EDUCATION – JOB MISMATCH AND EMPLOYMENT OUTCOMES OF YOUTH IN KYRGYZSTAN

Kamalbek Karymshakov[1]

Burulcha Sulaimanova[2]

Abstract

This paper aims to study the effects of an education-job mismatch on earnings and the school to work transition (STWT) for youth in Kyrgyzstan. Using individual-level data, the Kaplan-Meier failure analysis is applied to explore the relationship between the STWT and the education-job mismatch. OLS and propensity score matching (PSM) estimation techniques are used to analyze the impact of overeducation on wages. Results indicate that overeducation decreases earnings, confirming the existence of a "wage penalty" for overeducated young individuals. Moreover, youth with tertiary education are unlikely to be employed in a job relevant to their studies, while those with technical education are more likely to find relevant employment.

Keywords: Education mismatch, vertical mismatch, wages, overeducation, youth, Kyrgyzstan

1. Introduction

A high rate of educational involvement among a population may be encouraging in terms of human capital development, which in turn should have a positive contribution to long-term economic development. However, it is also important that received professional qualifications and skills correspond to those in demand in the labor market. A significant mismatch between professional qualifications and jobs may have negative effects on employment outcomes such as low wages, dissatisfaction and longer periods of time required to find satisfactory and stable employment (Allen and Van Der Velden, 2001; Badillo-Amador and Vila, 2013; Bauer, 2002; Bratberg and Nilsen, 2000; Cuesta, 2005; Lamo and Messina, 2010; Matei, Zamfir and Lungu, 2014). The study of education-job mismatch becomes particularly relevant where young people accounts for significantly larger share of population , labour market frictions and an education system in need of reform.

[1]**Corresponding author:** kamalbek.karymshakov@manas.edu.kg, Finance and Banking Department, Kyrgyz-Turkish Manas University, Djal District, 720038, Bishkek, Kyrgyzstan

[2] sulaymanova@gmail.com, Economics Department, Kyrgyz-Turkish Manas University, Djal District, 720038, Bishkek, Kyrgyzstan

Kyrgyzstan has a sufficiently high rate of general education enrolment (school education and tertiary education). Since declaring its independence in 1991, the country witnessed rapid growth in tertiary education, while the enrolment at pre-school educational institutions declined. For instance, in 1990 there were only nine higher education institutions in Kyrgyzstan, while in 2016 this number had reached 50. This multiplication of higher education institutions clearly encouraged a massive increase of tertiary education enrolment. According to the World Bank, in 2013 gross enrolment ratio at tertiary education was 47 percent (World Bank, World Development Indicators). A high rate of education enrolment is considered as a key factor in facilitating economic growth. However, according to most of the analytical reports on private sector development, insufficient human capital and the lack of necessary skills will restrict private sector development. The Business Environment and Enterprise Performance Survey (BEEPS) report on Kyrgyzstan indicated that its shortcoming in terms of its labor force having skills that were in demand was an obstacle for the country's economic development. In the BEEPS 2013 survey, this particular issue was ranked as the fourth most severe constraint for doing business for firms of all sizes. In its earlier survey of 2008 it was found that qualified labor was only a problem for larger firms and this issue was ranked as the 10th most severe constraint (World Bank, 2014, p 4). On the other hand, according to the data of the National Statistical Committee of the Kyrgyz Republic (NSCKR) in 2014 almost 51 percent of the nation's unemployed were aged between 15 and 29. Moreover, 29.2% of those unemployed who were aged 25-29 had tertiary education.

The high level of tertiary education enrolment combined with the increasing difficulty in finding a qualified labor force, underlines the issue of formal education content and its (in)ability to provide necessary skills required in the labor market. The education-job mismatch affects not only wage of youth, but also has an influence on their chances of finding stable and satisfactory employment (Elder et al. 2015).

Although many valuable studies have been carried out on the effects of an education-job mismatch on the STWT in developed nations, there have been few such studies to have been conducted in transition economies. Moreover, these studies have mostly focused on the mismatch effect from an economic restructuring perspective during transition, and have not specifically examined youth employment outcomes (Lamo and Messina, 2010;Kogan and Unt, 2005; Kupets, 2016).

The aims of this paper are twofold. First, it aims to analyse the relationships between educational levels, the STWT period for youth, and positions which suffer from an education-job mismatch. Second, it investigates the effect of the education-job mismatch on wage of youth.

Therefore, this study contributes to the current debate on education-job mismatch effects on youth employment. To the author's knowledge, this is the first study to investigate empirically the impact of education-job mismatch on wage in the specific case of Kyrgyzstan.

The study uses the International Labor Organization (ILO) 2013 data from the School-to-Work Transition survey for Kyrgyzstan. The specific focus of this survey on youth makes this dataset unique in reporting education and employment outcomes of youth in Kyrgyzstan. We employ the Kaplan-Meier failure analysis to demonstrate the relationship between STWT and mismatch status. To investigate the effect of an education-job mismatch on wages, a Mincer type equation with OLS estimations are used. In addition, in order to take into account potential unobserved heterogeneity, a PSM method is used.

The paper is structured as follows. The next section (section 2) provides a review of empirical studies examining education-job mismatch effects. Section 3 presents data and descriptive statistics. The STWT period and mismatch outcomes are analyzed in section 4. In section 5 and 6, the effect of overeducation on wages and conclusions presented respectively.

