# Education and Skill Mismatch in Korean Youth Labor Market: Panel Data Analysis

By

**KANG, Suyeon**

**Thesis**

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

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Committee in charge:

Professor Kim, Booyuel, Supervisor

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*Abstract.* This paper aims to explain the paradoxical phenomena of high unemployment and early turnover of young Korean workers by examining job mismatch in youth labor market. Using the Korea Youth Panel Survey (KYPS) from 2011 to 2015, this paper conducts panel data analysis and studies the effect of job mismatch among Korean youth graduates, assuming that job match affects worker's labor market outcomes and utilities. The results suggest that education and skill mismatch have significantly adverse effects on monthly wages, working hours, and job satisfaction: incidence of either types of mismatch is associated with wage penalties, longer working hours, and dissatisfaction. These results are line with findings from the previous literature that job mismatch is negatively associated with worker's labor market outcomes. In addition, in most estimations, the results of education and skill mismatch tend to be coincided in terms of direction and magnitude.

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1. Introduction

As of 2016, 70.0% of Korean youth from 25 to 34 years old have completed tertiary education, which is the highest rate among 35 OECD member states. (OECD stats, 2018). The trend of increase in the proportion of population with tertiary education has never dropped since it was firstly measured in 1996. This suggests that Korea has made substantial investment on education and human capital; thus, the majority of the young labor market participants attained above-college degree.

However, considering the statistics of youth labor market situation in Korea, new labor market entrants with higher education degree do not seem to have pleasant time being in transition period. In 2017, the unemployment rate of young people from 20 to 29 years old is 9.9 % and that of graduates who completed tertiary education was 11%, which is higher than that of high school graduates (Statistics Korea, 2018). Their average duration of job seeking is 112.3 days and it is longer than that of high school graduates. It means that university graduates who made more investment in human capital development tend to suffer more to get job position. Also, the supply of decent job that meets potential worker's competencies has been raised as another problem of youth unemployment. A study by Choi and Lee (2015) described that the majority of jobs offered by small and medium sized firm are inferior or precarious compared to those offered by big firms or public enterprises. For this reason, Kim (2017) stated that competition for decent job is getting severe and the university graduates choose to stay unemployed or choose the position that doesn't match with their competence.

On the other hand, while many young jobseekers and new entrant of labor market have hard time finding jobs, some Korean novice workers decide to leave their job. This is quite recent tendency of young workers who seek better matching job right after they have

been hired. As of 2016, the rate of voluntary resignation within 1 year after employment is 27.7%. The first reason for their leaving is failure to adapt to the job assignment or company culture with 49.1% of the response rate (Korea Employers Federation, 2016). From the results, we can infer that, in highly competitive job market, young jobseekers accept job offers to evade unemployment although the positions do not fit their qualifications or preferences.

When considering the situation of investment in education, youth unemployment rate, and the tendency of early turnover, decision of investment in education does not reap benefit out of it, at least in short term, and mismatch issues seem to exist among young Korean workers. Job mismatch experience and early job turnover in the stage of transition from education to job can be negative element in career building. They may hinder continuity of career development hinder better finding of job position. For the entire national labor market, continuing job mismatch may impede efficient utilization of human resource. Thus, this paper studies job mismatches among Korean young workers. In particular, job mismatch in terms of education level and skill utilization are main target of analysis to study the efficacy of education for job qualification. To showcase the effect of either job mismatch, relevant labor market outcomes are selected. Specific research questions are as follows.

1) To what extent workers suffer from job mismatch and whether the state of mismatch significantly affects novice workers?

2) Which worker suffers more from job mismatch?

3) Is either type of mismatch perceived distinctively, and can we tell this from the results?

Through these questions, this paper tries to explain the recent early turnover phenomenon in Korean youth labor market by examining the youth labor market job

mismatch, using the Korea Youth Panel Survey (KYPS) data from 2011 to 2015. With

premising the job matching quality affects worker's labor outcome and utilities, the incidence

and the effect of job mismatch among Korean youth graduates will be studied.

2. Literature Review

2.1. Definition of Job Mismatch

Job mismatch usually refers to the state of worker where the worker is employed in a

position which does not coincide with his qualification for work. It happens mainly for two

reasons: unobservable characteristics and asymmetric information problem. Labor market

participants have very different characteristics in terms of both qualification and intrinsic

qualities. Even among the worker with similar education level or skillset, there should be

difference in other qualification and characteristics such as job experience and willingness to

work. Also, in contemporary labor market, the required qualifications for jobs are

heterogeneous. As more and more jobs require both cognitive and non-cognitive skills, it

becomes harder to identify the qualifications that truly meets the firm-specific settings. In

addition to the heterogeneity issue, job mismatch problem arises also due to asymmetric

information between worker and employers. As Rothschild and Stiglitz (1976) stated

asymmetry in insurance market where insurance consumers not willingly tell true condition

of themselves, there exists also asymmetric information problem in job market. Employers

cannot be fully aware of worker's intrinsic characteristics and they rely on educational

credentials or certificates to ensure better candidates. Whereas, potential workers do not

know the true circumstances of the position until they actually start working.

The heterogeneous features and asymmetric information inherent to labor make it

difficult to find the optimal matching in employment and thus, the allocation of right worker

to right place has remained as crucial issue in understanding and ameliorating labor market dynamism. Considering the qualifications which employers take into account when employing worker, education and skill mismatch have primarily been studied in mismatch literature.

2.2. Educational Mismatch

In Human Capital theory (Becker, 1964), additional year of schooling should enhance individual's competences and thus the overall productivity. Following this premise, when employing a worker, a firm finds the worker with higher education, utilizing educational credential as a proxy for worker' qualifications and human capital, because it is one possible way to ensure the worker' higher productivity.

However, as overall national level of education rises in developed countries thanks to their policies promoting education, the problem of education mismatch arises. From the meta-analysis of 25 previous studies on education mismatch by Groot and van den Brink (2000), the incidence of education mismatch where workers' education attainment exceeds requirement level was about 26%. Even the positions that do not require higher education are occupied by the worker with advanced knowledge acquired from high level of education. From the employer's perspective, they can hire worker with higher education with lower compensation. For this reason, even though the workers have made investment on additional education, their return to education may not be satisfying.

Since Freeman (1976) started to argue the problem of education mismatch in America, major interest of many empirical studies on job mismatch has been focused on education mismatch - the mismatch between education attained by worker and required education for the job – and relevant outcomes. (Duncan and Hoffman, 1981; Rumberger,

1987; Hartog and Oosterbeek, 1988; Sicherman, 1991; Hersch, 1991; Battu et al, 1999; Cohn and Khan, 1995; van Smoorenburg and van der Velden, 2000; Dolton and Vignoles,2000; Rubb,2003; Leuven and Oosterbeek, 2011; Kim, 2005; Kim, 2006; Kim&Kim, 2008; Park, 2004).

