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The Impact of Job-Education Mismatch on Earnings: Empirical Evidence from Kyrgyzstan with Focus on Generation and Gender Difference

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Summary

The mismatch between the education and professional skills of workers and the needs of the labour market raises questions around the quality of education and training, the need to assess the current situation of the labour market, and the necessity of reforming the educational system in accordance with this situation. The purpose of this study is to identify and analyse the impact of discrepancies between educational services on earnings in the labour market in the Kyrgyz Republic, with special reference to generation and gender differences.

In this study, empirical analysis is based on Life in Kyrgyzstan (LiK) survey data collected in 2016. The sample for this analysis covers employees and self-employed persons aged 18-65 who reported their monthly income from employment. The mismatch is investigated by constructing objective parameters for the discrepancy between the level of education (based on the International Standard Classification of Education [ISCED]), field of education (based on the Fields of Education and Training classification [ISCED-F]) and employment (based on the International Standard Classification of Occupations [ISCO]). In this situation, mismatch could be horizontal or vertical. Horizontal mismatch refers to a situation where the level of education meets the requirements of the job, but the type of education is not appropriate for the given job.[1] Vertical mismatch occurs when the level of education does not correspond to the level of qualification required for a given job and can take three forms: undereducation, overeducation, and well-matched.[2]According to a linear analysis of the LiK data, over 41% of working people in Kyrgyzstan are over-educated for their positions, approximately 43% of workers have a level of education matching the requirements of their work, and 16% are under-educated. Analysing vertical mismatch by gender, it can be noted that those in vertically matching positions are predominantly women. The distribution of vertical mismatch varies greatly across the regions where workers live. In Issyk-Kul and Talas oblasts, the proportion of those over-educated is higher as compared to in other regions. By contrast, a high proportion of those in vertically well-matching position are in Naryn oblast. Analysis of the levels of completed education shows that almost half of tertiary educated workers are over-educated for their jobs. Over-educated workers are predominant in the agriculture and mining sectors and in private household businesses. In terms of positions, those who are over-educated are mostly found in positions such as clerk, unskilled worker or armed forces personnel.

Empirical results indicate that more than half of Kyrgyzstan's workers are in mismatched positions according to their field of education and occupation. Hence every second self-employed or wage employed worker is not working in accordance with their professional qualification. This result differs by gender, with women more likely to be in horizontally matched positions. The highest share of matched workers is seen in Naryn and Osh oblasts for women, and in Naryn and Jalal-Abad oblasts for men. Interestingly, the regions such as Issyk-Kul and Talas oblasts where the highest levels of overeducation are found also show the highest levels of horizontal mismatch. The highest rates of

[1] International Labour Organisation, *Global Employment Trends for Youth 2013: A Generation at risk*, (Geneva 2013).
[2] International Labour Organisation (ILO), *Global Employment Trends*, 2013.

horizontal mismatch rates are found among workers with education in Technical and Computer science, whilst the mismatch rates are lowest for workers with education in Economics, Law, Language and Arts-related fields. This horizontal mismatch can also be attributed to inconsistency of supply and demand for labour in certain fields. Hence, graduates from technical and computer sciences are not in demand in the predominantly service economy of Kyrgyzstan, while graduates from law, business and economics are more likely to be working in related fields. Further, when analysing the mismatch in the spheres of economic activity, one can see that the highest proportions of mismatched women are seen in agriculture, transport and private household businesses. The share of mismatched men is highest in the hotel and transport sectors and private household businesses. Both men and women who are horizontally matched are more likely to be working in health, education, finance and public administration.

To assess the impact of the education-job mismatch on earnings, Mincerian nonlinear wage model and quintile regression modelling was used. According to the results, workers who are horizontally or vertically mismatched are both wage-penalised and earn less than those who are well matched. Findings show that there is a significant overeducation wage penalty for youth and the oldest cohort of workers. Thus, in Kyrgyzstan some among the older cohort of workers are doubly wage penalised, once due to overeducation and twice for the fact that they do not hold the required specialisation. This is especially true for those workers who are in the lowest quintile of income distribution, and particularly true for women.

Keywords: Education mismatch, horizontal mismatch, vertical mismatch, earnings, generations, gender, Kyrgyzstan

Introduction

The high level of education of the population, being key to the development of human capital, makes a positive contribution to the long-term economic development of the country.[3] However, the discrepancy between the professional skills and qualifications obtained and the demand for these in the labour market can have a negative impact on employment and, as a consequence, on economic growth. Thus, employment of workers in accordance with their skills and education is not only relevant to, but also one of the priority long-term areas of, state policy. Policy, in particular, state employment policy, should be guided by the needs of the labour market and should include a set of measures to synchronise educational services and the labour market. Education-job mismatch is defined as a discrepancy between the educational attainment of graduates and the educational requirements of their job.[4] This mismatch can be horizontal or vertical. Vertical mismatch occurs when the level of education does not correspond to the level of qualification required to perform a given job.[5] One may possess an appropriate type of education (economics, law, tourism, biology, etc.) but not the required level of education (bachelor, master's or PhD degree) for a given position. Vertical mismatch can thus take on three forms; one may be under-educated, over-educated or well-matched for a position. By contrast, horizontal mismatch refers to a situation where the level of education meets the requirements of a job, but the type of education (field of study) is not appropriate.[6] The field of study required for particular position is understood to be a field delivering the cluster of ability, skills and knowledge that is needed to perform the job.[7] One may thus have the higher education required for a particular job, but within a field that does not match the requirements. This may be a graduate of law working in the field of economics or graduate of social sciences working in a pharmacy. The relevance of education-job mismatch as a field of study is revealed by the imbalance of supply and demand in the labour market. Inconsistency of educational services with labour market requirements can lead to low wages, worker dissatisfaction, decreased productivity, a lengthening of the period of job search, and an increase in the level of unemployment.[8] Kyrgyzstan boasts a high level of access to education, both secondary and higher, and, over the past twenty years there has been a rapid growth in the number of higher educational institutions.[9] However, the increase in the number of higher education institutions has not met the need of the labour market for qualified labour force. This problem has created public debate around the reformation of the education system and, in recent years, has led to the development of

[3] Theodore W. Shultz, 'Investment in human capital,' *The American economic review* 51, No. 1 (1961): 1-17.
[4] Sana Sellami, Dieter Verhaest and Walter Van Trier, 'How to Measure Field-of-Study Mismatch? A Comparative Analysis of the Different Methods,' *Labour* 32.4 (2018): 141-173.
[5] ILO, *Global Employment Trends*, 2013.
[6] Ibid.
[7] Sellami, Verhaest and Van Trier, 'How to Measure': 141-173.
[8] Kamalbek Karymshakov and Burulcha Sulaimanova' 'The School-to-Work Transition, Overeducation and Wages of Youth in Kyrgyzstan,' (2019); Ana Lamo and Julián Messina, 'Formal Education, Mismatch and Wages after Transition: Assessing the Impact of Unobserved Heterogeneity Using Matching Estimators,' *Economics of Education Review* 29, No. 6 (2010): 1086-1099; Thomas K. Bauer, 'Educational Mismatch and Wages: a Panel Analysis,' *Economics of Education Review* 21.3 (2002): 221-229; Loudres Badillo-Amador and Luis E. Vila, 'Education and skill mismatches: wage and job satisfaction consequences,' *International Journal of Manpower* 34, No. 5, (2013): 416-428; Jim Allen and Rolf Van der Velden, 'Educational mismatches versus skill mismatches: effects on wages, job satisfaction, and on-the-job search,' *Oxford economic papers* 53.3 (2001): 434-452.
[9] Karymshakov and Sulaimanova, 'The school-to-work transition,' 2019.

state policy around reforming the higher education system in Kyrgyzstan.[10] Such policy measures are focused on improving the effectiveness of higher education, increasing participation in the vocational education process, updating curricula, and integrating with international education systems. Nevertheless, the problem of the discrepancy between the skills acquired in educational institutions and the needs of the labour market remains unresolved. In order to balance supply and demand in the labour market, it is necessary to develop effective educational policies based on the identification and analysis of education and job mismatch. Given the importance of this topic, the main objective of this research is to investigate education-job mismatch in the Kyrgyz Republic and its consequences with special reference to differential effects by generation and gender. The main research questions of the study are as follows:

1. What is the impact of education-job mismatch on earnings?
2. What is the impact of education-job mismatch on earnings by gender?
3. What is the impact of education-job mismatch on earnings by age group?

This study can make several contributions to the analysis of education and labour markets in Kyrgyzstan and to the current literature on education and employment. These contributions can be summarised as the following:

1. To the best of our knowledge, this is the first study investigating both horizontal and vertical education-job mismatch and their impact on earnings in the specific case of Kyrgyzstan. Research findings can contribute to labour market policy discussions, with in-depth analysis on the labour market supply and demand side.
2. The research extends analysis to generation impact, to see differences between generations: those among the older cohort of workers (most of whom graduated before 1991 and the dissolution of Soviet Union), those who graduated after 1991, and the youth, who are newly entering the labour market. This research output will shed light on understanding how education impacts the earnings across generation and can drive policy recommendations regarding the education system in Kyrgyzstan.
3. The research also investigates the heterogeneous impact of the education-job mismatch across gender. This will have particular importance for government policy with regards to the labour market and social development.

This study is structured as follows. Section 2 focuses on the labour market features of Kyrgyzstan. Section 3 presents a literature review of possible impacts of both vertical and horizontal education-job mismatches. Section 4 discusses the empirical methodology and describes the data. Section 5 presents the descriptive statistics for vertical and horizontal mismatches. Finally, Section 6 presents the results of the study with regard to the impact of mismatches on earnings and provides conclusions with policy recommendations.

[10] Karymshakov and Sulaimanova, 'The school-to-work transition,' (2019); Burulcha Sulaimanova and Kamalbek Karymshakov. 'Factors of Education-Job Mismatch among Youth in Kyrgyz Republic.' *Actual Probs. Econ. & L.* (2018): 65.

Education and Labour Market Trends in Kyrgyzstan

As an inheritance of Soviet Union, the employed population of the Kyrgyzstan has a high level of education. According to the National Statistics Committee of the Kyrgyz Republic almost every fifth member of the employed population has higher or incomplete higher education, and every tenth has secondary vocational education.[11] In 2017, the share of women with higher professional education within the total number of employed women was 27%. For men this was 17%. In terms of secondary vocational education, this proportion was about 16% and 7% for men and women respectively. Over the years of independence, the number of higher educational institutions has rapidly increased from 9 in 1990 to 50 in 2016. Most of the higher educational institutions (approximately 64 percent) are located in Bishkek, the capital city. This is due to the presence of a developed network of state educational institutions for higher professional education.[12] Based on the distribution of graduates by subject, one may say that, among young people, the most popular professions are economist, foreign language translator, doctor, lawyer, engineer, IT programmer, builder and manager. According the NSCKR data, the distribution of students in higher educational institutions by groups of specialty for 2017 was as follows: more than half of students (53%) studied the humanities (economics, management, law, etc.) while 19.6% studied technical sciences, 14.7% studied education, 6.7% health care, 3.4% natural sciences, 1.7% interdisciplinary sciences, 1% agricultural sciences, and 0.3% service.

Obtaining a specialty, however, does not always guarantee employment in the labour market. Thus, according to the National Statistical Committee of the Kyrgyz Republic, in 2018, the overall unemployment rate for the country was 6.2%, with about 40% of those unemployed holding tertiary or technical education. This fact indicates that it is rather difficult for graduates to get a job after earning a diploma. It highlights how the high growth rates of tertiary education have led to an oversupply of highly skilled labour in Kyrgyzstan and, hence, the mismatch between the educational services market and labour market requirements.

Among other reasons for the education-job mismatch, such as weaknesses in the education system, the labour market features of transition economies must be mentioned. In post-Soviet countries, rapid job reallocation and the slow creation of jobs in high productivity sectors has resulted in difficulty for individuals in joining the labour market and putting their skills to use.[13] In Kyrgyzstan, during the years of independence, the structure of the employed population underwent significant changes. The share of people employed in agriculture decreased, while that of those employed in trade, services and construction increased. According to the statistics of NSCKR in 1991 agriculture, manufacturing and education dominated the economy of Kyrgyzstan, while in 2020, the services sectors, such as trade, construction, accommodation and food service activities, prevail. Another factor that contributes to education-job mismatch is labour migration, as people leave employment in agriculture to move into

[11] National Statistical Committee of the Kyrgyz Republic (NSCKR), *Education and Science in the Kyrgyz Republic*, Statistical Book, (Bishkek 2018).
[12] Ibid.
[13] Olga Kupets, 'Education-job mismatch in Ukraine: Too many people with tertiary education or too many jobs for low-skilled?' *Journal of comparative economics* 44.1 (2016): 125-147.

the sphere of trade and services or construction.[14] Yet another is a feature frequently seen in post-Soviet countries, as those employed in industrial labour prior to the fall of the Soviet Union suddenly found themselves in ambiguous job situations or became unemployed afterward. This, combined with the rapid transformation of the economy toward the service sector following Soviet collapse, created a shortage of skilled service sector workers.[15] In such cases, in the context of imperfect information with regard to employment opportunities, workers – especially inexperienced workers – may accept jobs that offer higher wages than their reserve wages without regard to whether the position matches their education.[16]Such education-job mismatch lowers the productivity of the workforce, and also brings forth a skills shortage despite the high educated labour supply.[17] Bearing in mind the high cost of education for individuals and the public cost of investment in education in Kyrgyzstan, an analysis of the impacts of education-job mismatch is very important. Over the 2013-2018 years, the share of expenditures allocated to education in the state budget of Kyrgyzstan was quite significant, ranging on average from 21% to 24%. The bulk of education spending has been on secondary education, at 57% on average, and on tertiary vocational education at 13%.[18]In general, we can say that Kyrgyzstan is a post-Soviet country challenged with both a shortage of skilled service workers due to the rapid economic changes after independence, and one which oversupplies highly educated workers as a result of educational expansion.

Literature Review

The literature on education-job mismatch indicates that there are substantial discrepancies in education-job mismatch incidence across different methods of mismatch measurement.[19] Even though no systematic differences are found for vertical mismatch incidences across different measurements methods, the considerably high incidence (from 5 to 59%) of horizontal mismatch could be explained by the fact that field of study (qualification) mismatch may capture vertical mismatch of worker as well.[20] This is particularly due to the fact that horizontal mismatch as estimated by worker assessment approach depends on the construction of the survey questions, which could lead to misunderstanding of these questions by individuals and cause them to self-assess incorrectly. Additionally, the literature indicates that there are substantial differences in mismatch incidences by geographic distribution.[21]

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[14] NSCKR, *20 years of independence of the Kyrgyz Republic. Figures and facts*. (Bishkek 2016).
[15] Aleksander Kucel, 'The sociology of educational mismatch,' *Polish Sociological Review* 173.1 (2011): 21-34.
[16] Catherine Béduwé and Jean-François Giret, 'Mismatch of vocational graduates: What penalty on French labour market?' *Journal of vocational behavior* 78.1 (2011): 68-79.
[17] Olga Kupets, 'Education-job mismatch': 125-147.
[18] NSCKR, *Education and Science*, 2018.
[19] Melline Somers, Cabus, Sofie, Groot, Wim Groot and Henriette Maassen van den Brink, 'Horizontal Mismatch Between Employment and Field of Education: Evidence from a Systematic Literature Review,' *Journal of Economic Surveys* 33, no. 2 (2019): 567-603.
[20] Sellami, Verhaest and Van Trier, 'How to Measure': 141-173.
[21] Ant´onio Morgado, Tiago Neves Sequeira, Marcelo Santos, Alexandra Ferreira-Lopes and Ana Balcao Reis, 'Measuring labour mismatch in Europe.' *Social Indicators Research* 129.1 (2016): 161-179; Martin Nordin, Inga Persson and Dan-Olof Rooth. 'Education–occupation mismatch: Is there an income penalty?.' *Economics of education review* 29.6 (2010): 1047-1059.

That is why it is difficult to compare mismatch incidences across countries.[22]While as the main consequences of education-job mismatch would appear to be income penalty and job dissatisfaction, the empirical literature indicates that there is a considerable pay gap between those who are matched and those who are mismatched.[23] Significant income penalties occur for both male and female workers who are over-educated,[24] while situations of horizontal mismatch are more likely to impact the job satisfaction and job search-related procedures.[25] According to the empirical literature, starting wages of workers are largely unrelated to education-job mismatch for inexperienced workers, while experienced workers are wage penalised by mismatch.[26] Despite asymmetric information on opportunities in the labour market, possessing the required education level in a relevant field of study has considerable financial compensation for certain types of jobs.[27] There is evidence from Europe that new graduates with higher education degrees are more likely to quickly find a job that horizontally matches their field of study, especially those who studied social science.[28] However, empirical evidence from post-Soviet countries shows that graduates from social sciences, business administration, law and service departments are more likely to be horizontally mismatched.[29] This could be explained by fact that, in the case of post-Soviet countries, the rapid economic transformation led to skill shortages and high-level discrepancies between educational attainment and the job positions available.[30] Here it is important to mention that returns to higher education for different fields of study should be analysed with respect to gender differences. According to the Lalley et al., when estimating horizontal mismatch penalty in each field of study, distinct differences between males and females were found.[31] Accordingly, wage penalties for horizontal mismatch of male workers were found primarily among law graduates, while female workers were wage penalised across all fields of study. The literature on education-job mismatch indicates that vertical and horizontal mismatches are positively correlated. Thus, their joint determination may lead to other results with respect to the results obtained when estimated separately.[32] Wage penalties estimated only by horizontal or vertical

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[22] Kentaro Asai, Thomas Breda, Audrey Rain, Lucile Romanello, Marc Sangnier. *Education, skills and skill mismatch. A review and some new evidence based on the PIAAC survey.* [Research Report] Rapport IPP n°26, Institut des politiques publiques (IPP). (2020).

