job satisfaction that has a mean of 3.52.¹⁸ Next, Battu et al. (1999) for the United Kingdom, Verhofstadt et al. (2003) and Verhaest & Omeij (2006) for the Belgium, Fleming & Kler (2008) for the Australia, and Peiró et al. (2010) for the Spain case, all find that overeducated workers are less satisfied with their job than well-matched workers with the same qualification. More recently, Diem (2015) and Congregado et al. (2016) also discover the negative effects of overeducation on job satisfaction in Swiss and several European countries, respectively.

Furthermore, some researches find that overeducated workers are less satisfied than well-matched workers in the same job as well. For example, by using an ordered logit model, Verhaest & Omeij (2006) find a negative effect of being overeducated on the job satisfaction with a coefficient of -0.07 compared to matched workers in the same job. This negative coefficient is, however, lower if compared to matched workers in the same education (-0.31).¹⁹

¹⁸The scale of job satisfaction is ranked from 1 to 5.

¹⁹They do not report the marginal effects after the ordered logit regression. The job satisfaction in their study is scaled from 1 to 5, but no report on the average job satisfaction level.

- In contrast, Amador et al. (2008), Green & Zhu (2010) and Sloane (2014) find that overeducation has no impact on job satisfaction for Spanish, British and Australian cases, respectively. Thanks to the questions asking about workers' skills utilization available in their data set, they find out that those overeducated workers are **not overskilled** in their jobs. Thus, even though it appears that their education does not correspond to their jobs, their skills do match. Consequently, those overeducated workers are not less satisfied than the well-matched.
- However, McGuinness & Sloane (2011) and Sánchez-Sánchez & McGuinness (2015) use the Flexible Professional in the Knowledge Society (REFLEX) data, which cover fifteen European countries, find that overeducation has a significant negative impact on job satisfaction, but the effect is **smaller** than overskilling. For instance, McGuinness & Sloane (2011) find that overskilling reduces the probability of job satisfaction by 25%, while the effects from overeducation only decrease the job satisfaction for 17%.²⁰ They explain that some overeducation may be voluntary as workers trade off for other desirable job characteristics, hence, it reduces the overall negative effects of overeducation on job satisfaction.

Little attention has been paid as well to the relation between overeducation and **unemployment duration**, but results diverge:

- Cuesta (2005) finds an existence of unobserved factors that increase the duration of unemployment and also reduce the probability of being overeducated among Spanish youths. Similarly, Pollmann-Schult & Büchel (2005), who use a data from the West Germany, 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

²⁰Both educational and skills mismatch variables were included in the same model. When they include these two variables separately, overskilling reduces job satisfaction by 30% and 28% for the case of overeducation.

matched job, resulting in shorter unemployment duration, which is consistent with the job search theory (Jovanovic, 1979).

- However, for the Italian case, Rose & Ordine (2010) argue that overeducation is associated with a longer period of unemployment. Barros et al. (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 or lower ability, 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, overeducated workers 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).

Moving to the dynamic case regarding the **career mobility** of overeducated workers, the results are also blended:

- Sicherman & Galor (1990) and Sicherman (1991) have empirical supports for their prediction on higher **upward occupational mobility**, within or across firms, among the initially overeducated workers relatively to matched workers in the United States. Robst (1995a) also shows that overeducated workers are more likely to move to better paid jobs over time. For the Dutch case, Dekker et al. (2002) find that career training and overeducation affect upward mobility positively, suggesting that overeducation is only a **temporary** phenomenon that dissolves after workers acquire job-specific skills or their performance is fully revealed to employers.
- However, Sloane et al. (1999), using a British dataset, find that overeducated workers change jobs often but no improvements of the match quality. They explain this phenomenon with two reasons: 1- Perhaps, overeducated workers have a greater propensity to quit the mismatched job in the hope for better jobs but fail to find, and 2- Overeducated workers may have lower ability. Next,

Büchel & Mertens (2004), using a German data, show that overeducated workers have **worse career prospects** than correctly matched workers, and Verhaest & Schatteman (2010) indicate that more than 40% of graduates in Belgium remain overeducated seven years after leaving school. These findings are thus in line with the job competition (Thurow, 1976) and assignment models (Sattinger, 1993) that mismatches are a **persistent** problem.

There are relatively less researches on the impacts of **horizontal mismatch**, yet based on the existing studies, the potential costs of horizontal mismatches appear **comparable** to those of overeducation (Domadenik et al., 2013):

- In terms of earnings, Robst (2007b) finds that the horizontally mismatched graduates earn around 10% less than well-matched in the United States. The wage effects are smaller when workers accept the position for supply-side reasons than demand-side reasons. For example, among male workers, the wage penalty equals 7.9% if they accept a mismatched job owing to their change in career interests, and 23.2% if due to the unavailability of jobs in their degree fields.

Nordin et al. (2010) and Tao & Hung (2014) also find negative impacts on wage associated to field of study mismatch in Sweden and Taiwan, respectively. In Sweden, being mismatched is associated with a 38% and 26% lower income than being matched for men and women, respectively (Nordin et al., 2010). In Taiwan, being horizontal mismatched earns 8.2% lower than being matched (Tao & Hung, 2014). This is slightly lower than the impact of overeducation that equals 8.3% in the same study (Tao & Hung, 2014).

However, Béduwé & Giret (2011) do not find such effects for the French case, and Montt (2015) indicates that the cost on earnings is so small. Béduwé & Giret (2011) argue that horizontal mismatch has no effects on salary because the human capital acquired in one field might be transferable to another.

- Besides earnings, Wolbers (2003) and Béduwé & Giret (2011) find that field-of-study mismatch makes workers more likely to quit or search for other jobs. Béduwé & Giret (2011) also find the negative effects on job satisfaction among

vocational graduates in France, especially when it is accompanied by the over-education.

Few number of studies also investigate the combined impact of horizontal and vertical mismatches yet remain limited. For instance, in the United States, Robst (2008) finds that overeducated workers but whose work and field of study are related earn 2.4% less than well-matched workers. The wage loss increases up to 21.6% for overeducated workers who report working in a job that is unrelated to their degree field. Nevertheless, the combined effects are very similar to the effect of overeducation for the French case owing to the absence of impacts from horizontal mismatches in the study of Béduwé & Giret (2011).

2.3.2 Impacts at macroeconomics level

There exist various evidences that mismatches have negative impacts at microeconomics level, especially on individual earnings, even though there are papers that contradict those findings. Looking at the macroeconomics side, however, very little work has looked at the effect of educational mismatches on macroeconomic indicators (McGuinness et al., 2017).

Talking about the role of education at macroeconomics level, we can refer to the **endogenous growth** theory that consider education as a factor to increase the innovation and economic growth of an economy (Lucas, 1988 ; Romer, 1990).

Therefore, overeducation can perhaps generate **positive impacts** at macroeconomics level for some reasons:

- As predicted by the assignment model (Sattinger, 1993), overeducated workers are at least more productive than their colleagues in the same jobs. It is thus more profitable for firms to hire overeducated workers to increase productivity, which is rather positive for economic growth.
- Similarly, as mentioned by Acemoglu (1999), when the skill composition of labor force in an economy exceeds a critical threshold, firms are encouraged to create high skilled jobs. Thus, a bulge of overeducated workers may indicate a stock of

high-skilled workers available in a country, which may attract more investments in high value-added industries, which is good for an economy.

- Furthermore, high educated people seem to take care more about their health (Ross & Wu, 1995), know how to tackle their life problems (Ross & Mirowsky, 2006) and are associated with lower crime (Hjalmarsson et al., 2015). Therefore, overeducation might be good for societies and economic development.

However, the **negative effects** of overeducation may also exist at macro-economics level for other reasons:

- The fact that the expectations of overeducated workers on the social position are not fulfilled, will make them dissatisfied and lose their intellectual challenges (Link et al., 1993). Then, this dissatisfaction, in turn, creates counterproductive behaviors, such as high rates of absenteeism and turnover, which can harm firm productivity and subsequently economic growth (Tsang & Levin, 1985).
- Additionally, the lack of pleasure in the job, may deteriorate the workers' mental health and make them depressed, thus all higher educated workers will not necessarily have better health if they cannot use well their abilities in their jobs (Kornhauser, 1965 ; Gal et al., 2008 ; Bracke et al., 2013 ; Artés et al., 2014). Hence, this may also provoke negative effects on economic improvement.
- Skott & Auerbach (2005) develop a model in which a rise of the overeducated persons would increase wage inequality. They argue that if the high educated workers fail to find the high skilled jobs, they would compete for the low skilled positions. As a result, they will be overeducated and earn less, while the low educated workers will become unemployed. Then, the income inequality and unemployment problems will rise, which is not good for economy.

Regarding the impacts of the **horizontal mismatches**, it seems to be rather negative:

- First, the fact that graduates are employed in a job that does not match their fields of education, may make them dissatisfied, which affects their efforts and

cooperation at working place, as the case of overeducated workers (Tarvid, 2012). Furthermore, people who are graduated in specialized fields may not be able at all to utilize their acquired skills in their mismatched jobs (Robst, 2008). These problems could constraint the productivity in an economy, and thus negative for economic growth.

- Second, the problem of horizontal mismatch may also indicate that the country produces many graduates in the sectors that need them less, and little graduates in the fields that strongly require them, which could be bad for the economy (Cedefop, 2010).

The lack of consensus in the theoretical mechanisms on the role of overeducation at macroeconomics level incites some researchers to conduct **empirical analyses**:

- Regarding the positive findings, we can refer to Kampelmann & Rycx (2012) who find that the Belgium firms' productivity increases on average by 3.5% following a one unit increase in mean years of overeducation. This result is more conforming to the "human capital approach" in which overeducated workers are more productive than matched workers in similar jobs, which is good for economy. Similarly, Ramos et al. (2012) find that overeducation has a positive impact on economic growth in nine European countries.²¹ They also argue that a high number of overeducated workers is positive at the aggregated level because those workers are more productive than their less qualified counterparts.
- In contrast, Tsang (1987) finds a negative effect of overeducation on the firms' outputs through low job satisfaction, leading to counterproductive behaviors in twenty two Bell companies in the United States. Indeed, he 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 the job satisfaction is associated with a 2.5% decrease in the level of the firms' output. Next, Guironnet & Jaoul-Grammare (2009) find that a share increase of overeducated graduates produces an unfavorable short-term effect on the economic growth for the French

²¹Those countries are Austria, France, Greece, Italy, Portugal, Romania, Slovenia, Spain and United Kingdom.

case between 1980 and 2002, owing to the underutilization of skills among the most qualified workers. Then, conforming to the prediction of Skott & Auerbach (2005), Budría & Moro-Egido (2008) find that mismatches contribute to enlarge wage differences within education groups in Spain for the period 1994-2001. Similar result is found by Slonimczyk (2009) who points out that a substantial fraction of the increase in wage dispersion during the period 1973-2002 in the United States is due to the increase in overeducation.

Despite various researches have been conducted to analyze educational mismatches in developed countries, only a little work has focused on developing countries where mismatches can be perhaps driven by **other factors** and the impacts might be also different.

3 Mismatches in developing countries and their specificity

The literature has shed light on the theoretical and empirical mechanisms that explain the determinants and impacts of educational mismatches, but mostly in the context of developed countries. Studying the possible specificity of developing countries is, however, important.

Indeed, with more than 80% of people living²² and working in low and middle income countries (ILO, 2016), it is crucial to understand the education-occupation matching process over there. More importantly, despite a lower unemployment rate compared to developed nations, many people in developing countries, including high educated persons, have been working in vulnerable employments in which workers do not fully utilize their human capital (Fields, 2010). Given that the costs of education-job mismatches to the economy can be as significant as the costs of unemployment (Teulings & Gautier, 2004), to understand the labor market distress in developing countries, educational mismatches should be an indicator to strongly focus. Nevertheless, most of the existing data allowing for the measurement of mismatches are generally only available for high income economies, which can be the reason why less researches have been conducted in developing states (McGuinness et al., 2017).

However, some evidence has recently emerged for developing countries related to the **incidence**, **determinants** and **impacts** of mismatches.

(i) **Incidence**

The rate of mismatches in developing economies seems to be **higher** than in the developed labor markets (McGuinness et al., 2017).

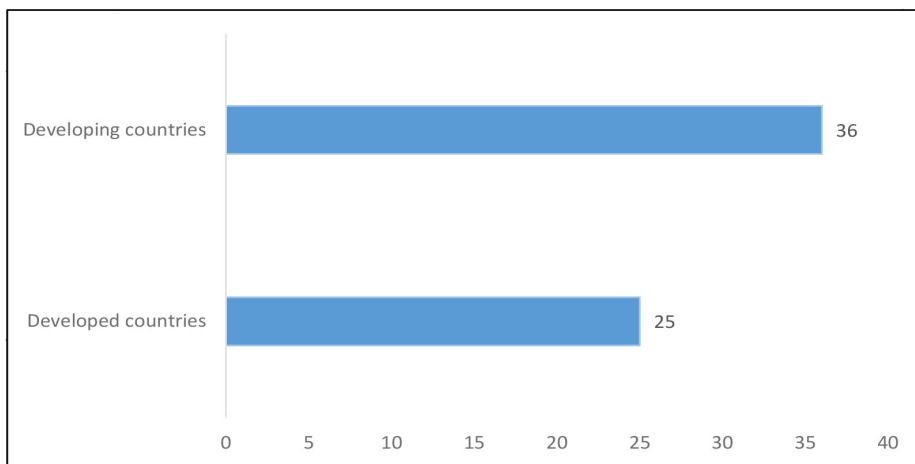
For instance, using the statistical mean and mode measures, Quinn & Rubb (2006) find that the rates of overeducation in 1991 in Mexico are 18% and 43%, respectively. They compare their results and find that these rates are higher than what found, within the same measures, in Portugal (11% and 26%) by Kiker et al. (1997) and in Hong Kong (14% and 37%) by Ng (2001).²³

²²Source: http://www.prb.org/pdf13/2013-WPDS-infographic_MED.pdf

²³Kiker et al. (1997) and Ng (2001) also analyze data in the same year 1991.

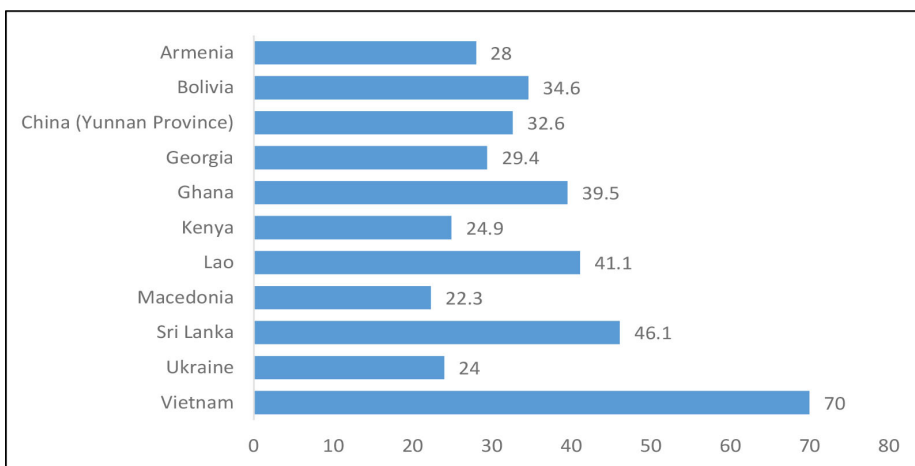
Another evidence is found in the study of Handel et al. (2016). Using the Skills Toward Employment and Productivity (STEP) data and subjective approach, Handel et al. (2016) find that the average incidence of overeducation across eleven developing countries equals 36%. McGuinness et al. (2017) find that these rates are much higher than those found in developed nations that approximately equals 25% on average based on the subjective approach too (Figure 8). We also notice that the rate of overeducation strongly differs between countries, ranging from 22% in Macedonia to 70% in Vietnam (Figure 9). This might reflect the difference between the educational level of attainment in each country and the possibility that some labor markets are more efficient (Handel et al., 2016).

Figure 8: Compared average incidence of overeducation (worker-self-assessment) (%)



Source: Author's graphic based on data in Table 5.2 of Handel et al. (2016) and Table 2 of McGuinness et al. (2017).

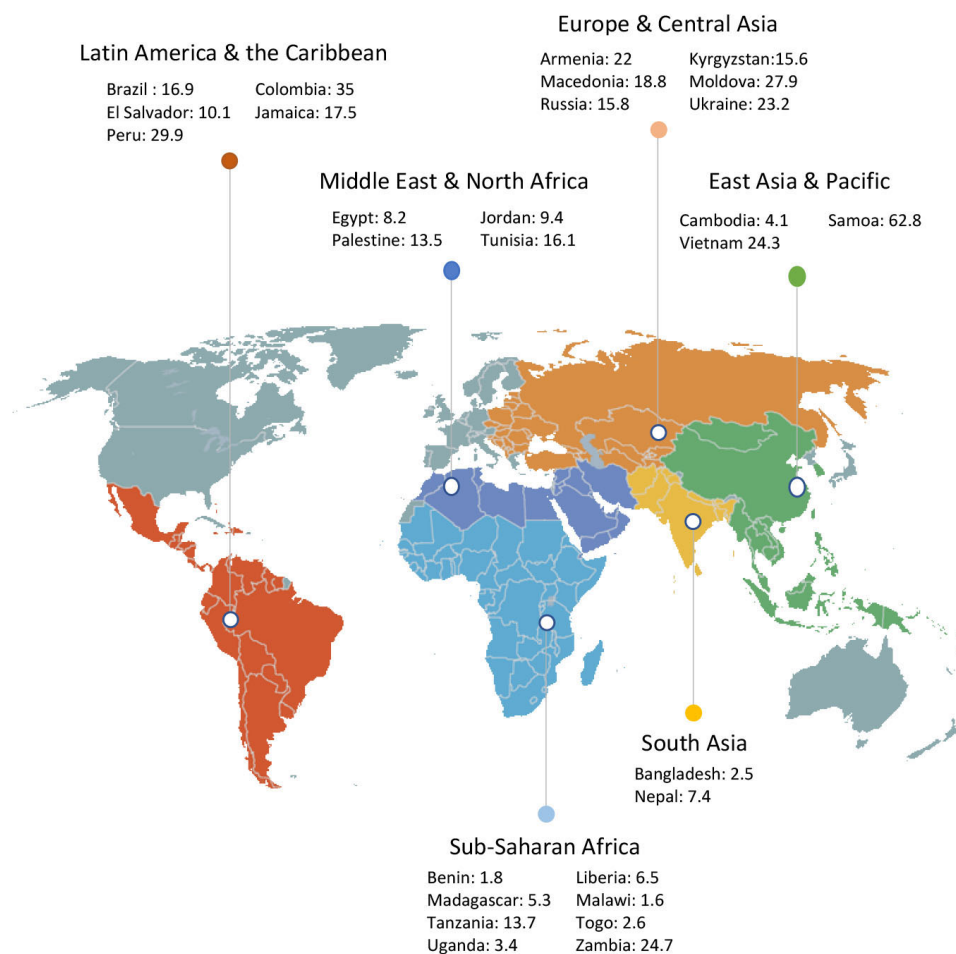
Figure 9: Incidence of overeducation (worker-self-assessment) in developing countries (%)



Source: Author's graphic based on data in Table 5.2 of Handel et al. (2016).

Among youth aged between 15 and 29 years old, the rate of overeducation also considerably varies from one country to another. For instance, Sparreboom & Staneva (2014), using the job analysis measure, find that the overeducation rate in twenty eight developing countries ranges from 1.6% in Malawi to 62.8% in Samoa with an average of 15.7% (Figure 10). This average incidence is higher by 2.7 percentage point if we compare to the same age group within the same measure of overeducation in twelve European countries reported in ILO (2014).