2. Conceptual Framework

In the economic literature, an education-job mismatch is broadly defined as the situation where qualifications required for specific jobs do not correspond with the educational qualifications of the labor force. A mismatch can be horizontal or vertical. A horizontal mismatch refers to the situation where the level of education matches the job requirements, but the type of education is not appropriate for the job. In a vertical mismatch, the education level does not correspond to that required to perform a particular job (Dehmel, 2014). Therefore, a vertical mismatch may result in overeducation or undereducation. Individuals with a level of education that is higher than required for a particular job are considered to be overeducated, while those with a lower level of education than that required for the job would be deemed undereducated.

Given the difficulties in measuring a horizontal mismatch which would require detailed survey data, most of the empirical studies have focused on vertical mismatch analysis, particularly the effects of overeducation (see for instance: McGuinness, 2006). Empirical findings suggest that overeducated workers are exposed to so-called a "*wage penalty*" through earning less compared to workers whose education level suitably matches the particular job, (Battu, Belfield, and Sloane 1999; Bauer 2002; McGuinness and Sloane 2011; Nordin, Persson, and Rooth 2010; Sloane, Battu, and Seaman 1999).

Labor market frictions and other characteristics related with the career development of individuals may determine whether a mismatch is of a temporary or permanent nature (Dolado, Jansen and Jimeno 2009; Frei and Sousa-Poza 2012; Jovanovic 1979). Mismatches are influenced by the geographical mobility of individuals and the as well (Hensen, De Vries, and Cörvers 2009; Şahin et al. 2014). Individuals with the ability to move across borders are more able to find a job corresponding to their education or skills. While there may be widespread overeducation at the tertiary education level, graduates from technical schools or vocational training programs encounter a comparatively low level of mismatch.

Distinguishing between a temporary and permanent mismatch is important from the point of view of the STWT process. Several empirical papers have indicated that the mismatch rate, and the burden of overeducation, decreases with age. Individuals at an earlier stage of their career, after education, may accept jobs with lower wages and jobs not corresponding to their education level. However, later, with some experience of the labor market, they will be less willing to do so and therefore there are fewer instances of mismatch (Groot 1996; Kiersztyn 2013; Sicherman and Galor 1990). Therefore, overeducation may decline with age. However, other empirical studies found that a mismatch may persist over a long period of time (Büchel and Mertens 2004). This is more probable in developing countries, where under the conditions of labour market rigidity and scarce employment opportunities, individuals may choose to accept being mismatched and remain in such a job for many years if not decades.

The process of finding stable or satisfactory employment after leaving school (or graduating from a tertiary education institution) is broadly defined as the STWT (International Labour Organization, 2013). In this period, individuals may opt to leave their current job and/or remain unemployed as they pursue satisfactory and stable employment. As the STWT period becomes longer this may have a negative effect on the employment prospects of individuals because of the depreciation of their skills and knowledge (Becker, 1964). Therefore, with a longer period of transition the probability of being employed in a mismatched position will increase. Ordine and Rose (2015) demonstrated that in Italy mismatched individuals have experienced a longer period of being unemployed compared to matched workers.

These discussions underline the importance of analyzing the education-job mismatch not only in terms of its effect on wage earnings, but also its interrelationship with STWT. Although most of the empirical papers on employment outcomes of such a mismatch have covered developed countries, only a few have been carried out in transition economies. Moreover, there have been a limited number of studies to have discussed the education-job mismatch among youth.

A study by Davalos, Atanasovska & Angjelkovska (2016) on Macedonia suggested that longer spells of unemployment lead to more pronounced mismatches, which is heterogeneous according to the educational background of youth. Another study on Macedonia by Petreski, Mojsoska-Blazevski & Bergolo (2017) showed that youth who had undergone a longer period of unemployment have less chance of finding a job, but there was not a significant wage difference between them and those finding work after a shorter period of unemployment. Meanwhile, Kupets (2016) indicated that older workers in Ukraine are more overeducated compared to their younger peers, with a surplus of workers with higher education and an over-supply of unskilled work.

Thus, empirical studies on education-job mismatch effects highlight certain wage earnings differences, particularly in cases of overeducation. Moreover, the duration of unemployment and transition to stable and satisfactory employment may be interrelated with such a mismatch. Individuals whose period of STWT is longer are more likely to be mismatched. Significantly, this issue has scarcely been covered in transition economies, and has not been empirically examined in Kyrgyzstan case yet.

3. Data and descriptive statistics

This study uses data from the School-to-Work Transition Survey (SWTS) by the ILO for Kyrgyzstan for 2013. The SWTS includes labor market information on people aged 15 to 29 years, including information on their transitions within the labor market. The dataset includes 3930 young individuals and is a nationally representative sample. The dataset is unique in focusing on youth education and job analysis in the case of Kyrgyzstan. The survey included different sections ranging from individual characteristics and educational background to employment history and experience. The information subsequently yielded makes it possible to analyze the STWT of youth. Other household survey data may not contain sufficient data for detailed analysis.

To empirically measure the education-job mismatch among youth, we count the number of wage employed respondents, while young individuals currently enrolled as full time-students are excluded. Our total sample for estimation is 885 people.