[23] Peter J. Mavromaras Sloane, 'Overeducation, skill mismatches, and labor market outcomes for college graduates.' *IZA World of Labor* (2020); Montt, Guillermo. 'Field-of-study mismatch and overqualification: labour market correlates and their wage penalty.' *IZA Journal of Labor Economics* 6.1 (2017): 1-20; Fernando Rios-Avila and Fabiola Saavedra-Caballero. 'It pays to study for the right job: Exploring the causes and consequences of education-occupation job mismatch.' *Levy Economics Institute, Working Papers Series* 922 (2019).

[24] Seamus McGuinnes and Peter J. Sloane. 'Labour market mismatch among UK graduates: An analysis using REFLEX data.' *Economics of Education Review* 30.1 (2011): 130-145.

[25] Béduwé and Giret, 'Mismatch of vocational graduates': 68-79.

[26] Peter Fredriksson, Lena Hensvik, and Oskar Nordström Skans. 'Mismatch of talent: Evidence on match quality, entry wages, and job mobility.' *American Economic Review* 108.11 (2018): 3303-38.

[27] Béduwé and Giret, 'Mismatch of vocational graduates': 68-79.

[28] Polona Domadenik, Dasa Farcnik, and Francesco Pastore. 'Horizontal mismatch in the labour market of graduates: The role of signalling.' (2013); Béduwé and Giret, 'Mismatch of vocational graduates': 68-79.

[29] Rudakov, Victor, Pedro Teixeira, Hugo Figueiredo, Sergey Roshchin, 'The Impact of Horizontal Job-Education Mismatches on the Earnings of Recent University Graduates in Russia.' (2019). Institute of Labor Economics (IZA). No. 12407.

[30] Olga Kupets, 'Education-job mismatch': 125-147.

[31] Christopher Lalley, John Houston, and Anne Gasteen. 'Gender Disparities in Horizontal Mismatch Penalties: An Examination of Professional Degrees in the UK (2007–2015).' *Studies in Higher Education* 44, no. 12 (2019): 2265-2280.

[32] Stephane Mahuteau, Kostas Mavromaras, Peter Sloane and Zhang Wei, 'Horizontal and vertical educational mismatch and wages.' *Adelaida*, Australia 216 (2015).

mismatches are generally overestimated.[33] In particular, such overestimations not only ignore the joint impact of vertical and horizontal mismatches, but also the division of samples into sub-samples by income distribution which can reveal significant differences in wage penalties. The income penalty for overeducation is predominantly seen in most income quantiles, while wage penalty by horizontal mismatch is mostly seen in the lowest quintiles.[34] These outputs highlight the importance of both the joint determination of mismatch influences over income, and disaggregate sampling for the investigation of impacts over different types of sub-samples, such as gender and age groups. Despite the rich research on the impact of education-job mismatch on income in developing countries which focus mainly on wage loss due to discrepancy between educational attainment and job requirements, there is a scarcity of research on education-job mismatch analysis for transition economies. Furthermore, empirical studies on transition economies mostly focus on the Eastern European countries, missing countries in economic transition in the Central Asian region such as Kyrgyzstan. To the best of our knowledge, one of the first studies specific to the case of Kyrgyzstan on this topic was conducted by Karymshakov and Sulaimanova in 2019. In that study, the authors wave assessed the impact of vertical mismatch on earnings of youth based on School-to-Work Transition ILO survey data for Kyrgyzstan. Our research contributes to the literature by extending this analysis to a broader sample, investigating the impacts not only on youth but also on older cohorts of workers, alongside giving consideration to the impact of horizontal mismatch on the income of workers.

Research Methods

Construction of mismatch variables: horizontal and vertical

The empirical literature identifies three main ways to measure both vertical and horizontal mismatch: worker self-assessment, job analysis and realised matching.[35] The self-assessment (direct) approach is based on the workers opinions of whether their educational attainment matches the job requirements. The second method, the job analysis or objective mismatch (normative) approach, relies on the technique of corresponding educational and occupational classification.[36] The realised matches (or statistical) method measures the distribution of workers' educational attainment within occupations. According to this method, the educational attainment required for the mean of modal of education within a given occupation is used.[37] Throughout this research, unless otherwise stated, education-job mismatch is investigated using the objective mismatch approach. This method is common in vertical

[33] Hong-Kyun Kim, Seung C. Ahn, and Jihye Kim. 'The income penalty of vertical and horizontal education-job mismatches in the Korean youth labor market: a quantile regression approach.' *Hitotsubashi Journal of economics* (2016): 67-90.
[34] Idem.: 67-90.
[35] Sellami, Verhaest and Van Trier, 'How to Measure': 141-173.
[36] Somers et al., 'Horizontal Mismatch,' 567-603; Sellami, Verhaest and Van Trier, 'How to Measure,' 141-173; International Labour Organisation (ILO), *Global Employment Trends*, 2013; Karymshakov and Sulaimanova, 'The school-to-work transition,' (2019).
[37] Olga Kupets. 'Education in Transition and Job Mismatch: Evidence from the Skills survey in Non-EU Transition Economies.' KIER Discussion Paper 915 (2015); Sellami, Verhaest and Van Trier, 'How to Measure,' 141-173; Somers et al., 'Horizontal Mismatch': 567-603.

mismatch literature. It is also used in the horizontal mismatch literature as far as fields of study are assigned to occupations with respect to the fact that these fields of study sufficiently prepare workers for given occupations.[38] We utilise the objective mismatch approach as the other two approaches – the worker self-assessment and realised match approach – are prone to criticism. The mismatch incidence based on the worker self-assessment approach may vary across the specific wording of the survey questions, while incidence by realised matches does not fully cover the concept of horizontal mismatch.[39] The vertical education-job mismatch variable is constructed by comparing two separate variables: the position held by the respondent according to the ISCO (International Standard Classification of Occupations) classifiers and the required level and type of education (The International Standard Classification of Education, ISCED) for a certain type of profession.[40] Mapping is done according to the four ISCO-08 skill levels onto ISCED-97 levels of education.[41] This classification defines the required education level for each job position. A worker could be vertically mismatched in three ways: they could be over-educated if the individual possesses a higher education level than required for the given job position; be matched if they hold the required level of education, or be under-educated if they hold a lower level of education than needed for the position. The horizontal mismatch variable is constructed based on the Fields of Education and Occupations Matching Table of European Commission.[42] This conversion table gives detailed information on fields of education (ISCED-F 1999) and their correspondence to the occupation classifiers (ISCO-08). The table uses 4-digit ISCO codes distributed within education field clusters according to the relevance of correspondence of a field of study and occupation. Since the "Life in Kyrgyzstan' (LiK) household study does not provide the ISCO codes as indicators of the occupation of respondents registered during the survey, we have interpreted and adapted the LiK responses to map onto the ISCO classifications. These ISCO classifications were then used to match the education and occupations of individuals. Based on the matching table of the European Commission, we distinguished two categories of horizontal mismatch: matched, or those who have educational attainment commensurate with their professional occupation, and mismatched, those who hold degrees in a completely different field of study than their given occupation. Thus, if an individual possesses a degree in the required field of study for given occupation they are considered to be horizontally matched, and mismatched if they do not.

Empirical strategy

Research that studies education and its returns is largely based on human capital theory. This theory stresses the importance of education for improving productivity.[43] The main argument of human capital theory is that better educated people are generally more skilled and are expected to be more productive than people with lower levels of education. Thus, skilled workers will earn more. Along

[38] Sellami, Verhaest and Van Trier, 'How to Measure': 141-173.
[39] Idem.: 141-173.
[40] Jorge Davalos, Viktorija Atanasovska and Tijana Angjelkovska. *Unemployment spell and vertical skills mismatches: the case of Macedonia's youth.* No. 2016-18. PEP-PMMA, 2016.
[41] ILO, https://www.ilo.org/public/english/bureau/stat/isco/docs/publication08.pdf, Accessed in March 2021.
[42] EC, https://ec.europa.eu/eurostat/documents/7884615/8088533/Conversion+Table+ISCO_08_ISCED_99.pdf – Accessed in June 2021.
[43] Theodore Schultz, 'Investment in human capital.' *The American Economic Review* 51, no. 1 (1961): 1-17.

with this, the empirical literature suggests that matching skills with job requirements increases the income of workers as well.[44] That is why it is relevant to use a discrete variable that shows the education-job matching as one of the key factors determining the level of earnings of employees.

To assess the impact of education-job mismatch on earnings, the Mincerian nonlinear wage model is used. It takes the following form:[45]

$$lnY_i = \alpha_i + \beta_i X_i + \gamma_1 VM_i + \gamma_2 HM_i + \varepsilon_i \quad (1)$$

where the dependent variable lnY_i is the logarithmic value of the worker's income as determined by the independent variables (X_i) such as age, gender, marital status, place of residence, and job characteristics. The vertical mismatch variable (VM_i) is the binary mismatch variable showing those who are over-educated and takes a value of 1 if the worker has a higher level of education than required for the position. The horizontal mismatch variable (HM_i) is the binary dummy variable indicating a matched worker, taking the value of 1 if the worker holds the required field of study for a given occupation. ε_i is the independent and identically distributed error term. According to the empirical literature, wage penalties estimated separately by vertical and horizontal mismatch are overestimated,[46] that is why we first calculate mismatches separately, then jointly.

Due to unobservable characteristics or unobserved individual heterogeneity that could jointly impact the regressors and the level of worker income,[47] we have applied quintile regression analysis along with ordinary least squares. This way the conditional income of individuals is sorted by unobservable characteristics to eliminate the impact of unobserved heterogeneity on the relationship between returns and mismatch.[48] The results of quintile regression modelling act as robustness analysis for OLS estimation outputs, which could be overestimated[49] and also reveal differences in wage penalty across income distribution.

Data

This study uses the "Life in Kyrgyzstan' (LiK) survey from 2016, a research-based, open access, multi-topic longitudinal survey of households and individuals in Kyrgyzstan. This survey is conducted by the German Institute for Economic Research, DIW Berlin and Stockholm International Peace Research Institute. The survey is representative at the national level as well as for urban and rural areas of the country.

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[44] Domadenik, Farcnik and Pastore. 'Horizontal mismatch.' 2013; Béduwé and Giret, 'Mismatch of vocational graduates': 68-79.
[45] Colin A. Cameron and Pravin K. Trivedi. *Microeconometrics: methods and applications*. Cambridge University Press, 2005.
[46] Kim, Ahn, and Kim. 'The income penalty': 67-90.
[47] Mahuteau, et al. 'Horizontal and vertical educational mismatch and wages.' 2015; Sloane, 'Overeducation, skill mismatches,' 2020.
[48] Kim, Ahn, and Kim. 'The income penalty': 67-90.
[49] Juerg Schweri, Annina Eymann, and Manuel Aepli. 'Horizontal mismatch and vocational education.' *Applied Economics* 52.32 (2020): 3464-3478.

The survey includes a wide range of data, including information on household characteristics (composition, dwelling, children, health etc.), assets, shocks, social networks, income, and expenditures. Along with this, the survey contains a special section on the employment and education of the respondents.

In this study, in order to analyse the impact of education-job mismatch on earnings, the sample selected included employees and self-employed persons aged 18-65 who indicated their monthly income from employment on the survey. Thus, the earnings variable consists of the monthly wages of employees and the monthly income of own-account workers in soms (KGS, the national currency of Kyrgyzstan). The sample for the study comprises 3,129 observations.

Table 1 reports the summary statistics of the variables for male and female workers respectively. According to the information given, the average income of the sample is 8,884 KGS per month, with male workers earning, on average, 2,000 KGS more. The average age of the workers is 39 years old, and most of them are married. The average age of women is almost 40 years, while for men it is 38.45, which probably indicates that female workers enter the labour market later and earn less than men. The gender wage gap is mostly related to fact that women are employed in sectors where wages are low. The most employed economic sectors are agriculture, trade, education and private household business. Male workers are more likely to work in the agriculture, construction, trade and transport sectors, while women are more likely to work in trade, education, health and private households. Workers were predominantly employed as unskilled workers (37.26%), service workers (15.14%) or in craft and trade related areas (10.8%). About 40% of employees and employers work in the urban areas. This share is higher for the female sub-sample.

Table 1. Descriptive statistics of variables by gender

	TOTAL SAMPLE			WOMEN			MEN		
	N	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**
Earnings *(monthly, KGS)*	3129	8884.9041	8796.5727	1297	7507.1904	8001.4276	1832	9860.2833	9196.7196
Age *(years)*	3129	39.07542	12.13356	1297	39.94757	11.85712	1832	38.45797	12.29136
Married *(1 = if indv. is married)*	3129	.72004	.44905	1297	.67695	.46782	1832	.75055	.43282
Education *(1 = if indv. obtained below given education level)*									
▪ Secondary education	3129	.56376	.496	1297	.53123	.49922	1832	.58679	.49254
▪ Technical education	3129	.155	.36196	1297	.16885	.37476	1832	.1452	.3524
▪ Tertiary education	3129	.19847	.39891	1297	.24287	.42898	1832	.16703	.37311
Ethnicity *(1 = if indv. is ....._)*									
▪ Kyrgyz	3129	.72899	.44455	1297	.73863	.43955	1832	.72216	.44806
▪ Uzbek	3129	.11761	.3222	1297	.09946	.29939	1832	.13046	.3369
▪ Russian	3129	.07702	.26667	1297	.09638	.29522	1832	.06332	.2436
Residence *(1 = if indv. reside in urban area)*	3129	.39469	.48886	1297	.42868	.49508	1832	.37063	.48311
Regions *(1 = if indv. reside in below given oblasts)*									
▪ Issyk-Kul	3129	.12592	.33181	1297	.14341	.35062	1832	.11354	.31733
▪ Jalal-Abad	3129	.2007	.40059	1297	.19892	.39934	1832	.20197	.40158
▪ Naryn	3129	.05465	.22733	1297	.05012	.21827	1832	.05786	.23354
▪ Batken	3129	.10227	.30305	1297	.09946	.29939	1832	.10426	.30568
▪ Osh	3129	.09748	.29665	1297	.08327	.2764	1832	.10753	.30987
▪ Talas	3129	.07287	.25996	1297	.07016	.25552	1832	.07478	.26311
▪ Chui	3129	.12975	.33609	1297	.11796	.32269	1832	.1381	.3451
▪ Bishkek	3129	.16651	.37259	1297	.19738	.39817	1832	.14465	.35184
▪ Osh city	3129	.04986	.21768	1297	.03932	.19443	1832	.05731	.23251
Sector *(1 = if indv. works in below given economic sectors)*									
▪ Agriculture and fishing	3129	.21892	.41358	1297	.15343	.36054	1832	.26528	.4416
▪ Mining	3129	.01502	.12165	1297	.00771	.0875	1832	.0202	.14071
▪ Manufacturing	3129	.04602	.20956	1297	.05243	.22298	1832	.04148	.19946
▪ Energy and water	3129	.02109	.14372	1297	.00848	.09174	1832	.03002	.17069
▪ Construction	3129	.07415	.26205	1297	.01079	.10337	1832	.119	.32387
▪ Trade and repair	3129	.1272	.33325	1297	.13184	.33845	1832	.12391	.32957
▪ Hotels and restaurants	3129	.02141	.14478	1297	.02853	.16654	1832	.01638	.12695
▪ Transport and communications	3129	.07798	.26818	1297	.01311	.11378	1832	.12391	.32957
▪ Finance	3129	.02525	.1569	1297	.03392	.1811	1832	.0191	.13693
▪ Real estate, renting and business activity	3129	.00384	.06182	1297	.00386	.06199	1832	.00382	.06171
▪ Public administration	3129	.03004	.17073	1297	.02544	.15753	1832	.0333	.17946
▪ Education	3129	.12528	.33109	1297	.23593	.42474	1832	.04694	.21158
▪ Health and social work	3129	.05817	.23409	1297	.10717	.30945	1832	.02347	.15144
▪ Utilities, social and personal services	3129	.05689	.23166	1297	.06322	.24346	1832	.0524	.2229
▪ Private households with employed person	3129	.09875	.29838	1297	.12413	.32986	1832	.08079	.27258
Position *(1 = if indv. holds below given job position)*									
▪ Senior official and manager	3129	.01886	.13604	1297	.00617	.07832	1832	.02784	.16455
▪ Professional	3129	.11282	.31642	1297	.16731	.3734	1832	.07424	.26223
▪ Technician, associated professional	3129	.09875	.29838	1297	.10948	.31237	1832	.09116	.28791
▪ Clerk	3129	.04698	.21163	1297	.05937	.2364	1832	.03821	.19175
▪ Service worker, shop or market sales wo	3129	.15149	.35858	1297	.13724	.34423	1832	.16157	.36816
▪ Skilled agricultural or fishery worker	3129	.0767	.26616	1297	.0478	.21343	1832	.09716	.29626
▪ Craft and related trades	3129	.10802	.31046	1297	.09406	.29203	1832	.1179	.32258
▪ Plant or machine operator or assembler	3129	.01087	.10369	1297	.00771	.0875	1832	.0131	.11374
▪ Unskilled worker	3129	.37264	.48359	1297	.37008	.48301	1832	.37445	.48411
▪ Armed forces	3129	.00288	.05356	1297	.00077	.02777	1832	.00437	.06596

Source: *Author's calculations, LiK 2016*

While nearly half of the workers hold a secondary level of education, almost a fourth of female workers hold a tertiary level of education. For males this share is 16.7%. About 90% of the workers are Kyrgyz, Uzbek and Russian.

To analyse the impact of generation, we created age groups reflecting the youth, middle-aged workers, and the older generation of workers (which represents those who graduated during the Soviet Union era). The last group was created with the idea that workers aged 50 and over are more likely to have

acquired education during the Soviet Union or right after its fall, and to have reached working age by 1991. These different age groupings provide an opportunity to assess how workers of different generations are matched or mismatched according to their education and employment.

Table 2. The incidence of education-job mismatch by age group

	VERTICAL MISMATCH			HORIZONTAL MISMATCH	
	Over educated	**Matched education**	**Under educated**	**Matched**	**Mismatched**
Youth *(18-29 years)*	.4103	.4103	.1795	.5649	.4351
Middle age *(30-49 years)*	.4087	.4271	.1643	.4982	.5018
Older age *(50-65 years)*	.4019	.4486	.1495	.5031	.4969

Source: *Author's calculations, LiK 2016*

Table 2 provides data on the incidence of education-job mismatch and shows that over 40% of workers are over-educated for their given position while nearly half of workers are horizontally mismatched. This high value of mismatch incidence may be due to country-specific effects. Firstly, the poor economic conditions in Kyrgyzstan; secondly, an educational system heavily dominated by social sciences and humanities; and thirdly, methodological issues, such as sample size or measurement technique.