Figure 10: Incidence of overeducation among youth (job analysis) in developing countries (%)

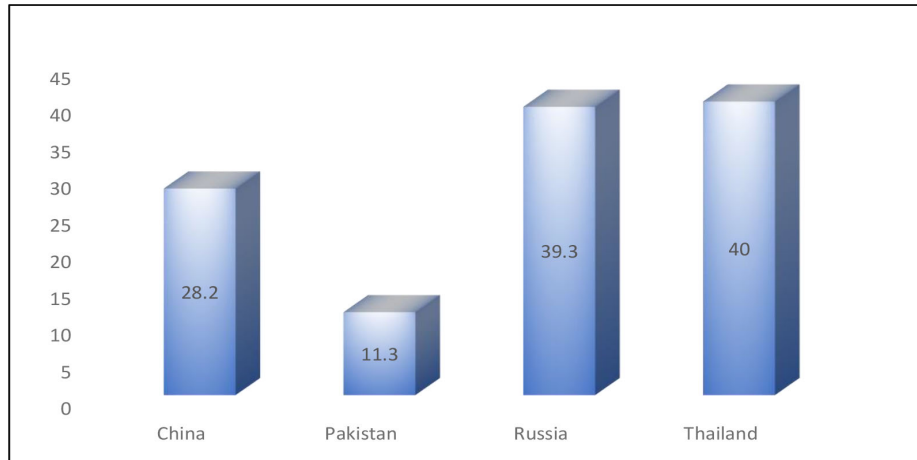


Source: Author's graphic based on data in Table 5.2 of Sparreboom & Staneva (2014).

Concerning **horizontal mismatches**, based on the literature survey of Somers et al. (2018) and results from Pholphirul (2017), only four papers, using the Worker-Self-Assessment method, report the incidence in developing countries between 1995 and 2017 (Figure 11). By comparing to the data in the Figure 5 above, it seems that the incidence is slightly higher than what found in high

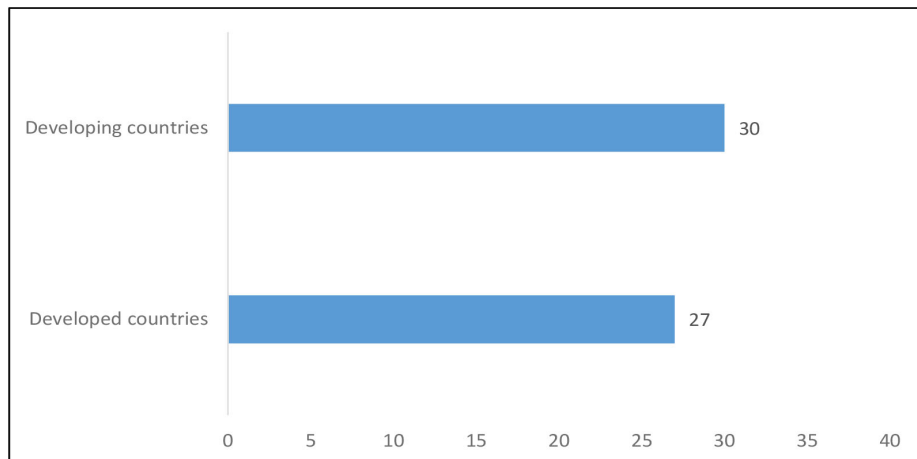
income economies on average (Figure 12).

Figure 11: Incidence of horizontal mismatches (worker-self-assessment) in developing countries (%)



Source: Author's graphic using data in Table 2 of Somers et al. (2018) and the incidence in Thailand from Pholphirul (2017).

Figure 12: Compared average incidence of horizontal mismatches (worker-self-assessment) (%)



Source: Author's calculation and graphic based on data in Figures 5 and 11.

Thus, overall, educational mismatches seem to be more prevalent and pervasive in developing societies (Chua & Chun, 2016 ; McGuinness et al., 2017). Are there **specific factors** that explain this higher rate?

(ii) **Determinants of educational mismatches**

First, based on the available studies, both supply and demand sides factors found in developed economies, are also estimated to influence the risks of mismatches in developing countries:

- From the supply side related factors, **job search constraints** play the most crucial role in developing societies (Chua & Chun, 2016). Indeed, as predicted by the job search theory (Jovanovic, 1979), a lack of information in the labor market, a poor public transportation, credit constraints and no unemployment insurance push workers to find a job as soon as possible, resulting in poor education-job match outcomes (Chua & Chun, 2016). Consequently, it is observed that workers with **a poor social background** face higher risks of being mismatched because they have **low reservation wages** (Chua & Chun, 2016). The same for Lim (2011) who finds that Malaysian graduates with economically inactive father and from a large family size are more likely to be overeducated.

Age is also found to be negatively correlated with mismatches in Thailand (Pholphirul, 2017) like in high income economies, suggesting that young workers might need to be more trained in their job-specific skills conforming to the **career mobility theory** (Sicherman & Galor, 1990). Nevertheless, Handel et al. (2016) do not find evidence in eleven countries that young workers are more likely to be overeducated.

While **individual preferences** for other job attributes, such as less job pressure, could lead workers to choose a mismatched job in developed countries (Robst, 2007b ; McGuinness & Sloane, 2011), Chua & Chun (2016) do not find this evidence among six developing nations.²⁴

- The demand side also has an effect. For example, Mehta et al. (2011) and Habibi (2015) find that the weak demand for educated workers explains the high rate of overeducation in Philippines and Iran. Handel et al. (2016) reach the same conclusion.

However, it is strange to learn that women face lower risks of mismatches (Filiztekin, 2011 ; Pholphirul, 2017) despite the discrimination against women is large in the developing societies (Jayachandran, 2015). These findings also contradict evidences in high income economies, yet Filiztekin (2011) explains this result as the women decision to not accept mismatched jobs and prefer to be housewives in traditional societies.

²⁴Those countries are Armenia, China (Yunnan province), Georgia, Lao, Sri Lanka and Vietnam.

Apart from the factors that typically drive mismatches in developed nations, there also exists **two specific factors** that may push mismatches in developing countries to be more prevalent: **1- The inefficiency of education system, and 2- the presence of large informal sector.**

(a) **Inefficiency of education system**

Despite developing countries have made considerable progress in closing the gap with developed nations in terms of school attainment, the skills of students remains relatively low, generating concerns on the quality of education (Hanushek & Woessmann, 2012).

The problem of **education quality** could increase the risks of mismatches among many educated workers for two main reasons:

- First, the lack of adequate skills required in high-skilled jobs push many high educated workers to have no choice besides working in a lower position or in another study field.
- Second, the lack of skills among the labor force may discourage firms to invest in high technology sectors, limiting high-skilled job creation as mentioned by the model of Acemoglu (1999).

For example, the overeducation in Mexico is found to be affected by the scarcity of education quality rather than a general abundance of educated workers (Mehta et al., 2011). In other words, workers are overeducated but not overskilled (Mehta et al., 2011). More alarming, in Egypt in September 2015, a group of university graduates set their PhD and MBA²⁵ certificates on fire to protest their inability to find suitable jobs despite these advanced degrees. Habibi & El Hamidi (2016) argue that this fact is somewhat due to the quality of Egyptian higher education.

Furthermore, many developing countries seem to be **less responsive to what the labor market needs**. Indeed, it seems that higher education institutions produce too many high educated workers in fields that have less demands such as business-management and related fields, and little in fields that have strong demands such as engineering (Salama, 2012 ;

²⁵MBA: Master of Business Administration.

Hu, 2013 ; Madhur, 2014a ; Ra et al., 2015 ; Habibi & El Hamidi, 2016 ; Habibi, 2017 ; Ferreyra, 2017). This creates intensive market tightness in some disciplines, resulting in a high risk of mismatched among many graduates from those fields of study.

(b) **Informal sector**

”Informal sector” is a term to describe the collection of firms, workers and activities that operate outside the legal and regulatory systems (Loayza, 2016). The informal sector is a widespread phenomenon in the majority of developing countries by producing about 35% of gross domestic product (GDP) and employs 70% of the labor force in typical developing economies (Loayza, 2016). The existence of this informal sector in developing countries is due to **bureaucracy and corruption**, combined with the incentive to avoid the burden of taxation and complex regulation (Loayza, 2016).

A great size of **informal sector** may increase the risks of educational mismatches among high educated persons for at least two related reasons:

- First, employment in informal sectors largely comprise jobs with low skill requirements, and workers are trapped in unproductive activities with poor career development (Herrera-Idárraga et al., 2015 ; Chua & Chun, 2016).
- Second, firms in the informal sector face high capital costs because of restricted access to formal credit institutions, which makes them difficult to expand their activities, resulting in limited high-skilled job creations (Loayza, 2016).

For example, Herrera-Idárraga et al. (2015), using micro-data for Colombia, find that informal salary workers are more likely to be overeducated than formal workers. Similarly, Handel et al. (2016) find that working in formal jobs are associated with a better education-job match in their analysis on eleven developing countries. In addition, workers in the informal sector tend to have not only higher probabilities of overeducation, but also higher risks of a horizontal mismatch than workers in the formal sector in Thailand (Pholphirul, 2017).

Thus, the **quality of education system** and **informal sector** may contribute to put graduates under higher risks of mismatches in developing economies, but do mismatches also generate negative impacts in those countries?

(iii) **Impacts of educational mismatches**

Given the low educational attainment, a higher return to education in developing countries is what we may expect for. Unfortunately, education-job mismatches also impact individual outputs such as earnings and job satisfaction in a similar way to what has been observed in high income countries.

For instance, Quinn & Rubb (2006), Filiztekin (2011) and Reis (2017) find that the returns for overeducation are about a half of required education in Mexico, Turkey and Brazil, respectively. Chua & Chun (2016) reach the same results when they estimate on the STEP data concerning six developing countries. These impacts are at the same magnitude to results in high income economies mentioned above. Then, Herrera-Idárraga et al. (2015) investigate Colombia and find that the overeducated workers in the informal sector suffer a larger wage penalty compared to their counterparts in the formal sector.

Pholphirul (2017) focuses on both forms of mismatches and finds the negative impacts of horizontal mismatches on workers' incomes in Thailand but with a weaker effect than vertical mismatches. Workers affected by overeducation have a lower income than workers whose jobs fit with educational qualifications by 18.6%, while workers with horizontal mismatches have lower incomes by about 7.2%. These findings reveal that the negative impact of overeducation seems to be higher than in developed countries if we compare to the average of 15.3% calculated by McGuinness (2006), while the effect from horizontal mismatches is lower if we compare to the study of Robst (2007b) in the United States (10%).

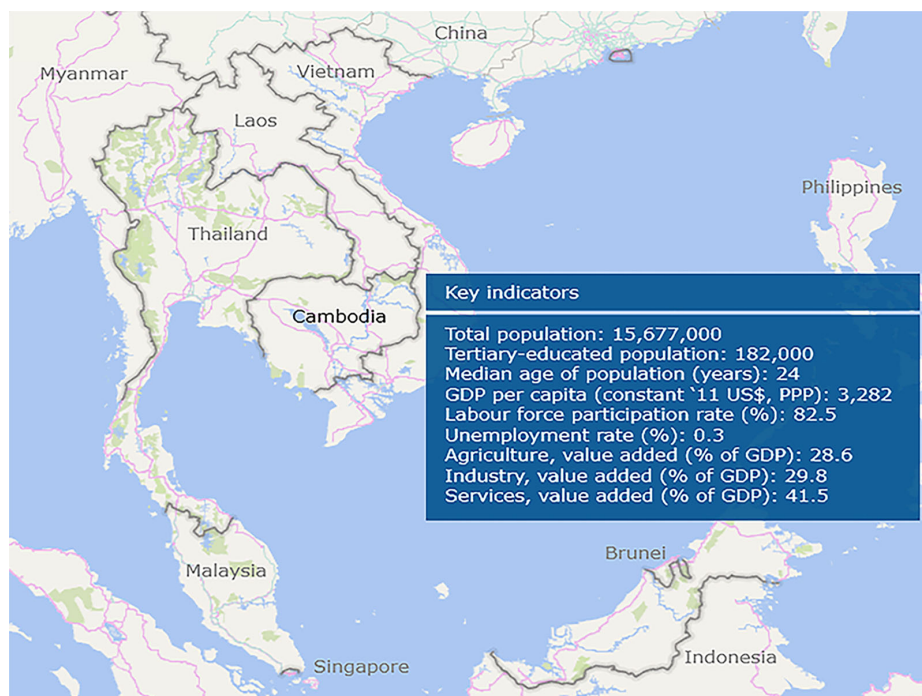
Negative effects of mismatches on the job satisfaction are also found among graduates in Malaysia (Lim, 2011 ; Zakariya & Battu, 2013).

We notice that those developing countries in the existing studies relatively concern more advanced economies than Cambodia, we propose therefore to extend the research on the impacts of mismatches to this latter country that has just upgraded

from low to lower middle income country in 2016.

Cambodia²⁶ is a special case considering its income status and his tragic history. Indeed, the Vietnam war in the decade of 1960s pushed Cambodia into the political instability at the beginning of 1970, and then into the genocide regime of Khmer Rouge between 1975 and 1979. During those four years, Cambodia considerably lost its human capital and social structures: 75% of university teaching staff and 96% of university students were massacred (Benveniste et al., 2008). Thus, Cambodia has not only lost its human capital but also the means to rebuild its human resources.

Figure 13: Cambodia: Key economic indicators 2015



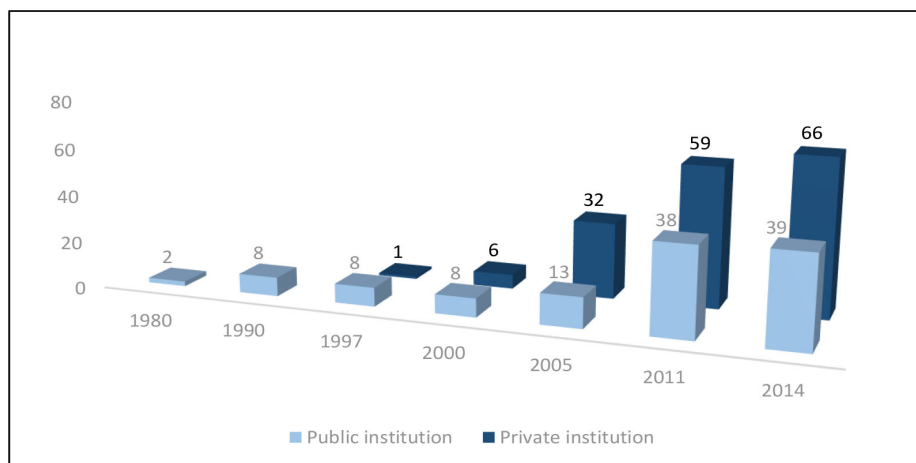
Data sources: World Economic Forum (2015) and World Bank's website.

After the Khmer rouge regime, the civil war still continued to reign over Cambodia. Hence, many educated survivors fled the country to live in the western countries, leaving a scarcer human capital. For instance, less than 3,000 trained secondary school teachers remained in Cambodia in the early of 1980s out of 21,000 before 1975 (Ayres, 2000). Next, the Paris Peace Agreements in 1991 led Cambodia to the first national election and economic reform in 1993, yet practically, the civil war and political instability came to a totally end in 1998.

²⁶Cambodia is a Southeast Asian country, located between Thailand, Laos and Vietnam.

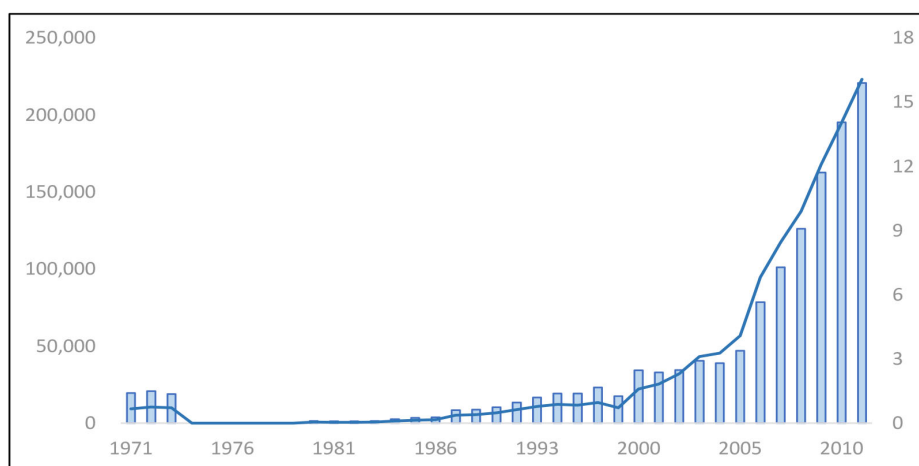
Since that time, Cambodia has been active to rebuild its education system, and a strong investment in higher education has been observed in the decade of 2000s. In fact, seeing increasing demands for high educated workers after economic reform and with the privatization of higher education sector in 1997, investors started investing in the education field (Chen et al., 2007). For example, the number of higher education institutions (HEI) massively increased from fourteen (14) in 2000 to one hundred and five (105) in 2014 (Un, 2015) (Figure 14). The number of the students enrolled in tertiary education was also rapidly increased from twenty-thousand (20,000) students in 2001 to two hundred and fifty thousand (250,000) in 2014 (Un, 2015) (Figure 15).

Figure 14: Number of HEI in Cambodia



Data source: DHE, MoEYS (2014) reported in Un (2015).

Figure 15: Number and ratio (%) of enrollment in tertiary education in Cambodia



Data sources: UNESCO's and World Bank's websites.

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

<http://data.uis.unesco.org/index.aspx?queryid=142>

Nevertheless, there exist concerns about the **inefficiency of the education system** due to corruption and weak governance (ADB and ILO, 2015). Furthermore, the bureaucracy also plays a main role in the existence of a **large informal sector** in Cambodia (EIC, 2006). These two problems could make graduates lack of adequate skills required by the labor market on the one hand, and limit high-skilled jobs creation, thus lack of demand for graduates in the market on the other hand.

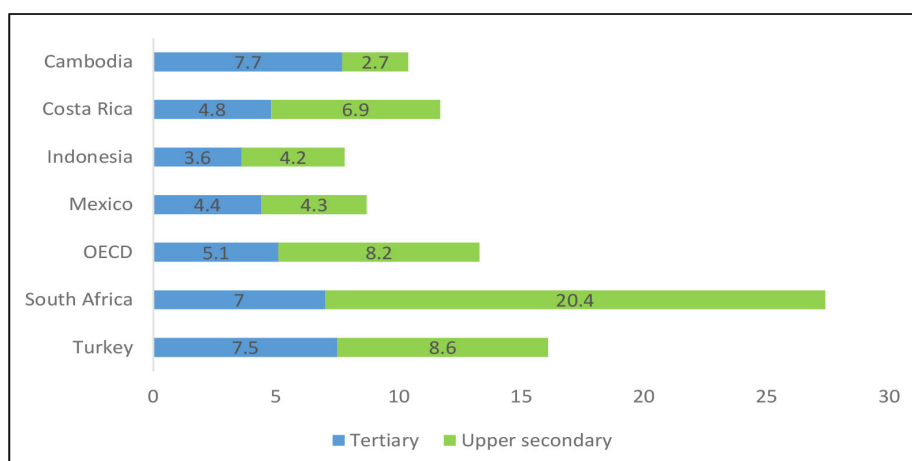
(i) **Inefficiency of education system in Cambodia**

One of the biggest risks of corruption in education system is the message it sends to students and educational staff that personal success comes, not through hard work, but through favoritism and bribery (D. W. Chapman & Lindner, 2016).

Because of corruption, many **private higher education institutions** (HEI) in Cambodia gained official recognition without following a clearly defined process (Ford, 2015). Indeed, by international comparison, most HEI are very small with narrow academic and resource bases (Mak, 2005). Additionally, the considerable competition among those private institutions led to the lowering of fees, followed by the reduced revenue, and coupled with **inattention to support quality**, results in weak HEI and expressed in **high graduates' unemployment rate** (Ford, 2015).

According to the Cambodian labor force survey in 2012 (NIS, 2012), the rate of unemployment among university graduates was 7.7% against 2.7% of people with only secondary education. This figure is inverse to what happens in the developed and also several developing countries where higher educated persons face lower risks of unemployment (Figure 16). Thus, the privatization might lead to an emphasis of knowledge as a marketable commodity rather than a social good (Lee, 2003).

Figure 16: Unemployment rate (%) by level of education in 2012*



*Unemployment rate in Indonesia is in 2013.