The most frequent subject of empirical study on education mismatch is wage effect. In human capital theory, individuals with higher education may be paid more as their higher productivity attributes to higher education. However, there have been quite conclusive results about the incidence of mismatch in education and wage penalties for mismatched workers. Duncan and Hoffman (1981) analyzed the Panel Study of Income Dynamics which relied on survey questions on perceived education mismatch. They reported that wage for those who are mismatched in terms of education (attained education exceeding required level) are lower compared to the well-matched worker. Consistent with the Duncan and Hoffman's study, Rumberger (1987) suggested that there is adverse relationship between educational mismatch and wage, utilizing comparison education level with Dictionary of Occupational Titles as proxy for mismatch. This wage effect implies underutilization of worker's human capital and its consequences in perspective of monetary outcome. When worker's education attainment exceeds the required level, the worker is not always compensated with higher wage because his additional education does not necessarily raise his productivity. Besides the two studies reviewed above, many other empirical studies have concluded that education mismatch have adverse effect in terms of wage (Sicherman, 1991; Dolton and Vignoles,2000; Rubb,2003; Leuven and Oosterbeek, 2011). This wage penalty accrued to mismatched workers could indicate worker's utilization of human resources and economic outcome are correlated. Also, opposed to Human Capital Theory, if worker's education level exceeds required level, it does not necessarily enhance productivity or raised productivity may not be utilized in workplace,

which might explain mere higher level of education does not guarantee higher level of income for worker.

Some studies have also identified the job satisfaction in relation to education mismatch (Tsang, 1987; Tsang et al.,1991; Battu et al.,1999; Kim, 2005; Park, 2004; Fleming&Kler,2007; Green&Zhu,2010). However, unlike the case of wage, there are mixed view on the association between job satisfaction and education mismatch. Early study shed light on the issue of education mismatch in relation to satisfaction and productivity. Conducting case study of United States Bell companies, Tsang (1987) found that the educational mismatch was adversely related to output through the lower job satisfaction. In other words, low level of job satisfaction related with overeducation may affect worker's overall productivity. Similar findings about adverse relationship between education mismatch and job satisfaction were made in education mismatch literatures. Battu et al.(1999) reported job satisfaction has negative relation utilizing overeducation regardless of gender using survey question that explicitly asked respondents' level of job satisfaction. With bivariate probit model, Fleming and Kler (2007) identified that there existed relationship between education mismatch and worker's dissatisfaction in Australian labor market. The most reason for the dissatisfaction they suggested was the overeducated worker's comparing themselves to the non-overeducated with similar educational background. On the other hand, limited to female workers, Tsang et al. (1991) asserted that there is no significant relation between education mismatch and job satisfaction. Green and Zhu (2010) asserted that educational mismatch itself cannot be significant determinant of lower job satisfaction. In their results, the mere discrepancy between education attained and required level of education did not necessarily decrease worker' job satisfaction. Rather, the overeducation which involves underutilization of skills undermined worker' satisfaction.

Lastly, in line with the conclusions on link between overeducation and lower job satisfaction, there have been studies asserting higher rate of job turnover associated with educational mismatch (Tsang et al., 1991; Hersch, 1991; Judge et al., 2001). The literature explains this in relation to lower job satisfaction induced from education mismatch due to lower satisfaction in workplace. As in matching theory of job search (Jovanovic,1970), Tsang et al. (1991) identified negative impact of overeducation on quitting relative to the well-matched worker. Alba-Ramirez (1993) found that overeducated worker showed higher turnover rates. Verhaest and Omey (2006) also added that overeducated worker tends to show higher turnover rate than those well-matched worker in terms of education. In Korean labor market, Park (2004) reported that those overeducated workers did not consider their current job as their life-long job, which lead to greater probability of turnover. Noh and Lim (2009) analyzed female worker who graduated from 2~3 year- college and the result showed that mismatch have negative correlation with wage and intention-to-turnover.

2.3. Skill Mismatch

Another component to consider as worker's qualification and human capital is skill utilization. Compared to formal education which give signal for better human capital development of worker, the level of skill utilization practically affects worker's performance in the setting of workplace. Thus, Employers consider skill relevance to the position they offer as important feature for employment because the type and level of skill utilization are associated with worker's productivity.

In this regard, differentiated from education mismatch, the level of skill utilization has been studied as an alternative measure for estimating the degree of job mismatch (Halaby, 1994), in that matching quality matters for worker's performance and satisfaction (Sattinger,

2012). Allen and van der Valden (2001) empirically showed that educational mismatch and skill mismatch affected different outcomes respectively, and they concluded that years of schooling does not necessarily mean overall mismatch in qualifications. Also, McGowan and Andrews (2015) reported skill mismatch is different from education mismatch and the two types of job mismatch stand for different phase of job matching. In line with these studies mentioned above, it is sound to assume that job mismatch may also happens in the form of skill mismatch other than educational mismatch because a worker is employed based on not only formal schooling but on other factors such as possession of skillset relevant to the job position. However, in the context of Korean youth labor market, there are mixed views on the differentiation of the two types of mismatch. A study conducted by Cha and Joo (2010) predicted the mismatch in education level is partly explained by skill mismatch. They included both types of mismatches in the model at the same time and it resulted in decreased coefficient of education mismatch. Noh and Lim (2009) analyzed Korean Education and Employment Panel data and finalized that overeducation and over utilization of skill are positively correlated.

Even though major focus of job mismatch studies was not attuned to skill mismatch, the starting point of skill mismatch studies was made by Berg (1970). He asserted that education had limits in fully accounting for worker's productivity and salaries. Recently, empirical researches have proved meaningful results about incidence and effect of skill mismatch on wages, job satisfaction and turnover as in the studies conducted focusing on education mismatch.

As in the education mismatch studies, the wage penalties have been found among skill-mismatched workers. Mavromaras, McGuinness and Fok (2009) reported that over-skilled worker experience 10.2% of wage penalties on average in Australian labor market.

Green and Zhu (2010) found that worker with under-utilization of skill suffer greater pay penalties. McGuinness and Sloane (2009) also discovered that over-skilling induced pay penalties, but only for male workers. Badillo-Amador and Vila (2013) made conclusion that both skill and education mismatches adversely affect wages of workers. In the context of Korean labor market, Cha and Joo (2010) reported that skill mismatch has negative correlation with wage, job satisfaction, and intention-to-turnover, and Lim, Hyun and Park(2012) analyzed Korean Education Employment panel and identified growth rate of wage of workers maintaining their education mismatch is low compared to those who overcome job mismatch.