Most workers are over educated and horizontally mismatched. While the youngest workers are best matched in terms of their field of education and occupation, the oldest cohort of workers is best matched in terms of their level of education and job position. Detailed descriptive statistical analysis is given in the following section and in Annex Table 2.

Descriptive Statistics for Education-Job Mismatch

Vertical mismatch statistics

Linear analysis of the data from the Life in Kyrgyzstan 2016 survey shows that the proportion of employed people in Kyrgyzstan who are over-educated relative to their job position is 41%. About 43% of workers have a matching level of education, and 16% are under-educated. Analysing vertical mismatch by gender, it can be noted that the proportion of those in vertically matched positions is higher among women.

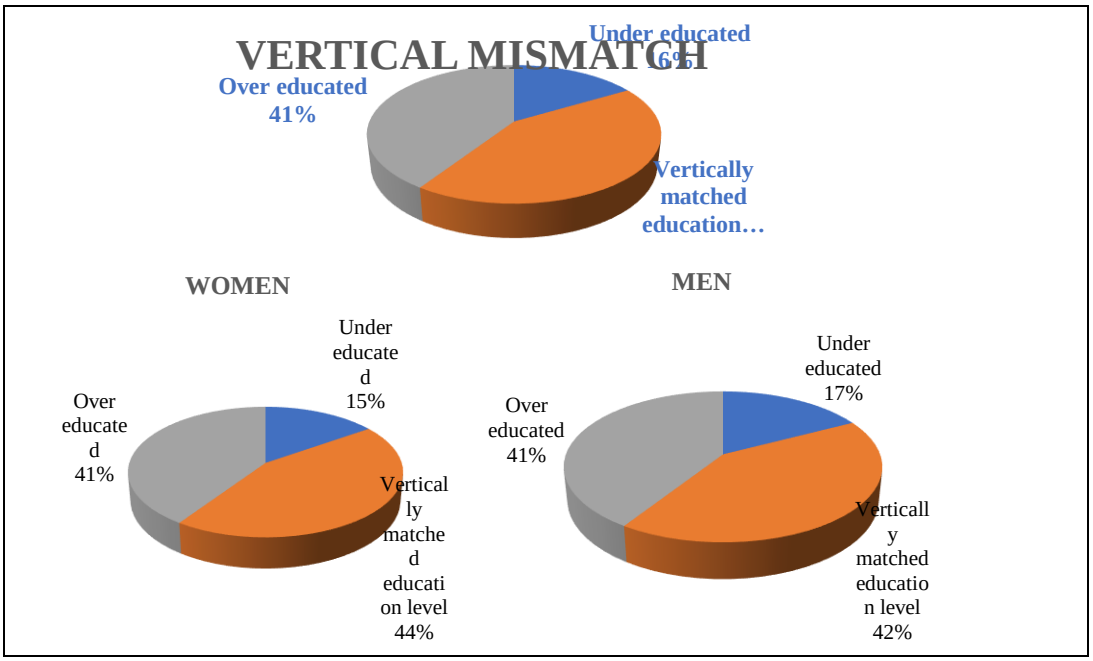
It should also be noted that the age of women and men correlates with the stage of vertical mismatch, though in opposite directions. The proportion of women who are over-educated with respect to their job position increases as the number of years increases, while for men the opposite is true.

The proportion of over-educated workers is much higher in rural areas than in urban areas. This may be closely related to the specifics of the rural labour market. As a rule, the labour market in rural areas

is very limited, in most cases jobs are low-skilled and, accordingly, the proportion of those who are over-educated in rural areas is higher.

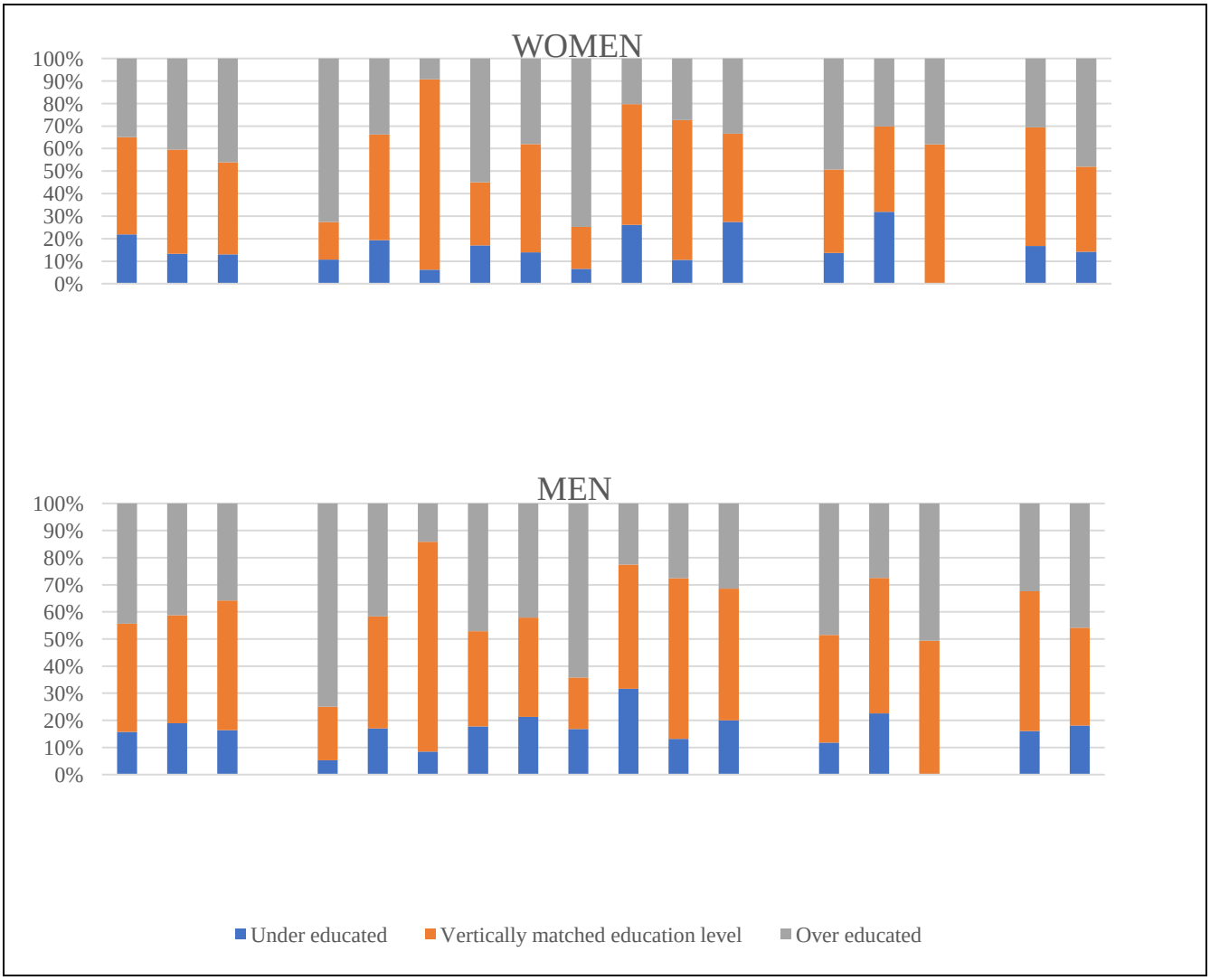
The distribution of vertical mismatch varies greatly across the regions of worker residence. In Issyk-Kul and Talas oblasts, the incidence of over-education is higher as compared to that in other regions, while a high proportion of those in vertically matched positions is noted in Naryn oblast.

Figure 1. Vertical mismatch by gender, (%)



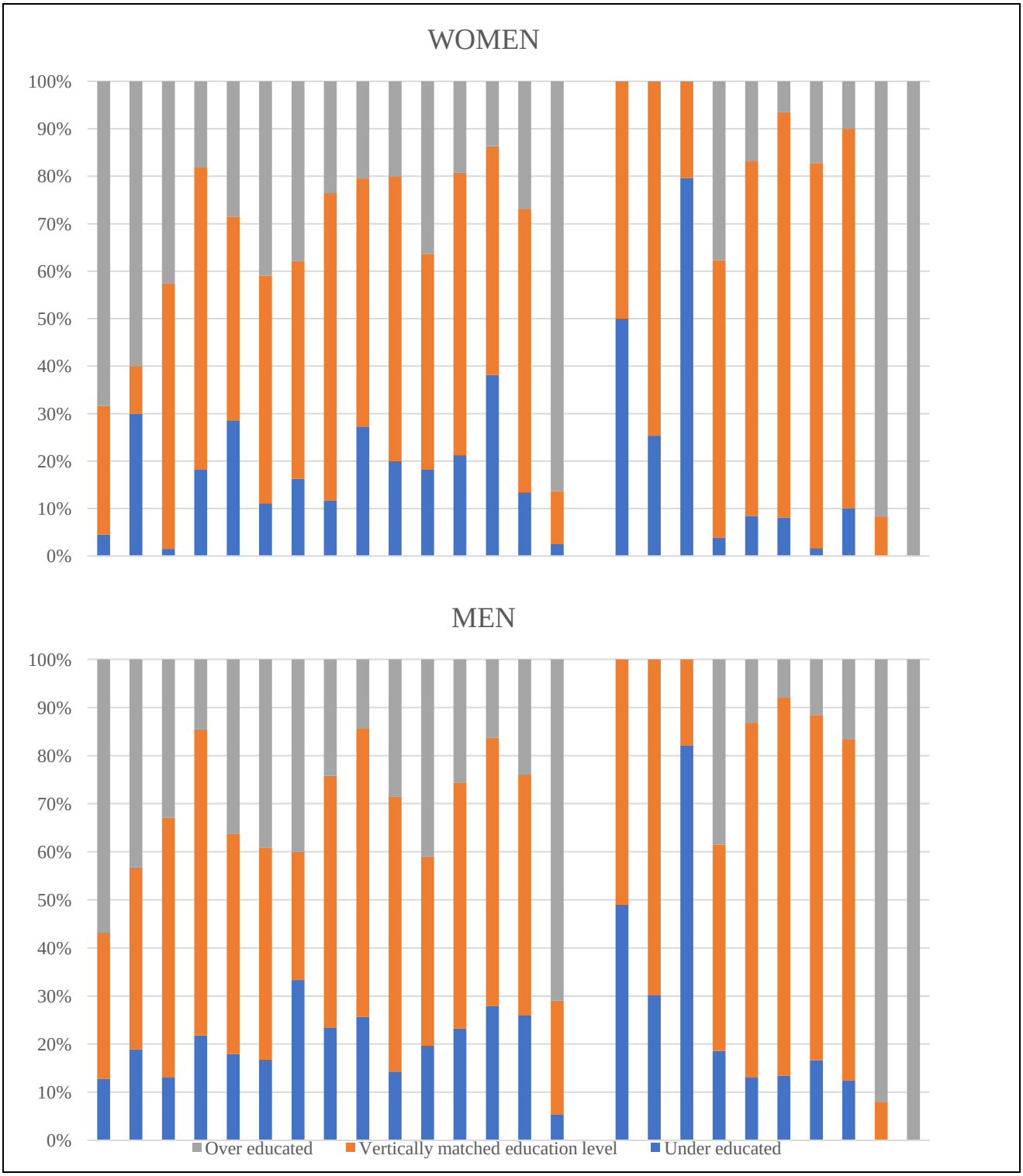
Source: Author's calculations, LiK 2016

Figure 2. Vertical mismatch by region, age, education and residence



Source: *Author's calculations, LiK 2016*

Figure 3. Vertical mismatch by economic sphere and job position



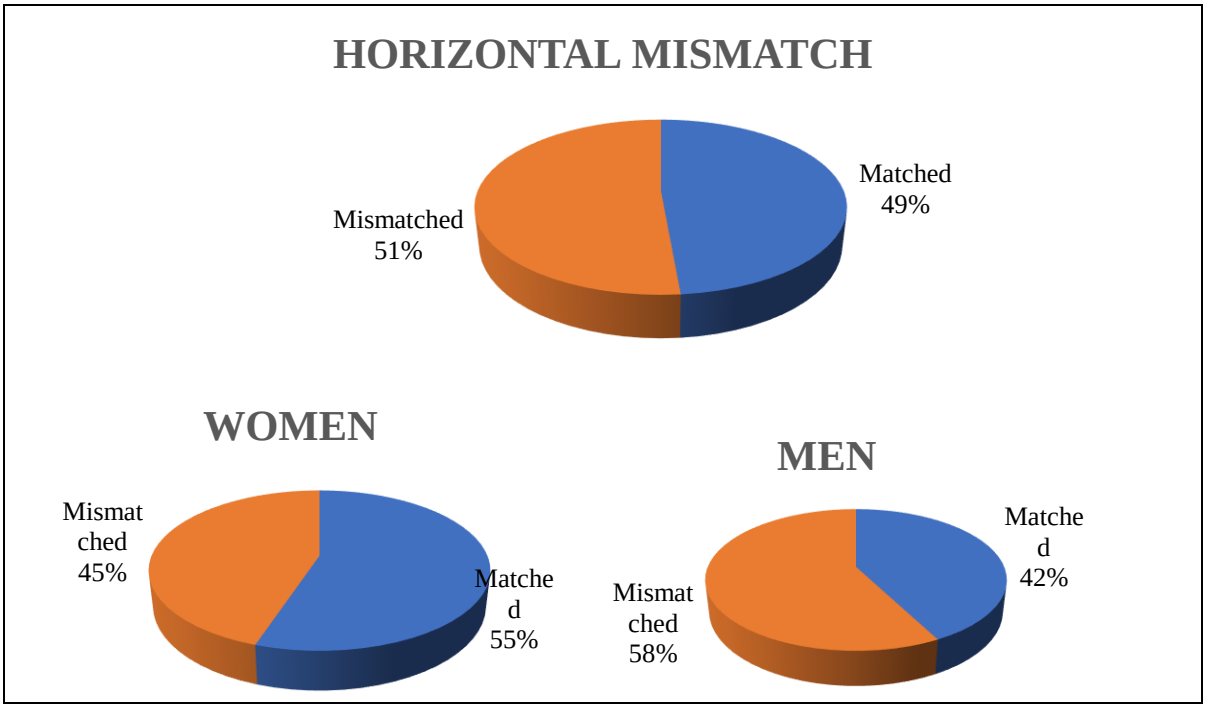
Source: Author's calculations, LiK 2016

Analysis of the levels of completed education shows that almost half of tertiary educated workers are over-educated for their job position. The proportion of over-educated workers is high in the agriculture and mining sectors and in private household businesses, and is primarily found in positions such as clerk, unskilled worker and armed forces member.

Horizontal mismatch statistics

More than half of Kyrgyzstan's workers are in mismatched positions according to their field of education and occupation. This means that every second worker, whether employer or employee, is not working in accordance with their professional qualification. However, this result differs by gender, with women more likely to be in horizontally matched positions as compared to men. This has been shown by other empirical literature as well which indicates that women are less likely to be severely mismatched than men.[50] Looking at the high rate of horizontal mismatch in Kyrgyzstan and that in the empirical literature, we can say that measuring horizontal mismatch by an objective definition generally yields high incidences.[51]

Figure 4. Horizontal mismatch by gender, (%)



Source: *Author's calculation, LiK 2016*

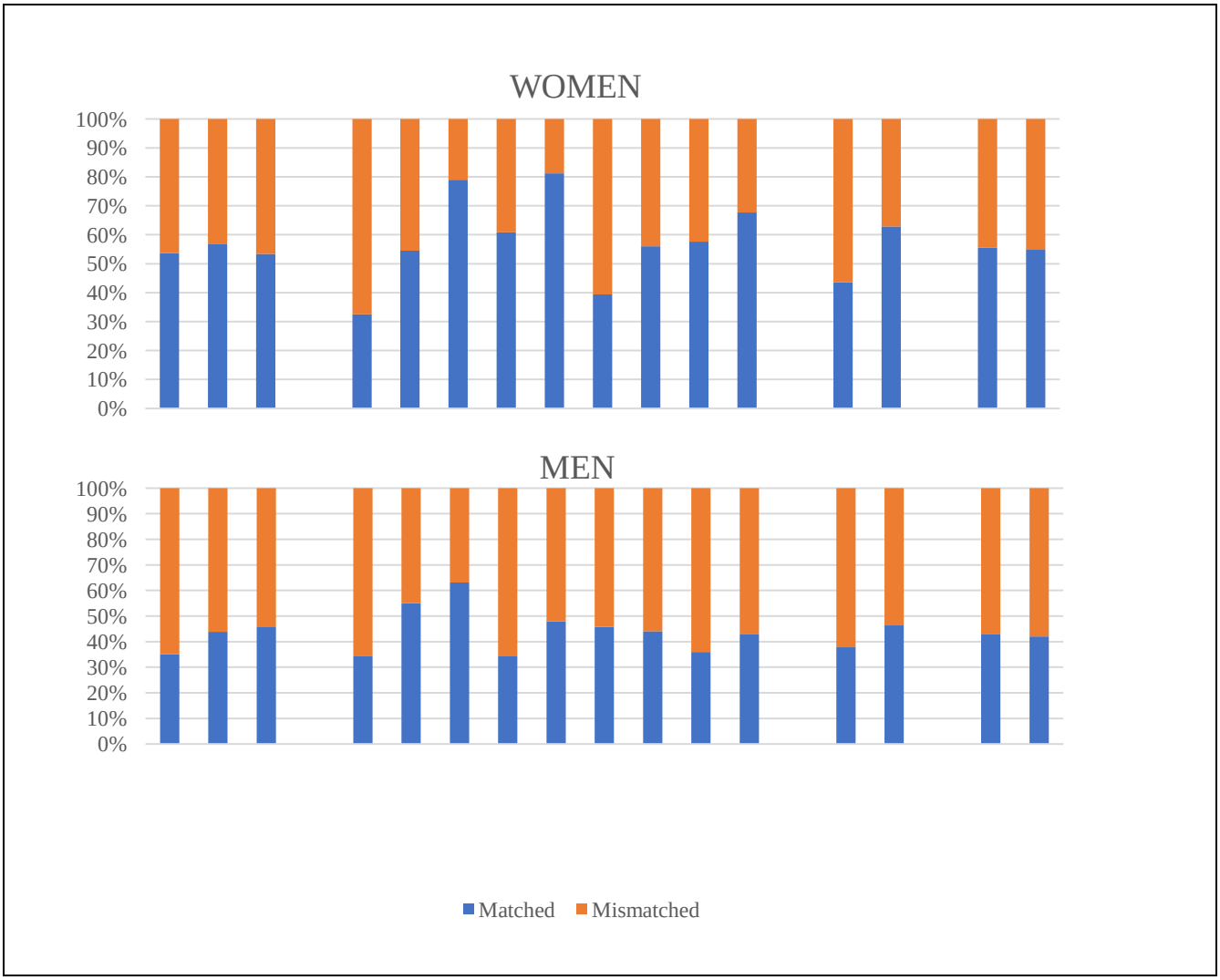
The age of men is positively related with the probability of being horizontally mismatched. This may be related with fact that, over time, formal education depreciates and the career interests of a worker might change.[52]

There is no significant difference between type of residence and probability of being horizontally mismatched. There are, however, some regions in which horizontal mismatch prevails. The highest shares of matches are seen in Naryn and Osh oblasts for women, and in Naryn and Jalal-Abad for men. Interestingly, in the regions such as Issyk-Kul and Talas oblasts where the highest levels of over-education are seen, there are also the highest rates of horizontal mismatch.