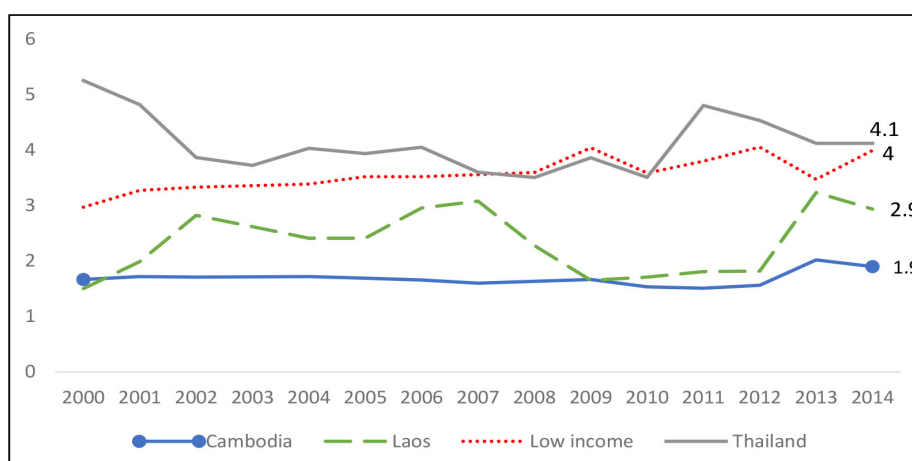
Data sources: NIS, 2012 for Cambodia and OECD's website for other countries.

Concerns also exist regarding the quality of **public higher education institutions**. The same to private institutions, most teachers do not focus on research and several of them hold just a bachelor's degree (40%) (D'Amico, 2010). Only 6% of lecturers hold PhD degree²⁷ and about 85% of them never published any papers (Chen et al., 2007). 90% of the lecturers never had technical discussion, and even though there is a library at each university, books and study materials are not up-to-date and inadequate (Chen et al., 2007).

Rewards and incentives are also insufficient to attract and retain qualified staff (ADB, 2011). For instance, teachers are found to be paid just 60% of what received by an average Cambodian worker with similar qualifications (Tandon & Fukao, 2015). As a result, they **teach many hours** and do not have time for interaction with students, nor for updating their teaching lessons. Furthermore, the **lack of government funding** is another factor making the teachers and students **lack of incentive to do researches**, which contributes to poor quality in higher education (Chen et al., 2007) (Figures 17 and 18).

²⁷We do not know how many of them were graduated in Cambodia that could also raise a question on the quality of education.

Figure 17: Government expenditure on education (% GDP)

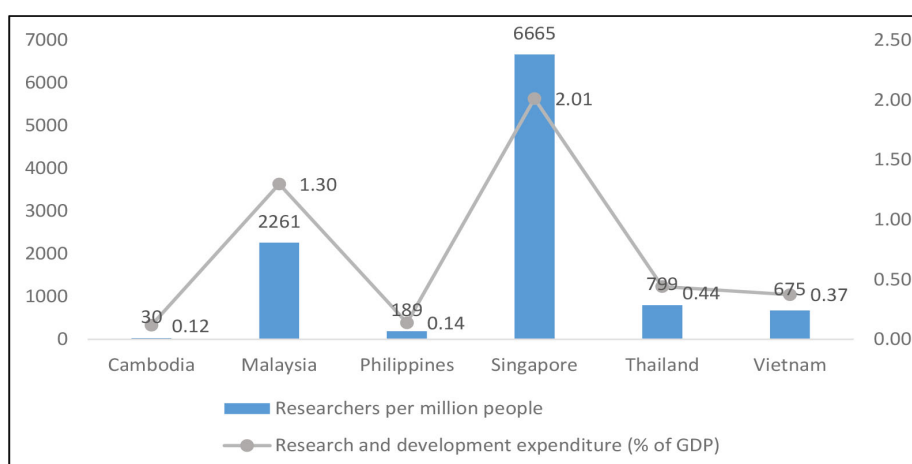


Cambodia's government expenditure on education is low compared to its neighboring countries and also below the average of low income countries.

Data source: World Bank's website.

Data link: <https://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS>

Figure 18: Number of researchers per million people and Research & Development expenditure (% of GDP) in 2013/2015*



There is a big gap observed between the developed country like Singapore and other developing countries in the region.

*Data on Cambodia and Malaysia are in 2015. The rest in 2013.

Data source: World Bank's website.

Data links: <https://data.worldbank.org/indicator/SP.POP.SCIE.RD.P6>

<https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>

Not only the quality of teaching, but the **quality of students** entering university are also worrisome because many of them chose to pursue their bachelor's degrees with a high degree of uncertainty (Peou, 2017). For example, a 2008 survey on youth employment reported that only 2 of 10 graduating secondary students decided on what to study at university based on the job market, while

7 of 10 followed their parents' advice (Di Gropello, 2011).²⁸ A recent survey also shows that only about 30% of the students chose their major based on the market demand (AUPP's²⁹ website, 2015).³⁰ Lack of information seems to be one of the main reasons to explain why less students consider the market demand in their decisions as there is no reliable tracking of the employment outcomes of recent university graduates (Di Gropello, 2011).

Furthermore, during the examinations, in several classes and schools since the primary education, corruption exists as students can pay money to teachers in order to work in groups, to cheat, to use phone or copy answers from other students (Brehm, 2016). After the examination, it is also possible for students to purchase higher grades.

To fight against this issue, the new Minister of Ministry of Education, appointed in 2013, has done a reform in the education system since 2014, especially on the national examination of high school terminal class. Note that before 2014, it is widely recognized that many students pay their exam controllers to cheat during this national examination, and as a result, **more than 80%** of students passed the exam each year (ILO and ADB, 2015). However, in 2014, when exam controllers did not accept the students' money anymore thanks to the reform, thus high risks of being fired, **only 26%** of students completed the exam successfully.³¹ This indicates that before 2014, many students might be not qualified to pursue higher education.

Despite the reform, more improvements are still required. Indeed, 73% of 220 employers think that university graduates do not have required skills in the jobs they ask for (World Bank, 2012). Bruni et al. (2013) find a similar result with 78% of 762 employers complain about the preparedness of newly hired university graduates. Another report finds a less negative opinion with 34% of 45 employers are dissatisfied with the college graduates' skills, but this figure is

²⁸The author does not clearly indicate if it is possible that students make the decision based on both the job market demands and parents' advice.

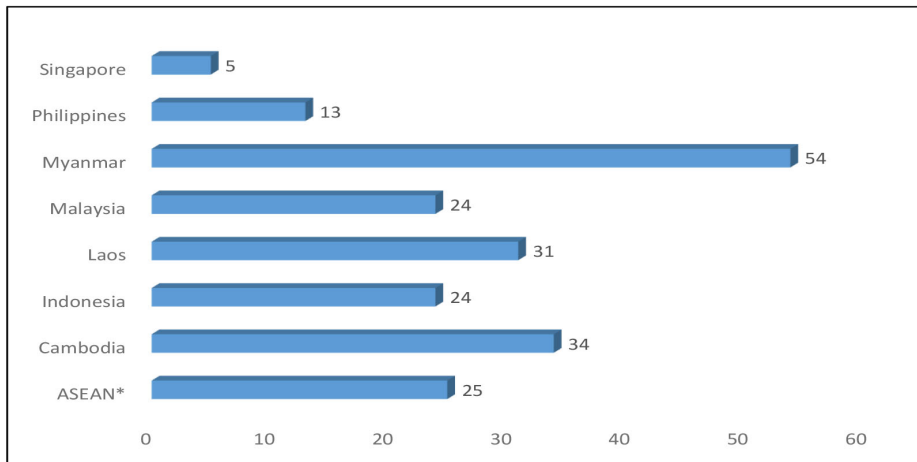
²⁹AUPP: American University of Phnom Penh.

³⁰Reference: <http://www.aupp.edu.kh/2015/07/01/study-shows-60-of-cambodian-students-choose-majors-based-on-personal-interest/>

³¹Due to a low number of students passed the exam, a second session was exceptionally allowed for that year and which brought the total pass rate above 40%.

still higher than several countries in the region (Figure 19) (EMC, 2014).

Figure 19: Dissatisfaction of employers with the skills of college graduates (%)

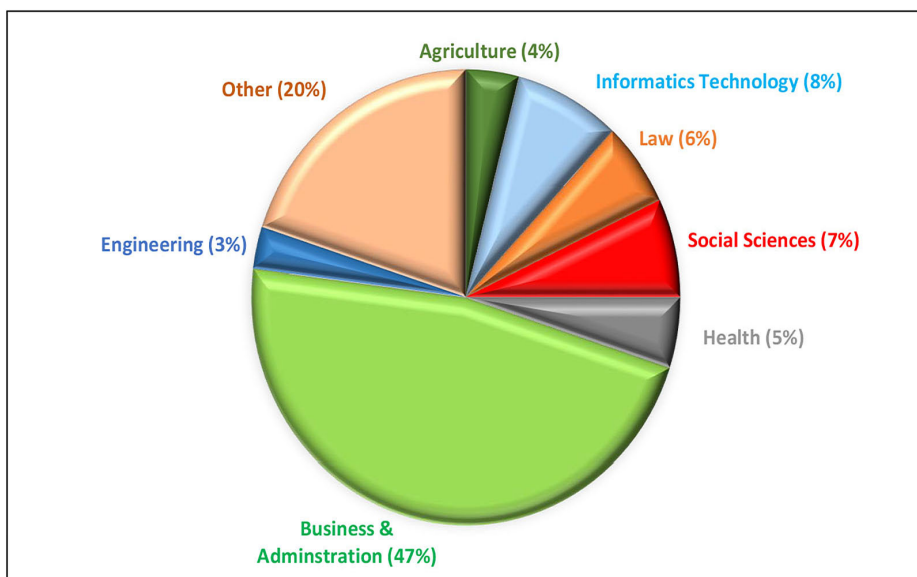


*ASEAN, composed of ten member nations, stands for Association of South-East Asia Nations. That report does not include Brunei, Thailand and Vietnam in their analysis.

Data source: Author's graphic based on data in the report of (EMC, 2014).

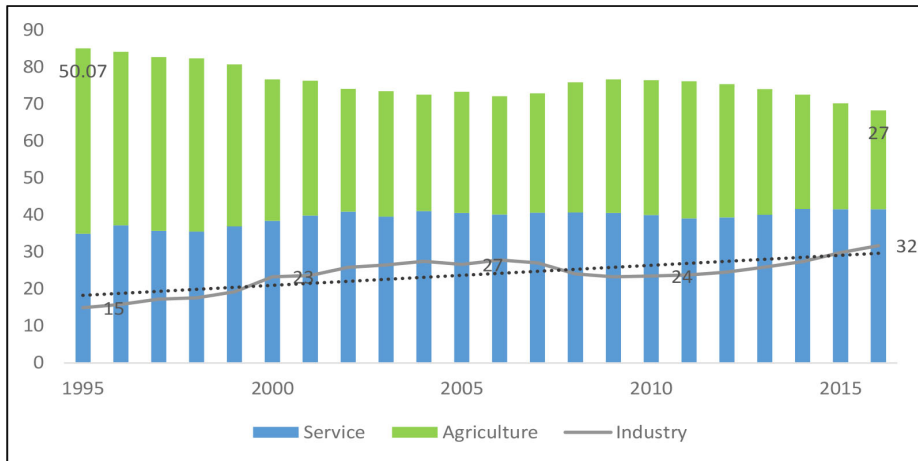
Concerns also exist regarding the **inadequacy between supply and demand** for some fields of education: 50% are enrolled in business-management related fields and only 3% in engineering fields, while Cambodia has been facing a rising demand for engineers (Madhur, 2014a, p.1 ; D'Amico, 2010, p.7) (Figures 20 and 21).

Figure 20: Student enrollment by fields of education in Cambodia in 2011



Data source: Un (2015).

Figure 21: Evolution of Cambodia's economic sectors, value added (% of GDP)



The industry sector in Cambodia has known an increased share to the detriment of the agriculture sector.

Data source: World Bank's website.

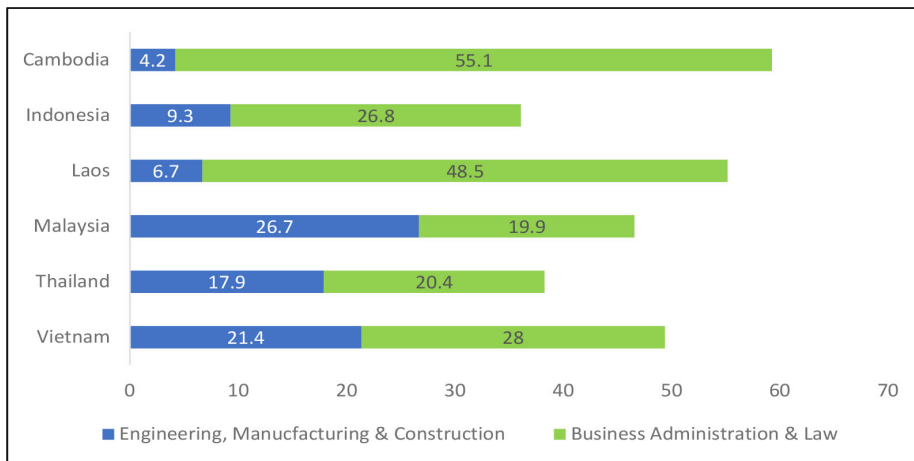
Data links: <https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=KH>

<https://data.worldbank.org/indicator/NV.IND.TOTL.ZS?locations=KH>

<https://data.worldbank.org/indicator/NV.SRV.TETC.ZS?locations=KH>

This horizontal mismatch seems to also occur in other countries in the region, but Cambodia seems to face a more severe mismatch (Figures 22 and 23).

Figure 22: Graduates by fields of education (%) in Cambodia and in some ASEAN countries in 2015*

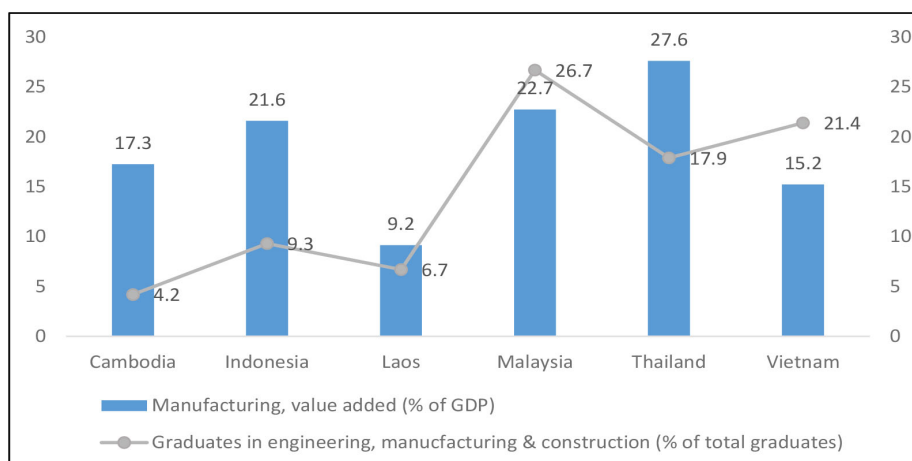


*Data on Indonesia is in 2014.

Data source: UNESCO's website.

Data link: <http://data.uis.unesco.org/index.aspx?queryid=163>

Figure 23: Manufacturing sector (% of GDP) and Graduates in Engineering, Manufacturing & Construction (%) in 2015*



*Data on Indonesia is in 2014.

Data sources: World Bank and UNESCO's websites.

Data links: <https://data.worldbank.org/indicator/NV.IND.MANF.ZS>

<http://data.uis.unesco.org/index.aspx?queryid=163>

Besides the problems of the education efficiency, Cambodia also faces a **great size of informal sector**, which may limit the high skilled jobs creation.

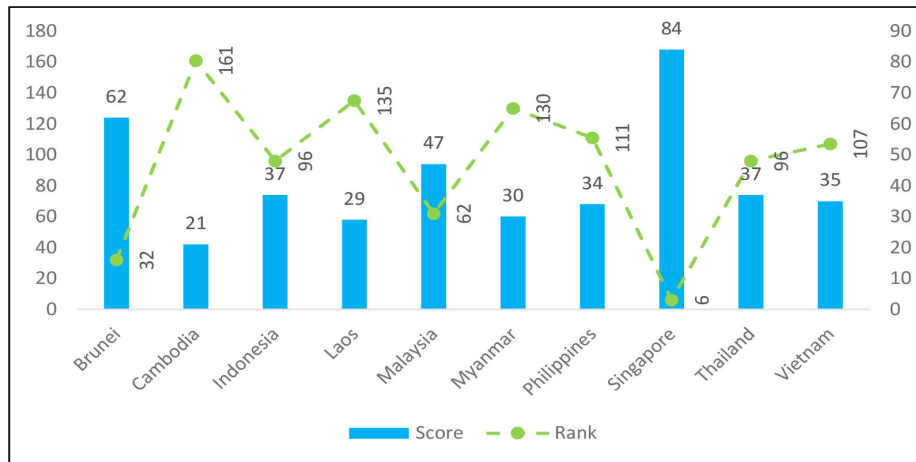
(ii) **Important size of informal sector in Cambodia**

In 2007, the informal economy represented 46% of Cambodian GDP (ADB and ILO, 2015). In 2011, 99.8% of business establishments and 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).

Again, a high corruption burden and weak governance in Cambodia can be linked to explain a major part of a substantial size of the informal economy (EIC, 2006). In 2017, based on the transparency international index, Cambodia scored only 21/100 and was ranked at 161/180, considered as one of the most corrupt countries (Figure 23). In a survey of EIC (2006), business operators cite many reasons why it is better to remain informal in Cambodia. In those reasons, avoiding the government bureaucracy, which makes the cost of doing business becoming prohibitive, is a very compelling reason. Business operators have no incentives to apply for formal business status unless they intend to engage in exporting and importing activities. According to the same survey, tax evasion and a lack of trust in the transparency of the government's tax management are

other powerful arguments for a large presence of informal economy in Cambodia.

Figure 24: Corruption Perceptions Index in ASEAN countries in 2017



Data source: Transparency International.

Link: https://www.transparency.org/news/feature/corruption_perceptions_index_2017

Consequently, by cause of both problems (inefficiency of education system and great size of informal sector), employers face difficulties in finding competent graduates to fill vacancies in various positions, while many graduates are struggling to find a good matched job to their educational level and field of study (Bruni et al., 2013).

This represents huge costs for both parties. In the survey of Bruni et al. (2013), 30% of employers say that the vacancies problem delayed the development of new products and 43% consider it as a cause to lose business to other competitors. Failing to find a decent job also represents a big cost for graduates, not only just a waste of money and time spent on higher education, but also psychological costs such as depression and exclusion from the society (Darity & Goldsmith, 1996). If this still continues, individuals may reckon completing higher education not worth as an investment. Then, the lack of high skilled labor may dissuade foreign direct investments in high value-added sectors, leaving Cambodia in the middle-income trap (Foraci, 2016). Thus, if Cambodia wishes to become an upper-middle income country by 2030 and a high-income country by 2050 as his setting goal,³² Cambodia urgently needs high quality labor and has to solve the **education-job mismatch problem** (Ogisu & Williams, 2016).

³²Reference: http://www.xinhuanet.com/english/2018-03/15/c_137041624.htm

Despite some technical reports written by the World Bank, Asian Development Bank (ADB) and International Labour Organization (ILO), have already found that many graduates in Cambodia suffer educational mismatches, the impacts of these mismatches on graduates' outcomes in the labor market were not clearly quantified. Those reports are descriptive researches based on interviews with stakeholders in higher education sector. Overall, they argue that there has been existing an oversupply of graduates in many fields except engineering and health sciences, but even with oversupply, employers are still difficult to fill many positions due to the lack of skills among graduates.

To understand deeper about this current issue, we need more accurate analyses on the **impacts of educational mismatches** among graduates in Cambodia, which is the main objective of this thesis.

4 Data, research questions and methods

Given a limited number of academic researches on the education-job mismatches in developing countries, the objective of this thesis is to investigate the **impacts of educational mismatches in developing countries with a special focus on the Cambodia's case.**

We propose three chapters: We begin with a theoretical and empirical analysis in the chapter 1, and we continue with two other empirical chapters. However, to realize our empirical tests, we confront a main challenge related to the lack of data on educational mismatches.