Also, skill mismatch emerged as a much better predictor of job satisfaction than educational mismatches in many studies where workers with skill mismatch showed lower job satisfaction than those well-matched worker for their position. Allen and van der Velden (2001) found out that compared to education mismatch, skill mismatch better estimates the aspects of job satisfaction in Dutch labor market of satisfaction. Vieira (2005) found that not only the overall job satisfaction but also other dimensions related to job characteristics are negatively affected by skill mismatch. McGuinness and Sloane (2011) compared effect education and skill mismatch on job satisfaction with including the two explanatory variables one at a time and at the same time. The result from this estimation implied that only skill mismatch decreased job satisfaction in the model where both education and skill mismatch variables are included. Badillo-Amador et al. (2012) concluded that the skill mismatch better estimated job satisfaction than educational mismatch did. Ahn, Moon, and Lee (2001) identified that the matched worker in terms of skill shows better job satisfaction about wage, job security and the contents of job by analyzing panel data with sample of the Korean workers.

Intention-to-Turnover or On-the-Job Search, as a result of skill mismatch and low

job satisfaction, has been also identified in some empirical researches. However, the degree of effectiveness of skill mismatch in explaining turnover is quite varying depending on the context of local labor market. In analysis of Allen and van der Velden (2001) on Dutch labor market, the skill mismatch is predicted to adversely affect behavior of job search while having job, and it better explains the job seeking behavior compared to education mismatch does. While in the analysis of Italian labor market where skill utilization issue is prevalent, the behavior of job search is associated less with skill mismatch (Di Pietro & Urwin, 2006). In the case of Korean female 2~3-year college graduates, Noh and Lim (2009) identified that skill-mismatched workers try to seek better matching job whereas educationally mismatched workers do not readily turnover, which confirms the conclusion made by Allen and van der Velden (2001).

3. Research Hypotheses

Previous literatures on job mismatches have found that formal education and skills are related with mismatching and that incidence of mismatch has adverse effect on wage and satisfaction. Also, in recent studies conducted outside of Korea, it has been proven that education mismatch and skill mismatch affect worker's labor market outcome differently. However, the literatures on mismatches have limitations for two reasons: One is that the range of labor market outcome studied in mismatch literature is mostly limited to wage and job satisfaction. The other is that especially in Korean mismatch literature, the distinction between education and skill mismatch is not yet firmly concluded.

The limited range of outcomes for study on job mismatch is not sufficient to understand productivity and the change in young worker's attitude toward job. According to OECD working paper which analyzed PIAAC data from 19 OECD countries, the negative

correlation between job mismatch and productivity has been identified (McGowan and Andrews, 2015). Sandulli et al.(2014) confirmed that educational mismatch affects the productivity negatively from the study that examined small IT companies in Spain. Even though job mismatch literatures paid little attention to working hour as an outcome of job mismatch, recent labor market studies focus on working hour admitting it as informative factor in explaining productivity. In ILO working paper, Golden (2012) reported that excessive working hour decreased worker's productivity. He pointed out fatigue was main reason for decrease in productivity, and longer working hour was correlated with lower job satisfaction, motivation and higher turnover. Collewet and Sauermann (2017) studied the connection between working hour and productivity from the case study on call center agents. They found that the increase in working hour induced workers to be less productive. Controlling for individual specific factors with fixed effect model and introducing scheduling of working hours as exogenous source of variation, the study measured the connection between working hour and productivity.

Thereby, following the definition of productivity, output per hours worked, and previous literature on mismatch, the length of working hour is added as one of the non-monetary outcomes to test the effect of state of job mismatch on working hour. This hypothesis assumes that not only the amount of income itself, but the working hour is also important factor to understand worker's attitudes in current labor market, and thus worker's productivity as consequence.

In addition to that, the possibility of distinction between education mismatch and skill mismatch will be discussed by comparing results derived from data analysis. Whether we can treat education and skill mismatch as different independent variable is still in question. Even though earlier international studies tend to conclude that the two types of mismatch are not considered to be similar ones, Cha and Joo (2010) found that education and

skill mismatch may measure some common aspects of job mismatch in Korean labor market context. Thus, it is worthy to test whether the two types of mismatch are distinctively different. Therefore, this paper will compare their effects on outcomes as a way of test for their distinction.

4. Data

   4.1. Sample of Analysis

        The data for the analysis is derived from the Korea Youth Panel Survey collected by Korean Employment Information Service. The rationale behind using this panel data is that the data is collected from the survey which includes questions that explicitly ask the degree of education and skill mismatch. In the starting year of 2007, 10,206 individuals between 15 and 29 years old were surveyed on their demographic, educational and work-related information and they have been tracked so far. This enable this paper to analyze the transitional period from education to work and even after they made transition. Until 2016, the sample has remained above 70% compared to the original sample in 2007.

        Basically, they are interviewed and mark answers on computer and for those who cannot have interview do online survey without interview. The panel used in the analysis consists of 677 individual workers (358 of female and 319 of male) of the Korean young workers who participated the surveys from 2011 to 2015 without attrition. Since existing job mismatch studies which used this panel only utilized the first-year data and focused on education mismatch, it is worth examining both of education and skill mismatch with more recent data applying panel data analysis. For each wave, the sample is restricted to those whose age is under 34, which coincides the term of youth in Korea and they are all paid workers who graduated 2 or 3-year college or 4-year university.

## TABLE 1. DESCRIPTIVE STATISTICS

|  | Observation | Mean | S.D. | Min. | Max. |
|---|---|---|---|---|---|
| *A. Demographic characteristics* |  |  |  |  |  |
| Female | 3,385 | 0.529 | 0.499 | 0 | 1 |
| Age | 3,385 | 27.99 | 2.946 | 19 | 34 |
| Single | 3,385 | 0.838 | 0.368 | 0 | 1 |
| *B. Education* |  |  |  |  |  |
| 4-year university | 3,385 | 0.641 | 0.480 | 0 | 1 |
| School in Seoul | 3,385 | 0.225 | 0.417 | 0 | 1 |
| Major in |  |  |  |  |  |
| Humanities or Social Science | 3,385 | 0.369 | 0.483 | 0 | 1 |
| *C. Job characteristics* |  |  |  |  |  |
| Full-time employed | 3,385 | 0.950 | 0.217 | 0 | 1 |
| Company with |  |  |  |  |  |
| more than 300 employees | 3,385 | 0.261 | 0.439 | 0 | 1 |
| Company in Seoul | 3,385 | 0.462 | 0.499 | 0 | 1 |
| Possession of certificate | 3,385 | 0.0242 | 0.154 | 0 | 1 |
| Tenure | 3,385 | 2.525 | 2.026 | 0 | 17 |
| Change in company | 3,385 | 0.193 | 0.395 | 0 | 1 |
| *D. Job mismatch* |  |  |  |  |  |
| Education mismatch[a] | 3,385 | 0.0647 | 0.246 | 0 | 1 |
| Skill mismatch[b] | 3,385 | 0.0588 | 0.235 | 0 | 1 |
| *E. Labor market outcomes* |  |  |  |  |  |
| ln(Wage) | 3,385 | 5.400 | 0.356 | 3.401 | 7.170 |
| Working hour | 3,385 | 42.39 | 4.859 | 40 | 72 |
| Job satisfaction | 3,385 | 0.689 | 0.463 | 0 | 1 |

