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Has a Mismatch Caused Korea's Youth Employment Rate Drop?*

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I. Introduction

Korea's youth employment rate stands at a lowest low level currently. As of 2013, the employment rate among men between age 25 and 29 is at 69.3% and among men between 30 and 34 the rate is 88.6% in urban areas. The level is lower than those in advanced countries as well. The average among G-7 countries is 80.8% and 85.9% in respective age groups as of 2012. In the past, high youth unemployment was seen as a symptom of the Eurosclerosis; now it is as an indicator of the Korean economy's underperformance.

Despite, a 'labor market mismatch' is fingered at as the cause of the low youth employment rate. The argument is as follows: The Korean young men are overeducated; they have a high aspiration and high reservation wage; they search for 'high quality' jobs in vein; hence they remain jobless for a long time while investing in their 'specs' (specifications) which is socially unproductive; therefore, the youth themselves are responsible and they should adjust their expectations if they are to grab jobs. However, this argument has loopholes: First of all, a persistent over-evaluation of one's own 'ability' is not a consistent explanation. It is not logical if an informed young person expects to find a 'college job' with his bachelor's degree while he knows that 40% of his age has a comparable education for more than a decade. Secondly, ever since Gary Becker's Human Capital Theory, we economists believe that higher education does not harm a person although it can be just a consumption and do not provide any benefits. Further, the demand shift has been skill-biased and favored those with higher skills. However, the youth employment rate dropped not because they stayed in school longer but because they remained as NEETs after finishing school. Third, Korea

is not the only country with an overeducated youth population.[2] The share of college graduates increased in all countries but Korea is exceptional in its drop of youth employment in the 2000s. Facts do not fit together.

In this article, I show that the Korea's recent youth employment rate drop can be explained by the parameter shifts we observe on the demand side—specifically the drop in job arrival rates and growth of wage variance which is the source of the returns for job search activity. This formulation redirects the search for culprits of youth employment problem from the youth themselves to business dynamism decline and wage disparity growth and to inefficient resource allocation, improper loan subsides, and inappropriate education and its weakened signals.

I start with a discussion on mismatch and on cost of over-education in Section 2. In the next section, I briefly characterize Korea's youth employment rate drop. Section 4 introduces a simple standard search model and Section 5 discusses parameter shifts in the 2000s. Section 6 concludes and discuss implications.

II. Skill Mismatch, Over-education, and Earnings

The notion of skill mismatch tacitly presumes a skill surplus situation where workers' skills are not fully utilized and workers are not properly compensated for their skills. Skill mismatch is operationally synonymous occupational mismatch as skill requirement is set by occupations. Over- and under-education regards workers' years of schooling. If a worker's acquired years of schooling is longer than the level typical of his occupation, he is said to be over-educated, and vice

[2] See for example, Hartog, 2000.

versa. Whether years of schooling are valid indicators of skills is controversial.[3] (Halaby, 1994) But as in Becker's Human Capital Theory, economics literature has taken years of schooling as a standard measure for skill levels.

In most countries, the supply of college graduates have surged in the 20th century. In the U.S., the share of college educated was … in … but reached … % in …. In Korea, the share of more than 4-year college educated among men with age between 30 and 34 have grown from 30.5% in 2000 to 45.3 in 2013. A natural consequence is an educational upgrading in occupations or 'college graduates in high school jobs.' When a skill mismatch is determined from a job analysis (JA), ie, when a required education level of a job is determined by a professional job analyst, the share of overeducation in the Netherland increased from 14% in 1971 to 24% in 1995. (Hartog, 2000, Table 1, p.134) Hecker (1992) demonstrated that the proportion of college and post-college graduates in 'high school type jobs' in the U.S. rose from 10.0% in 1970 to 17.9% in 1990, where the high school type jobs are those one-digit occupations for which employers did not traditionally required a college degree.[4] In Table 1, I compare the proportions of over-education in Korea with those in the Netherlands and the U.S. The figure for the U.S. is from Duncan and Hoffman (1981). For both countries, overeducation is determined from a job analysis method. The reason that the U.S. have such a high incidence of overeducation is that in Duncan and Hoffman's study, 21.9% of all the U.S. jobs were analyzed to require virtually no schooling (0-5 years) in 1976 whereas it held for only 3.8% in the Netherlands in 1982. (Hartog and Oosterbeek, 1988, p.192) Korea's overeducation in Table 1 is measured by a 'realized