Having found information regarding individual employment and educational attainment in the report of "Cambodian National Labor Force survey 2012", we requested for the data from the National Institute of Statistics (NIS), hopefully it would be useful for our empirical analysis. Unfortunately, our request was rejected because of some bureaucracy problems.³³

Consequently, for the first two chapters of this thesis, we use two other surveys on the employability of Cambodian graduates, in which the thesis's author has been involved for the second survey, but they are not national representative. Then, in the third chapter, to open to more internationally, another data from the Integrated Public Use Microdata Series International (IPUMSI) was employed for estimating the rate of overeducation across many developing countries.

(A) Data description

- The first survey data, for the first chapter, was conducted in 2011 by the University Research Center in Economics and Management (URCEM) and led by the professor Jean-Jacques Paul, ex-project manager of the French Department in economics and management at the Royal University of Law and Economics (RULE). That data collection was financed by the French-speaking University Agency, known as AUF. The database contains the sample of 4,025 bachelor's graduates in 2008, representative of nineteen higher education institutions (HEI) in Phnom Penh, Capital of Cambodia.

³³We were asked to find someone who has a high position in the government to guarantee that our analysis would not affect the government's reputation.

- The second data, for the second chapter, was conducted in 2014 by the thesis's author on behalf of URCEM's researcher. This data collection was financed by the World Bank under the project "Higher Education Quality and Capacity Improvement Project (HEQCIP)".³⁴ The aim of this data collection was to update labor market information such as employments and wages from the previous survey, and also the awareness of Cambodian graduates toward the ASEAN economic integration at the end of 2015.³⁵ This second database contains a sample of 1,050 bachelor's graduates in 2011, representative of eight HEI in Phnom Penh, in which four are public and four are private institutions.³⁶

Those interviewed individuals (in both waves of data) were graduated from eight aggregated fields of study:³⁷ 1- Economics and Management, 2- Engineering and Architecture, 3- Information and Computer Technologies, 4- Sociology and Humanities, 5- Social sciences in English language, 6- Tourism and Hospitality, 7- Law and Public Affairs and 8- Sciences.

We determine our sample size based on our time constraints and available contact lists. Then, we use the quota method in which the number of interviewed graduates is proportional to the number in our study population. For example, if the percent of graduates who finished a bachelor's degree in Economics and Management accounted for 40% in our population, 40% of students interviewed would be also graduated from this field. Then, if 25% of economics-management graduates come from the Royal University of Law and Economics (RULE), 25% of interviewees in this field would be also from the RULE. Next, we also divided graduates in this aggregated field proportionally to each specific major of the field (e.g., from economics development, business management, etc.).

³⁴Our sub-project was rewarded among the best nine sub-projects out of all forty-five sub-projects conducted by a total of twenty-four HEI under the HEQCIP project.

³⁵The questionnaire is available in the Appendix: A.

³⁶We requested for graduates' contact lists from twenty HEI, but only eight accepted. Other HEI said that they did not register any contacts of their graduates, and some HEI did not reply us at all, despite several following-ups. We also contacted the Department of Higher Education for assistance, but we were asked for paying some fees. However, it was prohibited in the World Bank's project to pay public staff for any services. Thus, we could interview only graduates from eight HEI.

³⁷A detail on study majors including in these aggregated fields is available in the Appendix: B.

After that, the interviewed graduates were randomly chosen from each study field, and the interviews were conducted by phone, using the phone numbers provided in the contact lists. Sometimes, owing to the changes of graduates' phone numbers, we needed to request the new phone numbers from the fellows at the moment of the interview. To realize the interviews, we employed twenty-five fourth year students of the French cooperation in economics and management at RULE, who had been previously trained in a subject related to the survey technique.

Before the final questionnaire was put into use, it was tested to determine if the questions were properly worded and could be understood well by both interviewers and interviewees. The questionnaire was re-examined and revised before finalization. After collecting all questionnaire answers, we also checked the reliability of responses, by randomly contacting some interviewees to see if they were really contacted for interviews, for how many questions and many minutes approximately.

These two surveys provide information regarding individual characteristics, and graduates' occupations that are classified following the International Standard Classification of Occupations (ISCO) and what majors they were graduated from. We can thus define which graduate is overeducated and horizontal mismatched based on the job analysis (JA) measure.

- The third chapter, focusing more internationally on several developing countries, uses the Integrated Public Use Microdata Series International (IPUMSI).³⁸ The IPUMSI data provides integrated series of census micro data samples from many countries since 1960.

However, as other typical data, there is no information on education-job mismatches, yet the obvious advantage of the IPUMSI samples is that they classify homogeneously the key variables such as educational level and occupations. Therefore, we can estimate the rate of overeducation by using the job analysis or statistical analysis methods, in a comparable way between different countries. Unfortunately, IPUMSI does not record

³⁸Data source: <https://international.ipums.org/international/>

data on individual fields of education, making impossible to evaluate the incidence of horizontal mismatch.

(B) **Research questions and methods**

Based on our research objective and available data, three research questions were formulated, which constitutes three chapters of this thesis.

- **Chapter 1** seeks to answer the question: **”What factors influence the transition duration from school to work and do educational mismatches decrease unemployment duration?”**

As we have seen in the section 2.3, the relation between mismatches and unemployment duration is not clear. If education-job mismatches are only driven by the search frictions in the labor market, the job search theory (Jovanovic, 1979) predicts that mismatches can decrease unemployment duration, and mismatches are a temporary phenomenon. However, if mismatches are also caused by the lack of job opportunities as mentioned by the job competition model (Thurow, 1976), several graduates may face higher risks of mismatches and longer unemployment duration.

In addition, the theoretical uncertainty is not resolved by empirical studies. The analytic methods of this chapter are divided in two parts. First, the theoretical model uses a job matching model to explain the mechanism linking unemployment duration and educational mismatches. Second, the empirical model uses an independent competing-risks regression, allowing to test the theoretical predictions.

Having learned that unemployment duration is not a sole possible output affected by mismatches, we propose to examine another output: The individual earnings.

- **Chapter 2** seeks thus to answer the question: **Do education-job mismatches decrease wages?**

Following the assignment model (Sattinger, 1993), working in a mismatched job may not allow individuals to fully use their potential skills, and as a result, they would earn lower wages.

Many empirical researches also find that mismatches have negative effects on wages, but no consensus has been reached. Additionally, less researches analyze in the context of developing countries and the combination effects of vertical and horizontal mismatches. Furthermore, previous researches did not consider yet the endogeneity of educational mismatches in the combination of their two forms.

Thus, the empirical method used in this chapter is the ordered Heckman selection model that considers the selection bias problem of educational mismatches.

Given that the first two chapters analyze at microeconomics level among graduates in Cambodia, we propose for the third chapter to switch the level of analysis to more macroeconomics and more internationally with an attention on thirty eight developing countries.

- **Chapter 3** seeks to answer the question: **What is the impact of over-education on economic growth in developing countries?**

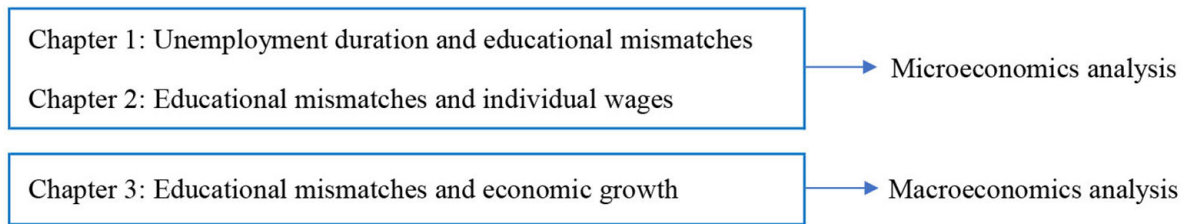
The effects of overeducation on the economic growth are not evident. Overeducated workers are more productive than their counterparts in the same job (Sattinger, 1993). Additionally, a bulge of overeducated workers may indicate a high human capital stock that may attract more foreign direct investments (FDI) in high-technology sectors (Acemoglu, 1999). Therefore, this is positive for economic growth. However, from the job satisfaction approach, overeducated workers may possess counterproductive behaviors (Tsang & Levin, 1985). This can lower the outputs and constraint the development of firms, which is negative for economic growth.

Little empirical researches also analyze the impacts of overeducation on economic growth but the results diverge as well.

To deal with unobserved heterogeneity between countries and endogenous problem of overeducation, two-stage least squares regression with country fixed-effects is estimated in this chapter.

The figure below presents the structure of this thesis:

Figure 25: Structure of the thesis



5 Thesis contributions

This thesis contributes to the literature by proposing several complements:

First, we contribute in terms of data on educational mismatches, which allows to analyze their impacts at both **microeconomics** and **macroeconomics level** in developing countries: 1- Two surveys concerning education-job mismatches among graduates in Cambodia, allowing to examine the impacts of educational mismatches on the **individual unemployment duration** and **earnings**, and 2- one database with the estimation of overeducation rate in **thirty-eight developing countries**, allowing to analyze the impacts of mismatches on their **economic growth**. Previous researches did not investigate yet the impacts of education-job mismatches on a low income country like Cambodia. In addition, no analysis exists neither regarding the impacts of mismatches at macroeconomics level in developing countries.

Second, we propose both **theoretical** and **empirical investigations** in the chapter 1. We also analyze education-job mismatches with their both forms (**vertical** and **horizontal forms**) and their both dimensions (**single** and **double mismatch**) in the chapters 1 and 2. Only a limited number of previous researches has examined the impacts of mismatches from their both forms and dimensions. In addition, we also take into account the **endogenous problem** of mismatches, and thus their **determinants**, while the majority of researches supposes education-job mismatches as exogenous.

Third, our thesis may attract educational policy makers in Cambodia to pay more attention on the impacts of education-job mismatches among graduates in Cambodia. This may incite them to consider appropriate policies to solve the problems. This thesis may also draw attention of other Cambodian scholars to pursue researches on education-job matching to support the coordination between the education system and labor market in Cambodia. The third chapter that focuses on several developing countries, might be an interest for other foreign scholars to conduct further researches on this issue in other developing nations.

Appendix: A

Questionnaire on the employability of bachelor's graduates

(For the analysis in chapters 1 and 2)³⁹

The survey, a part of HEQCIP-RULE project, funded by the World Bank and conducted by the University Research Center in Economics and Management of French Cooperation at the Royal University of Law and Economics (RULE), aims at studying the employability of Cambodian bachelor's graduates in 2011 from 8 Higher Educations in Phnom Penh.

All the students' collected information is confidential. Only statistical results concerning the labor market of the graduates will be published.

Questionnaire number:	Name of interviewer:
Interviewing date:	Starting time:
Finishing time:	Name of interviewee:

A. Information on the Bachelor's degree obtained in 2011

A.1. Specify the type and name of your degree:

Specialization: _____

Name of institution: _____

Annual tuition (year 4): _____

Date of obtaining the degree: _____

A. 2 Did you have any internship during your Bachelor's years?

Yes

No

³⁹The questionnaire was prepared in Khmer language. This is a non formal translation by the author.

B. Information on other training courses

B.1. In addition to the major skill you studied in the Part A, were you enrolled in other courses? *Include only course lasting at least 6 months.*

- Yes
- No (Go to question C1)

B.2. Please provide information related to this course!

Specialization: _____

Level of study (Bachelor/Master/Short-course): _____

Name of institution: _____

Annual tuition: _____

B.3. For this supplementary education, what is your situation?

- You are still studying
- You finished it
- You abandoned it

C. Transition from studies to employment

C.1. Have you ever had a paid job before your graduation in 2011?

- Yes
- No (Go to question C.4)

C.2. If yes, please indicate your position and functions:

Position: _____

Functions: _____

C.3. Have you continued the job until now?

- Yes (Go to question C.7)
- No

C.4. After having finished your study in 2011, have you ever had a paid job? Including independent job

- Yes
- No (Go to question H.1)

C.5. When did you start working after your graduation in 2011?

Date: _____

C.6. How many months did you spend to get this job?

Answer: _____

C.7. How did you find this job? (multiple choices possible)

- Newspapers
- Internet
- I contacted the employer
- I was contacted by the employer
- Through internship/job during study
- Through family/friends
- Through the career forum
- I run my own business
- Other, please specify:

D. Professional curriculum

D.1. How many employers in total have you worked for since your graduation in 2011?

Include yourself if you are self-employed.

Include your current employer.

Number of employers: _____

D.2. How many months in total have you been employed since your graduation in 2011?

Answer: _____

D.3. In the final year, have you ever participated in any training related to your job?

- Yes! Number of hours per week: _____
- No

E. Current employment

Answer these questions referring to your current job (including self-employment). If you are still in the first job you had before or after your graduation in 2011, answer these questions by referring to your current situation.

If you have more than one job, answer by referring to the job on which you spend your time the most.

E.1. What is your profession?

Answer: _____

E.2. Please indicate your position and functions!

Position: _____

Functions: _____

E.3. What type of employment contract do you have?

- No contract.
- Permanent employment contract
- Fixed-term contract

E.4. What is your current monthly gross salary (USD)?

Answer: _____

E.5. Are you satisfied with your job?

- Very dissatisfied
- Dissatisfied
- Neutral
- Satisfied
- Very satisfied

F. Information on the company

The following questions refer to the company/organization in which you are currently employed.

If you are self-employed or managing a company, these questions are also applicable.

F.1. For your current job, when did you start working?

Answer: _____

F.2. In which sector do you work?

- Public Non Governmental Organization
 Private Other, please precise:

F.3. Where is the location of your company?

City/province: _____

F.4. What is the total number of employees in your company?

- 1-9 10-49 50-99 \geq 100

G. Information on other jobs

G.1. Besides your main job, do you have other jobs?

- No (Go to question H1)
 Yes

First occupation: _____

Second occupation: _____

G.2. How many hours per week do you spend on these jobs?

Answer: _____

G.3. On average, how much do you earn from these supplement jobs?

Answer: _____

H. Evaluation on study program

H.1. If you could go back to the past, would you still choose the same major and in the same HEI?

- Yes.
 No, I would choose another major, but in the same HEI.
 No, I would choose the same major, but in another HEI.
 No, I would choose another major and in another HEI.
 No, I would choose not to pursue my bachelor's degree.

I. Information on funding of studies

I. 1 How did you finance your studies and your living during your bachelor's degree?

- Parents
 Family
 Self-finance
 Company's fund
 NGO's fund
 Scholarship
 Loan from banks or microfinance
 Other, please precise:

J. Value and preferences

J. 1. Please indicate the importance you personally attach to these following items and how they apply to your case.

If you are not currently employed, complete only column A.

Job characteristics	Importance for you					Implication in the job				
	1	2	3	4	5	1	2	3	4	5
Work independently										
Opportunities to learn new things										
High salary										
New challenges										
Good perspectives in the career										
Good social status										
Opportunity to do useful things for community										
Reconciliation of work and family life										

K. Knowledge and preparedness for ASEAN integration in 2015

K.1. Do you know the date of the ASEAN integration?

- Yes. Please precise the date:
 No

K.2. Do you know that after the integration, there will be free movement of skilled workers in ASEAN?

- Yes.
 No.

K.3. What is your opinion on this mobility?

- I think that is good. (Skip K.5)
- I think that is not good. (Go to K.5)
- I think it can be both good and bad.

K.4 Why do you think it is good?

- Young Cambodians will have more opportunities to work abroad.
- Young Cambodians will be able to improve their skills through competition.
- Young Cambodians will learn and understand better the cultures of ASEAN.
- Other. Please precise:

K.5 Why do you think that is not good?

- Young Cambodians will encounter difficulties in finding a job.
- The inflows of foreigners and their cultures.
- Economy of Cambodia remains weak and so could not accept the integration.
- Other. Please precise:

K.6. Have you done anything to prepare yourself for the eventual challenge from this integration?

- Yes, I did.
- No, not at all. (Go to K.8)

K.7 What are your preparations?

- I am working harder on my studies and jobs.
- I try to understand more the cultures of ASEAN.
- I try to follow the information on the integration of ASEAN.
- I am improving more my English language.

I learn other ASEAN languages.

Other. Please precise.

K.8. Are you confident to challenge other young people from ASEAN?

Low self-confident

High Self-Confident

1

2

3

4

5

L. Personal Information

L.1. Gender:

Male

Female

L.2. Birth year

Answer: _____

L.3. Where did you live while obtaining your high school diploma?

City/province: _____

L.4. Where do you live now?

City/province: _____

L.5. Whom did you stay with during the final year of your bachelor's degree?

Alone

Spouse

Friends

Parents

Pagoda

NGO

Other, please specify:

L.6. Nowadays, whom do you live with?

Alone

Spouse

Friends

Parents

Pagoda

NGO

Other, please specify:

L.7. What is the profession of your parents?

Mother: _____

Father: _____

L.7. What is the level of education of your parents?

Mother: _____

Father: _____

Appendix: B

1. Economics and Management major comprises specialties such as:
Economics sciences, Business management, Accounting, Marketing, Finance and banking, and other related skills.
2. Engineering and Architecture major consists of specialties such as:
Civil engineering, Electrical and energy engineering, Industrial and mechanical engineering, Architectural designs, and other related skills.
3. Information and Computer Technologies major comprises specialties such as:
Computer sciences, Management information system, and other related skills.
4. Sociology and Humanities major consists of specialties such as:
Khmer literature, Geography, History, Philosophy, Sociology, and other related skills.
5. Social sciences in English language major comprises specialties such as:
English literature, Translation, Interpretation, International relation, English for business, Professional communication, and other related skills.
6. Tourism and Hospitality major consists of specialties such as:
Hotel and tourism management, Tourism education and resource, Hospitality management, Hotel administration, and other related skills.
7. Law and Public Affairs major comprises specialties such as:
Business law, Public law, Public administration, and other related skills.
8. Sciences major consist of specialties such as:
Mathematics, Chemistry, Biology, Physics, and other related skills.

Chapter I

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

Abstract

This article analyzes the relation between unemployment duration and education-job mismatches (overeducation and horizontal mismatches). This study proposes a job matching model to identify the theoretical mechanisms. An econometric analysis using the independent competing-risks duration model on a survey of graduates from Cambodian universities, allows testing the theoretical predictions. The results prove that unemployment duration increases with educational mismatches. Reforms in the Cambodian education system are thus required to decrease unemployment risks and educational mismatches among university graduates.

Keywords: vertical and horizontal educational mismatches, unemployment duration, job matching model, independent competing risks duration model.

JEL Codes: I23, J24, J64.

1 Introduction

In developed countries, education plays a key role against unemployment: The higher educational levels, the lower risks of unemployment (Mincer, 1991). However, 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 & Tai, 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, over-education, or vertical mismatch, refers to an excess of education, beyond the level needed to perform a certain job (Hartog, 2000 ; McGuinness, 2006). Second, the 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. The analysis of unemployment duration and educational mismatches among graduates represents thus a critical research for developing countries.

Surprisingly, only little studies examine the relation between the 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, in particular the 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 is found in the stepping stone hypothesis (Sicherman & Galor, 1990): Overeducation is an investment in work experience, which enhances promotion opportunities. Hence, 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 wait for a matched job. Nevertheless, these

graduates may still fail to find a better matched job if there is an excessive supply of graduates in the labor market. In that situation, education-job mismatches can be also associated with a longer unemployment duration. The uncertainty exists, and this needs empirical investigations.

Cuesta (2005) uses a simultaneous equations' procedure and finds that there exist unobserved factors that increase unemployment duration and reduce probability of being overeducated in the first job for Spanish youths. Pollmann-Schult & Büchel (2005) apply a competing risk specification on the data of the West German Life History Study and show that a shorter unemployment duration is associated with higher rates of transition to overeducation. Thus, these two researches confirm that education-job mismatches can shorten unemployment duration. Nevertheless, Rose & Ordine (2010), using competing risks models applied to a survey carried out by the Italian Institute for Vocational Training of Workers, find that overeducation is an occurrence following long periods of unemployment. Barros et al. (2011) employ Cox duration and prove that overeducation increases unemployment duration among the graduates in France. Lin & Hsu (2013) implement censored regressions on the Taiwan's Manpower Utilization Survey and find overeducation lengthens unemployment duration as well. Hence, the link between unemployment duration and education-job 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 dimensions.