[50] Somers et al., 'Horizontal Mismatch': 567-603.
[51] Idem.: 567-603.
[52] Idem.: 567-603.

Level of education is also negatively correlated with horizontal mismatch and predicts the likelihood of being in a matched position. Thus, the occupation type of graduates from tertiary education is more likely to be matched with their field of education than those with technical education. One possible reason for this is that those with higher education who are not able to find a job that suits their level of education find work in a related field that requires a lower level of education.[53] In this case, more highly educated graduates are competing with less educated workers in the jobs related to their field of study, leaving fewer jobs for those who are more likely to accept jobs not matching their field of education.[54]

Figure 5. Horizontal mismatch by age group, region and level of education



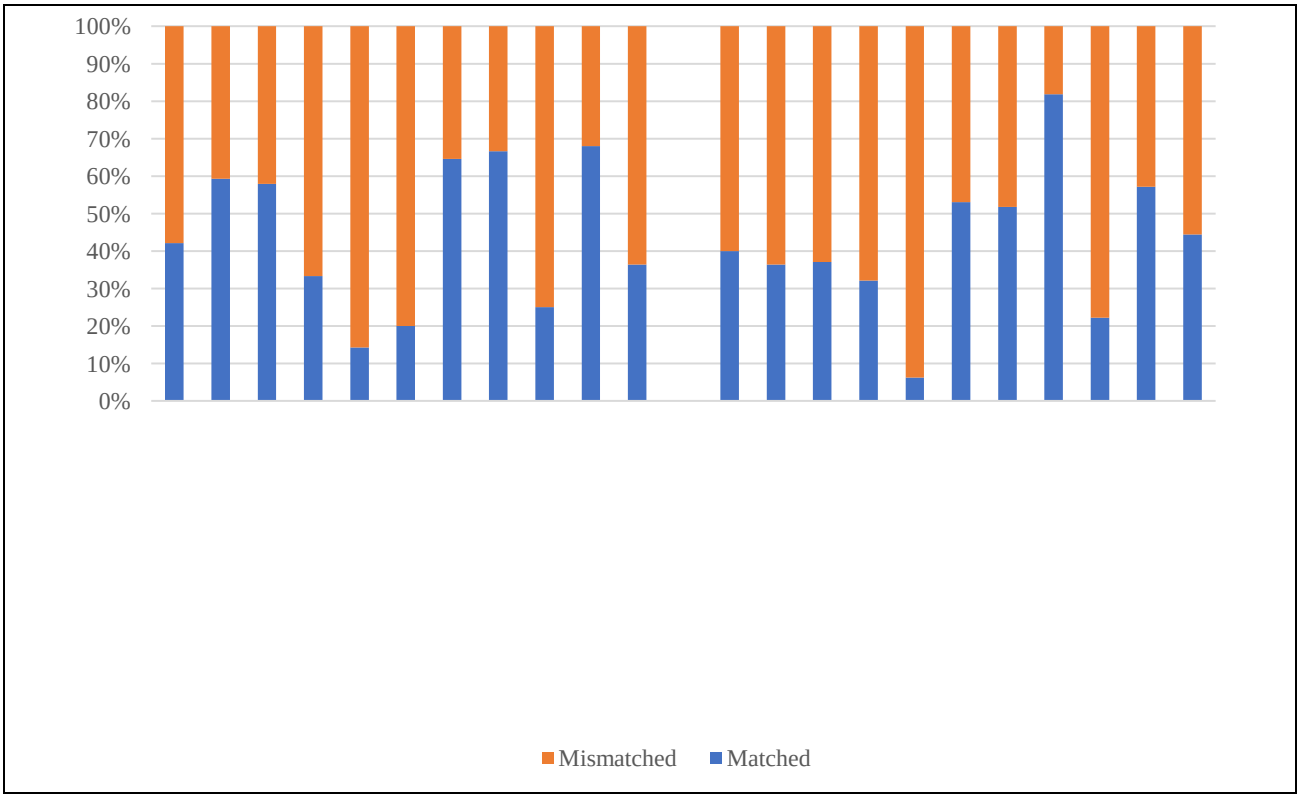
Source: Author's calculations, LiK 2016

Horizontal mismatch also depends on the field of education. Studies have formulated the hypothesis that horizontal mismatch is most likely to occur in workers who have graduated in the humanities,

[53] Lex Borghans and Andries De Grip. *The overeducated worker?*. Edward Elgar Publishing, 2000.
[54] Somers et al., 'Horizontal Mismatch,' 567-603; Valentina Di Stasio, 'Who is ahead in the labor queue? Institutions' and employers' perspective on overeducation, undereducation, and horizontal mismatches.' *Sociology of Education* 90.2 (2017): 109-126.

social sciences and liberal arts, and less likely among workers with education in medicine, computer science, engineering and technology.[55] The highest mismatch incidence based on the literature is found among liberal arts graduates, while those employed in sectors most matched to their field of study work in health. This is likely because healthcare education provides occupation-specific skills, which reduces the probability that graduates will search for jobs in other sectors.[56] Despite these empirical results, in the case of Kyrgyzstan, we can see that the opposite is true.

Figure 6. Horizontal mismatch by field-of-education, (%)



Source: *Author's calculations, LiK 2016*

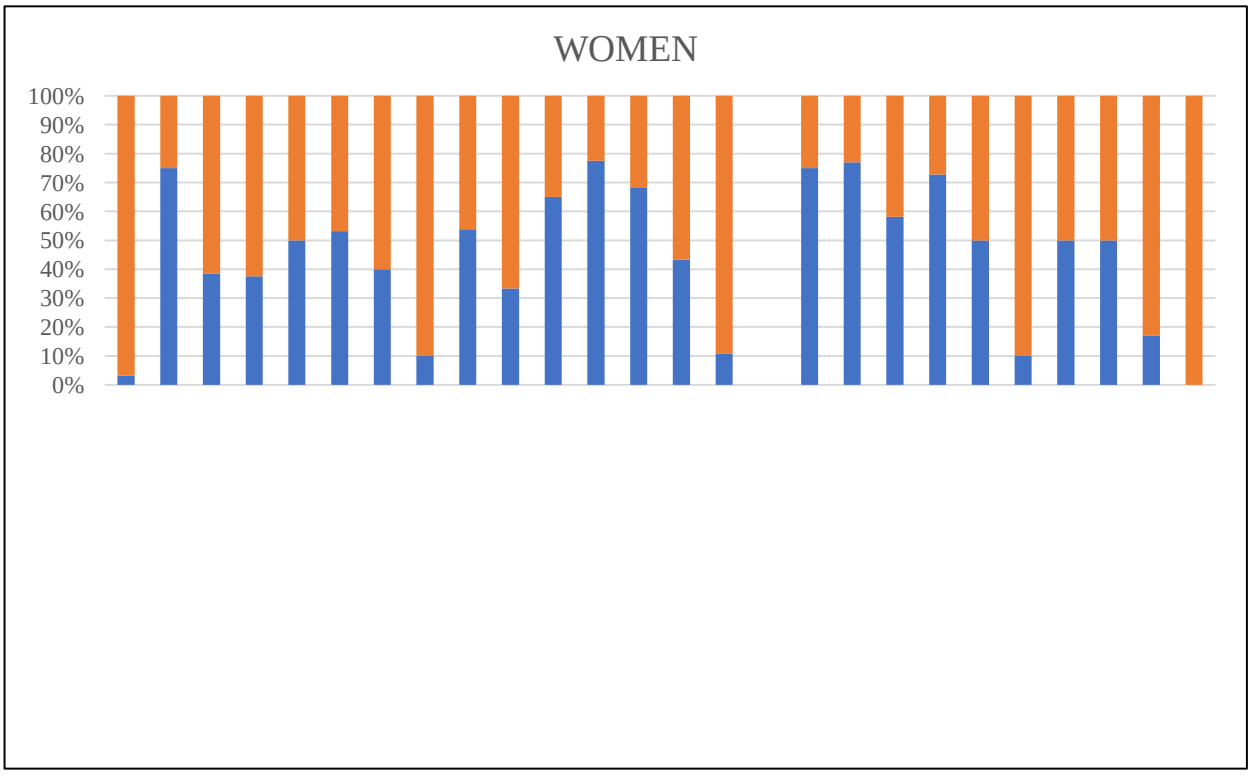
The highest mismatch rates are found among workers with education in technical and computer sciences, whilst the mismatch rates are lowest for workers with education in economics, law, language and arts-related fields. This horizontal mismatch can also be attributed to inconsistency between the supply and demand for labour in a certain field. Graduates from technical and computer sciences are not in demand in the predominantly service economy of Kyrgyzstan, while graduates from law, business and economics are more likely to be working in related fields. The other possible explanation for the low incidence of match in technical and computer sciences is the human capital depreciation associated with technological change that induces rapidly changing skill requirements.[57] Lower quality

[55] Rudakov, et al. 'The impact of horizontal job-education mismatches.' 2019.
[56] John Robst, 'Education and job match: The relatedness of college major and work.' *Economics of Education Review* 26.4 (2007): 397-407; Maarten HJ. Wolbers, 'Job mismatches and their labour-market effects among school-leavers in Europe.' *European sociological review* 19.3 (2003): 249-266; Dieter Verhaest, Sana Sellami, and Rolf Van der Velden. 'Differences in horizontal and vertical mismatches across countries and fields of study.' *International Labour Review* 156.1 (2017): 1-23.
[57] Somers et al., 'Horizontal Mismatch': 567-603.

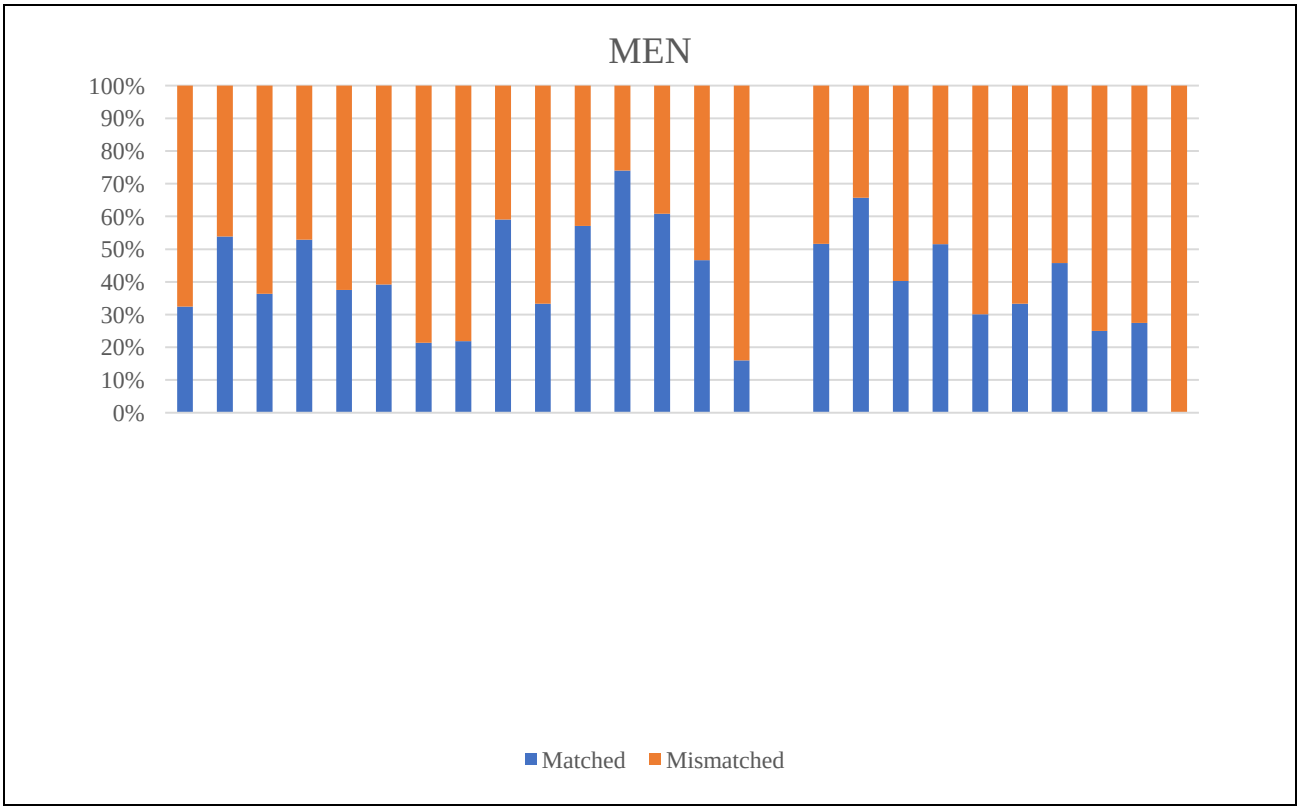
of study program may also increase a graduate's probability of being mismatched by any type of education-job mismatch,[58] while academically prestigious programs that endorse entrepreneurial skills avoid mismatch in general.[59]

Further, when analysing the mismatch in the spheres of economic activity, one can see that the highest proportions of mismatched women are found in agriculture, transport and private household businesses, while the share of mismatched men is highest in the hotel and transport sectors and private household businesses. Both men and women who are horizontally matched are more likely to be working in health, education, finance and public administration. This could be explained by fact that these sectors employ workers with vocationally oriented education.[60]

Figure 7. Horizontal mismatch by economic sphere and job position



[58] Verhaest, Sellami, and Van der Velden, 'Differences in horizontal and vertical': 1-23.
[59] Aleksander Kucel and Montserrat Vilalta-Bufí. 'University program characteristics and education-job mismatch.' *The BE Journal of Economic Analysis & Policy* 19.4 (2019).
[60] Somers et al., 'Horizontal Mismatch': 567-603.



Source: *Author's calculations, LiK 2016*

In general, workers in higher positions are more likely to be horizontally matched, this could be due to requirements in terms of education acquired for white-collar occupations.[61] Even though women with higher job positions are more likely to have matching education fields and occupations, nearly half of men in the highest job positions do not have matching education fields to their occupations. This gender difference falls in line with the literature which states that women in white-collar occupations are more likely to be horizontally matched than women in blue-collar positions, while for men no significant differences were found.[62]

[61] James C. Witte, and Arne L. Kalleberg. 'Matching training and jobs: The fit between vocational education and employment in the German labour market.' *European Sociological Review* 11.3 (1995): 293-317.
[62] Somers et al., 'Horizontal Mismatch': 567-603.

Findings

OLS regressions

Table 3 presents the income models that were generated using the method of least squares, with all results from the empirical models corrected for heteroscedasticity of random residuals. According to the empirical results, the main variables of interest, the over-education and horizontal mismatch variables, are generally consistent with previous empirical literature. Over-education is shown to be statistically significant and to negatively impact earnings, showing that over-educated workers are income penalised (see Table 3, Over-education (1) outputs). Here, it is important to mention that further analyses of mismatch, particularly adding in horizontal mismatch, bring forth changes in sample size. Since the horizontal mismatch variable is only observed for those who have completed study at specialised education institutions, these are the workers who completed technical or tertiary education; the total sample for analysis decreased to 1103 observations.

The coefficients of horizontal and vertical mismatch variables show that, indeed, their joint determination may lead to results other than those found when determining them separately. Consequently, disregarding one of the mismatch variables in the model leads to overestimation of another. According to the empirical outputs, the sole impact of over-education and horizontal mismatch are 13.50% and 6.19% respectively. In the joint calculation, however, the impact of over-education decreases to 12.80% and impact of horizontal mismatch decreases to 4.67%. These findings are in line with the literature which states that vertically and horizontally mismatched workers are generally wage penalised.[63]However, the incidence of horizontal mismatch is twice lower than the over-education incidence, which may indicate that, despite the horizontal mismatch, workers are still able to utilise the skills acquired from their fields of education.[64]

The empirical outputs for the gender sub-samples show that both men and women are prone to being wage penalised with respect to over-education, and that horizontal mismatch significantly negatively impacts the earnings of women workers, though at a 10% significance level. Hence, earnings of horizontally mismatched women are smaller than those of horizontally matched female workers by 6.06%, and the earnings of over-educated women are smaller than those of their vertically matched or under-educated female coworkers by 11.28%. For male workers, the penalty for over-education amounts to 11.58%, while there is no significant statistical evidence of horizontal mismatch-driven wage penalty.