[3] Halaby notes that the connections between nominal overeducation and the concept of 'skill mismatch' are so weak and inconsistent as to cast doubt on the validity of this popular conceptualization. (Halaby, 1994, p.48)

[4] Specifically, occupations within retail sales; administrative support; service; precision production, craft, and repair; operator, fabricator, and laborer; and farm jobs, except those noted above. (Hecker, 1992, p.4)

matches' method.[5] Using the Wage Survey data of Ministry of Employment and Labor for years 2002 and 2008 which used the same occupational classification, the mean and variance of workers' actual years of schooling for each occupation is calculated from the 2002 data set.[6] From the 2008 data set, I categorize as overeducated if the worker's years of schooling is more than ¼ standard deviation away from the mean in the occupation. A one standard deviation is commonly used in the 'realized matches' method. (Verdugo and Verdugo, 1989) But in the data set used, one standard deviation leaves too few observations (approximately 8%) in over-education category, which makes estimation of return for education less accurate. The size of over-education is not so meaningful as the choice of the borderline between over- and proper education is arbitrary. What matters is the consequences of over-education, which is the putative decline of returns to higher education.

The job competition theory of Thurow (1975) takes marginal productivity as a fixed characteristic of a job, independent of a worker. In this model, earnings are related to jobs rather than to the worker. Education just raises a worker's chance to get a high wage job. This yields a log wage as a function of the required years of schooling for the job, r.

$$\ln w = \beta_0 + \beta_1 r \qquad (1)$$

On the contrary, the human capital theory of Becker (1964) is fundamentally a supply side theory and claims that a workers' human capital determines his marginal productivity which is a function of a worker's attained years of schooling, s.

[5] See Hartog (2000) p.132 for an explanation on measures of overeducation.

[6] The Wage Survey data sets contain up to three digit classification codes for clerks, craft, assemblers and operators, and laborers, and two digit codes for other occupations.

$$\ln w = \alpha_0 + \alpha_1 s \quad (2)$$

In the job allocation theory of Tinbergen (1956), wages are instrumental in allocating the society's skill endowments to skill demands. Log wages are not only a function of jobs characteristics (r) but also a function of workers' skills (s).

$$\ln w = \gamma_0 + \gamma_1 r + \gamma_2 s^0 + \gamma_3 s^u \quad (3)$$

where $s^0 = s - r$, if $s > r$, and $= 0$ *, otherwise*

$s^1 = r - s$, if $s < r$, and $= 0$ *, otherwise*

The equation (3) embeds equation (1) and (2) as special cases. Thus it can be used to check validity of the two theories. Table 1 compares the estimation result when equation (3) is fitted with other typical human capital variables, age and age squared, to a sample of young men with age between 30 and 34 with the results from the Netherland and the U.S. The estimated return to education for proper match is larger for Korea as the equation is fitted to a restricted sample, but other estimates show comparable wage effects.

TABLE 1. COMPARISON OF INCIDENCE AND WAGE EFFECTS OF OVER-EDUCATION: US, NETHERLANDS AND KOREA

	Incidence (%)			**Wage Effects**		
	US (1976)	Netherlands (1982)	Korea (2008)	US (1976)	Netherlands (1982)	Korea (2008)
Proper match ($r = s$)	46.1	62.2	69.6	.063	.071	.136
Over-education ($r < s$)	42.0	16.0	21.7	.029	.057	.049
Under-education ($r > s$)	11.9	21.8	10.1	-.042	-.025	-.053

Notes: US and Netherlands are from Hartog and Oosterbeek (1988), Table 5, p.192.

Korea is among young men with age between 30 and 34 and figures are from Choi (2014).

The estimation results show that even for those with overeducation, that is, for those whose skills are underutilized, years of schooling provide a significant

gain. For example, for a 4-year college graduate in a college job the wage premium of college education is 54.4% compared with a high school graduate in a high school job. A 4-year college graduate in a high school job still receives a 19.6% wage premium compared with a high school graduate. College education yields a pretty large gain though it carries time cost and expenses. The consequence of over-education for a worker is the decline in returns to education. Over-education per se does not lengthen duration of job search in a dynamic setting.