Note: The sample contains data of paid workers under 34 years old from KYPS 2011–15. Except for age, tenure, log of wage, and working hour, which were measured as continuous, the other items were converted into dummy variables. [a] 1 indicates the state of job mismatch that a worker's education level exceeds the required level of education. [b] 1 indicates the state of job mismatch that a worker's level of skill exceeds the required level.

Table 1 describes samples and their demographic, education, and job-related

characteristics observed in five consecutive years. The mere incidence of education and skill

mismatch is 6.47% and 5.88%, respectively, in overall observations. When taking the panel structure into account, among 677 individuals, 136 responded that they experience education mismatch at least once within five years, which accounts for 20.09%. In the case of skill mismatch, 18.17% of respondents answered that they suffer from at least one time in the surveys. In previous meta-analysis on 25 education mismatch studies, it was concluded that the overall incidences overeducation was 26% (Groot and van den Brink, 2000). For skill mismatch, McGowan and Andrews (2015) reported 23% of over-skilled workers in Korean labor market. Thus, the rate of incidence of both types of mismatch in the data this paper examines is somewhat lower than the results reported in previous studies.

4.2. Measuring Education and Skill Mismatch

There have been questions raised regarding the proper way of measuring the mismatch in the previous discussion. Rumberger (1987) appropriated the Dictionary of Occupational Titles to measure the extent of overeducation. It provided more objective way of measuring job mismatch relative to the method of survey-based ones. Hartog (2000) asserted that responses acquired from survey which measures the perceived extent of mismatch may distort true state of mismatch. However, as Chae, Kim, and Oh (2005) stated, it is possible that the indices (such as the Standard Occupational Classification System in UK o Dictionary of Occupational Titles in US) do not fully reflect the business-specific or profession-specific requirements. This means that the objective measure also may have problem of measurement. Rubb (2003) found that subjective measure and objective measures based on the occupational dictionary are not statistically significantly different from each other in examining their effect on wage. McGuinness (2006) also verified that self-reported measures are reliable enough compared to than the objective measures of education

mismatch. Cha and Joo (2010) mentioned that it is reasonable to measure the degree of mismatch on the basis of self-assessment of workers considering the heterogenous and subdivided characteristics of work places and labor market. Following previous findings on the validity of measuring mismatch, responses collected from the panel survey are utilized in this paper.

To measure the extent of mismatch relative to their current position, the two questions below are chosen. They are the source of main explanatory variables for this paper: education mismatch and skill mismatch.

*1) How do you think your education level match with your job?*

*2) How do you think your skill match with your job?*

Both types of mismatch are originally measured in 5-likert scale (1 indicates the level of work is very low compared to respondent's educational / skill level and 5 refers to the level of work is very high compared to respondent's educational / skill level). To make comparison between the mismatched workers and well-matched ones, the responses of 1 and 2 are converted into 1 which indicates "mismatched" and the rest of three responses are categorized into 0 for the status of "matched".

4.3. Dependent Variables

Wage is originally collected in hourly, daily, weekly, monthly and yearly and converted into average monthly wage which includes tax and bonuses. Those who work less than a month at the moment of survey are asked to answer the expected wage. For converting, the wages measured in units other than monthly are multiplied by 8 for day, 5 for week and 4.3 for month. For all the responses of average monthly wage, natural log is

taken.

The regular working hour is weekly regular working hour prescribed by the company. According to The Labor Standard Act, the regular working hour for normal workers is 8 hours per day and for hazardous work, it is 6 hours per day. Within sample, the variation of working hour is wide, from 2 hours per week to 72 hours per week; thus, the responses for working hour are restricted to greater than 40 hours per week which has been legal standard working hour since 2004 (Labor Standards Act, 2003).

For job satisfaction, it measures overall satisfaction about current job and it is originally measured with 5-likert scale, where 1 means very unsatisfied, 2 indicates unsatisfied and 5 indicates very satisfied. For the purpose of analysis, it is coded into dummy variable. The responses from 1 to 3 are coded into 0, which indicates dissatisfaction and from 4 to 5 are coded into 1 indicating being satisfied.

## 5. Methodology

Since the outcomes of interest include both continuous (log of wage and working hour) and discrete type (job satisfaction), the estimation strategies are also different according to the type of outcome variables. For log of wage and working hour, pooled OLS and fixed effect model is used and in the case of job satisfaction, binary logit model is adopted for marginal effect analysis.

### 5.1. Pooled OLS Model

This paper uses Pooled OLS as a starting point of analysis.

$$y_{it} = \beta_0 + \beta_1 mismatch_{it} + \beta_2 x_{it} + \epsilon_{it} \quad (i= 1,...,N) \ (t=2,...,T_i) \qquad (1)$$

Equation (1) is estimation model with pooled sample of panel data where *y* is measure of labor market outcomes of employed worker i and year t, and *mismatch* indicates education (skill) mismatch which is explanatory variable constructed as dummy for analysis. $x_{it}$ is a series of control variables related to demographic, education, and job-related characteristics. $\epsilon_{it}$ represents individual- and time- specific error term with the assumption that it is normally distributed and uncorrelated with education (skill) mismatch. The coefficient $\beta_1$ is interpreted as the difference in outcome between the mismatched worker and the well-matched worker.