The control variables calculated show the expected signs and are significant. The age of workers has a positive impact, with increasing age leading to an increase in earnings, but with diminishing returns,

[63] Sloane, 'Overeducation, skill mismatches,' 2020; Somers et al., 'Horizontal Mismatch,' 567-603; Allen and Van der Velden, 'Educational mismatches,' 434-452; Nordin, Persson and Rooth. 'Education–occupation mismatch,' 1047-1059; Montt, 'Field-of-study mismatch and overqualification.' 1-20; Rios-Avila and Saavedra-Caballero. 'It pays to study for the right job.' 2019.
[64] Somers et al., 'Horizontal Mismatch': 567-603.

showing that earnings increase up to a definite age before decreasing. This result is in line with the literature showing that age and earnings have quadratic relations both for male and female workers.[65]

The marital status variable is also seen to have a statistically significant positive effect on the sample of men, supporting the specialisation hypothesis that marriage has a positive effect on men's earnings[66] since male workers, once married, can devote more time and effort to activities in the labour market and, as a result, increase their earnings.

[65] Kim, Ahn, and Kim, 'The income penalty.' 67-90.
[66] Losina Purnastuti, Paul W. Miller, and Ruhul Salim. 'Declining rates of return to education: evidence for Indonesia.' *Bulletin of Indonesian Economic Studies* 49.2 (2013): 213-236.

Table 3. Estimation outputs for OLS regressions by gender

	Vertical mismatch (1)	**TOTAL SAMPLE**			**WOMEN**			**MEN**		
		VM	***HM***	***VM and HM***	***VM***	***HM***	***VM and HM***	***VM***	***HM***	***VM and HM***
Ln Age	0.3461***	0.3676***	0.3713***	0.3637***	0.5000***	0.5494***	0.5041***	0.1839	0.1375	0.1750
	(0.0557)	(0.1011)	(0.1011)	(0.1008)	(0.1388)	(0.1368)	(0.1380)	(0.1395)	(0.1389)	(0.1392)
Ln Age squared	-0.0012***	-0.0012***	-0.0012***	-0.0012***	-0.0015***	-0.0017***	-0.0015***	-0.0009**	-0.0007*	-0.0008*
	(0.0002)	(0.0003)	(0.0003)	(0.0003)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Married *(1 = if indv. is married)*	0.0409***	0.0353	0.0354	0.0324	-0.0626*	-0.0712**	-0.0674**	0.1625***	0.1710***	0.1604***
	(0.0156)	(0.0240)	(0.0241)	(0.0238)	(0.0333)	(0.0329)	(0.0327)	(0.0351)	(0.0358)	(0.0351)
Tertiary education	0.1271***	0.1152***	0.0741***	0.1095***	0.1459***	0.1121***	0.1372***	0.0715**	0.0292	0.0681**
	(0.0159)	(0.0226)	(0.0215)	(0.0222)	(0.0356)	(0.0334)	(0.0343)	(0.0288)	(0.0276)	(0.0288)
Residence *(1 = if indv. reside in urban area)*	0.1570***	0.1414***	0.1429***	0.1432***	0.1231***	0.1259***	0.1271***	0.1577***	0.1598***	0.1585***
	(0.0154)	(0.0269)	(0.0272)	(0.0267)	(0.0365)	(0.0363)	(0.0361)	(0.0378)	(0.0386)	(0.0377)
North *(1 = if indv. lives in north regions)*	-0.1441***	-0.1871***	-0.2158***	-0.1863***	-0.1732***	-0.1974***	-0.1688***	-0.1760***	-0.1999***	-0.1783***
	(0.0193)	(0.0303)	(0.0300)	(0.0300)	(0.0411)	(0.0407)	(0.0410)	(0.0414)	(0.0409)	(0.0412)
South *(1 = if indv. lives in south regions)*	0.0380**	0.0405	0.0335	0.0401	0.0651	0.0608	0.0670	0.0047	-0.0023	0.0029
	(0.0175)	(0.0287)	(0.0286)	(0.0286)	(0.0433)	(0.0431)	(0.0432)	(0.0385)	(0.0382)	(0.0384)
Agriculture and fishing sector	-0.0806***	-0.0688	-0.0945**	-0.0629	-0.1756***	-0.1742***	-0.1554***	-0.0450	-0.0788	-0.0433
	(0.0181)	(0.0460)	(0.0452)	(0.0459)	(0.0499)	(0.0507)	(0.0499)	(0.0612)	(0.0589)	(0.0612)
Education sector	-0.1319***	-0.1266***	-0.0980***	-0.1397***	-0.0999**	-0.0734*	-0.1142**	-0.0817*	-0.0612	-0.0912**
	(0.0174)	(0.0286)	(0.0291)	(0.0299)	(0.0425)	(0.0423)	(0.0453)	(0.0418)	(0.0420)	(0.0420)
Health and social work sector	-0.0730***	-0.0925***	-0.0609*	-0.1026***	-0.0630	-0.0355	-0.0751*	-0.0078	0.0334	-0.0125
	(0.0234)	(0.0321)	(0.0321)	(0.0328)	(0.0437)	(0.0424)	(0.0452)	(0.0562)	(0.0555)	(0.0564)
Senior official and manager	0.1959***	0.2514***	0.3090***	0.2520***	0.3337***	0.3757***	0.3271***	0.2257***	0.2781***	0.2253***
	(0.0458)	(0.0613)	(0.0597)	(0.0608)	(0.1101)	(0.0960)	(0.0983)	(0.0691)	(0.0676)	(0.0688)
Overeducation	***-0.1336******	***-0.1350******		***-0.1280******	***-0.1230******		***-0.1128******	***-0.1206******		***-0.1158******
	(0.0134)	***(0.0243)***		***(0.0244)***	***(0.0346)***		***(0.0339)***	***(0.0334)***		***(0.0341)***
Horizontal mismatch			***-0.0619******	***-0.0467****		***-0.0756****	***-0.0606****		***-0.0474****	***-0.0351***
			(0.0218)	***(0.0217)***		***(0.0339)***	***(0.0332)***		***(0.0280)***	***(0.0284)***
Constant	8.6081***	8.5613***	8.5582***	8.6029***	8.1199***	7.9757***	8.1388***	9.1250***	9.2760***	9.1778***
	(0.1747)	(0.3233)	(0.3239)	(0.3229)	(0.4443)	(0.4383)	(0.4430)	(0.4450)	(0.4441)	(0.4457)
Log likelihood	-1032.8907	-331.4071	-343.2363	-328.9875	-157.3875	-160.6091	-155.5370	-151.2194	-157.0491	-150.4383
R2	0.2241	0.2375	0.2210	0.2409	0.2573	0.2483	0.2624	0.2413	0.2254	0.2434
F-statistics	84.4891	32.2668	30.6033	30.2616	25.7227	25.3435	24.5904	16.7800	15.5487	15.5865
N	3129	1103	1103	1103	539	539	539	564	564	564

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$

Source: *Author's calculations, LiK 2016*

According to the hypothesis of specialisation, marriage has an inverse effect on women's earnings. Marriage is hypothesised to reduce the earnings of working women, presumably because they then spend more time doing household chores and having and raising children.[67] It can be noted that this hypothesis is confirmed in the context of Kyrgyzstan as well (see Table 3).

These results show that, on average, there is a correlation between the level of education and income of the respondents. Thus, there is statistically significant positive impact of tertiary education on earnings for both men and women.

Analysis of the dummy variable for urban areas of residence shows that, on average, urban residents earn significantly more than rural residents. The coefficient of the dummy variable is statistically significant in all study sub-samples; that is, men and women all show a low level of income in rural areas. It is also possible to note a regional imbalance in the level of income. Those in the regions located in the northern part of Kyrgyzstan – in Talas, Issyk-Kul and Naryn oblasts – show lower earnings compared to those in Bishkek city and Chuy oblast. Whilst there is no significant difference in earnings between those in the southern regions – Batken, Jalal-Abad and Osh oblasts – and those in Bishkek city and Chuy oblast.

According to the empirical findings, earnings in the agriculture, education and health sectors are much lower than in other sectors. With regard to position, senior officials and managers tend to earn much more than those who are working in lower job positions. This is true for both male and female subsamples.

Quintile regressions

Taking into consideration the fact that unobservable individual heterogeneity may impact outcome variables, we calculated quintile regressions for female and male workers. The results are reported in Annex Tables 5 and 6 where we consider four different quintiles for the conditional distribution of worker income. We follow Kim et al. (2016) and assume that workers' ability levels, as unobserved individual heterogeneity, are proportional to the grouping of their observed income.

According to the results, the horizontal mismatch penalty is significant for the lower quintile of income distribution and is 6.03%. When we analyse the subsamples by gender, we can see that only women in the lowest income quintile are wage penalised with respect to horizontal mismatch, and the incidence of horizontal mismatch reaches 11.15%. This output drives attention to the fact that women in the lowest quintile with inappropriate educational attainment are the most wage penalised and vulnerable.

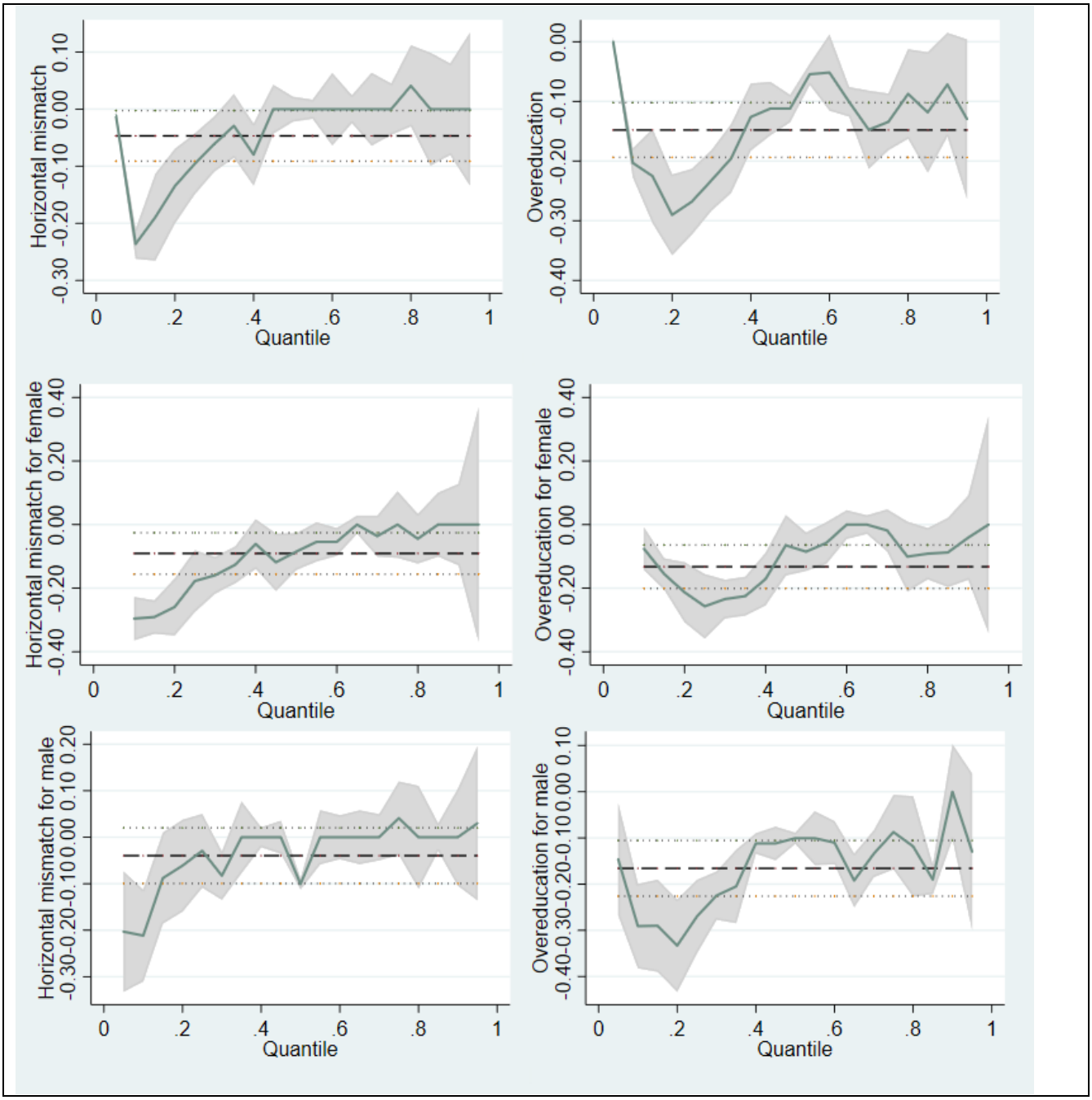
In contrast to horizontal mismatch, the income penalty for over-education is significant for all income quintiles and decreases with respect to increase in quintiles of conditional earnings from 14.20% in the lowest quintile to 8.15% in the highest. When we disaggregate results by gender, however, we can see that the highest wage penalty for over-education is seen in the lower and middle quintiles of income. Thus, the highest wage penalty for over-education among female workers is seen in the second and third quintiles at 12.38% and 11.96% respectively. For male workers, the highest wage penalty for over-education is seen in the lower quintiles, the first and second reaching 12.98% and 14.68%

[67] Purnastuti, Miller and Salim, 'Declining rates of return to education': 213-236.

respectively. These results show that women with middle income and men with lower income are the most wage penalised for their over-education.

These results are in line with Human Capital Theory and support the argument that omitting important unobservable variables related to human capital, such as ability, may lead to biased results.[68] Results show that, with increase in income distribution, education-job mismatch incidence may change considerably (see Figure 9).

Figure 8. Quintile regression outputs for education-job mismatch by gender



[68] Kim, Ahn, and Kim, 'The income penalty': 67-90.

Source: *Author's calculations, LiK 2016*

Impact of education job mismatch by age group

The analysis of the impact of education-job mismatch on wages is extended by its generational impact. This analysis sheds light on the difference, not only between age groups, but generations. In Kyrgyzstan, the oldest cohort of workers are graduates from the Soviet Union era education system. This oldest group of workers covers those ranging in age from 50 to 65 years old. Considering that the data that we are using in our analysis was compiled in 2016, we can say that those workers who were 50 years old in 2016 are those who newly entered the labour market after the fall of the Soviet Union. In 1991 these workers were 25 years old. At 25 years old, it is assumed that these workers had already graduated from higher education or had at least completed their educational attainment. Thus, the oldest age cohort, 50-65 years of age, are the workers who received their education during Soviet Union.

Table 4. Estimation outputs for OLS regressions by generations

	TOTAL SAMPLE	**GENERATIONS**		
		18-29 years	***30-49 years***	***50-65 years***
Ln Age	0.3637***	1.9469	-0.4168	0.5785
	(0.1008)	(1.4996)	(0.5709)	(2.5929)
Ln Age squared	-0.0012***	-0.0136	0.0017	-0.0016
	(0.0003)	(0.0166)	(0.0021)	(0.0037)
Married *(1 = if indv. is married)*	0.0324	0.0250	0.0212	0.0597
	(0.0238)	(0.0524)	(0.0352)	(0.0433)
Tertiary education	0.1095***	0.0908*	0.0771**	0.1573***
	(0.0222)	(0.0542)	(0.0338)	(0.0358)
Residence *(1 = if indv. reside in urban area)*	0.1432***	0.1564**	0.1569***	0.0934**
	(0.0267)	(0.0657)	(0.0348)	(0.0461)
North *(1 = if indv. lives in north regions)*	-0.1863***	-0.1692***	-0.1773***	-0.2369***
	(0.0300)	(0.0639)	(0.0459)	(0.0524)
South *(1 = if indv. lives in south regions)*	0.0401	0.1153*	0.0464	-0.0319
	(0.0286)	(0.0671)	(0.0394)	(0.0481)
Agriculture and fishing	-0.0629	-0.0633	-0.0627	-0.0713
	(0.0459)	(0.1250)	(0.0600)	(0.0685)
Education sector	-0.1397***	-0.2227**	-0.1175***	-0.0998**
	(0.0299)	(0.0895)	(0.0390)	(0.0500)
Health and social work sector	-0.1026***	-0.2375***	-0.0551	-0.1208**
	(0.0328)	(0.0711)	(0.0492)	(0.0518)
Senior official and manager sector	0.2520***	0.1364	0.3681***	0.0697
	(0.0608)	(0.1359)	(0.0827)	(0.0841)
Overeducation	***-0.1280******	***-0.1499******	***-0.0974******	***-0.1257******
	(0.0244)	***(0.0575)***	***(0.0350)***	***(0.0419)***
Horizontal mismatch	***-0.0467****	***0.0128***	***-0.0443***	***-0.0994******
	(0.0217)	***(0.0516)***	***(0.0313)***	***(0.0372)***
Constant	8.6029***	4.0452	11.0787***	7.9036
	(0.3229)	(4.1036)	(1.8369)	(9.4184)
Log likelihood	-328.9875	-91.0999	-149.2897	-67.6065
R2	0.2409	0.2486	0.2494	0.2962
F-statistics	30.2616	8.7377	12.5705	14.2753
N	1103	239	544	320