Further, Pryor and Schaffer (1997) show that when the quality of human capital is properly considered with a supplementary indicator in addition to years of schooling, which is the functional literacy scores in their case, the skill mismatch may not be very large in fact. They found that university graduates with lower functional literacy moved into high-school-level jobs whereas those with literacy skills commensurate with their education received rising wages. The quality of human capital is likely to be a private information, and a rational job seeker would have adjusted his job prospects accordingly. Thus over-education does not necessarily result in an extended period of job search.

III. Employment Rate Drop among the Young Korean Men

Two decades ago, youth unemployment was seen as a phenomenon of Eurosclerosis. But now employment rate among young Korean men below the level in most European countries. Table 2 compares young men's employment rate trend with those in selected OECD countries. In 1990, the rate among men with age between 25 and 29 stood at 87.4%, which is not among the highest as every Korean young man had a mandatory military service duty for two and half years. Despite the level is significantly higher than those in Germany and Italy

which stood at approximately 80%. Among men aged between 30 and 34 Korea had the highest employment rate at 95% next to that in Japan in 1990, when the level stayed at 90% in most advanced countries. The situation is completely reversed by 2012. Korea's youth employment rate among men aged between 25 and 29, at 70%, is the second lowest among the OECD countries selected in Table 2. The levels in other countries are around 80% and Japan, which is another country which suffers from youth employment problem, still stands at an healthy 87%. The drop among men aged between 30 and 34 is not as large, and it stands at 89% as of 2012 in Korea. Now the employment rate is not any higher than those in richer OECD countries.

TABLE 2. EMPLOYMENT RATES OF YOUNG MEN: 1980~2012

	Men 25 to 29				Men 30 to 34			
	1980	1990	2000	2012	1980	1990	2000	2012
France	90.2*	87.4	83.4	80.0	93.8*	91.5	88.4	85.3
Germany	84.7	79.7	81.1	80.9	94.2	88.2	89.3	88.8
Italy	87.2	79.4	69.4	64.7	95.7*	91.8	86.3	79.4
Japan	94.3	94.2	90.3	87.0	95.9	98.5	93.7	91.3
Korea	88.3	87.4	78.2	70.4	93.0	95.1	91.2	89.0
United Kingdom	83.4**	89.0	87.6	84.0	86.4**	89.8	89.7	88.0
United States	86.8	88.1	88.9	80.5	91.0	89.7	91.5	84.0

Note: * in 1983, ** in 1984
Source: OECD data base (http://stats.oecd.org), extracted 22 Jan 2014.

The increase of higher education is not the main reason for young men's employment rate drop. Table 3 shows the time-series trend of young men's economic activities in urban areas.[7] Between 2000 and 2013, employment rate fell 8.8 percentage points from 78.1 to 69.3 percent among men with age between

[7] Rural areas typically have higher employment rates as the borderline between employment and non-employment is fuzzy, hence the decrease of the rural population tend to lower aggregate employment rates. To guard against the possibility I excluded rural areas.

25 and 29. Among the decline, just 2.1 percentage point can be attributed to the increase in the share of the young in education and training. Unemployment contributed 1.0 percentage point. By far the most important contribution is made by the increase in the share of NEET (Not in Education, Employment, and Training). It account for 5.7 percentage point out of the 8.8 percentage point drop. Among men with age between 30 and 34, the employment rate fell by 2.8 percentage points between 2000 and 2013. Unemployment fell by 0.6 percentage points. The share of NEET rose 3.0 percentage points from 3.8 to 6.8%. The patterns of changes in sub-intervals within the period are similar.

TABLE 3. YOUNG MEN'S ECONOMIC ACTIVITY STATUS: 1995~2012

Men 25 to 29

	1995	2000	2005	2010	2013
Employment	86.6	78.1	74.8	70.0	69.3
Unemployment	3.3	5.8	6.0	6.7	6.8
Education/Training	6.8	9.8	10.7	12.1	11.9
NEET	3.3	6.3	8.5	11.3	12.0

Men 30 to 34

	1995	2000	2005	2010	2013
Employment	95.6	91.4	90.0	87.6	88.6
Unemployment	1.7	4.2	3.5	4.4	3.8
Education/Training	0.4	0.6	1.2	1.5	0.8
NEET	2.3	3.8	5.3	6.4	6.8

Notes: Urban areas. Employment / Training corresponds to activity category 6. 'in school' in 1995~2002 data sets; category 6. 'in formal education', 7. 'in a prep. academy,' 8. 'in a job training institution' between 2003~04; and category 7. 'in formal education', 8. 'in a prep. academy,' 9. 'in a job training institution' between 2005~13 data sets.