For education-job mismatch analysis, we used objective and subjective approaches (Davalos et al., 2016). The subjective variable constructed is based on the answers of the respondents when questioned how they assess the suitability of their educational qualifications for their present job, and whether the former was relevant to the latter. The objective mismatch variable is generated by comparing the required level of education for a certain position, following

ISCO (International Standard Classification of Occupations) and ISCED (International Standard Classification of Education) classifications of the ILO.

Table 1
Subjective and objective education-job mismatch

	Subjective	**Objective**
Overeducated	16.1	33.2
Matched	69.1	45.7
Undereducated	14.8	21.1

Table 1 shows the education-job mismatch shares according to the two mismatch variables. Interestingly, most of the respondents (69.1 percent) perceive themselves as having a suitable level of education for their present job, while only 45.7 percent of youth have the required level of education. Approximately one-third of youth in Kyrgyzstan are overeducated for their current jobs, but only half of these consider themselves overeducated. Meanwhile, 21.1 percent of youth in Kyrgyzstan are undereducated and only 14.8 percent perceive themselves as undereducated. Having considered the significant differences between subjective and objective mismatch variables, further analysis and estimations will be based exclusively on the objective mismatch measurements.

Descriptive information on the total sample and on overeducated youth are given in Table 2. The data indicates differences in wage earnings, and that on average overeducated youth earn less than the total sample. Most of the overeducated youth are male and have tertiary education. Interestingly, the geographical distribution of overeducated youth reveals high concentration in the northern part of the country. The average length of STWT is about 10 months, while for overeducated youth this period is on average one month longer.

Table 2
Descriptive information on youth

	Total Sample		**Overeducated**	
	Obs.	*Mean*	*Obs.*	*Mean*
Monthly wage (KGS)	885	11 110	264	9 919
Age	885	23.71	264	22.12
Gender (male=1)	566	0.6295	162	0.6136
Marital status (ever married=1)	424	0.4716	88	0.3333

Education:				
- Tertiary	254	0.2825	79	0.2992
- Technical	152	0.1691	5	0.0189
- Secondary	322	0.4380	16	0.1600
Mother education (1=tertiary education)	131	0.1868	23	0.2272
Number of children of respondent	885	0.5728	264	0.4015
Residence (1=urban)	331	0.3681	94	0.3560
Regions:				
- *North (Talas, Naryn, Issyk-Kul obl.)*	293	0.3259	126	0.4772
- *South (Osh, Batken. Jalal-Abad obl.)*	337	0.3748	61	0.2310
- *Central (Bishkek city and Chui obl..)*	269	0.2992	77	0.2916
Contract type (1=written contr.)	474	0.5272	130	0.4924
Firm size:				
- *1-5 employees*	243	0.2703	66	0.2500
- *6-20 employees*	316	0.3515	104	0.3939
- *21-200 employees*	274	0.3047	77	0.2916
STWT	721	10.7420	99	11.7420

Note: *,**,*** - statistically significant at 10, 5 and 1 significance levels respectively

4. School-to-work transition and education-job mismatch

According to much of the empirical literature, a longer period of transition from school to a first and satisfactory job may increase the probability of a mismatch. Most of the empirical studies so far have focused on the relationship between an education-job mismatch and the duration of unemployment, and have used the Kaplan-Meier estimated hazard function. In the duration of unemployment analysis, there are two possible outcomes: employment or unemployment. The Kaplan-Meier approach estimates the probability of being employed in a specific period of time. However, we do not focus on the duration of unemployment, and instead study the relationship between STWT and the education-job mismatch. Therefore, in our analysis,

the STWT period may have two possible outcomes: employment with a right match and employment with a wrong match.

The Kaplan-Meier nonparametric maximum likelihood estimate of the survivor function can be described as follows (Kaplan and Meier 1958):

$$\widehat{S}(t) = \prod_{j|t_j \leqslant t} \left(\frac{n_j - d_j}{n_j}\right) \quad (1)$$

Where t_j , j = 1,2,..j, denotes the times at which failures occurs. n_j is the number of individuals at risk of failure at time t_j, while d_j is the number of failures at time t_j. Subtraction of this estimated survivor function from one, gives the failure function - $\widehat{F}(t)$:

$$\widehat{F}(t) = 1 - \widehat{S}(t) \quad (2)$$

For analytical purposes, the failure position can be formulated differently. Figures 1-3 show Kaplan-Meier failure estimates with different formulation of failure states. The vertical axis of figures reports hazard rates, namely the rate of exit with defined failure from the STWT period. One of the most important aspects in education-job mismatch issues in the Kyrgyzstan context is whether tertiary or technical education is more valuable for youth. Therefore, in our failure analysis tertiary and technical education are compared.

Figure 1.
Kaplan-Meier failure estimates for tertiary education (Failure: employment with a right match)