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$

Source: Author's calculations, LiK 2016

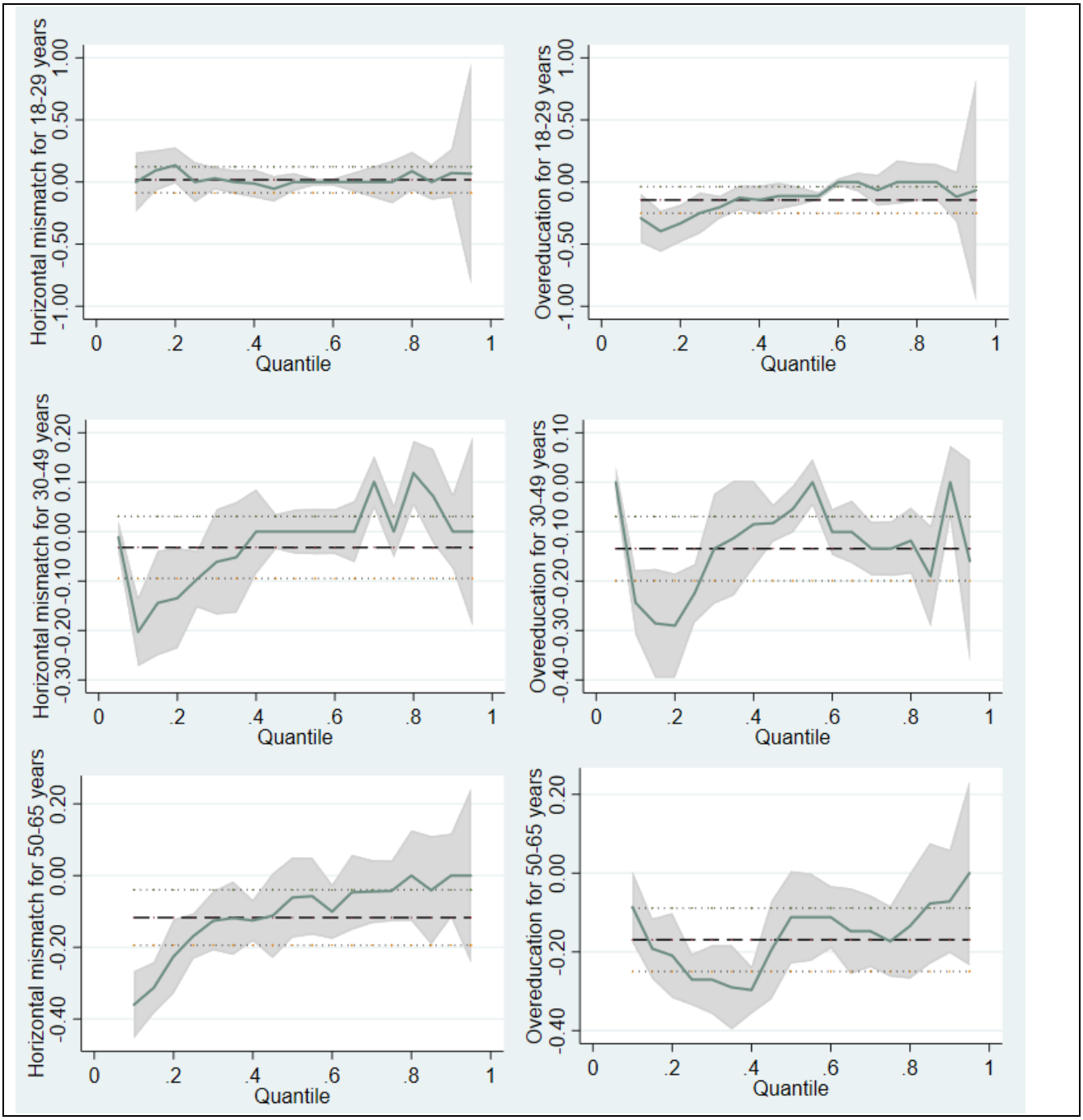
The other two age groups reflect those who received their education after the independence of Kyrgyzstan. The youngest worker group reflects the youth of Kyrgyzstan and investigating this age group separately can provide insight as to how they transition into the labour market after graduation. The middle age group reflects those who are more experienced than the youth. Inclusion of this grouping will shed light on how education acquired across generations impacts earning.

According to the results, the share of workers experiencing horizontal and vertical mismatch differs by age group. Thus, significant over-education wage penalty has been seen among the youth and in the oldest cohort of workers, at 14.99% and 12.57% respectively. Significant negative impact of horizontal mismatch is seen only for the oldest workers. This could be explained by the fact that, after the dissolution of the Soviet Union, a large number of previously employed industrial workers became unemployed due to the rapid transformation of economy into a service sector dominated economy and had to accept jobs that did not necessarily match their professional qualification.[69]. If we look at the quintile regression analysis, we can see that horizontal mismatch severely impacts older workers with the lowest incomes. Thus, the horizontally mismatched workers over 50 years of age in the lowest quintile receive on average 21.76% less income than their counterparts who are horizontally matched (see Annex Table 7). This finding shows that, in Kyrgyzstan, the older cohort of workers is twice wage penalised, firstly due to over-education and secondly for the fact that they do not hold the required specialisations, and that this is especially true for those in the lowest quintile of income distribution.

While investigating over-education, we can see that the incidence of over-education wage penalty among youth decreases with income quintile (see Figure 10), while the opposite is true for middle-aged workers; hence, wage penalty incidence increases with quintile of income distribution (see Annex Table 7). Interestingly, both age categories do not experience wage penalisation due to horizontal mismatch. This falls in line with the literature in that the starting wages of workers has been found to be unrelated with horizontal education-job mismatch for inexperienced workers, while experienced workers are wage penalised by mismatch.[70] The literature also states that the income penalty for over-education is seen in most income quantiles, while that for horizontal mismatch is predominantly seen in the lowest quintiles,[71] which appears to be true for Kyrgyzstan as well.

[69] Aleksander Kucel, 'The sociology of educational mismatch': 21-34
[70] Fredriksson, Hensvik, and Skans, 'Mismatch of talent': 3303-38.
[71] Kim, Ahn, and Kim, 'The income penalty': 67-90.

Figure 9. Quintile regression outputs for education-job mismatch by generation



Source: *Author's calculations, LiK 2016*

Conclusion

Employment and labour supply in Kyrgyzstan are among the main socio-economic issues facing the country. Against the background of the high level of unemployment among those with tertiary education, a study of the relevance of education's impact on employment, and its returns, is becoming one of the most pressing topics.[72]

In recent years there has been a tendency for the development of state policy in the field of reforming the higher education system. Policy measures are focused on improving the effectiveness of higher education, increasing youth participation in the vocational education process, updating curricula and integrating the education system both with international systems and needs of the current labour market. Nevertheless, the problem of the discrepancy between the skills acquired in educational institutions and the needs of the labour market remains one that is unresolved.[73] Taking this into account, this study is of great importance for furthering the understanding of mismatch between professional skills and occupation in Kyrgyzstan in order to determine the appropriate measures required to regulate and increase the employment level. In particular, this study provides empirical results which indicate that there is a substantial mismatch between the education on offer and how it is utilised in the labour market.

In many ways, the results of this study are in line with the findings of previous studies. They show that obtaining a higher education does not always guarantee a relatively high probability of employment in accordance with that education. Similar conclusions were obtained in other studies in developed countries. However, in the case of Kyrgyzstan, it is important to mention that there is high level of both vertical and horizontal education-job mismatch. Our findings show that there is a significant over-education wage penalty for youth and among the oldest cohort of workers. The oldest cohort of workers in Kyrgyzstan is twice wage penalised, firstly due to their over-education and secondly for the fact that they do not hold the required qualifications. This is especially true for those who are in the lowest quintile of income distribution, and particularly for female workers in the lowest income quintile.

These findings have several policy implications. First, the high incidence of horizontal and vertical mismatch in Kyrgyzstan calls for an improvement in the quality of education. From the supply side, educational institutions such as schools and universities can establish a closer relationship with the labour market in order to provide the appropriate professional skills and knowledge to their students. They should also strengthen the practice of apprenticeship in vocational education institutions and internships in higher education institutions. Successful programs for smooth transition from education to employment involve education systems where students are actively involved in practical training in companies within their specialisations while at the same time receiving theoretical knowledge from their educational institutions. The practice of apprenticeship is actively used in secondary vocational education in such developed countries as Korea, Germany, Austria and Japan. Emulating such systems

[72] Karymshakov and Sulaimanova, 'The school-to-work transition,' (2019); Sulaimanova and Karymshakov, 'Factors of Education-Job Mismatch*':* 65.
[73] Ibid.; idem.: 65; Karymshakov, Kamalbek, & Burulcha, Sulaimanova, "Divergence Analysis of Education and Employment of Youth in Kyrgyzstan.' *Reforma* 3, no. 75 (2017): 86-92.

could be the first step toward reducing the high rate of education-job mismatch. Representatives of enterprises and organisations consider educational institutions, rather than recruitment agencies, to be the main source of replenishment of their staff, and this reinforces the need for effective interaction between the educational services market and the labour market in the process of training young specialists.[74]

Second, from demand side, it is important to increase the usage of entrepreneurial skills that may help utilise knowledge gained from educational institutions. It is also important to promote life-long learning of adults, with special targets for women and older individuals as they are the most severely impacted by education-job mismatch. Here also, we can suggest a reduction of barriers to participation of women in the labour market, especially for married women returning to or starting participation in the labour market. Policy actions in this field might include enhancement of support for childcare services and education programs for women oriented toward adaptation to labour market requirements.

Third, policy to decrease education-job mismatch incidence should be targeted at the elimination of regional disparity in Kyrgyzstan. The surplus of over-educated workers varies greatly across the regions and rural and urban settlements. Therefore, creation of new opportunities for employment in rural areas via development of special programs designed for less developed regions of the country should be a focus of government policy.

[74] Irina Magera, *The problem of youth employment and unemployment in the context of the mismatch between the educational services market and the labor market* // SEPTP. 2012. No. 6.

References

Allen, Jim, and Rolf Van der Velden. 'Educational mismatches versus skill mismatches: effects on wages, job satisfaction, and on-the-job search.' *Oxford economic papers* 53.3 (2001): 434-452.

Asai, Kentaro, Thomas Breda, Audrey Rain, Lucile Romanello, Marc Sangnier. *Education, Skills and Skill Mismatch. A Review and Some New Evidence Based on the PIAAC Survey*. [Research Report] Rapport IPP n°26, Institut des Politiques Publiques (IPP). 2020, 114, halshs-02514746

Badillo-Amador, Lourdes, and Luis E. Vila. 'Education and Skill Mismatches: Wage and Job Satisfaction Consequences.' *International Journal of Manpower* 34, no. 5(2013): 416-428.

Bauer, Thomas K. 'Educational Mismatch and Wages: A Panel Analysis.' *Economics of education review* 21, no. 3 (2002): 221-229.

Béduwé, Catherine, and Jean-François Giret. 'Mismatch of Vocational Graduates: What penalty on French Labour Market?' *Journal of Vocational Behavior* 78, no. 1 (2011): 68-79.

Borghans, Lex, and Andries De Grip. *The overeducated worker?*. Edward Elgar Publishing, 2000.

Cameron Colin A. and Pravin K. Trivedi. *Microeconometrics: Methods and Applications*. Cambridge University Press, 2005.

Davalos, Jorge, Viktorija Atanasovska, and Tijana Angjelkovska. *Unemployment Spell and Vertical Skills Mismatches: The Case of Macedonia's Youth*. 2016-18. PEP-PMMA, 2016.

Di Stasio, Valentina. 'Who is Ahead in the Labor Queue? Institutions' and Employers' Perspective on Overeducation, Undereducation, and Horizontal Mismatches.' *Sociology of Education* 90, no. 2 (2017): 109-126.

Domadenik, Polona, Dasa Farcnik, and Francesco Pastore. 'Horizontal Mismatch in the Labour Market of Graduates: The Role of Signaling.' (2013).

EC Fields of Education and Occupations Matching Table, https://ec.europa.eu/eurostat/documents/7884615/8088533/Conversion+Table+ISCO_08_ISCED_99.pdf (accessed June 2021).

Fredriksson, Peter, Lena Hensvik, and Oskar Nordström Skans. 'Mismatch of Talent: Evidence on Match Quality, Entry Wages, and Job Mobility.' *American Economic Review* 108, no. 11 (2018): 3303-38.

International Labour Organisation. *International Standard Classification of Occupations: ISCO-08* / International Labour Office. – Geneva: ILO (2012) https://www.ilo.org/public/english/bureau/stat/isco/docs/publication08.pdf (accessed March 2021).

International Labour Organisation. *Global Employment Trends for Youth 2013: A Generation at risk.* Geneva. (2013)

Karymshakov, Kamalbek, and Burulcha Sulaimanova. 'The School-to-Work Transition, Overeducation and Wages of Youth in Kyrgyzstan.' *International Journal of Manpower* (2019).

Karymshakov, Kamalbek, & Burulcha, Sulaimanova, "Divergence Analysis of Education and Employment of Youth in Kyrgyzstan.' *Reforma* 3, no. 75 (2017): 86-92.

Kim, Hong-Kyun, Seung C. Ahn, and Jihye Kim. 'The Income Penalty of Vertical and Horizontal Education-Job Mismatches in the Korean Youth Labor Market: A Quantile Regression Approach.' *Hitotsubashi Journal of Economics* (2016): 67-90.

Kucel, Aleksander. 'The Sociology of Educational Mismatch.' *Polish Sociological Review* 173, no. 1 (2011): 21-34.

Kucel, Aleksander, and Montserrat Vilalta-Bufí. 'University Program Characteristics and Education-Job Mismatch.' *The BE Journal of Economic Analysis & Policy* 19, no. 4 (2019).

Kupets, Olga. 'Education in Transition and Job Mismatch: Evidence from the Skills survey in Non-EU Transition Economies.' *KIER Discussion Paper* 915 (2015).

Kupets, Olga. 'Education-Job Mismatch in Ukraine: Too Many People with Tertiary Education or Too Many Jobs for Low-Skilled?.' *Journal of Comparative Economics* 44, no. 1 (2016): 125-147.

Lalley, Christopher, John Houston, and Anne Gasteen. 'Gender Disparities in Horizontal Mismatch Penalties: an Examination of Professional Degrees in the UK (2007–2015).' *Studies in Higher Education* 44, no. 12 (2019): 2265-2280.

Lamo, Ana, and Julián Messina. 'Formal Education, Mismatch and Wages after Transition: Assessing the Impact of Unobserved Heterogeneity using Matching Estimators.' *Economics of Education Review* 29, no. 6 (2010): 1086-1099.

National Statistical Committee of the Kyrgyz Republic. *20 Years of Independence of the Kyrgyz Republic. Figures and Facts.* (Bishkek 2016)

National Statistical Committee of the Kyrgyz Republic. *Employment and Unemployment. Results of an Integrated Sample Survey of Household Budgets and Labour Force in 2015*. Statistical Book, (2016) Bishkek.

National Statistical Committee of the Kyrgyz Republic (NSCKR), *Education and Science in the Kyrgyz Republic*, Statistical Book, (Bishkek 2018).

National Statistical Committee of the Kyrgyz Republic. *Employment Statistics* https://www.stat.kg/ru/statistics/zanyatost/ (accessed 15 July 2021).

Magera, Irina, Магера Ирина Валерьевна. Проблема молодежной занятости и безработицы в контексте несоответствия рынка образовательных услуг и рынка труда. СЭПТП. 2012. №6. [The Problem of Youth Employment and Unemployment in the Context of the Mismatch between the Educational Services Market and the Labour Market.] SEPTP, no. 6 (2012).

Mahuteau, Stephane, Kostas Mavromaras, Peter Sloane and Zhang Wei 'Horizontal and Vertical Educational Mismatch and Wages.' *Adelaida, Australia* 216 (2015).

McGuinness, Seamus, and Peter J. Sloane. 'Labour Market Mismatch among UK Graduates: An Analysis using REFLEX Data.' *Economics of Education Review* 30, no. 1 (2011): 130-145.

Montt, Guillermo. 'Field-of-Study Mismatch and Overqualification: Labour Market Correlates and Their Wage Penalty.' *IZA Journal of Labour Economics* 6, no. 1 (2017): 1-20.

Morgado, Ant´onio, Tiago Neves Sequeira, Marcelo Santos, Alexandra Ferreira-Lopes and Ana Balcao Reis , 'Measuring Labour Mismatch in Europe.' *Social Indicators Research* 129, no. 1 (2016): 161-179.

Nordin, Martin, Inga Persson, and Dan-Olof Rooth. 'Education–Occupation Mismatch: Is There an Income Penalty?' *Economics of education review* 29, no. 6 (2010): 1047-1059.

Purnastuti, Losina, Paul W. Miller, and Ruhul Salim. 'Declining Rates of Return to Education: Evidence for Indonesia.' *Bulletin of Indonesian Economic Studies* 49, no. 2 (2013): 213-236.

Rios-Avila, Fernando, and Fabiola Saavedra-Caballero. 'It Pays to Study for the Right Job: Exploring the Causes and Consequences of Education-Occupation Job Mismatch.' *Levy Economics Institute, Working Papers Series* 922 (2019).

Robst, John. 'Education and Job Match: The Relatedness of College Major and Work.' *Economics of Education Review* 26, no. 4 (2007): 397-407.

Rudakov, Victor, Pedro Teixeira, Hugo Figueiredo, Sergey Roshchin, 'The Impact of Horizontal Job-Education Mismatches on the Earnings of Recent University Graduates in Russia.' (2019). Institute of Labour Economics (IZA). No. 12407

Schultz, Theodore W. 'Investment in Human Capital.' *The American Economic Review* 51, no. 1 (1961): 1-17.

Schweri, Juerg, Annina Eymann, and Manuel Aepli. 'Horizontal Mismatch and Vocational Education.' *Applied Economics* 52, no. 32 (2020): 3464-3478.

Sellami, Sana, Dieter Verhaest, and Walter Van Trier. 'How to Measure Field-of-Study Mismatch? A Comparative Analysis of the Different Methods.' *Labour* 32, no. 4 (2018): 141-173.

Somers, Melline, Cabus, Sofie, Groot, Wim Groot and Henriette Maassen van den Brink. 'Horizontal Mismatch Between Employment and Field of Education: Evidence from a Systematic Literature Review.' *Journal of Economic Surveys* 33, no. 2 (2019): 567-603.

Sloane, Peter J. Mavromaras. 'Overeducation, Skill Mismatches, and Labor Market Outcomes for College Graduates.' *IZA World of Labor* (2020).

Sulaimanova, Burulcha, and Kamalbek, Karymshakov. 'Factors of Education-Job Mismatch among Youth in Kyrgyz Republic.' *Actual Probs. Econ. & L.* (2018): 65.

Verhaest, Dieter, Sana Sellami, and Rolf Van der Velden. 'Differences in Horizontal and Vertical Mismatches across Countries and Fields of Study.' *International Labour Review* 156, no. 1 (2017): 1-23.

Witte, James C., and Arne L. Kalleberg. 'Matching Training and Jobs: The Fit between Vocational Education and Employment in the German Labour Market.' *European Sociological Review* 11, no. 3 (1995): 293-317.