## 5.2. Fixed Effect Model

Second specification is the main estimation model of this paper to measure the effect of education(skill) mismatch on labor market outcomes with fixed effect. It uses education (skill) mismatch as independent variable and the variable is a dummy as in the specification of pooled OSL model.

$$y_{it} = \gamma_0 + \gamma_1 mismatch + \gamma_2 x_{it} + \delta_i + \theta_{it} \qquad (2)$$

Here, the coefficient $\gamma_1$ is interpreted as the difference in outcome between mismatched worker and the well-matched worker. $\delta_i$ contains individual-specific and time-invariant unobserved random variables. $\theta_{it}$ is time and individual specific error term which is assumed to be with normal distribution and being exogenous. This specification is assumed to controls for time-invariant individual-specific characteristics that may affect labor market outcomes. In Pooled OLS model, even though we construct our model from pooling the observations, it may not offer better estimation in panel data analysis since the model shall

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suffer from heterogeneity bias issue. In other words, the coefficient from Pooled OLS model might not successfully estimate and represent true coefficient of each individual in the panel. Thus, compared to Pooled OLS model, by taking identification and individual specific factors into account, the fixed effect model should have advantage in estimating more meaningful coefficient to analyze the correlation between job mismatch and labor market outcome.

### 5.3. Binary Logit Model with Fixed effect and Marginal Effect

In the case of discrete dependent variables such job satisfaction (whether satisfied with current job, which is coded as a dummy variable, binary logit model is adopted to estimate the effect of mismatch on the outcome. For binary logit model in this paper, marginal effects analysis is utilized for analysis, which measures how the likelihood of event (job satisfaction) change conditional to the change in state of education (skill) mismatch from 0 to 1. As binary logit is non-linear model and the effect for individuals should be different to each other, marginal effect provides the mean effect of individuals.

$$\text{Logit}(y_{it}) = \ln \frac{P(y_{it})}{P(1-y_{it})} = x_{it}'\beta + \varepsilon_{it} \quad (3)$$

$$\text{Marginal Effect of } x_i \text{ is given by } \frac{\partial P(y_{it}=1|x_{it})}{\partial x_{it}}$$

Since the responses of being mismatched are coded as 1 when constructing dummy variable, the positive result of marginal effect implies that the becoming mismatched in terms of education (skill) is more likely to have effect on the chance of being satisfied with current job. If the result of marginal effect is negative, the interpretation should be on the other way around; the change in state of mismatch from 0 to 1 is less likely to have effect on the chance of the event.

# 6. Results

## 6.1. Main Estimation

Table 2 reports the education skill mismatch estimates derived from both specification 1 and 2. Dependent variables subject to analysis are log of monthly wage and working hour. The first two columns of each outcome are results from specification 1 which utilizes pooled OLS estimation. The last two columns for each outcome are results of specification 2 with fixed effect model that accounts for unobserved individual specific characteristics invariant across timing of observation. Also, all the columns marked with odd number are estimated without control variables and the columns marked with even number are estimated with controls which includes demographic, education, and job-related characteristics.

## TABLE 2. EFFECT OF MISMATCH ON WAGE AND WORK HOUR

| | Log of Monthly Wage | | | | Work Hour | | | |
|---|---|---|---|---|---|---|---|---|
| | Pooled OLS | | Fixed Effect | | Pooled OLS | | Fixed Effect | |
| VARIABLES | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Edu Mismatch | -0.226*** | -0.134*** | -0.068*** | -0.064*** | 2.842*** | 2.338*** | 1.207*** | 1.249*** |
| | (0.025) | (0.019) | (0.015) | (0.015) | (0.336) | (0.329) | (0.243) | (0.244) |
| Skill Mismatch | -0.236*** | -0.109*** | -0.055*** | -0.045*** | 3.048*** | 2.368*** | 0.610** | 0.651** |
| | (0.026) | (0.020) | (0.016) | (0.016) | (0.351) | (0.346) | (0.260) | (0.261) |
| Control variables | No | Yes | No | Yes | No | Yes | No | Yes |
| Observations | 3,385 | 3,385 | 3,385 | 3,385 | 3,385 | 3,385 | 3,385 | 3,385 |
| N of sample id | | | 677 | 677 | | | 677 | 677 |

Note: ***/** indicate significance at the 1 and 5% level, respectively. Standard errors are reported in parentheses. Monthly wage is converted with natural log and work hour is reported in hourly unit. The coefficients in first two columns of each outcome are measured with Pooled OLS estimation and those in the last two columns of each outcome are measured with individual and year fixed effect estimation. In columns marked with even numbers, to control for individual specific factor, demographic (gender, marital status, and age), education background (level of education, field of major and location of school), and current job-related characteristics (size and location of firm, possession of job-related certificates, change of workplace, employment contract type, and tenure) are included as control variables.

In table 2, the first four columns are results of education and skill mismatch estimation on log of wages. As hypothesized and proven in previous studies, the state of mismatch is likely to adversely affect wage of workers. Estimates from both pooled OLS model and fixed effect model exhibits negative effect of both education and skill mismatch with 1% of significance. It suggests that the workers mismatched in terms of education experience and skill set experience wage penalties relative to the well-matched workers. Comparing the two models with controls in column 2 and 4, the pooled OLS model reports that mismatched workers in terms of education earn around 13% less than the well-matched ones, and those who perceive themselves as mismatched in terms of skill experience about 11% of wage penalties. The size of effect decreases by more than half when taking individual-specific characteristics into account. The adverse effect of education mismatch is around 6% and that of skill mismatch is around 5%. On the other hand, when comparing the results with fixed effect estimation in column 3 and 4, the coefficients for both education and skill mismatch are very similar regardless of inclusion of controls, showing the robustness of education mismatch as the independent variable. In particular, the coefficients of education mismatch show very small decrease in size.

Columns from 5 to 8 are coefficients of mismatch in relation to working hours. For analysis, working hour is hypothesized that it is important feature that affects worker's productivity and if mismatch has any effect on working hour, it should mean productivity is also affected. Basically, all four estimates of mismatch on working hour are statistically significant and the direction of them is positive. It means that education and skill mismatch of worker has significantly adverse effect on working hour, implying that workers mismatched in terms of education and skill tend to spend more time working than those who perceive

their level of education well matched with current job. Compared with results from pooled OLS model, coefficients form fixed effect model show more consistency in size. Focusing on fixed effect coefficients in column 8 which are estimated holding both individual specific features fixed, workers with education mismatch are likely to work about 1.25 hour longer than their reference group. Skill mismatch may also prolong working time by 0.7 hour. The results of significant correlation between mismatch and working hour lead us to make argument for productivity, which explains many aspects of labor market outcomes.