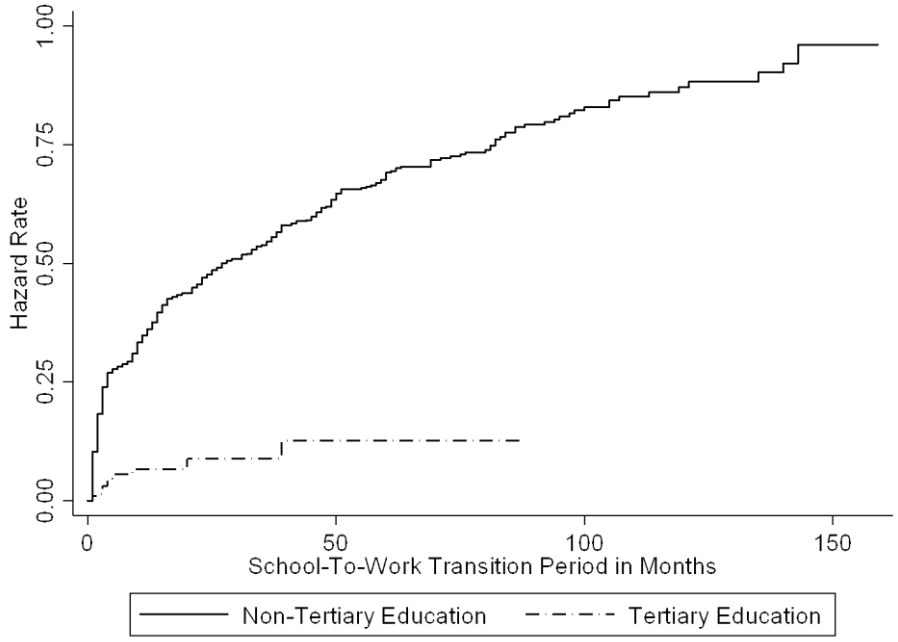
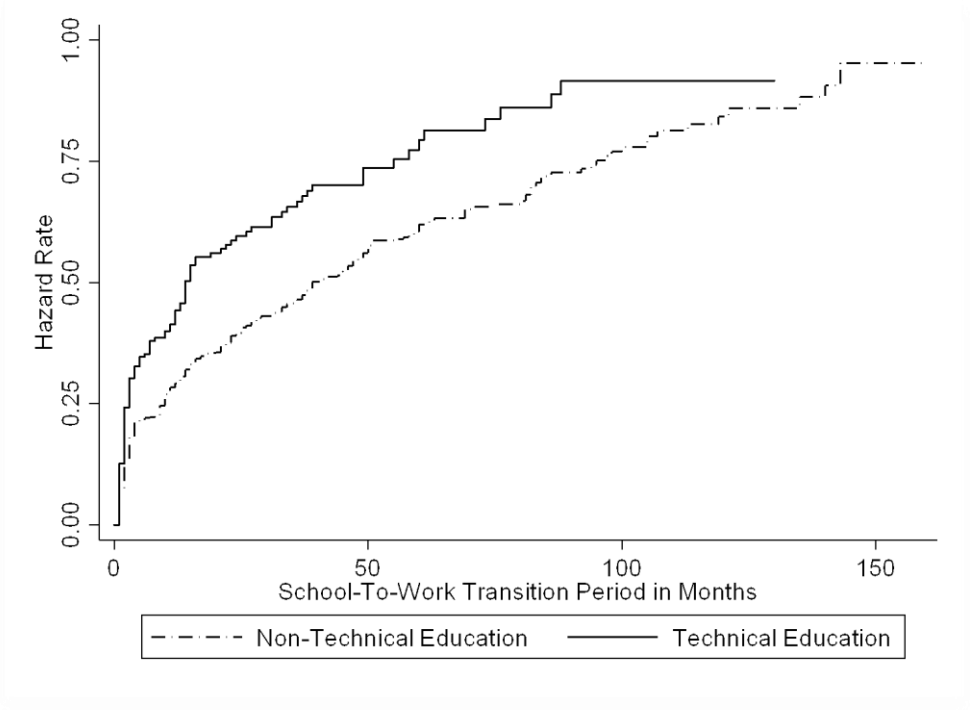


Figure 1 presents youth exit rates towards employment with a right match according to tertiary education against non-tertiary education status. Interestingly, those who leave school without tertiary education find a job that matches their education very quickly. However, many youth with higher education do not work in jobs matching their professional education. The probability of finding youth with higher education working in matching jobs even after 50 months of transition is less than 25 percent.

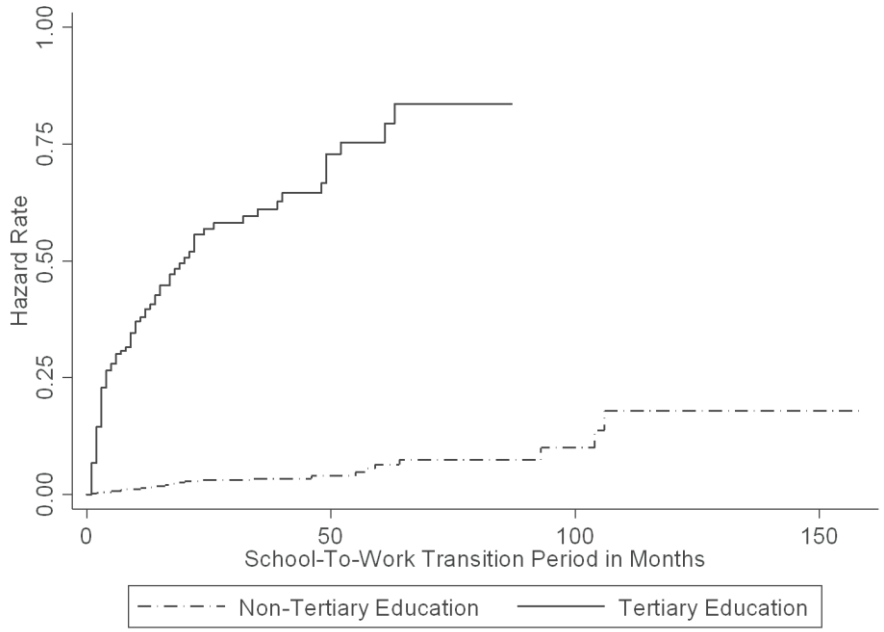
Figure 2.
Kaplan-Meier failure estimates for technical education (Failure: employment with a right match)



Failure estimates towards the matching position with technical education are described in Figure 2. Youth with technical education have more than 50 percent probability that they will find a job that matches their education with a short period of time after graduation. However, there is no large difference between individuals with non-technical and technical education.