The objective of this article is accordingly 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. The unemployment rate in Cambodia was only 0.2% in 2011

and 0.4% in 2014 (ILO's website¹), but according to two surveys conducted by Paul (2011) and Sam (2014), the unemployment rate among university graduates was much higher and reached 2.4% and 4.1%, respectively, even though they had left university for three years. Between 2000 and 2014, the number of higher education institutions (HEI) in Cambodia massively increased from fourteen (14) to one hundred and five (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.

¹<http://www.ilo.org/global/research/global-reports/weso/2016/lang--en/index.htm>

2 Theoretical model framework

We propose to model the individual search behaviors to identify relation between the 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 also 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, $q(\theta)^2$ 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:

$$rV_j = q(\theta)(J_j - V_j) - y_j c_v \quad (\text{I.1})$$

$$rJ_j = y_j - w_j - \delta J_j \quad (\text{I.2})$$

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:³

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

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, $\theta q(\theta)^4$ the arrival rate of job offers, and $z = b - c_s$. Hence, U can be defined as:

$$rU = z + \theta q(\theta)(W - U) \quad (\text{I.4})$$

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

² $q(\theta) = \frac{m}{v}$ and $\theta = \frac{v}{u}$ represents the market tightness

³See Appendix: A

⁴ $\theta q(\theta) = \frac{m}{u} = \frac{v}{u} \frac{m}{v}$

defined as:

$$rW = \alpha w_R + (1 - \alpha)w_M + \delta(U - W) \quad (\text{I.5})$$

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

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

$H(w_R)$ 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 .

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:

$$\phi_R = \lambda_R[1 - F_R(w^*)] \quad (\text{I.7})$$

$$\phi_M = \lambda_M[1 - F_M(w^*)] \quad (\text{I.8})$$

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.

⁵See Appendix: B

Table I.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 graduates⁶ 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.⁷

This survey records the total unemployment spell that graduates had faced since the 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 overeducation, job analysis (JA) method, which offers an objective measure, is employed. The International Standard Classification of Occupations Code (1-digit) published in 2012 (ISCO-08) and the International Standard Classification of Education published in 1997 (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 corresponds to the occupational levels 1 (managers), 2 (professionals),

⁶The 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.

⁷By 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.

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. Thus, overeducated graduates are those who do not need the tertiary education for their occupations.

Two tables specify the process for matching the occupational class to the educational level required.

Table I.2: 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 I.3: 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

The data also include the 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.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 4 with the relation to unemployment duration.

Table I.4: 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 4, 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

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

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

of study, internship, parents' educational levels, job networks, and preferences on different job characteristics. Table 5 provides a description of unemployment duration by graduates' attributes.

Table I.5: 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 5, 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 education-job 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 .

$$(T_j^* \amalg T_k^*) \mid X, \quad \forall j \neq k, \quad j, k = 1, 2, \dots, N \quad (\text{I.9})$$

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:

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

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.

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 6 presents the results.

Table I.6: 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 I.6: 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	-0.153*** (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 7).

Table I.7: 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, there is no relation between the 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 the graduates prefer to wait 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 6, 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 (2016), 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 expecting for 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 con-

sider 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 (Sicherman & Galor, 1990). 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 (Robst, 2007a), 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 if there exists a link 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 potential mismatches between educational endowments and job characteristics. The survey also informs the total unemployment duration that graduates had faced since their graduation and other observed graduates' attributes. Our research 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, we analyze from both theoretical and empirical angles. In the theoretical part, we use the job matching model to explain the mechanism linking unemployment duration and education-job mismatches. In the empirical part, 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 mismatches.

Thus, 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, HEI and the private sector. Each HEI needs to recruit qualified teachers and update the teaching methodologies to improve the students' professional skills, including cross-cutting knowledge such as computer and English skills. Internships should be set as compulsory because students can acquire practical experiences and create their professional networks. Evaluations of different universities' performance in terms of students' employability should be also 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.

Appendix: A

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

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

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

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

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

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

$$q(\theta)(y_R - w_R) - y_R c_v(r + \delta) > q(\theta)(y_M - w_M) - y_M c_v(r + \delta) \quad (\text{I.14})$$

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

Appendix: B

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

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

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

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

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

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

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

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

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

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:

$$w^* = z + \theta q(\theta)(W - U) \quad (\text{I.20})$$

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

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

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

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).

Appendix: C

Table I.8: Field of education and matching jobs

Field of education	Matching jobs (ISCO-08 3-digit codes)
Economics and Management	112, 121, 122, 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 Sciences	112, 216, 231, 232, 233, 234, 262, 263, 264, 265, 341, 511
Information and Computer Technologies	211, 212, 231, 232, 233, 311, 331, 421, 431
Tourism and Hospitality	112, 121, 133, 134, 231, 232, 233, 251, 252, 351, 352, 524
Law and Public Affairs	112, 122, 134, 141, 231, 232, 243, 264, 341, 343, 441, 511
	111, 121, 231, 232, 242, 261, 262, 263, 264, 334, 335, 341

Table source: Author's estimation. The thesis's author reviews the job prospect described for each specialty in each university, then compares with individual occupation.

Chapter II

Overeducation and horizontal mismatch: A double wage penalty for graduates in Cambodia?¹

Abstract

This article analyzes the wage impact of the level of educational mismatches (vertical and horizontal mismatches). To control for selection bias in the educational mismatch process, this study applies an ordered selection Heckman model. The results of a survey of graduates from Cambodian universities confirm the need for a selection correction and the presence of a double wage penalty when vertical and horizontal mismatches both occur. Reforms in the Cambodian educational system thus are required to decrease the propensity of educational mismatches and reinforce incentives for education.

Keywords: overeducation, vertical and horizontal educational mismatches, wage differentials, ordered Heckman model.

JEL Codes: I23, I26, J24, J31.

¹This chapter is co-authored with my supervisor, Professor Mareva Sabatier.

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 contributed significantly to economic growth, yet 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 ; McGuinness, 2006). The mismatch can lead to a troubling wage penalty for overeducated workers (Duncan & Hoffman, 1981 ; Hartog & Oosterbeek, 1988 ; Groot & Van Den Brink, 2000 ; Hartog, 2000; Rubb, 2003 ; Battu & Sloane, 2004 ; McGuinness, 2006). This penalty is mainly explained by a lower labour productivity and thus higher skill costs for firms.

This mismatch problem also may be expanding to developing countries, which is somewhat surprising, considering the relatively low levels of educational attainment and higher rate of returns to education in developing economies (OECD, 2014). Two main factors may explain this education-occupation mismatch: Poor management of the educational system, such that students do not graduate endowed with the actual skills required by the labor market, and employment inequality resulting largely from the substantial size of the informal sector in these economies. The wage penalty associated with overeducation in turn may discourage people from investing in their own human capital, which likely will constraint the future economic growth and hinder developing economies' ambitions to upgrade to more technology-based industrial structures. Therefore, investigating the risk of a wage penalty due to overeducation in developing countries represents a critical research need.

Previous research into educational mismatches in developing economies is quite recent and scarce though: Quinn & Rubb (2006) study overeducation in Mexico; Abbas (2008) investigates Pakistan; Mehta et al. (2011) consider four developing countries, namely, the Philippines, Mexico, Thailand, and India; Filiztekin (2011) studies Turkey; both Zakariya & Battu (2013) and Lim (2013) study the effect in Malaysia; Herrera-Idárraga et al. (2015) investigate Colombia, Reis (2017) analyzes Brazil; and Pholphirul (2017) examines Thailand. None of these investigations focus on countries that appear poised to reach middle-income status though. For example,

in Cambodia, the gross domestic product (GDP) per capita was only 1.095 USD in 2014 (World Bank's website²), and it has just graduated to a lower middle-income status by 2016. This country thus offers an interesting case, particularly considering its unique history and current status. During the Khmer Rouge regime, between 1975 and 1979, 75% of higher education lecturers, 96% of university students, and 67% of all primary and secondary school pupils were killed (Rany et al., 2012, p.230 ; Benveniste et al., 2008, p.3). Since then, Cambodia has been struggling to rebuild its educational system, and its achievement has been remarkable. Its illiteracy rate declined from 37.2% to 21.6% between 1998 and 2008 (ILO & ADB, 2015, p.41), while the percentage of the tertiary-age population enrolled in tertiary education increased from 2.37% in 2001 to 15.9% in 2011 (UNESCO's website³).

Concurrent with these notable achievements, concerns about overeducation among university graduates have arisen, along with predictions that the mismatches could constrain growth and development, which may leave the Cambodian economy stuck in the middle-income trap. The main reason that Cambodian graduates fail to find a job that matches their educational level is due to a learning gap, such that 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). Unquestionably, the education-job mismatches can diminish people's motivation to invest in education. As a result, the lack of human capital can create pitfalls for Cambodia, including limits to foreign direct investment (FDI) inflows, and lower prospects of job creation (Noorbakhsh et al., 2001). For the 300,000 to 400,000 Cambodian youths expected to enter the labor market each year during the next decade (MoC & UNDP, 2014, p.15), educational mismatches will foster their disillusionment with education, the society, and their lifestyle. Therefore, without viable solutions, the costs of educational mismatches would be prominent (e.g., youth unemployment, underemployment, social inequality, and potential social unrest). Improving the skills of this young workforce in a way that matches the demand of labor market represents a substantial challenge for Cambodia's education system, but it also is an opportunity to invoke inclusive economic growth based on the human capital and decent employment. Furthermore, Cambodia needs to exploit the potential inherent in its large youth population before

²Data link: <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=KH>

³Data link: <http://data.uis.unesco.org/?queryid=142>

it is too late; the working age population (15-64 years) has increased rapidly, from 7.6 million in 2004 to 9.6 million in 2013 (ADB, 2014, p.36)⁴, yet the window during which this demographic dividend will exist ultimately will close. The resolution of human capital problems inherently involves a long-term process, so it is urgent to consider educational mismatches carefully.

The objective of this article is accordingly to investigate if the educational mismatches generate a wage penalty for Cambodian university graduates. The research also accounts for two methodological issues that have not been resolved fully in prior literature pertaining to educational mismatches.

First, overeducation produces vertical mismatch, such that graduates possess a level of education that is above the required level for their occupations. Another type of mismatch also exists, namely, horizontal mismatch, which implies that people's occupations do not match their fields of education (Sloane, 2003 ; Robst, 2007a,b ; Domadenik et al., 2013). The potential costs of horizontal mismatch appear comparable to those of overeducation, so recent studies focus much more on this category in developed countries (Domadenik et al., 2013). However, little research has addressed the possibility of a double mismatch and its wage impacts. Robst (2008) considers both mismatches and finds a stronger wage penalty among U.S. graduates subjected to both mismatches. In Cambodia, the imbalance between the demand for and supply of graduates in particular fields provokes horizontal mismatches. Similar to other developing countries, Cambodia needs engineers who can fill construction, infrastructure, and manufacturing jobs; specially, Cambodia would need about 35,000 engineers and 46,000 technicians by 2018 (Madhur, 2014a, p.1). Yet the percentage of students enrolled in engineering studies is marginal, such that only around 3% of all students are pursuing engineering or mechanical degrees (D'Amico, 2010, p.7).

Second, education-job mismatches may be endogenous. According to Becker (1964), educational choices involve a trade-off between the expected return to the education and the costs of this investment. Thus, solving the endogeneity is necessary to attain robust estimates. Previous research that has tried to deal with this endogeneity do not account for the possible combination of vertical and horizontal

⁴Cambodia's total population was 15.1 million in 2013 (World Bank's website).

educational mismatches, and relies on different techniques, such as propensity score matching (McGuinness, 2008), instrumental variables (Korpi & Tåhlin, 2009), or fixed effects (Dolton & Vignoles, 2000 ; Bauer, 2002 ; Dolton & Silles, 2008 ; Lindley & McIntosh, 2009 ; Korpi & Tåhlin, 2009 ; Tsai, 2010 ; Carroll & Tani, 2013). To extend this line of research, the current study therefore adopts a different method, namely, an ordered selection Heckman model, applied to a new database drawn from a survey of the employability of Cambodian university graduates that was conducted in 2014 by the University Research Center in Economics and Management (URCEM) at the Royal University of Law and Economics (RULE) in Cambodia.

2 Data and descriptive statistics

2.1 Measuring educational mismatches

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 March and May 2014, among Cambodian graduates who had received their bachelor's degrees in 2011.⁵ The 1,050 observations are randomly selected and representative of eight universities (four public four private) in Phnom Penh, the capital of Cambodia. The current study excludes self-employed people from the initial data set, because there are no detailed information available to evaluate if they require a university degree for their business or not. Some observations that offered no information on occupation or earnings also were dropped. The final sample thus contains 624 university graduates, who are representative of the study population.

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.⁶

Based on this objective measure, 22.3% of graduates are overeducated. Women tend to be more vertically mismatched though, such that 29.3% of female graduates and 16.3% of male graduates are overeducated, as Table 1 indicates.

⁵This data collection is a part of the Higher Education Quality and Capacity Improvement Project (HEQCIP), with the financial and technical supports of the World Bank and the Department of Higher Education (DHE) of the Ministry of Education, Youth and Sport (MoEYS) in Cambodia.

⁶Tables that specify the process of matching the occupational class to the educational level required, are in the Appendix.

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, we compared these descriptions with each individual occupation to discern if each graduate’s job corresponded with his or her field of study. This analysis revealed that 36.2% of these graduates are horizontally mismatched (see Table 1), and again, women appear to be more mismatched than men, by around 6 percentage points.

Table II.1: Incidence of educational mismatches

VARIABLE	TOTAL		Male		Female	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Overeducation	0.223	0.416	0.163	0.370	0.293	0.456
Horizontal mismatch	0.362	0.481	0.335	0.473	0.394	0.489

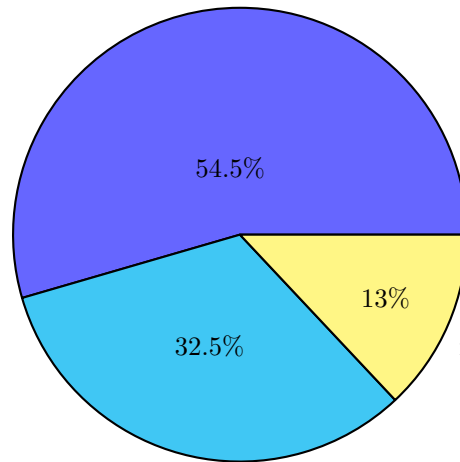
The incidence of overeducation is thus 14 points lower than this of horizontal mismatches. Moreover, combination of the two educational mismatches are observed: 13% of graduates suffer from a double mismatch. Finally, only 32.5% of the graduates are single mismatched and among them, only 29% are overeducated. All these statistics highlight that horizontal mismatches can be more common as well and that taking into account only overeducation would neglect another main source of educational mismatches in Cambodia.

To capture both vertical and horizontal mismatches, we decide to focus on the overall level of mismatch,⁷ through a variable denoted *mismatch*. This variable equals 0 if graduates’ education matches both the field and level of education required for their jobs, 1 if graduates face one of these two mismatches, and 2 if a double mismatch exists (see Figure 1).

⁷Note that among graduates who face only one mismatch, 145 suffer from only horizontal mismatch and 58 from only overeducation. The relatively small sample of vertically mismatched graduates makes it impossible to estimate the different types separately with a robust analysis, so an investigation of the *mismatch* variable is preferable.

Figure 1: Percentage distribution of mismatched level

mismatch = 0 (no mismatch)



mismatch = 2 (double mismatch)

mismatch = 1 (single mismatch)

2.2 Descriptive statistics

Table 2 presents descriptive statistics for variables included in the analysis.⁸

Table II.2: Descriptive statistics

VARIABLES	TOTAL			Level of Mismatch:		
	Mean	Std. dev.	Observed mean wage	No Mismatch	Single Mismatch	Double Mismatch
<u>Dependent variable</u>						
Salary (log)	5.78	0.52		5.86	5.75	5.50
<u>Individual attributes</u>						
Male	0.54	0.50	5.82	0.60	0.47	0.44
Age at the end of study	23.54	2.31	5.93	23.46	23.78	23.31
Married	0.13	0.33	5.93	0.11	0.15	0.14
Sciences	0.19	0.39	5.98	0.25	0.12	0.09
Law-Eco-Management	0.58	0.49	5.66	0.53	0.61	0.70
Social Science Khmer	0.06	0.23	5.38	0.05	0.04	0.12
Social Science English	0.17	0.38	6.05	0.16	0.23	0.09
Double training	0.41	0.49	5.85	0.45	0.34	0.40
Internet training	0.33	0.47	5.77	0.38	0.29	0.27
High level education of parents	0.12	0.32	5.84	0.13	0.12	0.05
Studying in a private university	0.43	0.50	5.80	0.39	0.52	0.42
Educ_parents x Private_Univ	0.19	0.40	5.76	0.17	0.22	0.23
Being born in a developing area	0.80	0.40	5.79	0.82	0.77	0.78
Internship during the study	0.54	0.50	6.03	0.57	0.50	0.48
<u>Firm and job characteristics</u>						
Experience	27.46	7.45	5.87			
Working in the public sector	0.12	0.33	5.77			
Permanent contract	0.21	0.41	5.84			
Working in a small firm	0.35	0.48	5.82			
Working outside Phnom Penh	0.19	0.40	5.83			
Observations		624		340	203	81

⁸For continuous variables (age at the end of study and experience), observed mean wages are evaluated for the two last quartiles of each variable.

According to these statistics, graduates facing single or double mismatch earn, respectively (logarithms), 1.9% and 6.1% less than graduates with no mismatch. The wage penalty is thus observed, though these initial figures cannot reflect the true impact of mismatches. For example, Table 2 suggests a strong link between the level of mismatches and individual attributes, which influence wages. Gender and marital status appear to have less influence on educational mismatches, but strong differences emerge according to academic background characteristics. In line with some previous research (e.g., Dolton & Vignoles, 2000 ; Morano, 2014), more scientific (e.g., engineering) and specific (e.g., medicine, architecture) disciplines are less likely to suffer the risk of mismatches. Graduates in the sciences represent 18% of the sample but only 9% of those who suffer from a double mismatch. In terms of competencies, skills in English and Internet use, as well as a double degree, seem to protect against mismatches. Moreover, the type of university affects education mismatch frequencies. Private institutions seem to favor mismatches, probably related to teaching quality, as Robst (1995b) proposes for colleges. Finally, family characteristics, such as the parents' educational levels, limit educational mismatches. Competent instruction, more expenditures on education, and greater attention to children's education appear to function as financial and technical supports that help children perform better from their earliest experiences with school (Hansen & Mastekaasa, 2006 ; Torche, 2011 ; Capsada-Munsech, 2015).

Thus, educational mismatches are not exogenous. Moreover, attributes that link with mismatches seem to have an impact on wages (together with firms' characteristics). An econometric analysis could help estimate the real impact of education mismatches on wages.

3 Method and results

The descriptive analysis shows substantial wage heterogeneity according to the level of educational mismatches. To identify the impact of these mismatches on wages, ordinary least squares (OLS) offers an estimate of the following equation:

$$lwage_i = a'x_i + bmismatch_{ij} + \theta_i, \quad (1)$$

where $lwage$ defines the observed wages (in logarithm), x is a vector of independent variables (including experience, business sectors, type of contracts, and firm size), $mismatch_i$ reflects the observed categorical variable of educational mismatches ($j = 0, 1, 2$), θ defines the error term, and a and b are unknown parameters, such that b represents the estimated effect of educational mismatches on wages, *ceteris paribus*.

According to this first equation, educational mismatches are perfectly exogenous, a situation that is clearly contradicted by prior research and the descriptive statistics in the previous section. To account for the potential endogeneity of the level of educational mismatches, this study instead proposes estimating a selection-bias correction model. Consider a model in which all individuals i are sorted into three levels of educational mismatches on the basis of an ordered-probit selection:

$$mismatch_i^* = \alpha'w_i + \mu_i, \quad (2)$$

where w define the explanatory variables of educational mismatches. In turn,

$$mismatch_i = \begin{cases} 0 & \text{if } mismatch_i^* \leq \delta_0 \\ 1 & \text{if } \delta_0 < mismatch_i^* \leq \delta_1 \\ 2 & \text{if } mismatch_i^* > \delta_1 \end{cases} \quad (2 \text{ bis})$$

where α is an unknown vector of parameters, μ_i is a standard error term, δ_0 and δ_1 are the unknown cutoffs, and $mismatch_i^*$ defines the latent variable.