*Source: A*uthor's calculation from the Statistics Korea, the Economically Active Population Survey (EAPS) micro data sets.

In Table 3, the youth employment rate fell as the proportion of the NEET among them rose, which hints that a weakened labor demand for them is a most plausible explanation for the employment rate drop. The employment rate among young men fell as they lengthened their job search continued to invest in themselves if possible. But by how much the youth labor market has been worsened? The employment rate drop means that the total time spend by the young men without jobs has increased by 40% between 2000 and 2013 among

men 25 to 29 years old, and by 35% among men 30 to 34.[8] Alternatively, assume that none of them had a job five years before. Youth employment rate of 78.1% means that the hazard rate during the five year interval is 78.1% (or 86.6% if we leave out those in school). The rate fell to 69.3% (or 78.7%) in 2013, which implies that the hazard rate fell by 11.3% (or 9.2%). If non-employment duration is exponentially distributed with a constant hazard, the mean is the inverse of the constant hazard. Then an 11% fall in the hazard rate means an increase of the mean duration by the same amount. Interestingly, the size of employment rate gain between age 25 to 29 and 30 to 34 did not decrease in the 2000s. The employment rate of the 25 to 29 group in 2000 increased by 11.9% points to 88.6% five years later in 2005. The rate for the same age group in 2005 increased by 12.8% points, and the age group's employment rate in 2008 was 70.6%, which means that the rate rose by 12.0% points during the next five years. The employment rate gain between 30 to 34 age group and 35 to 39 age group five years later shows a similar pattern. The size of gain did not change much in the 2000s.[9] The employment rate gain was achieved by those out of jobs taking lower status jobs.

The EAPS Youth Supplementary Survey contain data on the length of the waiting period for the first job, but the information is very incongruent since the first job is not always a permanent job. Hence, I turn to an analytical solution in the next section. The statistics for the waiting period after graduation is give in Table 4. The duration of the waiting period for the first job shows no trend.

TABLE 3. YOUNG MEN'S ECONOMIC ACTIVITY STATUS: 1995~2012

[8] Or, 55% for 25 to 29 years old and 33% for 30 to 34 years old, if we do not count those in school or training.

[9] The employment rate of the age group 30-34 in 2000 rose to 92.4% in 2005 in the 35 to 39 age group, which is a gain of 1.0%p. The 2005 group gained 1.5%p during the next five years. The group's employment rate in 2008 was 88.8%. The group gained 3.5%p, as the employment rate of 35 to 39 years old in 2013 was 92.3%.

men 25-29, urban areas	*June 2002*		*May 2005*		*May 2012*	
population	1,677		1,833		1,660	
employment	1,308	78.0	1,386	75.6	1,172	70.6
never had a job	317	18.9	367	20	267	16.1
among those who ever had a job						
- first job timing missing	414	30.4	850	46.4	709	45.8
- first job before graduation	120	8.8	177	9.6	89	5.7
- first job after graduation	827	60.8	807	44.0	752	48.5
*mean duration (months)od**	15.1		12.4		11.4	

Notes: Urban areas. * Among those who ever had a job and the first job date is later than the last graduation date.

Source: author's calculation from the Statistics Korea, the EAPS Youth Supplementary Survey micro data sets.

IV. Inference from a Job Search Model

In Section 4, I use a very simple and standard job search model and see if what parameter shifts could have generated such a drastic fall in male youth employment rates in Korea. As a standard job search model, I use the versions given by Lancaster and Chesher (1983) and Zvi Ecksten and Gerard J. van den Berg (2006). The two models are very similar and even use the same notation.