Overall, most of the results regressed on either type of job mismatch show similar pattern and size. To verify the differences between educational mismatch and skill mismatch, t-test between the two job mismatches is conducted. The result reports that they are

TABLE 3. EFFECT OF MISMATCH ON JOB SATISFACTION

| VARIABLES | Job Satisfaction | | |
|---|---|---|---|
| | Pooled OLS (1) | Pooled Logit (2) | Logit FE (3) |
| Edu Mismatch | -0.401*** | -0.352*** | -0.166** |
| | (0.032) | (0.029) | (0.062) |
| Skill Mismatch | -0.402*** | -0.354*** | -0.188** |
| | (0.033) | (0.031) | (0.071) |
| Observations | 3385 | 3385 | 2040 |
| N of sample id | | | 408 |

Note: *** /** indicate significance at 1 and 5 % level. Standard errors are reported in parentheses. The estimates from pooled OLS estimation model are regression coefficients of education and skill mismatch. The results reported in column 2, 3, 5, and 6 are marginal effect estimated following pooled logit, and logit with fixed effect estimation. To control for individual specific factor, demographic (gender, marital status, and age), education background (level of education, field of major and location of school), and current job-related characteristics (size and location of firm, possession of job-related certificates, change of workplace, employment contract type, and tenure) are included as control variables. The number of observations for fixed effect model are reduced due to the repetitive same responses across waves.

statistically different with p-value of 0.09, which means 10% of significance.

The results reported in Table 3 are regression coefficients from pooled OLS and marginal effects from pooled logit and logit model with fixed effect estimation for job satisfaction. In line with findings that education and skill mismatch have negative association with job satisfaction, it is hypothesized that workers mismatched in terms of education (skill) would more likely to be less satisfied with their current job.

In column 1, regression coefficients for job satisfaction are presented and both for education and skill mismatch are - 0.4. When it comes to marginal effects reported in column 2 and 3, they indicate negative correlation between job mismatch and job satisfaction. Interpreting marginal effects derived after binary logit estimation, the probability of being satisfied with the current job may change as the state of mismatch changes from the matched to the mismatched, controlling for individual specific confounding factors. In pooled logit model which does not take the structure of panel data into account, the average probability of satisfaction is 35% lower if a worker's state of job match changes from matched to mismatched. Whereas, in logit analysis with fixed effect model, the average probability of satisfaction will be 16% lower if a worker is mismatched in terms of education, and it will be 19% lower if mismatched in terms of skill utilization. Decrease in marginal effect in fixed effect model implies that unobserved individual specific characteristics should be considered in understanding the effect of mismatch on job satisfaction.

In literature review of education mismatch, there has been quite conclusive argument that education mismatch has adverse effect on job satisfaction of workers. The marginal effect for education in the table confirms the previous finding. On the other hand, regarding the association between skill mismatch and job satisfaction, there has been mixed view either negative or non-significant reported in the literature. The marginal effect reported above corresponds to the view of negative effect of skill mismatch on worker's job satisfaction.

## 6.2. Subsample Analysis

### TABLE 4. SUB-SAMPLE ANALYSIS: Wage and Working Hour

| VARIABLES | Education Mismatch | | Skill Mismatch | |
|---|---|---|---|---|
| | (1) Log of Monthly Wage | (2) Work Hour | (3) Log of Monthly Wage | (4) Work Hour |
| *Gender* | | | | |
| Female | -0.073*** | 1.686*** | -0.041* | 1.503*** |
| | (0.021) | (0.348) | (0.023) | (0.375) |
| Male | -0.054** | 0.755** | -0.049** | -0.208 |
| | (0.022) | (0.341) | (0.024) | (0.361) |
| *Level of Education* | | | | |
| 4-Year University | -0.057*** | 1.253*** | -0.058*** | 1.023*** |
| | (0.019) | (0.293) | (0.021) | (0.325) |
| 2-3 Year College | -0.071*** | 1.146*** | -0.022 | 0.097 |
| | (0.026) | (0.434) | (0.027) | (0.438) |
| *Type of Employment Contract* | | | | |
| Full-time | -0.070*** | 0.772*** | -0.047*** | 0.082 |
| | (0.015) | (0.243) | (0.017) | (0.264) |
| Temporary | 0.003 | 0.412 | -0.004 | -1.178 |
| | (0.103) | (0.800) | (0.112) | (0.865) |
| *Field of Major* | | | | |
| Humanities & Social Science | -0.048** | 1.572*** | -0.031 | 0.688* |
| | (0.020) | (0.366) | (0.021) | (0.379) |
| Natural Science & Engineering | -0.090*** | 0.872*** | -0.073*** | 0.586* |
| | (0.023) | (0.314) | (0.026) | (0.350) |

Note: ***/**/* indicates significance at the 1, 5 and 10% level, respectively. Standard errors are reported in parentheses. All the coefficients are estimated with fixed effect model and to control for individual specific factor, demographic (gender, marital status, and age), education background (level of education, field of major and location of school), and current job-related characteristics (size and location of firm, possession of job-related certificates, change of workplace, employment contract type, and tenure) are included as control variables. Humanities and Social Science subgroup contains the observations from Humanities, Social Science, Education and Art major. Natural Science and Engineering subgroup contains the major of Natural Science, Engineering, and Medicine.

In table 4, the estimates of sub sample estimation with fixed effect regression model controlling for individual specific characteristics are reported. Gender, level of education, type of employment contract, and field of major of sample are utilized as subject for analyses. For subgroup analysis, the fields of major are categorized into two: Humanities and Social

Science subgroup contains the observations from Humanities, Social Science, Education and Art major. Natural Science and Engineering subgroup contains the major of Natural Science, Engineering, and Medicine. Before examining the relationship between mismatch and outcomes, first stage regression is conducted preliminarily to see if certain type of subgroup experience significantly more of education or skill mismatch. Among those four subgroups, the type of employment contract is reported to have significant correlation with the state of mismatch. In other subgroups, the results show no statistical significance or small sized coefficient ranging from 0.016 to 0.020 with 10% significance.

Considering gender of workers, female workers with education tend to experience wage penalties greater than in the case of male workers. Skill mismatch also adversely affect workers in both gender but the magnitude for male worker is slightly greater than in the case of female workers. Also, the size of coefficient is greater for education mismatch compared to the case of skill mismatch for both genders and for female workers, the coefficient for education mismatch is much more significant than that for skill mismatch which implicates education mismatch could more seriously affect worker's monetary outcome.

In the case of working hour, female workers with mismatch show longer working hour than their counterparts. Male workers with education mismatch also tend to work longer, but the length of working hour is shorter compared to that of female workers with education mismatch. Moreover, the result for male workers with skill mismatch is not statistically significant. As in analysis of more severe wage penalties for female workers with education mismatch, the state of mismatch in education and skill utilization have negative association with working hour.

Estimation by grouping the level of education of workers, both workers who graduated 4-year university or 2~3-year college undergo wage penalty and longer working

time if they are with education mismatch. On the other hand, skill mismatch has negative effect among 4-year university graduates, not 2~3-year college graduates. This may suggest that since the focus of education of college is inclined to occupation-related, workers graduated college may not get negative outcome even though they perceive themselves as mismatched in skill utilization.