The logarithm of wage is a linear function of observed characteristics x_i , but the effects of x_i depend on the level of educational mismatches (Chiburis & Lokshin, 2007):

$$lwage_i = \begin{cases} \beta'_0 x_i + \epsilon_{0i} & \text{if } mismatch_i = 0 \\ \beta'_1 x_i + \epsilon_{1i} & \text{if } mismatch_i = 1 \\ \beta'_2 x_i + \epsilon_{2i} & \text{if } mismatch_i = 2 \end{cases} \quad (3)$$

with:

$$\epsilon_{ij} \rightarrow \Phi^2(0, \sigma^2, \rho_j), \quad (4)$$

where Φ^2 is the bivariate normal distribution. Here, the ρ_j coefficients give the correlation between the ordered level of educational mismatches and the wage equations. If $\rho_j = 0$, the OLS estimate (model(1)) is unbiased, and there is no need to use a selection-bias correction model.

This ordered Heckman model leads to predictions of the estimated wage, conditional on the level of educational mismatches, as given by:

$$E[lwage_i/mismatch_i, w_i, x_i] = \beta'_j x_i + \rho_j \sigma_j \lambda_{ij}, \quad (5)$$

where λ_{ij} is the inverse Mills ratio (Heckman, 1979).

The estimate of the ordered Heckman model uses a Full Information Maximum Likelihood (FIML) procedure, which maximizes the following likelihood function:

$$L_{ij}^{lwage} = \frac{1}{\sigma_j} \left[\Phi \left(\frac{\alpha' w_i + \rho_j t_i - \delta_j}{\sqrt{1 - \rho_j^2}} \right) - \Phi \left(\frac{\alpha' w_i + \rho_j t_i - \delta_{j+1}}{\sqrt{1 - \rho_j^2}} \right) \right] \quad (6)$$

Table 3 summarizes the results of the OLS estimate and the ordered Heckman model.

Table II.3: Results

VARIABLES	(1)	(2)	(3)	(4)	(5)
	lsal (ols)	mismatch	lsal0	lsal1	lsal2
Male	0.024 (0.039)	-0.220** (0.102)	-0.046 (0.054)	-0.046 (0.109)	0.242** (0.108)
Married	0.182*** (0.067)	0.147 (0.142)	0.093 (0.093)	0.362*** (0.140)	0.313* (0.164)
Law - Economics - Management	-0.273*** (0.057)	0.561*** (0.148)	-0.233*** (0.067)	0.236 (0.185)	-0.662*** (0.206)
Social Sciences English	0.065 (0.072)	0.470*** (0.170)	0.055 (0.091)	0.538*** (0.185)	-0.222 (0.215)
Social Sciences Khmer	-0.531*** (0.094)	0.891*** (0.270)	-0.347** (0.136)	0.073 (0.294)	-0.863*** (0.256)
Double training	0.082** (0.039)	-0.177* (0.108)	0.023 (0.053)	-0.018 (0.122)	0.150 (0.110)
Experience	0.007*** (0.002)		0.007** (0.003)	0.006 (0.004)	0.012* (0.006)
Working in the public sector	-0.026 (0.057)		-0.027 (0.066)	0.033 (0.126)	-0.489* (0.254)
Permanent contract	0.121** (0.053)		0.149** (0.065)	0.045 (0.092)	0.334* (0.182)
Fixed-term contract	0.160*** (0.045)		0.202*** (0.059)	0.185** (0.077)	0.034 (0.107)
Working in a small firm	0.081** (0.040)		0.083* (0.050)	0.054 (0.068)	0.120 (0.115)
Working in a medium firm	0.036 (0.063)		0.037 (0.085)	0.067 (0.104)	-0.009 (0.125)
Working outside Phnom Penh	-0.085* (0.045)		-0.149*** (0.057)	-0.033 (0.088)	0.225* (0.123)
Mismatch=0	ref.				
Mismatch=1	-0.074* (0.041)				
Mismatch=2	-0.223*** (0.059)				

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

Notes: Robust standard errors are in brackets.

Table II.3: Results-continued

VARIABLES	(1) lsal (ols)	(2) mismatch	(3) lsal0	(4) lsal1	(5) lsal2
Age at the end of the study		-0.052*** (0.015)			
Internet training		-0.238** (0.109)			
High level education of parents		-0.218* (0.131)			
Studying in a private university		0.239* (0.139)			
Educ_parents x Private_Univ		0.191** (0.097)			
Being born in a developing area		-0.204*** (0.079)			
Internship during the study		-0.249** (0.098)			
Constant	5.637*** (0.101)		5.850*** (0.141)	4.869*** (0.287)	6.144*** (0.473)
δ_0			-1.077*** (0.378)		
δ_1			0.805 ** (0.379)		
ρ_0			0.538*** (0.157)		
ρ_1			0.849** (0.143)		
ρ_2			-0.776** (0.167)		
σ_0			0.477*** (0.033)		
σ_1			0.743*** (0.243)		
σ_2			0.569** (0.131)		
Observations	624	624	624	624	624
R^2	0.233				
Log likelihood			-932.429		
Wald test of indep. eqns. (rho = 0)			15.031***		

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

Notes: Robust standard errors are in brackets.

The OLS estimate shows that a person who faces only horizontal or vertical mismatching suffers 7.7% ($\exp(-0.074)$) lower wage on average. The wage penalty grows three times more substantial, increasing to about 25% ($\exp(-0.223)$), when both mismatches are observed ($mismatch = 2$). But selection bias can affect these estimates, as stressed by Dolton & Vignoles (2000) and Dolton & Silles (2008) and suggested by descriptive statistics. The ordered Heckman model indicates the existence of such bias.

First, the level of educational mismatches strongly depends on several observed attributes. In Cambodia, the propensity of high educational mismatches is much higher for women, as also noted by McGoldrick & Robst (1996). Women have more excess skills than their male counterparts, which may reflect the tendency of women to select more literary or management majors that offer poorer employment prospects (see *infra*). Gender stereotypes also may limit women's access to well-suited, well-paid jobs (Athey & Hautaluoma, 1994). In addition, individual skills affect the mismatch risks and level. Graduates from non-scientific majors are more likely to suffer from education-job mismatches, similar to findings by Green & McIntosh (2007) for the United Kingdom and Tao & Hung (2014) in Taiwan. The Cambodian educational system thus seems insufficiently adapted to the country's labour market, with too many people graduating in certain disciplines such as law, economics and management, literature, and social sciences in the Khmer language. According to one projection, between 2009 and 2014, the relative supply of graduates in law, economics-management, and related fields, was about 2.5 times greater than the demand for graduates in these fields, while the supply of graduates in engineering fields was lower than the demand (D'Amico, 2010, p.61). Regarding the allocation of genders by fields of study, across the eight universities in this study, women are substantially under-represented in engineering (8%), whereas they represent nearly half of the graduates enrolled in economics-management and related fields (47%). Yet among graduates with a double major, who have Internet skills, and who have completed an internship, educational mismatches are scarcer. Having skills demanded by employers thus offers improved employability and wage prospects. Parents' education also influences the level of educational mismatches: When students had parents who also had a university degree, they were subjected to lower educational mismatches. As Hansen &

Mastekaasa (2006), Torche (2011), and Capsada-Munsech (2015) suggest, graduated parents likely are better informed and share more knowledge with their children. Finally, studying in private universities leads to higher educational mismatches, even after controlling for the link with the level of parents' education. This result could be interpreted as a signal of the lower quality of education provided by these institutions in developing countries (Kwok, Chan, Heng, Kim, Neth, & Thon, 2010, p.41).

The results highlight that the correlation coefficients between the selection and wage equations, ρ_j , are all significantly different from zero (Wald test). This result conclusively indicates that the selection-correction model must be preferred over OLS estimates.

For a robust estimate of the wage penalty according to the level of educational mismatches, Table 4 provides the results of a calculation of the estimated wage, conditional on the level of educational mismatches (see Equation 5).

Table II.4: Observed and estimated wages (logarithms)

	Observed wage	Predicted wage
Mismatch=0	5.860	5.820
Mismatch=1	5.750	5.769
Mismatch=2	5.501	5.602

The observed wage differential between people suffering from no mismatch and those facing one or two mismatches is about 1.9% and 6.1%, respectively. But after the selection bias correction, these wage differentials fall to 0.9% for one mismatch and 3.7% when both horizontal and vertical mismatches occur. Selection effects thus cause about a half of the observed wage differentials. This finding is not really surprising; the current study results identify several variables that affect both the level of educational mismatches and wages. Neglecting the selection process leads thus to overestimates of the impact of mismatches on wages. For example, men have a dual advantage: They are less likely to face educational mismatches and also earn higher wages. Similarly, a degree in law, economics-management, literature, or social sciences strongly increases the level of educational mismatches and decreases wages. Accounting for the selection process in educational mismatches thus provides a more accurate assessment of the real impact of wage determinants and level.

Nevertheless, even after controlling for the selection bias, the predicted wage gaps remain positive and increasing with the level of educational mismatches. It is thus essential to move beyond traditional measures of overeducation to study educational mismatches in all their dimensions and combinations (Robst, 2008 ; Nordin et al., 2010 ; Tao & Hung, 2014). A double wage penalty exists for graduates from Cambodian universities who face both vertical (overeducation) and horizontal mismatches.

4 Conclusion

This article investigates whether the level of educational mismatches is associated with lower wages in Cambodia, on the basis of an original survey of graduates of Cambodian universities. This approach provides precise insights into the jobs obtained by university graduates and supports measures of the potential mismatches between educational endowments and job characteristics. A key contribution of this paper thus is the methods provided for dealing with two critical methodological issues. First, educational mismatches are dual in nature, involving both overeducation, or a vertical mismatch, and a horizontal form. Second, educational mismatches cannot be treated as exogenous, because educational choices clearly depend on the trade-off that each student makes between the expected benefits and costs of an investment in education.

To deal with both the double nature of educational mismatches (vertical and horizontal) and their endogenous status, the current study used an ordered Heckman selection model. The econometric results confirm that the level of educational mismatches significantly depends on individual attributes, parents' education, and study characteristics. After controlling for this selectivity process though, a wage penalty persists for graduates who suffer from educational mismatches. This penalty even worsened when vertical and horizontal mismatches were combined.

Therefore, this study highlights the need for a reform to the educational system in Cambodia, including a refocus of the educational programs on the real needs of the labor market, such that it helps students develop professional, Internet, and computer skills, English capabilities, and access to internships. Informational campaigns could be conducted to inform families about the real opportunities in the labor market, by focusing on the least educated members of the population. Furthermore, evaluations of different universities' performance in terms of students' employability could be developed to help families make more informed educational choices. Financial incentives might be an effective way to guide students toward the training courses the hiring companies prefer. Finally, programs focused specially on young female students should be established, to overcome the gender differences in the Cambodian labor market.

Appendix

Table II.5: 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 II.6: 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

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Chapter III

Overeducation among graduates in developing countries: What impact on economic growth?

Abstract

This article analyzes the impact of graduates' overeducation on economic growth in thirty-eight developing countries. A combination of macro data from the World Bank and micro data from the Integrated Public Use Microdata Series International (IPUMSI) is employed. To deal with unobserved heterogeneity between countries and endogeneity of overeducation, two-stage least squares regression with country fixed effects is estimated. Results highlight that a high rate of overeducated graduates is estimated to have a negative impact on economic growth at both short and medium terms. The expansion of higher education sector in developing countries should be realized with a deep attention on the education-job matching process among graduates.

Keywords: higher education, overeducation, economic growth, two-stage least square with fixed-effects regressions.

JEL Codes: I23, I25, J24.

1 Introduction

The human capital theory (Becker, 1964) considers education as an investment for a productivity enhancing and thus positively impacts individual earnings. At the national level, the models of endogenous growth view human capital as a factor of production that can increase the innovative capacity of the economy (Lucas, 1988 ; Romer, 1990). Education may also facilitate the diffusion and transmission of knowledge needed to successfully implement new technologies devised by others (Nelson & Phelps, 1966 ; Benhabib & Spiegel, 2005). Hence, from the theoretical point of view, higher education may generate a strong positive effect on economic growth.

As more education, more growth, countries are incited to invest in education. Consequently, a sharp increase in educational levels has been observed during the last few decades all over the world (Barro & Lee, 2001 ; OECD, 2014). Nevertheless, the positive impact of education on economic growth is very controversial from empirical studies, in particular for higher education sector.

While Chatterji (1998), Wolff (2000), Gyimah-Brempong et al. (2005) and Holland et al. (2013) find that higher education has a positive effect on economic growth, Holmes (2013) finds that mass higher education does not lead to higher growth in ninety one developed and developing countries during a period of forty years from 1966 to 2006. Hanushek (2013) also finds that the amount of tertiary education have no impact on economic growth for either developed or developing countries, especially when the quality of education is controlled.

The divergence between theoretical prediction and empirical studies on the role of higher education in the economic growth could be also related to the education-job matching process, particularly when the supply of highly educated workers is beyond the demand, generating a phenomenon called overeducation (Ramos et al., 2012 ; Kupets, 2015). Overeducation, or vertical educational mismatch, refers to an excess of education, beyond the level needed to perform a certain job (Hartog, 2000 ; McGuinness, 2006).

From the microeconomics' perspective, two approaches differ on the effect of overeducation. Researches in line with the "human capital approach" find that overeducated workers are more productive than their adequately educated colleagues in

the same jobs thanks to their more years of education, which is rather positive for economic growth (Sattinger, 1993 ; Kampelmann & Rycx, 2012). Nevertheless, from the "job satisfaction approach", overeducated workers are found to be less satisfied that may reduce their work efforts/cooperation, and they are likely to quit their jobs (Tsang & Levin, 1985 ; Wald, 2005 ; Blenkinsopp & Scurry, 2007 ; Tarvid, 2012). This can incur additional hiring/training costs and constraint the firms' development, which can negatively affect economic growth (Mahy et al., 2015 ; McGuinness et al., 2017).

From a strict macroeconomics' point of view, educational mismatches represent wasteful public investments and resources allocated to higher education sector, thus risks of not training enough graduates for industries that extremely need them and too much graduates for fields that do not have enough demands. Hence, it could have an unfavorable effect on the countries' gross domestic product (GDP) (Cedefop, 2010).

Up to now, little researches devote a special examination to a direct link between overeducation and economic growth. First, focusing on the French case between 1980 and 2002 and employing the vector autoregression (VAR) model, Guironnet & Jaoul-Grammare (2009) find that a share increase of overeducated workers of the higher education produces an unfavorable short-term effect on the economic growth with a significant threshold of 10%. In contrast, by using the ordinary least squares (OLS) regression and panel data models, Ramos et al. (2012) find that overeducation has a positive impact on economic growth in nine European countries.¹ Hence, the link between overeducation and economic growth is not clear. Furthermore, no studies focused yet on developing countries where there seems to be an increasing trend of overeducated graduates, and where resources for investment in education are severely constrained and can ill afford to be wasted (Keese & Tan, 2013).

Given the inconclusiveness of the existing literature, the objective of this paper is to investigate the impact of overeducation among tertiary graduates on economic growth with a focus on developing countries where educational mismatches may be also driven by factors other than those verified in developed countries.

¹Those countries are Austria, France, Greece, Italy, Portugal, Romania, Slovenia, Spain and United Kingdom.

Indeed, while there still exists a significant shortage of high skilled workers² reported by employers in several fields, the increase of higher education enrollment in developing countries is, however, accompanied by an increase in educational mismatches among graduates (Ra et al., 2015). Thus, the higher education sector in developing countries seems to face two problems: **1- A low quality of education system and 2- an inadequate link between demand and supply of graduates in some study fields** (Reis, 2017).

First, regarding the quality of education in developing countries, some higher education institutions (HEI) might have grown faster than qualified instructors, which affects the quality of teaching (Dessus, 1999 ; D. Chapman & Chien, 2014). In 2011-2012, for example, only 16% and 14% of university instructors hold doctoral degrees in China and in Vietnam, respectively (D. Chapman & Chien, 2014). Furthermore, in Cambodia for example, several HEI are driven by commercial interests and do not focus on the quality of education (Kwok et al., 2010).

Second, in regard to the relation between supply and demand for graduates, a severe mismatch may occur in some sectors. For instance, the country's education system has not produced enough graduates for nursing and high-tech manufacturing in China (Ra et al., 2015), while excessive supply for finance and management majors (Hu, 2013). This supply-demand inadequacy also exists in other countries like in Egypt (Salama, 2012), Thailand EIC (2014), Cambodia (Madhur, 2014a) and Latin American countries (Ferreyra, 2017). In fact, many students in developing nations, for example in Thailand and Cambodia, do not have enough information of labor market requirements, and they are more likely directed to simply attaining a degree rather than acquiring skills important for their future careers (Pholphirul, 2017 ; Peou, 2017). In other words, the *diploma disease*³ coined by Dore (1976) is likely existing over there.

²Skill shortages refer to unfilled or hard to fill vacancies that have arisen as a consequence of a lack of qualified candidates for posts (McGuinness et al., 2017)

³Diploma disease refers to credential inflation. As a consequence of the belief that educational certificates are the key to obtaining the best-paid jobs, individuals come to strive for constantly higher credentials in order to obtain jobs that previously did not demand those certificates, and for which their education does not in any case prepare them for those jobs and thus less likely to transform them into productive and innovative workers.

Due to these two problems, overeducated graduates might be not necessarily over-skilled (Sattinger et al., 2012). Thus, if the analysis of overeducation in developing countries seems at first sight not crucial given their still low educational attainments, it is actually much more important because the negative effect of overeducation might represent a risk of losing the potential growth as well as the capacity to catch up the developed nations.

To analyze our research question, this article uses two sources of data, a macro data from the World Bank to mainly calculate the economic growth and a micro data from the Integrated Public Use Microdata Series International (IPUMSI) to principally measure the incidence of overeducation. Then, we combine these two data and get an unbalanced panel of thirty-eight developing countries between 1990 and 2011. Next, to deal with the unobserved heterogeneity between countries and the endogenous problem of overeducation, two-stage least square (2SLS) regression with fixed-effects is employed.

Therefore, this research contributes to the literature on two main points: 1- Matching a micro and macro data, which allows to analyze the impact of overeducation on economic growth in developing countries, and 2- Dealing with the unobserved heterogeneity between countries and endogeneity of overeducation that have not been fully resolved in the prior literature.

The paper is structured as follows: Section 2 describes the database and how we measure overeducation, section 3 focuses on descriptive statistics, section 4 presents the method and results, and section 5 concludes.

2 Data

Our estimated model on the impact of overeducation on economic growth is based on the growth models and the conceptual framework developed in OECD's and the World Bank's report (2013) on the indicators of skills for employment and productivity.⁴

Nevertheless, there is no database available for us to directly test the model and analyze our research question. It is thus indispensable to construct a database by collecting both macro and micro data and then match them together.

At macroeconomics level, the World Bank's website permits us to extract data on several key variables,⁵ but to complement the lack of data for some variables, in particular the rate of overeducation among graduates, we need to employ a micro data from the IPUMSI.⁶

The IPUMSI's database provides integrated series of census micro data samples from 1960 to the present day. Nevertheless, given that the share of tertiary graduates has just started to increase in many developing countries from 1990s,⁷ we choose to analyze the period between 1990 and 2011.⁸

The obvious advantage of using the IPUMSI's samples lies in the fact that a number of key variables such as educational level and occupations are recorded using a homogeneous classification, allowing us to calculate the rate of overeducation and other variables in a comparable way between different countries.

⁴The conceptual framework consists of five inter-related domains of indicators, including: contextual factors which drive both the supply of and demand for skills (e.g, total population); skill acquisition which covers investments in skills (e.g, workforce with tertiary education); skill requirements which measure the demand for skills in the labour market (e.g, share of high skilled jobs); the degree of matching which captures how well skills obtained through education and training correspond to the skills required in the labour market (e.g, educational mismatch); and outcomes which reflect the impact of skills on economic performance (e.g, economic growth).

⁵Data source: <https://data.worldbank.org/indicator/>.