In these figures, failure is defined as employment with a right match, while for mismatched positions it is not specified whether the individual is undereducated or overeducated for the position. For our analysis, it is worthwhile to compare those who found employment with and with a right match.

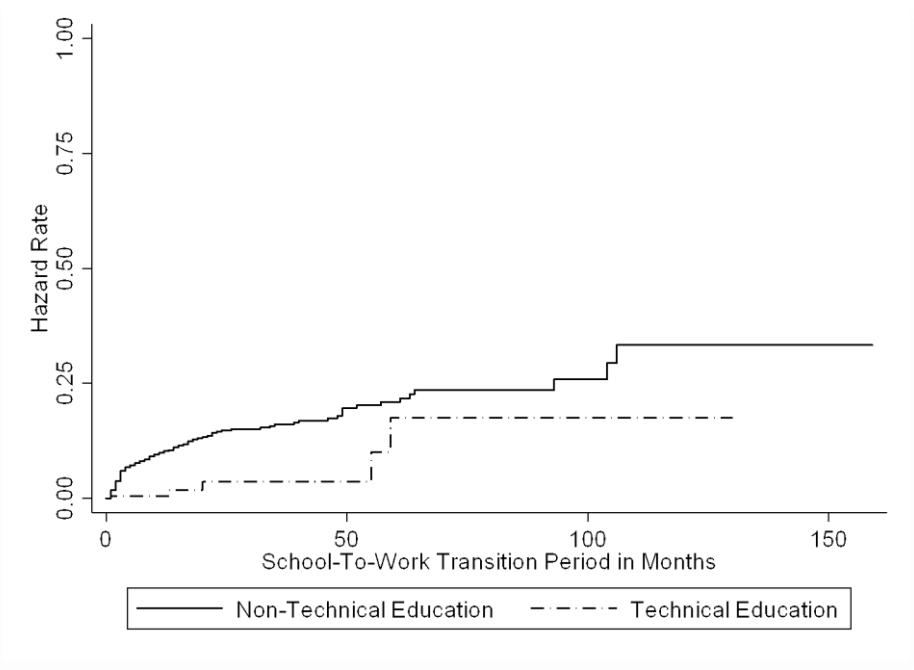
Figure 3.
Kaplan-Meier failure estimates for tertiary education. (Failure: employment with overeducation)



Figures 3 and 4 represent failure estimates for tertiary and technical education correspondingly. As can be noted from Figure 3, youth with tertiary education find employment at overeducated position quicker compared to youth with non-tertiary education. This difference between two groups is large. Young people with technical education (figure 4) demonstrate less probability to be employed with overeducation than those with non-technical education. Based on this trend it can be argued that technical education provide with skills that help to find job according to the professional qualification.

Figure 4.

Kaplan-Meier failure estimates for technical education. (Failure: employment with overeducation)



The Kaplan-Meier failure analysis indicates that in Kyrgyzstan young people with higher education are less likely to be employed in jobs that correspond to their professional education. Contrary to higher education, technical education leads young people to a shorter period of transition to stable and satisfactory employment after education. Moreover, those with technical education are more inclined to find employment with a right match. The analysis shows that overeducation is widespread among youth in Kyrgyzstan and this has important implications for their labor market outcomes. One of the possible effects of the education-job mismatch is wage disparity. This effect is analyzed in the next section.

5. Wages and education-job mismatch

5.1. Empirical strategy

OLS regression

Estimations of the relationship between the transition to stable and satisfactory employment, mismatching and wage earnings in the literature have mainly followed bivariate or multivariate discrete choice model or Mincer type model estimation techniques (Allen and Van Der Velden 2001; Kogan and Unt 2005; Lamo and Messina 2010; Mocanu et al. 2012). Following

previous literature, we investigate the impact of an education-job mismatch on wages using standard regression analysis (Lamo and Messina, 2010; McGuinness and Sloane, 2011; Nordin, Persson and Rooth, 2010).

To investigate the wage differences between matched and unmatched youth, Mincer-type equations will be estimated. The model specification is:

$$lnY_i = \alpha_i + \beta_i X_i + \gamma_i M_i + \varepsilon_i \quad (3)$$

where the logarithmic of wage income (lnY_i) is regressed on individual-level characteristics and other characteristics (X_i) showing location and employment features of individuals, and on overeducation (M_i) .

Propensity score matching

One of the potential methodological issues in the application of the standard OLS estimation techniques is that individuals may have unobserved characteristics that may result in different earnings. This unobserved heterogeneity from OLS estimations may lead to biased results. Therefore, along with the OLS estimations, a PSM model is applied. PSM estimates the treatment effect, which in our case is being overeducated. Average treatment effect is estimated through the comparison of treatment group with similar individuals that do not receive treatment or a control group consisting of individuals whose education matches their current job.