Grouping the type of employment contract exhibits more adverse effect for full-time workers who are usually considered to be in secure position compared to those employed with temporary contract. On the other hand, results for workers employed temporary contract do not show statistically significant effect. It may suggest that temporary workers with mismatch do not experience wage penalty or longer working hour compared to their counterparts.

Within both categories of major, workers with education mismatch experience wage penalties and longer working hour. Wage effect is larger for those mismatched workers who majored in science or engineering and the mismatched workers who majored in humanities or social science experience longer working hour. When it comes to skill mismatch, only workers who majored science and engineering show negative correlation between the state of mismatch and monthly wage. This suggests workers who primarily learned science and technology are affected more if they cannot fully utilize their skill and relevant knowledge attained from their education.

TABLE 5. SUB-SAMPLE ANALYSIS: Job Satisfaction

| VARIABLES | Education Mismatch | Skill Mismatch |
|---|---|---|
| *Gender* | | |
| Female | -0.156* | -0.177* |
| Male | -0.104 | -0.112 |
| *Level of Education* | | |
| 4-Year University | -0.081* | -0.119* |
| 2-3 Year College | -0.271** | -0.228** |
| *Type of Employment Contract* | | |
| Full-time | -0.162* | -0.179* |
| Temporary | -0.027 | -0.023 |
| *Field of Major* | | |
| Humanities & Social Science | -0.131* | -0.145 |
| Natural Science & Engineering | -0.188** | -0.215* |

Note: **/* indicates significance at 5 and 10% level, respectively. All the results are marginal effect estimated logit analysis with fixed effect estimation. To control for individual specific factor, demographic (gender, marital status, and age), education background (level of education, field of major and location of school), and current job-related characteristics (size and location of firm, possession of job-related certificates, change of workplace, employment contract type, and tenure) are included as control variables. Humanities and Social Science subgroup contains the observations of workers with Humanities, Social Science, Education and Art major. Natural Science and Engineering subgroup contains the major of Natural Science, Engineering, and Medicine.

In Table 5, the results of subsample analysis on job satisfaction are reported. For both of explanatory variables, binary logit method with fixed effect model is utilized. Considering the level of education and its effect on the chance of outcome of interest, regardless of education attainment, workers with education or skill mismatch would possibly feel unsatisfied with their job. Especially, the probability of job satisfaction for 2-3 year college graduates with education mismatch may be 27% lower than their counterparts. In terms of skill mismatch, the probability of satisfaction may be 23% lower when the state of skill match turn into mismatch.

The estimation with subsampling by type of employment contract provides meaningful results only for full-time workers' job satisfaction. For full-time workers, both education mismatch and skill mismatch are negatively correlated with the likelihood of being less satisfied with job. The probability of being satisfied with current job decreases by 16%

when the worker's level of education becomes mismatched. In the case of skill mismatch, the probability of satisfaction reduces by 18%. Whereas the result indicates that temporary workers' job satisfaction is statistically correlated with the state of any type of job mismatch.

Lastly, subsampling field of majors, educationally mismatched workers who majored in humanities and social science job satisfaction is 13 % lower compared to the well-matched workers with the same major. The marginal effects for workers who majored in science and engineering are reported to be significantly negatively associated with job satisfaction. In the case of education mismatch, the probability of job satisfaction is 19% lower if there is change in the state of job match into being mismatched. About 22% of lower probability of job satisfaction accrues to the workers with skill mismatch compared to their counter parts with the same major.

7. Discussion

In this paper, the state of job mismatch is analyzed by using the Korean Youth Panel Survey data from 2011 to 2015. Job mismatch has been categorized into two types which are education and skill mismatch and estimated controlling for individual specific characteristics such as demographic, education, and job-related variables. As outcome variables, wage, working hour, and job satisfaction are analyzed to see whether the state of job mismatch affects the outcomes of interest.

In the analysis on wage and job satisfaction, conclusive findings are made, which coincides with the previous findings in job mismatch literatures. As shown in table 2, both education and skill mismatch have adverse effect on worker's monthly wage with 1 % of significance. In fixed effect estimation, the coefficients of education and skill mismatch are

consistent regardless of inclusion of control variables. When taking individual specific factors into account, both types of mismatch induce around 5 to 6 % of wage penalties. This coincides with the previous findings from job mismatch literature that surplus education or educational mismatch results in lower wage for workers. To compare the size of the coefficient, Dolton and Vignoles(2000) found from 8 to 13 % of wage penalty in U.S. labor market, which is higher than the coefficient of this paper. From Leuven and Oosterbeek's work (2011), it was found that there was 4% of wage penalty for overschooling, which is similar or somewhat lower than the result of this paper. In the case of skill mismatch, Mavromaras, McGuinness and Fok (2009) reported that over-skilled worker experience 10.2% of wage penalties on average in Australian labor market. In Korean case, both education and skill mismatch were found to have around 8% of negative effect of wage. In all, the results of this paper show somewhat lower coefficients when it comes to wage effect.

Considering background of higher education attainment and educational focus in higher education system, lower wage correlated with job mismatch can be explained in the context of Korean labor market. As the focus of 4-year university education is on academic perspectives and it is considered the standard of Korean education, many of graduates may not have occupational competences. Thus, their perception on education and skill mismatch should measure similar aspects of job mismatch. Also, as this supply of highly educated workers increases, their expected level of wage could decrease. When employers require certain level of education, this should include market value of that level of education which has been translated into wage level. If the employer hires a worker who is with exceeding level of education, he or she could utilize higher level of knowledge and productivity presumed to be better in human capital perspective. At the same time, that worker may be paid lower than he could have been.

The result of job satisfaction is also significantly negative, and it confirms the solid findings from previous literature. As reported in table 3, the likelihood for job satisfaction lower for mismatched workers suggest that workers with education and skill mismatch are more likely to experience dissatisfaction. In the result of this paper from logit fixed effect model, probability of Job satisfaction is reduced by 16% if the worker perceived himself as mismatched in terms of education and by 19% if mismatched in terms of skill utilization. On the other hand, in the study by McGuinness and Sloane (2011) with probit model, overeducation reduces the probability of job satisfaction by 27% and overskilling reduces the likelihood of job satisfaction by 30%. Badillo-Amador et al. (2012) reported that being mismatched in terms of skill utilization reduces the probability of job satisfaction at least 10% in the context of Spanish labor market. Compared to the result from previous studies, the probability of perception on job satisfaction varies in the context of local labor market but there is significant correlation between job mismatch and satisfaction.