Lancaster and Chesher show that the reservation wage policy, where a job seeker sets a wage level and accepts a job offer whose wage is above the level and rejects one if the wage is below the level is a result of optimizing behavior on the part of the job seeker. Specifically, the reservation wage (ξ) is determined by three parameters: that are, i) non-labor income b, ii) job offer arrival rate λ, and iii) wage distribution $F(w)$. Specifically,

$$\xi = \mathrm{b} + \frac{\lambda}{\rho}\int_{\xi}^{\infty} \bar{F}(w)dw \qquad \textbf{(4)}$$

where $\bar{F} = 1 - F$, F is the distribution function of wage offers, w.[10] The optimal policy for the job seeker is as follows. The probability of accepting a job offer as a function the wage level, $\phi(w)$, is

$$\phi(w) = 1\,, \quad if \;\; w \geq \rho R = \xi \qquad \textbf{(5)}$$

$$= 0\,, \quad \text{otherwise}$$

where R is the return when the job seeker reject a job offer and continue searching.

The hazard or re-employment probability of a job seeker in a short interval of length (θdt), is the product of job arrival rate (λdt) and the probability that the offer exceeds his asking price ($\bar{F}(\xi)$). Thus the hazard function is, $\theta dt = \lambda\,\bar{F}(\,\xi)$. When the hazard is constant average duration of a unemployment spell is $1/\theta$.

In the following, I consider what parameter change could have brought about the 30% increase in the average duration of unemployment spell between 2000 and 2010.

A. The Effect of Non-labor Income, b

The parameter b represents the effect of labor supply side on duration of unemployment spells. The elasticity of unemployment duration $1/\theta$ with respect to the change in b is given by

[10] Lancaster and Chesher, 1983, equation 2.6, p.1663.

$$\frac{\partial \log \theta}{\partial \log b} = -\frac{f(\xi)}{\bar{F}(\xi)} \frac{b}{1+\theta/\rho} \leq 0 \qquad \textbf{(6)}$$

Lancaster and Chesher estimates this elasticity as approximately 1.0 using the estimates obtained from a British survey on the unemployed. (ibid, Table V, p.1671.) Injae Lee (2010) claims that in Korea the b parameter should be as high as 85% of the reservation wage ξ if the employment rate drop among the youth is to be explained by the rise of non-labor income.

If non-labor income rise is to be solely responsible for the youth employment drop, the above calculation shows that b should rise as much as 30% compared to wage parameters, since the hazards equation is homogenous of degree one with respect to (w, R, b, ξ). However, such a sicuation is highly improbable. Between 2000 and 2012, the mean income rose by 28% and the mean disposable income rose by 25% in real terms among urban households with two or more members. In the same period, mean hourly wage rose by 36% among men aged between 30 and 34 and by 34% between age 25 and 29. As those youth out of jobs probably depend on family support, it is unlikely that their non-labor income rose when average family income did not rise compared to wages.

B. The effect of job arrival rate, λ

The business growth dynamism has appreciably weakened in Korea during the 2000s. Job creation rate, which is the job additions due to establishment creation and expansion as a ratio to existing jobs has fallen from 36% in 2000 to 24% in 2012, which is a decrease of 30%. If the number of job offers to the youth are proportional to the number of jobs created, one can infer that the job arrival rate λ has fallen by 30% between 2000 and 2012. Further, if the proportion of jobs offered to the young workers out of total jobs created has fallen, as Byung-hee

Lee (2003) and Daeil Kim (2004) claims, the job arrival rate could have fallen by even a larger extent for the youth.

The fall in λ causes the employment probability θ to fall, but by much less extent the fall of λ. Since $\theta = \lambda\bar{F}(\xi)$, when θ is differentiated with respect to λ, $\partial\theta/\partial\lambda = \bar{F}(\xi) - \lambda f(\xi)\,\partial\xi/\partial\lambda$. Here, $\partial\xi/\partial\lambda$ has a positive sign and partially cancels the decrease in re-employment probability. When job offers are frequent, a seeker becomes more choosy by raising the reservation wage ξ. When it becomes sparse, he/she exploits the offer more intensively by lowering ξ. Thus the effect of the fall in λ is smaller than one would expect.

Lancaster-Chesher gives the following formula regarding the elasticity of re-employment probability change with respect to the job arrival rate change.

$$\frac{\partial \log\theta}{\partial \log\lambda} = 1 - \frac{f(\xi)}{\bar{F}(\xi)}\ \xi\ \frac{\partial \log\ \xi}{\partial \log\lambda} \qquad \textbf{(7)}$$

In the above, the elasticity of reservation wage change with respect to job arrival rate, $\partial\log\xi/\partial\ \log\lambda$, has a value between 0 and 1, specific value of which is determined by the wage distribution $F()$ and non-labor income level b.[11] Langcaster-Chesher estimates this parameter value as 0.1 using estimated parameter values obtained from a British unemployment survey, which means that when a job seeker receives 9 instead of 10 offers per year, he/she lowers the reservation wage by just 1%.