Wolbers, Maarten HJ. 'Job Mismatches and Their Labour-Market Effects among School-Leavers in Europe.' *European Sociological Review* 19, no. 3 (2003): 249-266.

Annex

Table 1. Description of variables

DEPENDENT VARIABLE	
Earnings	Monthly income of employees, own-account workers in Soms(KGS)
INDEPENDENT VARIABLE	
Age	Full age in years
Married	1 = if individual is married, 0 = otherwise
Education	
▪ Secondary education	1 = if individual obtained secondary level of education, 0 = otherwise
▪ Technical education	1 = if individual obtained technical level of education, 0 = otherwise
▪ Tertiary education	1 = if individual obtained tertiary level of education, 0 = otherwise
Ethnicity	
▪ Kyrgyz	1 = if individual is Kyrgyz, 0 = otherwise
▪ Uzbek	1 = if individual is Uzbek, 0 = otherwise
▪ Russian	1 = if individual is Russian, 0 = otherwise
Residence	1 = if individual reside in urban area, 0 = rural area
Regions	
▪ Issyk-Kul	1 = if individual reside in Issyk-Kul oblast, 0 = otherwise
▪ Jalal-Abad	1 = if individual reside in Jalal-Abad oblast, 0 = otherwise
▪ Naryn	1 = if individual reside in Naryn oblast, 0 = otherwise
▪ Batken	1 = if individual reside in Batken oblast, 0 = otherwise
▪ Osh	1 = if individual reside in Osh oblast, 0 = otherwise
▪ Talas	1 = if individual reside in Talas oblast, 0 = otherwise
▪ Chui	1 = if individual reside in Chui oblast, 0 = otherwise
▪ Bishkek	1 = if individual reside in Bishkek city, 0 = otherwise
▪ Osh city	1 = if individual reside in Osh city, 0 = otherwise
Sector	
▪ Agriculture and fishing	1 = if individual employed in Agriculture and fishing sector, 0 = otherwise
▪ Mining	1 = if individual employed in Mining sector, 0 = otherwise
▪ Manufacturing	1 = if individual employed in Manufacturing sector, 0 = otherwise
▪ Energy and water	1 = if individual employed in Energy and water sector, 0 = otherwise
▪ Construction	1 = if individual employed in Construction sector, 0 = otherwise
▪ Trade and repair	1 = if individual employed in Trade and repair sector, 0 = otherwise
▪ Hotels and restaurants	1 = if individual employed in Hotels and restaurants sector, 0 = otherwise
▪ Transport and communications	1 = if individual employed in Transport and communications sector, 0 = otherwise
▪ Finance	1 = if individual employed in Finance sector, 0 = otherwise
▪ Real estate, renting and business activity	1 = if individual employed in Real estate, renting and business activity sector, 0 = otherwise
▪ Public administration	1 = if individual employed in Public administration sector, 0 = otherwise
▪ Education	1 = if individual employed in Education sector, 0 = otherwise
▪ Health and social work	1 = if individual employed in Health and social work sector, 0 = otherwise
▪ Utilities, social and personal services	1 = if individual employed in Health and social work sector, 0 = otherwise
▪ Private households with employed person	1 = if individual employed in Private households with employed person sector, 0 = otherwise
Position	
▪ Senior official and manager	1 = if individual works as Senior official and manager, 0 = otherwise
▪ Professional	1 = if individual works as Professional, 0 = otherwise
▪ Technician, associated professional	1 = if individual works as Technician, associated professional, 0 = otherwise
▪ Clerk	1 = if individual works as Clerk, 0 = otherwise
▪ Service worker, shop or market sales worker	1 = if individual works as Service worker, shop or market sales worker, 0 = otherwise
▪ Skilled agricultural or fishery worker	1 = if individual works as Skilled agricultural or fishery worker, 0 = otherwise
▪ Craft and related trades	1 = if individual works in Craft and related trades, 0 = otherwise
▪ Plant or machine operator or assembler	1 = if individual works as Plant or machine operator or assembler, 0 = otherwise
▪ Unskilled worker	1 = if individual works as Unskilled worker, 0 = otherwise
▪ Armed forces	1 = if individual works as Armed forces, 0 = otherwise

Table 2. Descriptive statistics of variables by age group

	YOUTH 18-29 YEARS			30-49 YEARS			50-65 YEARS		
	N	**mean**	**sd**	**N**	**mean**	**sd**	**N**	**mean**	**sd**
Earnings *(monthly, KGS)*	858	8458.3263	10679.665	1522	9327.2891	8536.9498	749	8474.6155	6628.8669
Age *(years)*	858	24.41725	3.17932	1522	39.26018	5.88655	749	55.49132	4.15302
Married *(1 = if indv. is married)*	858	.42308	.49434	1522	.83903	.36763	749	.81842	.38575
Education *(1 = if indv. obtained below given education level)*									
▪ Secondary education	858	.63287	.4823	1522	.54731	.49792	749	.51802	.50001
▪ Technical education	858	.11655	.32107	1522	.15243	.35956	749	.20427	.40344
▪ Tertiary education	858	.162	.36867	1522	.20696	.40526	749	.22296	.41651
Ethnicity *(1 = if indv. is ___)*									
▪ Kyrgyz	858	.72844	.44502	1522	.73982	.43888	749	.70761	.45516
▪ Uzbek	858	.15618	.36323	1522	.10315	.30426	749	.1028	.30391
▪ Russian	858	.04196	.20061	1522	.07622	.26543	749	.11883	.3238
Residence *(1 = if indv. reside in urban area)*	858	.39744	.48965	1522	.37845	.48516	749	.42457	.49461
Regions *(1 = if indv. reside in below given oblasts)*									
▪ Issyk-Kul	858	.0979	.29736	1522	.12681	.33287	749	.15621	.3633
▪ Jalal-Abad	858	.23776	.42596	1522	.19974	.39993	749	.16021	.36705
▪ Naryn	858	.06177	.24088	1522	.05059	.21923	749	.05474	.22762
▪ Batken	858	.11305	.31684	1522	.08541	.27959	749	.12417	.32999
▪ Osh	858	.10256	.30357	1522	.09855	.29816	749	.08945	.28559
▪ Talas	858	.06061	.23875	1522	.08344	.27664	749	.06542	.24743
▪ Chui	858	.12587	.3319	1522	.13666	.3436	749	.12016	.32537
▪ Bishkek	858	.14219	.34945	1522	.16754	.37358	749	.19226	.39434
▪ Osh city	858	.05828	.2344	1522	.05125	.22058	749	.03738	.18983
Sector *(1 = if indv. works in below given economic sectors)*									
▪ Agriculture and fishing	858	.20979	.4074	1522	.21945	.41401	749	.2283	.42002
▪ Mining	858	.01981	.13944	1522	.01708	.12962	749	.00534	.07293
▪ Manufacturing	858	.05828	.2344	1522	.04271	.20226	749	.03872	.19305
▪ Energy and water	858	.02448	.15461	1522	.01511	.12204	749	.02937	.16896
▪ Construction	858	.07576	.26476	1522	.09133	.28817	749	.03738	.18983
▪ Trade and repair	858	.13403	.34089	1522	.12943	.33579	749	.11482	.31902
▪ Hotels and restaurants	858	.02914	.16829	1522	.01774	.13205	749	.02003	.14019
▪ Transport and communications	858	.07226	.25907	1522	.07424	.26225	749	.09212	.28939
▪ Finance	858	.04312	.20325	1522	.01905	.13676	749	.01736	.13068
▪ Real estate, renting and business activity	858	.0035	.05906	1522	.00526	.07233	749	.00134	.03654
▪ Public administration	858	.0303	.17152	1522	.02628	.16002	749	.03738	.18983
▪ Education	858	.09441	.29256	1522	.13403	.3408	749	.14286	.35016
▪ Health and social work	858	.05361	.22538	1522	.06242	.24199	749	.05474	.22762
▪ Utilities, social and personal services	858	.06876	.2532	1522	.05388	.22585	749	.0494	.21684
▪ Private households with employed person	858	.08275	.27567	1522	.09198	.2891	749	.13084	.33745
Position *(1 = if indv. holds below given job position)*									
▪ Senior official and manager	858	.00583	.07616	1522	.02168	.14569	749	.02804	.16519
▪ Professional	858	.10023	.30049	1522	.10907	.31183	749	.13485	.34179
▪ Technician, associated professional	858	.11538	.31967	1522	.09198	.2891	749	.09346	.29127
▪ Clerk	858	.05245	.22306	1522	.05191	.22191	749	.03071	.17264
▪ Service worker, shop or market sales wo	858	.17133	.37702	1522	.14849	.3557	749	.13485	.34179
▪ Skilled agricultural or fishery worker	858	.06993	.25518	1522	.07096	.25684	749	.09613	.29496
▪ Craft and related trades	858	.08974	.28598	1522	.12418	.32989	749	.09613	.29496
▪ Plant or machine operator or assembler	858	.01515	.12223	1522	.0092	.0955	749	.00935	.09629
▪ Unskilled worker	858	.37646	.48478	1522	.36925	.48276	749	.37517	.48449
▪ Armed forces	858	.0035	.05906	1522	.00329	.05724	749	.00134	.03654

Source: *Author's calculations, LiK 2016*

Table 3. Descriptive statistics of variables by horizontal mismatch

	MATCHED			MISMATCHED		
	N	**mean**	**sd**	**N**	**mean**	**sd**
Earnings *(monthly, KGS)*	536	10918.478	8719.7148	567	9987.8554	9802.5095
Age *(years)*	536	41.5429	11.6806	567	40.9206	12.2262
Married *(1 = if indv. is married)*	536	.7481	.4345	567	.6984	.4594
Education *(1 = if indv. obtained below given education level)*						
▪ Technical education	536	.3526	.4782	567	.4903	.5003
▪ Tertiary education	536	.6343	.4821	567	.4956	.5004
Ethnicity *(1 = if indv. is ___)*						
▪ Kyrgyz	536	.7836	.4122	567	.7407	.4386
▪ Uzbek	536	.0448	.207	567	.0511	.2205
▪ Russian	536	.1213	.3267	567	.1376	.3447
Residence *(1 = if indv. reside in urban area)*	536	.5765	.4946	567	.5785	.4942
Regions *(1 = if indv. reside in below given oblasts)*						
▪ Issyk-Kul	536	.0858	.2804	567	.1623	.369
▪ Jalal-Abad	536	.1493	.3567	567	.1164	.321
▪ Naryn	536	.0504	.2189	567	.0194	.138
▪ Batken	536	.0504	.2189	567	.06	.2376
▪ Osh	536	.0914	.2885	567	.0547	.2275
▪ Talas	536	.0448	.207	567	.0582	.2343
▪ Chui	536	.1381	.3453	567	.134	.341
▪ Bishkek	536	.3228	.468	567	.3422	.4748
▪ Osh city	536	.0672	.2505	567	.0529	.2241
Sector *(1 = if indv. works in below given economic sectors)*						
▪ Agriculture and fishing	536	.0466	.2111	567	.1411	.3484
▪ Mining	536	.0187	.1354	567	.0123	.1105
▪ Manufacturing	536	.041	.1986	567	.0653	.2472
▪ Energy and water	536	.0392	.1942	567	.037	.189
▪ Construction	536	.041	.1986	567	.06	.2376
▪ Trade and repair	536	.1325	.3393	567	.1446	.352
▪ Hotels and restaurants	536	.0131	.1136	567	.03	.1707
▪ Transport and communications	536	.028	.1651	567	.1041	.3056
▪ Finance	536	.0504	.2189	567	.037	.189
▪ Real estate, renting and business activity	536	.0037	.061	567	.0071	.0838
▪ Public administration	536	.069	.2537	567	.0441	.2055
▪ Education	536	.3078	.462	567	.0882	.2838
▪ Health and social work	536	.1306	.3373	567	.0617	.2409
▪ Utilities, social and personal services	536	.0634	.244	567	.0723	.2592
▪ Private households with employed person	536	.0149	.1214	567	.0952	.2938
Position *(1 = if indv. holds below given job position)*						
▪ Senior official and manager	536	.0354	.1851	567	.0282	.1657
▪ Professional	536	.3825	.4864	567	.1358	.3429
▪ Technician, associated professional	536	.1474	.3548	567	.1393	.3466
▪ Clerk	536	.0914	.2885	567	.0494	.2169
▪ Service worker, shop or market sales wo	536	.1119	.3156	567	.164	.3706
▪ Skilled agricultural or fishery worker	536	.0205	.1419	567	.0511	.2205
▪ Craft and related trades	536	.1157	.3201	567	.1217	.3272
▪ Plant or machine operator or assembler	536	.0056	.0747	567	.0123	.1105
▪ Unskilled worker	536	.0896	.2858	567	.291	.4546
▪ Armed forces	536	0	0	567	.0071	.0838

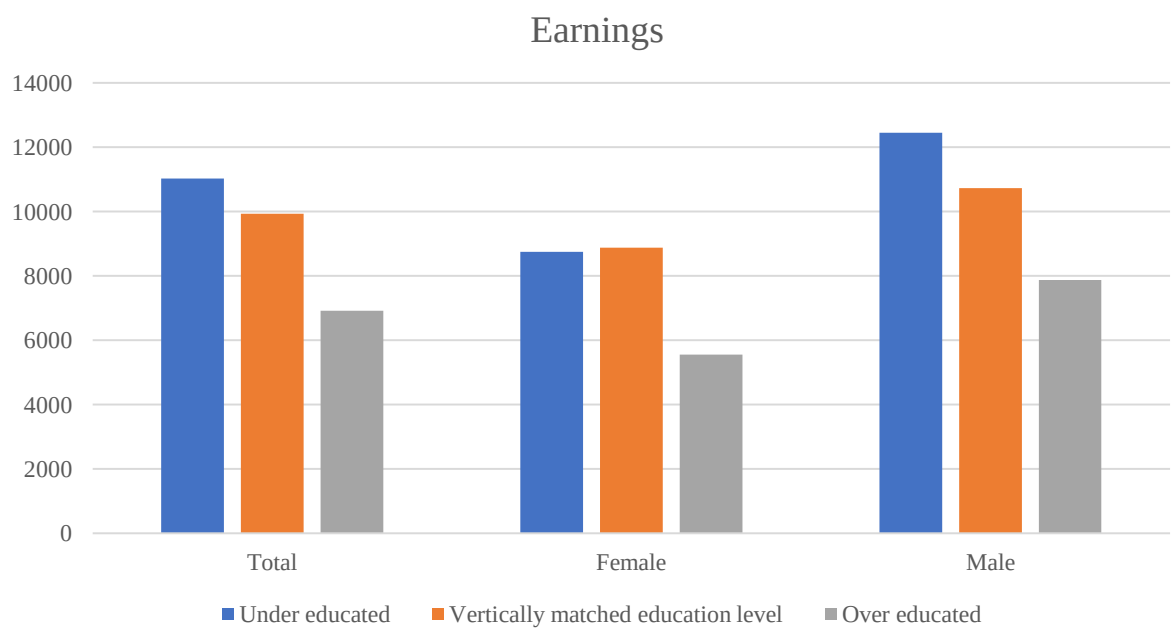
Source: *Author's calculations, LiK 2016*

Table 4. Descriptive statistics of variables by vertical mismatch

	MATCHED EDUCATION			OVER EDUCATION			UNDER EDUCATION		
	N	**mean**	**sd**	**N**	**mean**	**sd**	**N**	**mean**	**sd**
Earnings *(monthly, KGS)*	1338	9934.3543	9463.3362	1275	6916.3012	6889.0643	516	11027.936	10150.466
Age *(years)*	1338	39.5389	11.9274	1275	38.9631	12.4034	516	38.1512	11.9519
Married *(1 = if indv. is married)*	1338	.7362	.4409	1275	.7176	.4503	516	.6841	.4653
Education *(1 = if indv. obtained below given education level)*									
▪ Secondary education	1338	.5097	.5001	1275	.6753	.4684	516	.4283	.4953
▪ Technical education	1338	.1614	.3681	1275	.109	.3118	516	.2519	.4345
▪ Tertiary education	1338	.2586	.438	1275	.2157	.4115	516	0	0
Ethnicity *(1 = if indv. is ___)*									
▪ Kyrgyz	1338	.704	.4566	1275	.7851	.4109	516	.655	.4758
▪ Uzbek	1338	.1248	.3306	1275	.1075	.3098	516	.124	.3299
▪ Russian	1338	.0859	.2804	1275	.0627	.2426	516	.0891	.2852
Residence *(1 = if indv. reside in urban area)*	1338	.4806	.4998	1275	.3059	.461	516	.3915	.4886
Regions *(1 = if indv. reside in below given oblasts)*									
▪ Issyk-Kul	1338	.0538	.2257	1275	.2282	.4199	516	.0601	.2379
▪ Jalal-Abad	1338	.2048	.4037	1275	.189	.3917	516	.219	.414
▪ Naryn	1338	.1024	.3033	1275	.0165	.1273	516	.0252	.1569
▪ Batken	1338	.077	.2667	1275	.1263	.3323	516	.1085	.3113
▪ Osh	1338	.0927	.2901	1275	.0973	.2964	516	.1105	.3138
▪ Talas	1338	.0321	.1764	1275	.1224	.3278	516	.0562	.2305
▪ Chui	1338	.148	.3552	1275	.069	.2536	516	.2326	.4229
▪ Bishkek	1338	.2362	.4249	1275	.1122	.3157	516	.1202	.3255
▪ Osh city	1338	.0531	.2242	1275	.0392	.1942	516	.0678	.2517
Sector *(1 = if indv. works in below given economic sectors)*									
▪ Agriculture and fishing	1338	.151	.3582	1275	.3231	.4679	516	.1376	.3448
▪ Mining	1338	.0112	.1053	1275	.0173	.1303	516	.0194	.138
▪ Manufacturing	1338	.059	.2358	1275	.0424	.2015	516	.0213	.1446
▪ Energy and water	1338	.0314	.1744	1275	.0078	.0882	516	.0271	.1626
▪ Construction	1338	.0792	.2702	1275	.0651	.2468	516	.0833	.2767
▪ Trade and repair	1338	.136	.3429	1275	.1247	.3305	516	.1105	.3138
▪ Hotels and restaurants	1338	.0187	.1355	1275	.0204	.1414	516	.031	.1735
▪ Transport and communications	1338	.0972	.2963	1275	.0463	.2102	516	.1066	.3089
▪ Finance	1338	.0329	.1784	1275	.011	.1043	516	.0407	.1978
▪ Real estate, renting and business activity	1338	.0052	.0722	1275	.0024	.0485	516	.0039	.0622
▪ Public administration	1338	.0291	.1683	1275	.029	.1679	516	.0349	.1837
▪ Education	1338	.1689	.3748	1275	.0635	.244	516	.1647	.3713
▪ Health and social work	1338	.068	.2519	1275	.0204	.1414	516	.126	.3321
▪ Utilities, social and personal services	1338	.0725	.2594	1275	.0353	.1846	516	.0698	.255
▪ Private households with employed person	1338	.0396	.1951	1275	.1914	.3935	516	.0233	.1509
Position *(1 = if indv. holds below given job position)*									
▪ Senior official and manager	1338	.0224	.1481	1275	0	0	516	.0562	.2305
▪ Professional	1338	.1921	.3941	1275	0	0	516	.186	.3895
▪ Technician, associated professional	1338	.0441	.2054	1275	0	0	516	.4845	.5002
▪ Clerk	1338	.0561	.2301	1275	.0439	.205	516	.031	.1735
▪ Service worker, shop or market sales wo	1338	.2623	.4401	1275	.0541	.2263	516	.1047	.3064
▪ Skilled agricultural or fishery worker	1338	.1442	.3515	1275	.0141	.118	516	.0562	.2305
▪ Craft and related trades	1338	.1898	.3923	1275	.0361	.1866	516	.0736	.2614
▪ Plant or machine operator or assembler	1338	.0187	.1355	1275	.0039	.0625	516	.0078	.0878
▪ Unskilled worker	1338	.0703	.2557	1275	.8408	.366	516	0	0
▪ Armed forces	1338	0	0	1275	.0071	.0838	516	0	0