The PSM methodology comprises three basic stages (Rosenbaum and Rubin, 1983). In the first stage, the logit regression model of the treatment is estimated. In the second stage, estimated parameters from the first stage are used to calculate the propensity score. The propensity score represents the predicted probability to receive treatment given observed characteristics. In the third stage, estimated propensity scores are used to match treated individuals with those who not received treatment.

The treatment effect for individual i can be expressed as the difference between the outcome indicators, which in our case is wage of the individual with the treatment (overeducated) and wage of the individual without the treatment (matched). The treatment effect can be written as:

$$\tau = Y_{i1} - Y_{i0} \quad (4)$$

where i denotes individuals. Y_{i1} and Y_{i0} are outcome variables describing wage of the individual conditional on treatment status. However, only one of the potential outcomes is observed for each individual i, i.e. one individual cannot be observed in both states. Our main interest in the evaluation of education-job matching effect is the average treatment effect on those treated (ATT). If we note the treatment state as D, which is equal to one if the unit received treatment, then ATT can be defined as:

$$ATT = E[Y_1|D_1] - E[Y_0|D_1] \quad (5)$$

However, the issue is that $E[Y_0|D_1]$ is not observed, which is solved based on the conditional independence assumption. The condition states that, given a set of observable variables X_i the outcome of interest is independent of the treatment participation, which can be expressed as:

$$Y_{i0} | Y_{i1} \perp D_1 | X_i \quad (6)$$

Besides this assumption, PSM has the further requirement of common support or overlap conditions. This condition states the perfect predictability of D given X_i :

$$0 < P(D = 1 \mid X_i) < 1 \quad (7)$$

Then ATT can be estimated

$$ATT = E[Y_{i1}|D_1 = 1, P(X_i)] - E[Y_{i0}|D_1 = 0, P(X_i)] \quad (8)$$

As participation in the treatment is expressed as a dichotomous variable, we use a logit model to estimate propensity scores. Different matching estimators are used to ensure that the propensity score of matched treated and comparison units is sufficiently close. In this study, the the Gaussian kernel matching and nearest-neighbor matching estimators are used. The former matches each treated unit with a weighted average of all control units, while the nearest-neighbor estimator selects a control observation for treated observation that has the closest propensity score (Heckman et al. 1997).

5.2. Estimation results

The OLS estimation results and simple mean difference estimations are given in the Appendix Table A2. Our main variable of interest, overeducation, has an expected outcome - it

reduces wage earnings of individuals. In the total sample estimation (see Table A2), being male has a positive impact on wages, suggesting that men receive higher wage earnings compared to women. However, estimations on the male sample indicate that overeducation negatively affects the wages of men, while for the female sample this effect is not statistically significant. Higher education has a positive impact on wages for both genders. Regional dummies show a negative influence, which is an expected outcome as the central region includes the capital city and is used as the reference category. Given the concentration of economic activities in the central part of the country, lower wages in other regions were expected. Interestingly, having a written contract decreases wage earnings and underlines that official employment to some extent is penalized through lower wage earnings, while informal employment may bring comparatively higher wages. As informal wages avoid taxes and social fund payment obligations, this sector of the economy can more easily attract employees.

The OLS estimation results do not take into consideration potentially unobserved heterogeneity and may provide biased results. A PSM estimation procedure is applied in order to deal with this issue. Table A3 reports the logit regressions for overeducation, which is the first stage of the PSM estimations. Interestingly, overeducation in these results is not explained by gender[3]. Males with tertiary education were more likely to be overeducated. Also, individuals from the northern part of the country were more likely to be overeducated. Formal employment measured as the incidence of using written contract demonstrates negative effect over the overeducation likelhood.

Based on logit model results and propensity scores, ATT are estimated with the Kernel and nearest-neighbor estimators. Appendix Table A4 provides balancing tests for both matching estimators. As shown in the table, there is a considerable decrease in bias after matching and there is no large difference between treated and non-treated groups after matching. For comparison, the coefficients of overeducation impact on wages from mean differences and OLS estimations and average treatment effects are presented in Table 2. As can be seen from this table, overeducation decreases wage earnings of youth. Moreover, this effect is evident in the male sample only, while for the female sample this impact is not statistically significant.

[3]We also examined the age variable among the explanatory variables. However, it does not show statistically significant effect. As this study focus on the youth sample specifically and there may be no large differences by age groups.

Table 3.
Impact of overeducation on wages

	Total sample	Females	Males
Mean difference	-0.1160** (0.0489)	-0.0193 (0.0753)	-0.1655*** (0.0626)
OLS	-0.0899* (0.0492)	-0.0178 (0.0812)	-0.1682** (0.0657)
PSM	*Average treatment effects*		
- *Kernel*	-0.1222*** (0.0425)	-0.0839 (0.0752)	-0.1696*** (0.0507)
- *Nearest-neighbor*	-0.1949*** (0.0465)	-0.0922 (0.0803)	-0.2481*** (0.0566)

*,**,*** - statistically significant at 10, 5 and 1 significance levels respectively
Note: Other covariates include gender, marital status, education level, children number, mother education level, residence and regional dummies, contract type, firm size. Number of observations: total sample – 885, males – 560 (treated – 161), females – 325 (treated – 101).