⁶Data source: <https://international.ipums.org/international/>

⁷The increasing trend of tertiary education can be seen on <https://ourworldindata.org/tertiary-education/>

⁸Because one of our dependent variables is the economic growth between t_0 and t_5 , we cannot include the data after 2011 due to the unavailability of Gross Domestic Product (GDP) per capita at t_5 .

The IPUMSI's database contains sixty-three developing countries,⁹ but each country presented is not observed at the same year and contains a different number of observations. Thus, it is an unbalanced panel data that we will discuss and tackle this issue in the method part.¹⁰

Given that samples from Argentina, Bangladesh, Columbia, Kenya and Ukraine do not provide information on occupations, we are forced to exclude those countries because we cannot calculate their rate of overeducation. Next, having learned that the quality of census data in most sub-Saharan African countries, even in a big country like Nigeria, often suffer from operational glitches that affect the credibility of the results (Chandy,¹¹ 2015 ; Beguy,¹² 2016), we decide to exclude the countries from that region. This leaves us with a sample of thirty-eight countries equaling seventy-five observations.¹³

These countries are heterogeneous in terms of GDP, surface and geography. The GDP per capita (PPP) is ranked from 904 USD in 1998 for Cambodia until 18,094 USD for Romania in 2011. In terms of surface, we have small countries like Saint Lucia (617 km²) and Fiji (18,274 km²) to large countries like China (9.6 million km²) and India (3.3 million km²). In terms of location, our sample is composed of sixteen countries in Latin America & the Caribbean, nine countries in East-Asia & Pacific, six countries in the Middle-East & North Africa, five countries in Europe & Central Asia, and two countries in South Asia.

⁹The data is extracted in September 2017.

¹⁰A country is classified as a developing country and which region it belongs to, is based on the World Bank's website. Reference:

<https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>

¹¹Laurence Chandy is currently the director of data, research and policy at the UNICEF: <https://www.brookings.edu/blog/africa-in-focus/2015/05/04/why-is-the-number-of-poor-people-in-africa-increasing-when-africas-economies-are-growing/>

¹²Donatien Beguy is the head of statistics and surveys unit at the African population and health research center:

<https://theconversation.com/poor-data-affects-africas-ability-to-make-the-right-policy-decisions-64064>

¹³The full list of countries are available in the in the Table 8 of the Appendix: A.

2.1 Macro data

Several main variables can be found in the World Bank's database.

First, we can extract data on our dependent variable: The growth of Gross Domestic Product (GDP) per capita based on Purchasing Power Parity (PPP). Previous researches on the impact of overeducation on economic growth have used two different measures of economic growth: Short-term ($t = 1$) for Guironnet & Jaoul-Grammare (2009) and medium-term ($t = 5$) for Ramos et al. (2012). We will employ thus two measures, different in years-term: GDP per capita growth between 1- t_0 and t_1 and 2- t_0 and t_5 . This allows to observe the impact of overeducation more completely from the short to medium terms.

Next, regarding the independent variables, the classical models view the quantity of labor as an essential element to economic growth (Eltis, 2000). We employ therefore the total population and labor force participation rate as proxies for the quantity of labor. Then, the neoclassical growth model finds that there exists the convergence effect between poor and rich countries (Barro & Sala-i Martin, 1992), so we introduce the initial GDP per capita into our model. Afterward, the endogenous growth theory recommends the role of education in stimulating economic growth (Lucas, 1988), and some empirical evidences also find that education especially the quality of education matters to economic growth (Hanushek & Wößmann, 2007). We use thus the pupils to teacher ratio in primary school as a proxy for the quality of education¹⁴ because several studies use class size to infer the effect of school quality on student outcomes (Bernal et al., 2016). Infrastructure also plays a key role in supporting economic growth (Barro, 1990), we employ thus the access to mobile phone as a proxy variable for infrastructure.¹⁵

¹⁴This indicator is preferable than the pupils-teacher ratio in secondary school or in tertiary school because the typical school dropouts in developing countries would lower the pupils-teacher ratio at higher grades, thus using these last two indicators to represent the educational quality might be bias.

¹⁵The number of mobile phones is also used as a proxy for communication infrastructure in other researches such as Ismail & Mahyideen (2015).

2.2 Micro data

For missing variables at macroeconomics level, the IPUMSI database allows us to overcome this problem.

Indeed, the OECD's and the World Bank's report (2013) have mentioned the importance of skill requirement in the determination of how productive each country's economy is and also its potential economic growth. We calculate thus the shares of high-skilled jobs¹⁶ as a proxy for the skill requirements in each country. Next, the skill acquisition among the workforce is another key driver of economic growth because it is a source of skills for meeting the skill requirement of employers, and more educated workforce can also be more productive (Becker, 1964 ; Lucas, 1988). We calculate then the percent of workforce with secondary and tertiary education as proxies for skill acquisition. Lately, Wei & Zhang (2011) find that the sex-ratio imbalance stimulates economic growth in China because men are more likely to take risks in their careers (thus higher returns), are expected to get more supports from parents in access to education, and gender inequality in the labor market that favor men to gain access to managerial positions. We add therefore the male ratio in the workforce calculated from the IPMUSI database as another independent variable.

Finally, our main independent variable is the rate of overeducation among the tertiary graduates that measures how well the skill requirement and skill acquisition match each other in each country or how the tertiary education acquired by graduates is transformed into productive activities for economic growth enhancing (please refer to the Box 1 below to see how we measure overeducation).

¹⁶We consider jobs as high-skilled jobs if those jobs need tertiary education. For the detailed description, please refer to the Tables 9 and 10 in the Appendix: B.

Table 1 summarizes the variables and sources of data used in this research:

Table III.1: Variables and data sources

Indicator domains	Variables	Data sources	Nature of data
Outcome or dependent variable	Economic growth		
Contextual factors	Total population Labor force participation rate Initial GDP per capita Pupils-teacher ratio Access to mobile phone	World Bank	Macro data
	Male ratio in the Workforce		
Skill requirement	Share of high-skilled jobs	IPUMSI	Micro data
Skill acquisition	Workforce with secondary education Workforce with tertiary education		
Matching	Graduates' overeducation rate		

Table source: OECD's and the World Bank's report (2013)

Box 1: Overeducation indicators

Based on the IPUMSI data, two methods can be used to calculate the incidence of overeducation: Job analysis (JA) and statistical method. Between these two measures, Hartog (2000) and Sloane (2003) consider JA to be conceptually superior because the statistical measure possesses several drawbacks.

One of the main shortcomings of statistical measure lies in the fact that in case of excess supply of graduates for a given occupation, it will underestimate the level of overeducation and will overestimate in case of excess demand (Kiker et al., 1997 ; de Oliveira et al., 2000).

For example, suppose a country is facing an excess of tertiary graduates, and consequently, to avoid the unemployment, many of them may accept to work as clerical support workers, an occupation that, however, does not needs tertiary education. The statistical measure calculates the average (or mode) number of years of education of all workers occupying the clerical position and then classifies a worker in this occupation as overeducated if his/her number of years of study is above the average plus one or two standard deviations (or alternatively above the modal value). Thus, if a high proportion of graduates work as clerical clerks, this will raise the average years of education within this occupation. As a result, those graduates are likely not deemed to be overeducated, which underestimates the true level of overeducation. Thus, the use of statistical measure is often regarded as inferior and is only used when there is no available data to conduct the JA method (Leuven et al., 2011).

In our data, we do observe that the incidence of overeducation based on statistical measure (using mode) has a significant negative correlation (coefficient = -0.61) with the proportion of graduates in the workforce, that is to say, a country having a high proportion of graduates is more likely to have a low incidence of overeducation, and vice versa. This seems to be in line with the inconvenience of using statistical measure mentioned by the literature above. Hence, we decide to only employ the JA measure.

Box 1: Overeducation indicators (continued)

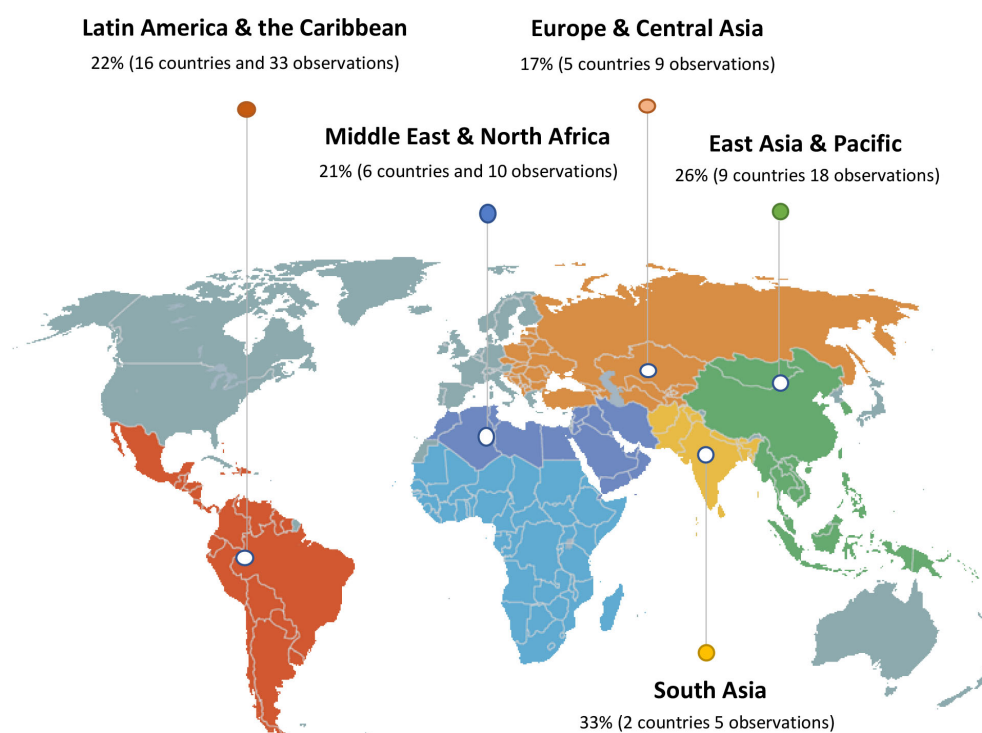
The IPUMSI database classifies individual occupations following the International Standard Classification of Occupations Code (ISCO). Based on JA measure, each occupation is assigned to what level of skill or education required classified in the International Standard Classification of Education (ISCED). For example, the occupational levels 1 (managers), 2 (professionals) and 3 (technicians) classified in the ISCO are assigned to educational levels 5 and 6 (first stage and second stage of tertiary education) in the ISCED. Thus, if graduates are employed in those occupational levels, they are considered as matched workers because those occupations need tertiary education. In contrast, if they are employed in occupational levels of ISCO that require education lower than the levels 5 and 6 in ISCED, they are defined as overeducated.^a

After defining which individual is overeducated, we calculate the proportion of graduates who are overeducated in each country. Results highlight that the incidence of overeducation quite differs between countries. For example in 2011, the rate of overeducation among graduates is found to be 17% in Romania and 30% in Armenia. Within the same country, overeducation seems to increase over time, which gives us more motivation to analyze its impact. For instance in Costa Rica, the overeducation rate was 12% in 2000 and increased to 23% in 2011. Between regions, the difference also pronounces: Overall, the rate ranked from 17% in Europe & Central Asia to 33% in South Asia (Figure 1).^b

^aTables specifying the matching process between the occupational classes and the required educational levels, are in the Appendix: B.

^bThe incidence of overeducation in each region is calculated by the sum of each country's incidence and then is divided by the number of countries in the region.

Figure III.1: Overeducation rate among tertiary graduates across regions



3 Descriptive statistics

Table 2 below presents the descriptive statistics. Q1 & Q2 in the Table 2 refer to the first two quartiles of dependent variables containing only the half of sample with lower economic growth, while Q3 & Q4 refer to the last two quartiles of dependent variables containing only the half of sample with higher economic growth.

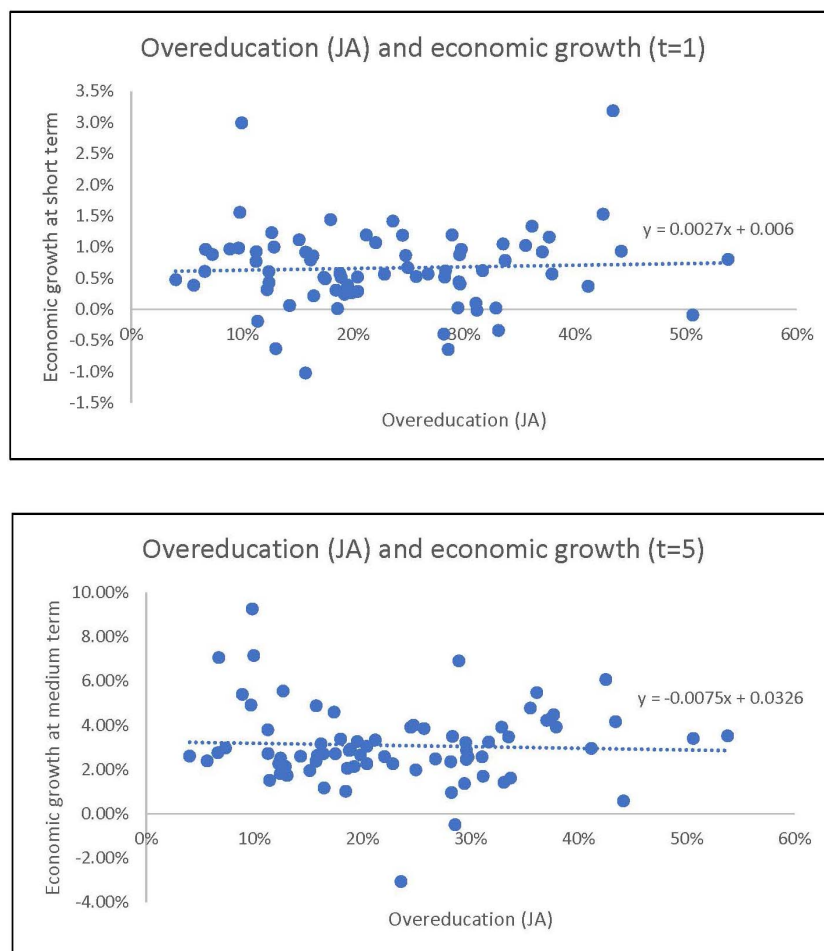
Table III.2: Descriptive statistics

VARIABLES	All observations		Q1 & Q2 (Low)		Q3 & Q4 (High)	
Dependent Variable	Mean	Std.	Mean	Std.	Mean	Std.
Economic growth at t_1 (g_1) (%)	0.66	0.65	0.21	0.39	1.13	0.53
Independent Variables						
Total population (million)	128.73	299.59	64.55	169.11	194.65	382.47
Labor force participation rate (%)	61.08	9.56	60.16	7.69	62.02	11.20
Log GDP per capita at t_0	8.52	0.71	8.66	0.65	8.38	0.76
Pupils-teacher ratio	26.84	7.33	27.54	6.43	26.12	8.18
Access to mobile phone (%)	25.02	38.26	24	33.32	26.07	43.18
Male ratio in the workforce (%)	66.50	10.32	66.65	9.08	66.36	11.57
Share of high-skilled jobs (%)	17.18	7.39	16.91	6.05	17.47	8.63
Workforce with secondary education (%)	25.35	16.43	23.81	12.81	26.94	19.52
Workforce with tertiary education (%)	9.07	6.47	8.59	5.86	9.57	7.09
Overeducated graduates (%)	23.00	11.12	22.11	10.02	23.91	12.22
Dependent Variable	Mean	Std.	Mean	Std.	Mean	Std.
Economic growth at t_5 (g_5) (%)	3.09	1.82	1.90	1.09	4.31	1.46
Independent Variables						
Total population (million)	128.73	299.59	46.03	57.65	213.67	407.98
Labor force participation rate (%)	61.08	9.56	58.49	7.43	63.74	10.82
Log GDP per capita at t_0	8.52	0.71	8.79	0.66	8.25	0.67
Pupils-teacher ratio	26.84	7.33	26.28	5.98	27.41	8.54
Access to mobile phone (%)	25.02	38.26	30.06	39.23	19.85	37.05
Male ratio in the workforce (%)	66.5	10.32	67.96	9.88	65.00	10.67
Share of high-skilled jobs (%)	17.18	7.39	18.25	7.00	16.09	7.72
Workforce with secondary education (%)	25.35	16.43	26.57	15.89	24.10	17.09
Workforce with tertiary education (%)	9.07	6.47	9.46	7.38	8.68	5.46
Overeducated graduates (%)	23	11.12	20.45	8.94	25.62	12.58
Total observations	75		38		37	

According to the Table 2, economic growth seems to be linked to several factors. First, population and labor force participation rate seem to yield positive impacts. Next, less developing economies look to grow faster. Nevertheless, the relation with other variables are not clearly observed. For example, the workforce with secondary or tertiary education seem to be positive for economic growth at short term but negative at medium term.

Regarding the effect of overeducation, the rate of overeducation might have a positive effect. To make their relation more clearly, we create a scatter plot with a linear regression line in the figure 2 below:

Figure III.2: Relation between overeducation and economic growth



Based on the figure 2, the relation between overeducation and economic growth seems to be a bit perplex. At short term, overeducation seems to yield a positive effect. In contrast, at medium term, it looks to have a negative impact.

The uncertainty of their relation may be due to two factors: 1- The influence of other variables on the economic growth that we need to control for their effects, and 2- overeducation might be endogenous as suggested by prior researches (Dolton & Vignoles, 2000 ; Korpi & Tåhlin, 2009). For example, the quality of education is found to affect both economic growth (Hanushek, 2013) and overeducation (Charlot & Decreuse, 2005). The existence of search friction in the labor market can also make graduates take more time to find a matched job (Jovanovic, 1979). Therefore, a good infrastructure that facilitates the communication as well as reduces the asymmetric of information in an economy may affect not only the economic growth (Barro, 1990), but also the overeducation rate (Chua & Chun, 2016).

It is thus necessary to conduct an econometric analysis to identify the real impact of overeducation on economic growth.

4 Method and Results

4.1 Method

The descriptive statistics have shown that the incidence of overeducation among graduates and other variables may have an impact on GDP growth per capita.

To identify the impact of overeducation on economic growth, we face two main problems: 1- Unobserved heterogeneity between countries and 2- Endogeneity of overeducation.

To deal with the first problem, we employ a fixed-effect (FE) model that offers an estimate of the following equation:

$$g_{it} = a_i + \alpha' x_{it} + \beta \text{overeducation}_{it} + u_{it} \quad (\text{III.1})$$

where g_{it} defines the observed GDP growth per capita in country i at time t , a_i the individual-specific effects, x_{it} is a vector of independent variables (including the total population, labor force participation rate, log of initial GDP per capita, pupils-to-teacher ratio, access to mobile phone, male ratio in the workforce, share of high-skilled jobs, percent of workforce with secondary and tertiary education), $\text{overeducation}_{it}$ reflects the observed rate of overeducation among graduates, u_{it} defines the error term, and α , β are unknown parameters, such that β represents the estimated effect of overeducation on economic growth, *ceteris paribus*.

One more useful thing about using the fixed effect model is that it also allows attrition, an eventual problem caused by unbalanced panel data, to be also captured by a_i , the unobserved individual-specific effects (Wooldridge, 2012, p.492).

Nevertheless, please note that an unbalanced panel data may cause attrition only if the reason that makes the panel unbalanced is correlated with idiosyncratic error (Wooldridge, 2012, p.491). Provided the reason that each country usually conducts its census surveys in different years, and the length of time between two surveys can also differ from one country to another country, it is naturally random that our data is unbalanced. Thus, if the data is purely unbalanced due to survey availability in

the relevant country, it should be not correlated with idiosyncratic errors (Chun et al., 2017, p.11). Hence, unbalanced panel of this type should not cause attrition or any serious problems (Wooldridge, 2012, p.491 ; Andress et al., 2013, p.177).

FE model supposes, however, that all variables are exogenous, but we have done the Durbin test, and it shows that overeducation is not exogenous:

Table III.3: Test for endogeneity of overeducation

Hypothesis	Short-term economic growth (g_1)		Medium-term economic growth (g_5)	
	Durbin score	P-value	Durbin score	P-value
H_0 : Overeducation is exogenous	15.446	0.0001	6.645	0.0099

Indeed, according to the Table 3, the p-value is highly significant, which rejects the null hypothesis that overeducation is exogenous.¹⁷ To also deal with the problem of endogeneity, 2SLS regression with FE is used in the Model 2.