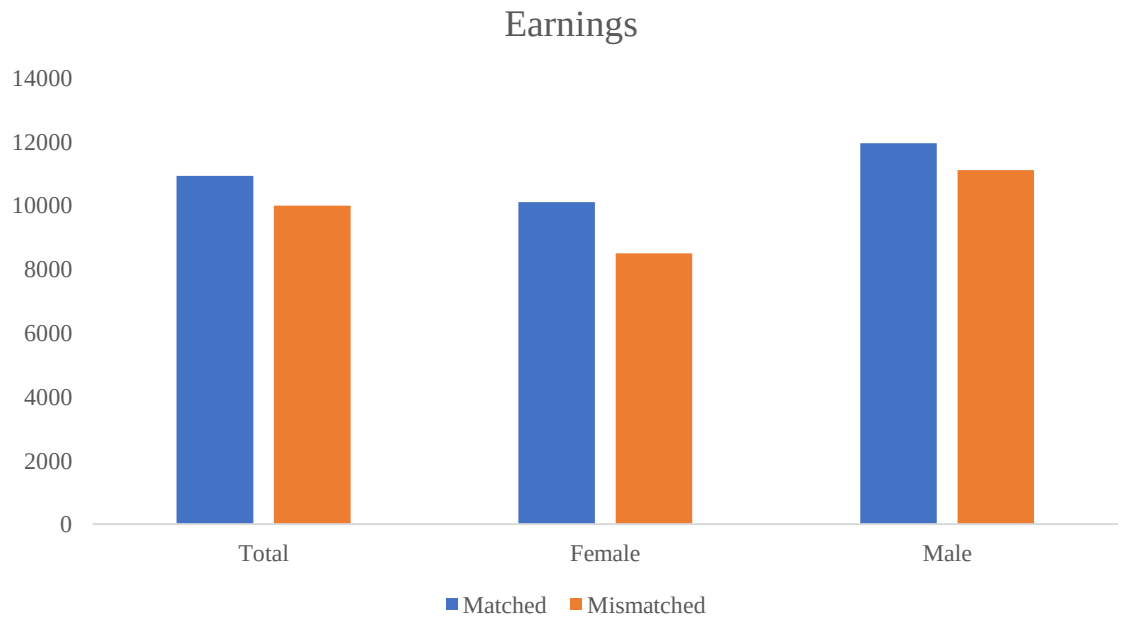
Source: *Author's calculations, LiK 2016*

Figure 10. Earnings by vertical mismatch, (KGS)



Source: Author's calculations, LiK 2016

Figure 11. Earnings by horizontal mismatch, (KGS)



Source: Author's calculations, LiK 2016

Table 5. Estimation outputs for Quintile regression

	Quintiles of the earnings			
	0.20	***0.40***	***0.60***	***0.80***
Ln Age	0.3071**	0.3685***	0.3614***	0.5301***
	(0.1310)	(0.0820)	(0.0811)	(0.1178)
Ln Age squared	-0.0010**	-0.0012***	-0.0011***	-0.0016***
	(0.0004)	(0.0003)	(0.0003)	(0.0003)
Married *(1 = if indv. is married)*	-0.0055	0.0236	0.0332*	0.0914***
	(0.0323)	(0.0163)	(0.0189)	(0.0250)
Tertiary education	0.1550***	0.1056***	0.1216***	0.0931***
	(0.0269)	(0.0170)	(0.0191)	(0.0265)
residence	0.1091***	0.0975***	0.1064***	0.1344***
	(0.0324)	(0.0187)	(0.0182)	(0.0297)
Residence *(1 = if indv. reside in urban area)*	-0.2334***	-0.2342***	-0.1843***	-0.1606***
	(0.0308)	(0.0211)	(0.0258)	(0.0444)
North *(1 = if indv. lives in north regions)*	-0.0136	-0.0320*	-0.0066	0.0234
	(0.0308)	(0.0185)	(0.0213)	(0.0297)
South *(1 = if indv. lives in south regions)*	-0.0715*	-0.1126***	-0.1482***	-0.1540**
	(0.0378)	(0.0359)	(0.0419)	(0.0623)
Agriculture and fishing sector	-0.1150***	-0.0886***	-0.1531***	-0.1703***
	(0.0369)	(0.0184)	(0.0212)	(0.0291)
	-0.0424	-0.0762***	-0.1276***	-0.2266***
Education sector	(0.0397)	(0.0254)	(0.0260)	(0.0400)
	0.3083***	0.2632***	0.2200***	0.2359***
Health and social work sector	(0.0721)	(0.0350)	(0.0520)	(0.0277)
Overeducation	***-0.1420******	***-0.1312******	***-0.1327******	***-0.0815****
	(0.0294)	***(0.0171)***	***(0.0239)***	***(0.0322)***
Horizontal mismatch	***-0.0603******	***-0.0261***	***-0.0000***	***-0.0470****
	(0.0229)	***(0.0160)***	***(0.0179)***	***(0.0239)***
Constant	8.6094***	8.5772***	8.6718***	8.2788***
	(0.4243)	(0.2641)	(0.2542)	(0.3820)
N	1103	1103	1103	1103

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$

Source: Author's calculations, LiK 2016

Table 6. Estimation outputs for Quintile Regressions by Gender

	WOMEN				MEN			
	Quintiles of the earnings				*Quintiles of the earnings*			
	0.20	***0.40***	***0.60***	***0.80***	***0.20***	***0.40***	***0.60***	***0.80***
Ln Age	0.4075***	0.4925***	0.5427***	0.6283***	0.1170	0.1573	0.2239	0.2366
	(0.1400)	(0.1195)	(0.1128)	(0.1890)	(0.1507)	(0.1196)	(0.1390)	(0.1502)
Ln Age squared	-	-	-	-0.0017***	-0.0006	-0.0008**	-0.0009*	-0.0009*
	0.0011***	0.0015***	0.0014***	(0.0006)	(0.0005)	(0.0004)	(0.0005)	(0.0005)
	(0.0004)	(0.0004)	(0.0004)					
Married *(1 = if indv. is married)*	-0.0417	-0.0477*	-0.0416*	-0.0387	0.1058**	0.0965***	0.1853***	0.2152***
	(0.0407)	(0.0254)	(0.0225)	(0.0347)	(0.0535)	(0.0284)	(0.0365)	(0.0367)
Tertiary education	0.1893***	0.1296***	0.1264***	0.1159***	0.0628**	0.1003***	0.0803**	0.0764**
	(0.0290)	(0.0299)	(0.0238)	(0.0353)	(0.0252)	(0.0258)	(0.0316)	(0.0325)
residence	0.0764**	0.1295***	0.1086***	0.1439***	0.1318***	0.0723**	0.1031***	0.1393***
	(0.0311)	(0.0274)	(0.0280)	(0.0377)	(0.0304)	(0.0289)	(0.0324)	(0.0333)
Residence *(1 = if indv. reside in urban area)*	-	-	-	-0.1190**	-	-	-	-0.1676***
	0.2550***	0.1677***	0.1742***	(0.0489)	0.1949***	0.2208***	0.2257***	(0.0527)
	(0.0446)	(0.0359)	(0.0368)		(0.0289)	(0.0332)	(0.0424)	
North *(1 = if indv. lives in north regions)*	0.0027	0.0089	0.0001	0.0483	-0.0730**	-0.0415	-0.0193	-0.0071
	(0.0324)	(0.0303)	(0.0261)	(0.0460)	(0.0345)	(0.0297)	(0.0358)	(0.0356)
South *(1 = if indv. lives in south regions)*	0.0265	-	-	-0.3071***	-	-0.1222**	-0.1142**	-0.1336*
	(0.0513)	0.2233***	0.2658***	(0.0680)	0.1408***	(0.0493)	(0.0521)	(0.0700)
		(0.0554)	(0.0526)		(0.0506)			
Agriculture and fishing sector	-0.0685	-	-	-0.1499***	-0.0003	-	-0.0947	-0.1633***
	(0.0431)	0.0881***	0.1157***	(0.0567)	(0.0263)	0.0835***	(0.0648)	(0.0345)
		(0.0320)	(0.0272)			(0.0258)		
	0.0365	-0.0824**	-0.0794**	-0.1392***	0.0407	-0.0270	0.0081	-0.0313
Education sector	(0.0381)	(0.0371)	(0.0314)	(0.0508)	(0.0354)	(0.0418)	(0.1083)	(0.0586)
	0.3082***	0.3172***	0.2698***	0.3750	0.2439***	0.2402***	0.1590	0.2217***
Health and social work sector	(0.1129)	(0.1006)	(0.0507)	(0.3233)	(0.0853)	(0.0338)	(0.0998)	(0.0349)
Overeducation	**-**	**-**	**-**	***-0.0756***	**-**	**-**	**-**	***-0.0720****

	0.0999*	***0.1238****	***0.1196****	***(0.0503)***	***0.1298****	***0.1468****	***0.0979****	***(0.0358)***
	(0.0342)	***(0.0317)***	***(0.0316)***		***(0.0352)***	***(0.0302)***	***(0.0332)***	
Horizontal mismatch	*** -***	***-0.0341***	***-0.0308***	***-0.0731****	***-0.0344***	***-0.0241***	***0.0088***	***-0.0101***
	0.1115*	***(0.0315)***	***(0.0228)***	***(0.0437)***	***(0.0298)***	***(0.0240)***	***(0.0315)***	***(0.0302)***
	(0.0423)							
Constant	8.2135***	8.1274***	8.0505***	7.8975***	9.2471***	9.2841***	9.0846***	9.1605***
	(0.4493)	(0.3760)	(0.3636)	(0.6162)	(0.4698)	(0.3807)	(0.4337)	(0.4764)
N	539	539	539	539	564	564	564	564

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$

Source: *Author's calculations, LiK 2016*

Table 7. Estimation Outputs for Quintile Regressions by Generation

	18-29 YEARS				30-49 YEARS				50-65 YEARS			
	Quintiles of the earnings				*Quintiles of the earnings*				*Quintiles of the earnings*			
	0.20	***0.40***	***0.60***	***0.80***	***0.20***	***0.40***	***0.60***	***0.80***	***0.20***	***0.40***	***0.60***	***0.80***
Ln Age	3.7349***	2.8471*	2.1004	-0.7042	-0.4986	0.0217	-0.2864	0.2326	-2.9307	-0.5761	2.0666	-0.0634
	(1.4217)	(1.4814)	(1.5469)	(2.0913)	(0.8344)	(0.3317)	(0.4667)	(0.7394)	(2.6381)	(2.3721)	(2.2432)	(2.0406)
Ln Age squared	-0.0319**	-0.0249*	-0.0188	0.0140	0.0016	0.0001	0.0015	-0.0007	0.0037	-0.0003	-0.0039	-0.0006
	(0.0152)	(0.0150)	(0.0166)	(0.0221)	(0.0030)	(0.0012)	(0.0016)	(0.0026)	(0.0038)	(0.0034)	(0.0034)	(0.0029)
Married *(1 = if indv. is married)*	0.0360	0.0053	0.0158	0.0483	-0.0061	0.0026	0.0608**	0.0970*	-0.0246	0.0676*	0.0974**	0.1220***
	(0.0447)	(0.0345)	(0.0385)	(0.0586)	(0.0569)	(0.0178)	(0.0258)	(0.0495)	(0.0404)	(0.0352)	(0.0425)	(0.0369)
Tertiary education	0.0389	0.0639*	0.1380***	0.1768***	0.1433***	0.0964***	0.1273***	0.0523	0.2074***	0.1801***	0.1540***	0.1266***
	(0.0508)	(0.0354)	(0.0393)	(0.0535)	(0.0549)	(0.0190)	(0.0266)	(0.0457)	(0.0374)	(0.0344)	(0.0353)	(0.0381)
residence	0.0724	0.0492	0.0405	0.0817*	0.1682***	0.1237***	0.1248***	0.1838***	0.0714	0.0739**	0.0776**	0.0690*
	(0.0543)	(0.0347)	(0.0336)	(0.0483)	(0.0522)	(0.0231)	(0.0284)	(0.0425)	(0.0486)	(0.0364)	(0.0393)	(0.0406)
Residence *(1 = if indv. reside in urban area)*	- 0.2958***	- 0.3034***	- 0.1931***	-0.1470**	-0.1670**	-0.2175***	-0.2097***	-0.1563**	-0.1422***	-0.2402***	-0.2431***	-0.2514***
	(0.0613)	(0.0705)	(0.0532)	(0.0619)	(0.0836)	(0.0191)	(0.0472)	(0.0606)	(0.0532)	(0.0374)	(0.0520)	(0.0600)
North *(1 = if indv. lives in north regions)*	-0.0360	-0.0053	0.0022	0.0839	0.0201	-0.0155	-0.0550*	-0.0089	-0.0467	-0.0699	-0.0284	-0.0003
	(0.0497)	(0.0374)	(0.0435)	(0.0699)	(0.0551)	(0.0225)	(0.0284)	(0.0498)	(0.0493)	(0.0463)	(0.0405)	(0.0397)
South *(1 = if indv. lives in south regions)*	-0.1283*	-0.1584**	-0.1314	-0.2490***	-0.1320*	-0.1655*	-0.0864	-0.0394	-0.0562	-0.1374**	-0.1549***	-0.1935**
	(0.0697)	(0.0719)	(0.1007)	(0.0635)	(0.0701)	(0.0855)	(0.0736)	(0.1159)	(0.0547)	(0.0553)	(0.0545)	(0.0863)
Agriculture and fishing sector	- 0.2370***	- 0.1687***	- 0.2094***	-0.2705***	-0.0603	-0.0686***	-0.1190***	-0.2181***	-0.1263***	-0.0689	-0.0566	-0.1059**
	(0.0460)	(0.0599)	(0.0427)	(0.0607)	(0.0548)	(0.0235)	(0.0347)	(0.0488)	(0.0476)	(0.0459)	(0.0526)	(0.0431)
Education sector	- 0.2592***	- 0.1540***	- 0.1682***	-0.2198**	0.0176	-0.0385	-0.1007***	-0.2347***	-0.0917	-0.0516	-0.1252***	-0.3067***
	(0.0437)	(0.0466)	(0.0375)	(0.0964)	(0.0759)	(0.0247)	(0.0314)	(0.0657)	(0.0770)	(0.0514)	(0.0458)	(0.0447)
Health and social work sector		0.0692	0.3110		0.2649***	0.3071***	0.3925***	0.2684***	0.2925*	0.1882***	0.1065**	-0.0769
		(0.3773)	(0.3391)		(0.0801)	(0.0284)	(0.1325)	(0.0499)	(0.1627)	(0.0420)	(0.0449)	(0.0557)
Overeducation	***-0.1289****	***-0.1007****	***-0.0974****	***-0.0742***	***-0.0691***	***-0.1040*****	***-0.1226*****	***-0.1308*****	***-0.1338*****	***-0.1667*****	***-0.1161****	***-0.0761***
	(0.0523)	***(0.0391)***	***(0.0511)***	***(0.0581)***	***(0.0480)***	***(0.0211)***	***(0.0343)***	***(0.0483)***	***(0.0453)***	***(0.0416)***	***(0.0521)***	***(0.0462)***
Horizontal mismatch	***-0.0389***	***0.0000***	***0.0025***	***-0.0547***	***-0.0496***	***-0.0139***	***-0.0012***	***-0.0399***	***-0.2176*****	***-0.0548***	***-0.0499***	***-0.0931*****
	(0.0405)	***(0.0310)***	***(0.0328)***	***(0.0581)***	***(0.0485)***	***(0.0185)***	***(0.0269)***	***(0.0408)***	***(0.0575)***	***(0.0343)***	***(0.0358)***	***(0.0349)***
Constant	-0.9106	1.7234	3.8929	11.5875**	11.1368***	9.6351***	10.6955***	9.2543***	20.4276**	12.0983	2.5803	10.4489
	(3.9180)	(4.1143)	(4.2589)	(5.7676)	(2.6939)	(1.0597)	(1.5085)	(2.3814)	(9.5777)	(8.6169)	(8.1087)	(7.4158)
N	239	239	239	239	544	544	544	544	320	320	320	320

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.010$

Source: Author's calculations, LiK 2016