Overall, the analysis of this paper provides clue for suggestive interpretation that mismatches in job may have less self-actualization and motivation in their current position. So, the deficiency or discrepancy in utility resulted from the state mismatch can be reflected on overall job satisfaction. From the result on job satisfaction, we can discuss possibilities that lower job satisfaction coming from job mismatch may lead to turnover of workers. In several empirical studies, the adverse correlation between job mismatch and turnover has been identified (Tsang et al., 1991; Hersch, 1991; Judge et al., 2001), besides the correlation between mismatch and job satisfaction. Covering the two sequential outcomes of job satisfaction and turnover, we can substantiate the phenomenon of early turnover of young workers in Korean labor market. Appropriating findings in literature and the result of lower job satisfaction of mismatched workers, in the circumstances where workers cannot fully utilize knowledge and

skillset, the incentive for workers would tilt to change in workplace or job itself. As the report from Korean Employers Federation (2016) pointed out, many Korean young workers perceive mismatch of job assignment as primary reason for early quitting. This decision of turnover may be because the workers believe better utilization of knowledge and skillset would lead to better outcome in labor market considering the harsh condition of recent labor market in Korea.

The result of working hour reported in table 2 indicates both education and skill mismatch significantly affect working hour. It conforms previous findings of negative correlation between them. Regarding the size of effect, it is twice greater among educationally mismatched workers than among those with skill mismatch. Exploiting previous finding from the studies of McGowan and Andrews (2015) and Sandulli et al.(2014) that mismatch and productivity is negatively correlated, the discussion on working hour in relation to job mismatch and thus, on productivity can be extended. As the productivity is the inverse function of working hour as in the definition, if mismatch is positively correlated with working hour, there should be negative correlation between job mismatch and productivity. As shown in relevant table in 2 and 4, the state of mismatch and working hour are positively correlated, meaning that mismatch increases the length of working time. Following the argument of Collewet, M. and Sauermann, J. (2017) that working hour is linked with worker's productivity in negative manner, job mismatch could have negative correlation with productivity through longer working hours. Even though this paper could not test which one come first, it is possible to consider long working hour can presage lower productivity of worker.

Focusing on subsample analysis, the sample categories which exhibit consistently similar result are female, 4-year university graduates and full-time workers. Since all the results from the categories implies mismatch has adverse effect on labor market outcome, it is

possible to think of trade-offs that might occur between employment and the workers in the four aforementioned subsample categories. Females are generally considered to be disadvantaged in labor market. If they acknowledged it and wanted secure employment, they could be more likely to submit to mismatch which induces unfavorable outcomes. Also, most of 4-year university graduates learned academic aspects, not occupational training while in education period. Due to the lack of occupation relevance in their education, 4-year graduates are more likely to accept jobs that does not perfectly match with their true competences. Regarding full-time employment, since it is secure position compared to temporary one, most workers exert themselves for getting full-time job. To achieve it, they might have accepted the positions which does not fit their competences or qualifications.

Lastly, from overall results from the estimations in this paper, it can be found that education and skill mismatch measure similar aspects of job mismatch. In the t-test conducted to verify the difference of the two mismatches, the result of difference with 10% of statistical significance reveals that they are technically different. On the other hand, for the results of wage and job satisfaction, education and skill mismatch exhibit same direction and similar size of effect in fixed effect model. In the case of working hour, the direction of the coefficients is the same from both types of mismatch even though the differences in size exist. The correlations found in estimation with fixed effect model confirms the finding made in the study of Cha and Joo (2010) and McGuinness and Sloane (2011) imply education mismatch in Korean labor market is largely associated with skill mismatch. This can be partly accounted for with respect to credentialism prevailing in the society, and thus less emphasis on occupation-specific skill development. As mentioned in the introduction part, Korean people make substantial investment on higher education. However, 4-year university education is mostly focused on general or academic aspects. One of important criteria for

qualifications has been the ranking of the school and thus, credentials override the relevant competences or skillset for the position in employment. For this reason, labor market participants may perceive education mismatch as a concept that covers overall competences including skill mismatch. To identify whether workers genuinely perceive education and skill mismatch as the same concept or not, and whether the mismatch they perceive is education mismatch or skill mismatch requires further studies.

8. Conclusions

Korean society has long been making investment on higher education and consequently, around 70% of Korean youth have above-college degree as of 2016. On one hand, for recent 10 years youth unemployment problem has been deteriorated. On the other hand, the rate of early turnover is above a quarter as of 2016 and the most reason for it is mismatch in job assignment. To examine current Korean youth labor market where investment on education do not seem to be benefitting and early turnover tendency is emerging, analyses on education and skill mismatch are conducted in this paper.

Korean Youth Panel data from 2011 to 2015 is analyzed with fixed effect model which controls for individual specific characteristics. Considering the distribution of outcome, continuous variables (wage and working hours) are estimated with regression model and discrete variable (job satisfaction) is examined with binary logit model. In analyses with regression model, it is found that both types of mismatch have significantly adverse effect on monthly wage and working hour: incidence of either types of mismatch is associate with wage penalties and with longer working hours. These results are line with previous findings from mismatch literature. On the other hand, apart from the previous studies from mismatch literature mostly analyzed cross-section data, and thus reported

statistical limitation in controlling for unobserved heterogeneity issue of individual workers and their mismatches, the panel data analysis with the fixed effect model has advantage to deal with endogeneity issue. Also, the addition of working hour as an outcome not only enlarged the range of outcome for mismatch but provides possibility to link job mismatch to productivity. In logit analysis, marginal effects for the probability of job satisfaction are identified to be lower for both types of job mismatch. When estimated with fixed effect model, marginal effects probability of job satisfaction decreased by half. It substantiates the existence of unobserved confounding factors that affects the association between job mismatch and satisfaction. Overall, the results follow previous arguments that the state of mismatch negatively affects job satisfaction. Thus, the results partly support the current situation of Korean youth labor market where mismatch and early turnover are raised as issue to address.

In all, in most estimations, the results of education and skill mismatch tend to be coincided in terms of direction and magnitude. Considering the similarities in measuring the effect of job mismatch, even though the statistical evidence on distinction of the type of mismatch has not been proved in detail, it can be maintained that the incidence of mismatch is important measure to understand recent Korean youth labor market issues. However, admitting no clear-cut distinction regarding job mismatch, further studies are required to find more conclusive results. To conduct the research for this, it is essential to ask workers distinctive perception of the type of mismatch or to what extent either type of mismatch is perceived to be similar. This is important in that clear identification of source of mismatch is crucial in determining and amending policy direction for education and labor market.

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