To employ the 2SLS regression model, we need an instrumental variable that has to fill two conditions: 1- instrument relevance and 2- instrument exogeneity (Wooldridge, 2012, p.514). The relevance of instrument implies that it must be correlated with the endogenous variable. The exogeneity assumption requires that the instrument must be exogenous (uncorrelated with the error term) and not a direct cause of the dependent variable.

In advanced economies, they find that older graduates are less likely to be overeducated because they have more experience, better relevant skill sets, and have more opportunities for upward mobility (Morano, 2014 ; Kupets, 2015). Thus, graduates' age can be correlated with overeducation. Next, we find no evidence that graduates' age can directly impact economic growth. Hence, graduates' age should be exogenous. Therefore, the average of graduates' age, calculated from the IPUMSI data, should be eligible to be the instrumental variable.

¹⁷Reference: Stata manual at <https://www.stata.com/manuals13/rivregresspostestimation.pdf>

Next, we also check the quality of this instrument by using the Cragg-Donald Wald test:

Table III.4: Test for the quality of instrument

Hypothesis	Cragg-Donald Wald F-statistic	P-value
H_0 : Instrument is weak	14.729	0.005

Based on the Cragg-Donald Wald test in the Table 4, the F-statistic value is significant and higher than the conventional value of 10 proposed by Staiger & Stock (1994) and Stock et al. (2002), which allows us rejecting the null hypothesis that the instrument is weak. Thus, employing graduates' age as instrumental variable is not subjected to be bias.

We also pay attention to a possible high multicollinearity between independent variables that we have selected. One common way to measure multicollinearity is the variance inflation factor (VIF), which assesses how much the variance of the estimated regression coefficient increases if the predictors are correlated (Wooldridge, 2012, p.98). Table 5 below presents the results of multicollinearity test using VIF:

Table III.5: Variance inflation factor

Variables	VIF
Male ratio in the workforce	4.65
Labor force participation rate	4.5
Share of high skilled job	4.19
Workforce with tertiary education	3.39
Initial GDP per capita	2.39
Workforce with secondary education	2.30
Access to mobile phone	2.14
Overeducation	1.92
Pupils-teacher ratio	1.85
Total population	1.41
Mean VIF	2.87

Hair et al. (2009)[p.193] and Wooldridge (2012)[p.98] state that a VIF value smaller than 10 is commonly acceptable in the literature, and thus the correlations between independent variables should not cause serious problems.

According to the Table 5, the mean VIF value is only 2.87 and each variable possesses a VIF value less than 5 in accordance with the conventional threshold ($VIF < 10$) generally employed in the literature.

Finally, it is recommended to add a time variable in the panel data regression (Damodar et al., 2004, p.643) because if there exists a negative (or positive) economic shock in a given period, overeducation rate at that time could be high (or low) and economic growth could be low (or high). To check the presence of time effects, we conduct a Chi-squared test: .

Table III.6: Test for time effects

Hypothesis	Chi-squared value	P-value
H_0 : No effects of time variable	4373.18	0.000

The test result shows a significance of p-value, which leads to the rejection of null hypothesis that there are no time fixed effects (Damodar et al., 2004, p.644). Thus, a year dummy indicator is added as another control variable in the regression model.

4.2 Results

Table III.7: Impact of graduates' overeducation on economic growth

Impact on economic growth VARIABLES	Short-term growth (g_1)		Medium-term growth (g_5)	
	FE	2SLS-FE	FE	2SLS-FE
Overeducated graduates (%)	-0.006 (0.014)	-0.032*** (0.011)	-0.104** (0.050)	-0.158*** (0.050)
Log GDP at t_0	-0.716 (0.784)	-0.495 (0.415)	-4.698** (2.060)	-4.251*** (1.500)
Share of high skilled jobs (%)	-0.077 (0.076)	-0.103** (0.046)	-0.086 (0.154)	-0.140 (0.105)
Total population (million)	0.005** (0.002)	0.005*** (0.001)	0.019*** (0.006)	0.0180*** (0.004)
Labor force participation rate (%)	0.007 (0.031)	0.005 (0.019)	0.032 (0.066)	0.029 (0.049)
Male ratio in the workforce (%)	0.076** (0.034)	0.093*** (0.023)	0.241** (0.095)	0.275*** (0.063)
Workforce with secondary education (%)	0.009 (0.014)	0.017** (0.008)	0.029 (0.031)	0.045* (0.024)
Workforce with tertiary education (%)	0.030 (0.049)	0.048* (0.027)	0.061 (0.082)	0.099* (0.058)
Pupils to teacher ratio	-0.011 (0.037)	-0.006 (0.023)	-0.153 (0.102)	-0.143** (0.066)
Access to mobile phone (%)	0.007 (0.009)	0.005 (0.005)	0.030* (0.018)	0.027* (0.014)
Constant	1.300 (8.093)	0.134 (4.300)	27.13 (22.79)	23.08 (15.51)
Overeducated graduates^a (%)				
Pupils-teacher ratio		1.282 (0.980)		1.282 (0.980)
Access to mobile phone		0.011 (0.180)		0.011 (0.180)
Mean of graduates' age		-3.54** (1.491)		-3.54** (1.491)
Constant		199.61 (190.63)		199.61 (190.63)
Year dummies	yes	yes	yes	yes
Observations	75	75	75	75
Countries	38	38	38	38
R^2	0.89	0.96	0.87	0.95
R^2 (no year dummies)	0.29	0.63	0.36	0.79

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

Notes: Robust standard errors are in brackets.

^aThe 2SLS consists of two-stage equations. The equation that explains the endogenous variable (overeducation) is the first stage equation, and the one that explains dependent variable (economic growth) is the second stage equation. Readers may observe that the coefficient results for the first stage equation is the same for both columns (short and medium terms) because only the dependent variable in the second stage equation that was changed (from g_1 to g_5), while there is no modification for the first stage equation.

According to the model 2SLS-FE in the Table 7, several **contextual factors** affect the economic growth.

First, a high quantity of population, which may indicate a labor abundance, exerts a positive impact on economic growth as suggested by the classical model (Eltis, 2000). Then, we also note that the male ratio in the workforce does yield a positive impact at both short and medium terms as found by Wei & Zhang (2011). Perhaps, the gender inequality in developing countries, favoring males in education and access to managerial positions, is systematically large in developing countries (Jayachandran, 2015), making men more productive and being able to contribute more to economic growth. Reducing gender inequality in those countries should improve their economic development (Hakura et al., 2016). Next, there exists the convergence effect between poor and rich countries as estimated by the neoclassical model (Barro & Sala-i Martin, 1992), but only at medium term. An increase in pupils-teacher ratio, a proxy for a lower quality of education, decreases the economic growth rate at medium term as well, which emphasizes the importance of educational quality (Hanushek & Wößmann, 2007). Infrastructure, proxied by the access to mobile phone, positively influences the medium term growth rate as suggested by the endogenous growth model of Barro (1990).

Regarding the **skill requirement**, the share of high skilled jobs has a negative effect at short term that is a bit surprising at first glance. Having learned, however, that many high-skilled vacant jobs are unfilled or hard to fill at short-term, which can lead to high costs at both company and country levels (BCG, 2016), the negative sign of the share of high-skilled jobs can be comprehensible. Looking at another side to the **skill acquisition**, the workforce with secondary and tertiary education do have positive impacts for both short and medium terms. This also supports the human capital theory of Becker (1964) and endogenous growth model of Lucas (1988) who recommend that more educated people are more productive.

Finally, overeducation among graduates, the **matching indicator** between the skill requirement and acquisition, is found to have a negative impact on economic growth. Without taking into account the endogeneity of overeducation (Model FE), this mismatch only significantly affects economic growth at medium term. After correction for the endogenous problem (Model 2SLS-FE), overeducation affects the growth rate at both short and medium terms, with also stronger effects. Thus, if we do not consider the endogenous problem, we will underestimate the impact of overeducation.

We also note that at $t = 1$, the impact of overeducation is marginal. Perhaps, at short-term, some overeducated graduates still feel optimistic to find a better matched job in the future, and thus, their job satisfaction are not yet too low. However, at medium-term of five years, they may feel more dissatisfied, which strongly impacts their productivity.

The negative effect of overeducation might also indicate that overeducated graduates in developing countries are perhaps not overskilled due to the possible lack of quality in education and inadequacy problem between supply and demand for graduates in some fields. Thus, the expansion of higher education might be not fully beneficial to those countries if educational mismatches among graduates are not taken into consideration.

5 Conclusion

Using a combination of the World Bank and IPUMSI data, this article analyzes the impact of overeducated graduates' incidence on economic growth with a focus on thirty-eight developing countries. Job analysis is employed to measure the rate of overeducation, and to deal with unobserved heterogeneity between countries and endogeneity of overeducation, two-stage least square regression with country fixed-effects is estimated on the economic growth at short-term (one year) and medium-term (five years).

We find that higher rate of overeducated graduates lower the GDP growth per capita with a stronger effect at medium-term and when the endogeneity of overeducation is taken into account. This result is therefore more conforming to the "job satisfaction approach" than the "human capital approach". Indeed, many overeducated graduates in developing countries might be not overskilled due to the quality of education and the inadequacy between the supply and demand for graduates in some economic sectors. This may also explain why some researches did not find significant relationship between higher education and economic growth, especially when the data contains developing countries. The main key contribution of this research is thus to take into consideration the education-job matching that the theoretical prediction and empirical literature on the link between tertiary education and economic growth seemly ignore.

Perhaps, to exploit the potential benefits of higher education, developing countries should improve more the quality of their education system from the primary school to tertiary education, such that students will graduate with the actual skills that correspond to their educational level. At the same time, they need to strengthen the links between the higher education sector and the labor market. The negative impact from investing in higher education could discourage people, especially young generations, to apply more effort on their human capital development, which could make the situation worse in the future.

Given the limited available data, we cannot further analyze the effects of overeducation for specific regions and specific economic sectors. Future researches are obviously needed to shed more light on this issue.

Appendix: A

Table III.8: Percentage of overeducated graduates by regions, countries and years

		Year and incidence of overeducation among graduates									
Region & Country		Year	% Overedu.	Year	% Overedu.	Year	% Overedu.	Year	% Overedu.	Year	% Overedu.
I	Latin America & Caribbean	1990-1994	18%	1995-1999	18%	2000-2004	22%	2005-2009	26%	2010-2011	28%
1	Bolivia	1992	19%			2001	20%				
2	Brazil	1991	19%			2000	19%			2010	28%
3	Costa Rica					2000	12%			2011	23%
4	Cuba					2002	10%				
5	Dominican republic					2002	33%			2010	30%
6	El Savador							2007	18%		
7	Ecuador	1990	12%			2001	30%			2010	30%
8	Haiti					2003	33%				
9	Jamaica	1991	6%			2001	12%				
10	Mexico	1990	32%	1995	19%	2000	31%			2010	34%
11	Nicaragua			1995	16%			2005	25%		
12	Panama	1990	21%			2000	31%			2010	24%
13	Paraguay	1992	27%			2002	20%				
14	Peru	1993	18%					2007	34%		
15	Saint Lucia	1991	13%								
16	Venezuela	1990	15%			2001	16%				
II	South Asia	1990-1994	26%	1995-1999	38%	2000-2004	36%	2005-2009	38%	2010-2011	n/a
1	India	1993	37%	1999	38%	2004	36%	2009	38%		
2	Pakistan	1991	16%								

Table III.8: Percentage of overeducated graduates by regions, countries and years (continued)

Region & Country		Year and incidence of overeducation among graduates									
		Year	% Overedu.	Year	% Overedu.	Year	% Overedu.	Year	% Overedu.	Year	% Overedu.
III	Europe and Central Asia	1990-1994	12%	1995-1999	17%	2000-2004	17%	2005-2009	11%	2010-2011	24%
1	Armenia									2011	30%
2	Belarus			1999	9%			2009	11%		
3	kyrgyzstan			1999	25%						
4	Romania	1992	4%			2002	7%			2011	17%
5	Turkey	1990	20%			2000	28%				
IV	East Asia & Pacific	1990-1994	21%	1995-1999	27%	2000-2004	25%	2005-2009	33%	2010-2011	n/a
1	Cambodia			1998	43%			2008	51%		
2	China	1990	10%			2000	29%				
3	Fiji			1996	11%			2007	16%		
4	Indonesia	1990	36%	1995	44%			2005	54%		
5	Malaysia	1991	16%			2000	14%				
6	Mongolia					2000	17%				
7	Philippines	1990	29%			2000	41%				
8	Thailand	1990	13%			2000	26%				
9	Vietnam			1999	10%			2009	11%		
V	Middle East & North Africa	1990-1994	13%	1995-1999	24%	2000-2004	18%	2005-2009	19%	2010-2011	29%
1	Egypt			1996	7%			2006	16%		
2	Iran							2006	22%	2011	29%
3	Iraq			1997	43%						
4	Jordan					2004	7%				
5	Morocco	1994	13%			2004	28%				
6	Palestine			1997	24%			2007	20%		
38 countries (75 observations)		1990-1994	19%	1995-1999	24%	2000-2004	23%	2005-2009	26%	2010-2011	27%

Appendix: B

Table III.9: 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 III.10: 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

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General Conclusion

Our thesis analyzes the impacts of education-job mismatches (overeducation, horizontal mismatch and their combination) in the context of developing economies. We answer to three research questions within three chapters. The first two chapters are analyzed at microeconomics level with a special attention to the case of Cambodia, a country that has just upgraded from low income to lower middle income status at mid-2016. The last chapter is analyzed at macroeconomics level concerning thirty-eight developing countries. Results from these three chapters allow us drawing conclusions and some recommendations.

Chapter 1 examines if mismatches decrease or increase unemployment duration among graduates in Cambodia.

Based on the job search theory (Jovanovic, 1979), accepting a mismatched job can decrease unemployment duration. Nevertheless, in the context of a limited job opportunity, the higher risks of mismatches can be associated with a longer duration of unemployment, especially among the less competent workers (Thurow, 1976). This theoretical uncertainty is not resolved either in the empirical literature.

Hence, this chapter is divided in two parts: The first part establishes a theoretical model linking educational mismatches and unemployment duration, and the second part tests the theoretical prediction by using independent-competing risks regression applied on a survey data from nineteen HEI in Cambodia.

The regression results highlight that the risks of mismatches increase unemployment duration. This evidence is thus consistent with researches that find the overeducation is associated with a longer period of unemployment in developed countries (Rose & Ordine, 2010 ; Barros et al., 2011 ; Lin & Hsu, 2013). Yet, we contribute to these studies on at least two main points: 1- We analyze the case of a developing country, and 2- we define mismatches from both types (overeducation and horizontal

mismatch) and from both dimensions (single and double mismatch).

Based on this finding, it seems that the higher education sector in Cambodia has been facing two problems: 1- The quality of education is low and 2- the inadequacy between supply and demand for graduates in some sectors. These problems can make several graduates not having the corresponding skills to what required by the labor market, and consequently they can face higher risks of mismatches and longer duration of unemployment.

Chapter 2 investigates if educational mismatches decrease graduates' wages in Cambodia.

There is a theoretical consensus on negative impacts of mismatches on wages. For instance, the assignment model (Sattinger, 1993) mentions that working in a mismatched job would limit the full utilization of worker's potential skills, and consequently, mismatched workers would earn less than matched workers of the same education. Nevertheless, the consensus is not reached in the empirical studies, with less researches in developing countries, and more importantly, the endogeneity of education-job mismatches in the combination of their two forms is not yet considered.

Thus, to take into account this endogeneity problem, this chapter employs an ordered Heckman selection model applied on a survey data from eight HEI in Cambodia.

The regression results confirm that the wage penalties exist and increase with the level of mismatches. This is consistent with most of previous studies either in developed or developing countries, especially the study of Robst (2008) who also finds a much stronger penalty when graduates in United States suffer both vertical and horizontal mismatches. Yet, we mainly contribute to the literature by: 1- Analyzing the combination effects of vertical and horizontal mismatches in a country that has just upgraded to a lower-middle income status, and 2- Taking into account the possible endogeneity of this combination.

This negative impact highlight that Cambodia should reconsider the expansion of the higher education system, by finding ways to improve the quality and make the educational programs answer better to the needs of the labor market.

Precisely, several actions are needed to be conducted in Cambodia for all levels.

(i) The possible actions at the individual level can be:

- Encouragement of students towards engineering and medical sciences that have been facing a lack of graduates. For instance, the government can provide more scholarships and other incentives to students in these fields.
- Promoting job opportunities for different study fields to better inform the students and their parents on the career perspectives.
- Improving students' knowledge since primary schools, especially on the math, English, computer and Internet knowledge.
- Internship should be compulsory at high schools and universities, so that students can acquire professional experiences and information in the labor market, and learn about their potentiality and career preferences.

(ii) At the organizational level, several actions are also needed:

- The government must be vigorous in the accreditation process by strictly evaluating the quality and objective of training programs provided by an education institution, if they correspond to what the labor market needs or not.
- The government should develop a culture of evaluating the performance of each HEI and disseminate the results. This will push all universities to compete more in terms of quality, and will also help students in their decision to select a major and an HEI.
- Lecturers and educational staff should be more trained to improve their teaching and research capacities.
- The government needs to strongly fight against corruption and builds more infrastructure, especially in the rural areas. The corruption and the lack of infrastructure disturb the investment facilities in Cambodia, and as a result, high skilled jobs are created at a lower rate than their potentiality.

Chapter 3 switches the analysis to more international and macroeconomics level. This chapter aims at examining the impacts of overeducation among graduates on economic growth in thirty-eight developing countries.

The "human capital approach" mentions that overeducated graduates are more productive than their matched counterparts in the same job (Sattinger, 1993), which is good for economic growth. However, the "job satisfaction approach" underlines a possible counterproductive behavior (Tsang & Levin, 1985), which is bad for the growth outcome. Little empirical researches exist in advanced countries and their results also diverge.

Thus, this chapter contributes to the literature on two main points. First, we match two sources of data: 1- The IPUMSI database to estimate the rate of overeducation and 2- the World Bank database to calculate economic growths. The combination of these data allows to analyze the effects of overeducation at macroeconomics level in the context of developing countries. Second, we treat the unobserved heterogeneity between countries and especially the endogeneity of overeducation by employing the two-stages least-square regression with country fixed-effects.

The findings indicate that overeducation exerts negative impacts on economic growth at both short and medium terms. This evidence is thus rather in line with the "job satisfaction approach" than the "human capital approach".

The negative influence of overeducation on the economic growth stresses the importance for developing countries to focus more on the quality in education and to improve the matching efficiency of the skills provided by the higher education sector and the skills required by employers.

As other researches, this thesis also faces some limits:

(i) Limits related to data

- The data for the first two chapters on the Cambodia's case are not national representative: This needs another broader survey at national level.
- Those data are not dynamic, thus it is needed to establish a panel data to measure the long term effects.

- There is no data regarding the informal sector, thus it is needed to develop a specific study to take into account the trajectory of people having worked in the informal economy.
- There is no data allowing to determine the overskilling phenomenon. Even though overeducation and overskilling are correlated, it might be more interesting to analyze both issues at the same time. Thus, the next survey should also contain questions that support the estimation of overskilling.
- There is no available data to measure the incidence of horizontal mismatches at macroeconomics level in the third chapter, while the effects of horizontal mismatches could be also important.

(ii) Limits owing to geography

- There is only one country at microeconomics level, thus a strong specificity: This needs to enlarge the geographical zone, for example, a study regarding the Asian context.

(iii) Limits concerning methods

- We take into account the selection bias but only for observable variables: It is possible that there exists unobserved heterogeneity such as individual preferences, motivation, beliefs and mimetic behaviors. With panel data, it would be possible to isolate those individual fixed effects.
- We do not consider the regional/local effects. With more precise data on the location of workers' residents, it would be possible to employ spatial econometric to take into account those effects.

These limits indicate that further researches are needed, especially when there are more available data. Hence, it is recommended that developing countries should collect more data and make it available for public users. This would allow for more accurate analysis regarding this education-job matching issue.

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