PSM estimation results indicate that overeducation had a more negative impact on wages compared to OLS estimation results. Following the PSM results, it can interpreted that young individuals who are overeducated receive lower wages compared to individuals with similar education and characteristics but who are employed with a right match. The rate of negative effect varies from 12 percent to about 19 percent. For the male sample, this rate is even higher, ranging from 16 percent to about 24 percent. Therefore, we can conclude that overeducated young people in Kyrgyzstan incur a *"wage penalty"*, whereby they receive lower earnings than matched youth.

These findings are in line with previous empirical studies on education-job mismatch (McGuinness and Sloane 2011; Nordin, Persson, and Rooth 2010; Sloane, Battu, and Seaman 1999). Taking into consideration the upward trend for higher education enrolment during the recent decade and private financial resources being invested by households into higher education, it can be stated that overeducation not only leads to a *"wage penalty"*, but it also implies that households are not using financial resources efficiently given the low probability of a high returns from higher education.

Overall, these findings suggest that overeducation among youth in Kyrgyzstan leads to considerable wage disparity whereby overeducated individuals receive lower wages. This effect is more significant among males. However, this nonexistence of a significant effect on the female sample does not mean that the education-job mismatch is irrelevant for employment. Rather, it can

be related with other labor market issues, such as the low labor market activity of females, gender discrimination in the labor market and gender bias in education.

6. Conclusion

This study used individual-level data to evaluate the relationship between STWT and the education-job mismatch, and the mismatch effect on the wages of young individuals in Kyrgyzstan. The relationship between the transition period from school to work and mismatch was analyzed using the Kaplan-Meier failure analysis. In order to investigate the effect of mismatch on wage earnings, the OLS and PSM approaches have been applied. As a mismatch may have different effects according to gender, estimations were made on both the total sample and gender subsamples.

The results indicate a large difference between those with tertiary education and those with non-tertiary education in terms of the probability of being employed with a wrong match. Higher education does not guarantee a corresponding job. On the contrary, young individuals without tertiary education are more likely to be employed with a right match. Analogously, technical education graduates find a matching job more commonly. Further analysis of the impact of overeducation on wage earnings shows that overeducated individuals receive low wages compared to those with suitably matching employment and confirms the "wage penalty" effect in Kyrgyzstan. However, the evaluation of this effect according to gender groups underlines the existence of a "wage penalty" among males only. Our findings are consistent with the empirical literature for transition economies, showing that as a result of rapid structural change in the economy, there is a significant mismatch between formal education and labor demand (Atanasovska et al., 2016; Kupets, 2016; Kogan and Unt, 2005).

The results of the analysis show that education policy in Kyrgyzstan should re-direct its focus from tertiary education towards technical education. Nevertheless, our analysis focused on the vertical mismatch issue, where the level of skills or education is more or less than the level of skills or education required to perform a job. Therefore, we cannot argue in detail as to which type of education is in higher demand in the labor market. Further analysis of horizontal education-job mismatch could be undertaken, where the research concerns the mismatch of the type of education, rather than the level of education, appropriate for a job. Taking into consideration the high demand among students for subjects such as economics and law, the horizontal mismatch effect may well intensify in the future.

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ANNEX

Table A1. Variables description

Dependent variables:	
Wage	Amount of monthly wage, KGS
Explanatory variables:	
Gender	1=male, 0=female
Marital status	1=ever married
Education:	
- Tertiary	1=if individual has tertiary education
- Technical	1=if individual has technical education
- Secondary	1=if individual has secondary education
Mother education	1=if mother has tertiary education
Number of children of respondent	The number of children of individual
Residence	1=urban, 0=rural
Regions:	
- *North*	1=if individual resides in Talas, Naryn or Issyk-Kul oblasts
- *South*	1=if individual resides in Osh, Batken or Jalal-Abad oblasts
- *Central*	1=if individual resides in Bishkek city or Chui oblast
Contract type	1=individual has written employment contract
Firm size:	
- *1-5 employees*	1=the number of employees in firm is 1-5
- *6-20 employees*	1=the number of employees in firm is 6-20
- *21-200 employees*	1=the number of employees in firm is 21-200

Table A2. Mean difference and OLS wage equations

	Mean difference			**OLS**		
	Total	Female	Male	Total	Female	Male
Overeducation (1=if ind.is overeducated)	-0.1160**	-0.0193	-0.1655***	-0.0899*	-0.0178	-0.1682**
	(0.0489)	(0.0753)	(0.0626)	(0.0492)	(0.0812)	(0.0658)
Gender (male=1)				0.2440***		
				(0.0464)		
Marital status (ever married=1)				0.1757***	0.1729*	0.1817**
				(0.0621)	(0.1010)	(0.0800)
Education (1=if ind. has tertiary education)				0.1432***	0.1626**	0.1603**
				(0.0543)	(0.0799)	(0.0758)
Mother education (1=tertiary education)				0.1105*	0.0582	0.1715**
				(0.0587)	(0.0837)	(0.0824)
Number of children of individual				-0.0424	-0.0405	-0.0287
				(0.0362	(0.0522)	(0.0502)
Residence (1=urban)				0.0431)	0.0267	0.0576
				(0.0454	(0.0735)	(0.0579)
Regions (ref.: Bishkek and Chui obl.)						
- *North (Talas, Naryn, Issyk-Kul obl.)*				-0.2377***	-0.3287***	-0.1550**
				(0.0557)	(0.0850)	(0.0743)
- *South (Osh, Batken. Jalal-Abad obl.)*				-0.1417***	-0.1777**	-0.0974
				(0.0539)	(0.0832)	(0.0714)
Contract type (1=written contr.)				-0.2519***	-0.3454***	-0.1834***
				(0.0520)	(0.0875)	(0.0670)
Small firm (1=if the number of employees less than 6)				-0.1508***	-0.1688*	-0.1328**
				(0.0534)	(0.0952)	(0.0660)
Constant	9.0668***	8.8977***	9.1618***	9.0740***	9.1693***	9.2313***
	(0.0266)	(0.0420)	(0.0335)	(0.0692)	(0.0991)	(0.0801)
No. of Obs.	885	325	560	885	325	560
R-Squared	0.0063	0.0002	0.0124	0.0933	0.1062	0.0651