Under an assumption that F is a Pareto distribution as Lancaster-Chesher invoke, $f(\xi)/(\bar{F}(\xi)) = 1/(\sigma\xi)$ and the elasticity is given as follows where σ is estimated as 0.13.

[11] See Lancaster and Chesher, 1983, Table 1, p.1666.

$$\frac{\partial \log \theta}{\partial \log \lambda} = 1 - \frac{1}{\sigma} \frac{\partial \log \xi}{\partial \log \lambda} \quad \textbf{(8)}$$

Thus, the elasticity estimate is 0.2 and a 30% drop of λ lowers reemployment probability θ by 6% and lengthens the duration $1/\theta$ by 6%. Therefore, the effect of the job arrival rate drop is not as large as to be a major cause of the youth employment rate drop. Although the reservation wage ξ drops by a small amount it raises the re-employment probability θ sufficiently since $1/\sigma$ has a large value ($\cong 8 = 1/0.13$). The small adjustment of ξ means that a job seeker do not lose a lot in terms of the expected wage ($x = E[w|w \geq \xi]$ 0 as well. In the case of an increase in non-labor income b, the job seeker discards the full area of w for which $[w \leq b]$ in setting the reservation wage. However, when just the job arrival rate changes without any change in wage distribution, the job seeker can adjust the reservation wage level and minimizes its detrimental effect on the expected wage.

The job creation rate cited is calculated from a match panel of the Census of Establishments data sets the Statistics Korea between 2001 and 2012. Job creation is defined as the number of jobs created by start-ups and by the growth of establishment, and job destructions are the jobs that disappeared as establishments exit or contract. Observations in adjacent years' data sets are matched with the establishment identification codes in order to trace the growth and entrance of establishments. In calculating the ratios, average employment sizes across the two years are used as the denominator. For details, see Haltiwanger (2013). The match is very poor for some years as a significant portion of establishments have either missing or duplicated identification codes. The years not reported in Table

4 are those for which the match has been poor. Even without them the trend in Table 4 shows a clearly falling trend of business growth dynamism in the 2000s.[12]

TABLE. 4. JOB CREATION AND JOB DESTRUCTION TREND: 2001-2012

	As a ratio to total jobs (%)			size (thousands)		
	Job creation	Job destruction	Net increase	Job creation	Job destruction	Net increase
2001	36.7	33.2	3.5	5,076	4,590	486
2002	36.5	32.8	3.7	5,227	4,699	528
2005	32.6	30.2	2.4	4,862	4,510	352
2006	25.3	23.3	2.0	3,859	3,558	302
2011	20.9	18.5	2.4	3,730	3,299	431
2012	24.4	21.8	2.7	4,479	3,988	491

Source: author's calculation from a panelized version of the Statistics Korea, Census of Establishments data sets.

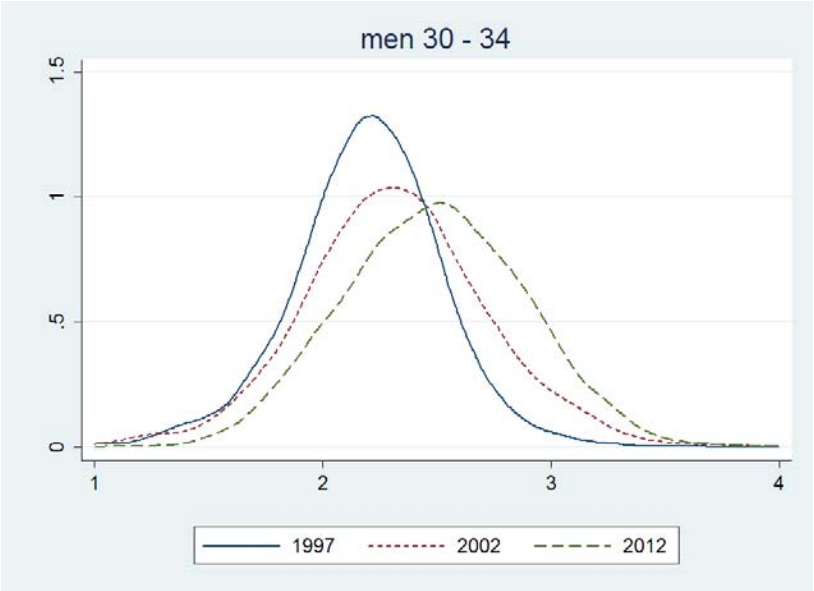
C. The effect of wage distribution dispersion, σ