*Note:**,**,*** - statistically significant at 10, 5 and 1 significance levels respectively

Table A3. Logit model regressions on overeducation (coefficient estimates)

	Total	Female	Male
Gender (male=1)	-0.1499	-	-
	(0.1660)		
Marital status (ever married=1)	-0.7467***	-0.8359**	-0.6520**
	(0.2363)	(0.4178)	(0.3041)
Education (1=if ind. has tertiary education)	0.3598*	-0.8560**	1.1771***
	(0.1952)	(0.3431)	(0.2516)
Mother education (1=tertiary education)	0.2271	0.3657	0.3669
	(0.2041)	(0.3470)	(0.2758)
Number of children of individual	-0.0380	-0.1760	0.0969
	(0.1450)	(0.2428)	(0.1914)
Residence (1=urban)	-0.1595	-0.3624	-0.0850
	(0.1655)	(0.3010)	(0.2101)
Regions (ref.: Bishkek and Chui obl.)			
- North (Talas, Naryn, Issyk-Kul obl.)	0.6783***	0.5821*	0.9661***
	(0.1889)	(0.3273)	(0.2524)
- South (Osh, Batken. Jalal-Abad obl.)	-0.5147**	-0.6107*	-0.3066
	(0.2039)	(0.3481)	(0.2687)
Contract type (1=written contr.)	-0.4131**	-0.9943***	-0.0485
	(0.1873)	(0.3231)	(0.2405)
Small firm (1=if the number of employees less than 6)	-0.2356	0.0616	-0.3037
	(0.1949)	(0.3533)	(0.2471)
Constant	-0.3236	0.5706*	-1.1617***
	(0.2287)	(0.3249)	(0.2815)
No. of Obs.	885	325	560
R-Squared	0.0772	0.1822	0.1098
LR chi2	83.02***	73.38***	73.80***
Log likelihood	-496.1061	-164.7191	-299.0437

Note:*,**,*** - statistically significant at 10, 5 and 1 significance levels respectively

Table A4. Propensity score matching and covariate balance (Total sample)

		Kernel Matching				Nearest Neighbor Matching			
	Sample	MeanTreated	MeanControl	Bias (%)	Reduction in bias (%)	MeanTreated	MeanControl	Bias (%)	Reduction in bias (%)
Gender (male=1)	Matched	0.6145	0.6404	-5.4		0.6145	0.6404	-5.4	
	Unmatched	0.6145	0.6293	-3.1	42.8	0.6145	0.6091	1.1	79.4
Marital status (ever married=1)	Matched	0.3320	0.5313	-41		0.3320	0.5313	-41	
	Unmatched	0.3320	0.3604	-5.8	85.8	0.3320	0.3129	3.9	90.4
Education (1=if ind. has tert.edu.)	Matched	0.2977	0.2696	6.2		0.2977	0.2696	6.2	
	Unmatched	0.2977	0.3134	-3.5	44	0.2977	0.2809	3.7	40.1
Mother education (1=tertiary education)	Matched	0.2290	0.1701	14.7		0.2290	0.1701	14.7	
	Unmatched	0.2290	0.2208	2	86.1	0.2290	0.2137	3.8	74.1
Number of children of individual	Matched	0.4007	0.6468	-29.6		0.4007	0.6468	-29.6	
	Unmatched	0.4007	0.4435	-5.1	82.6	0.4007	0.3480	6.3	78.6
Residence (1=urban)	Matched	0.3549	0.3740	-4		0.3549	0.374	-4	
	Unmatched	0.3549	0.3712	-3.4	14.4	0.3549	0.3870	-6.7	-68.4
Regions (ref.: Bishkek and Chui obl.)									
- North (Talas, Naryn, Issyk-Kul obl.)	Matched	0.4771	0.2616	45.7		0.4771	0.2616	45.7	
	Unmatched	0.4771	0.4598	3.7	92	0.4771	0.4855	-1.8	96.1
- South (Osh, Batken. Jalal-Abad obl.)	Matched	0.2328	0.4382	-44.5		0.2328	0.4382	-44.5	
	Unmatched	0.2328	0.2573	-5.3	88	0.2328	0.2419	-2	95.5
Contract type (1=written contr.)	Matched	0.4923	0.5409	-9.7		0.4923	0.5409	-9.7	
	Unmatched	0.4923	0.5331	-8.2	16	0.4923	0.5251	-6.6	32.4
Small firm(1=if the number ofemployees less than 6)	Matched	0.2480	0.2809	-7.4		0.2480	0.2809	-7.4	
	Unmatched	0.2480	0.2488	-0.2	97.8	0.2480	0.2099	8.6	-16.3