If the wage distribution of job offers becomes more dispersed, a job seeker tends to search for a longer period with a higher reservation wage to exploit the increased chances of getting a high wage job. In other words, a larger wage variance raises the return of the job search and lengthen durations of unemployment spells. The standard deviation (σ) of real hourly wage distribution among young men aged between 30 and 34 increased by 3% between 2000 and 2012 and by 9% between 1995 and 2010. Suppose that wage offer distribution follows a Pareto distribution as in Lancaster and Chester (1983). Then the hazard rate at the reservation wage is given as $1/\sigma\xi$. If ξ remain unchanged a 3% rise of σ means a 3% fall of the hazard rate. But as ξ rises when σ grows, the hazard rate

[12] The falling trend can be confirmed from other sources of data. The number of bankruptcies fell consistently in the 2000s from 6,693 in 2000 to 1,228 in 2012. In the mean time, the default rate of business notes fell from 0.26% in 2000 to 0.02% in 2012. (The Statistics Korea, http://www.kosis.kr)

falls much larger than the amount of growth of σ. The real hourly wage distribution is given in Figure 1.

FIGURE 1. REAL HOURLY WAGE DISTRIBUTION OF MEN AGED BETWEEN 30 AND 34: 1997, 2002, 2012.



Source: Author's calculation from the Ministry of Employment and Labor, Survey on Labor Conditions by Types of Employment data sets.

When the variance of wage offer distribution grows, a job seek becomes more selective in accepting a job offer with a higher reservation wage. As he or she continues job search, it is likely that the job seeker invest further in his or her own human capital in order to raise the probability of getting a better job. A casual observer who does not have an information on the wage offer distribution, may view such a behavior as an evidence that the job seeker has a too high reservation wage or invests too much in 'specs' (job specifications) rather than getting a job and accumulating job experience. That is, an optimizing behavior on the part of a job seeker in response to wage distribution change can be misinterpreted as a result of non-labor income growth. But how significant is the effect of the growth of wage offer variance on employment rate fall? Is it large enough to account for

the drastic fall of the youth employment rate? Such questions can only be answered after its effect has been derived analytically or empirically.

The calculation of the elasticity of re-employment probability (θ) with respect to the standard deviation (σ) of wage offer distribution is rather lengthy. In the below I derive the elasticity when the wage distribution follows a Pareto distribution as in Lancaster-Chesher. I believe that the case when the wage offer has a normal distribution can be handled with a reasonable simplicity, but a normal distribution case has not been worked out yet.

Since the elasticity is given as:

$\frac{\partial \log \theta}{\partial \log \sigma} = \frac{\sigma}{\theta}\frac{\partial \theta}{\partial \sigma}$, let $\alpha = \frac{1}{\sigma}$ then $\frac{\partial \log \theta}{\partial \log \sigma} = -\frac{1}{\sigma\theta}\frac{\partial \theta}{\partial \alpha}$

Further, $\frac{\partial \theta}{\partial \alpha}\frac{\partial \log \theta}{\partial \log \sigma} = -\frac{1}{\sigma\theta}$

$\frac{\partial \theta}{\partial \alpha} = \frac{\partial \lambda \bar{F}(\xi)}{\partial \alpha} = -\lambda \frac{\partial F(\xi)}{\partial \alpha} = -\lambda f(\xi)\frac{\partial \xi}{\partial \alpha}$, since $\theta = \lambda \bar{F}(\xi)$

$\frac{\partial \xi}{\partial \alpha}$ is obtained by differentiating the following equation (eq. 2.6 in Lancaster-Chesher, p.1663.)

$\xi = b + \frac{\lambda}{\rho}\int_{\xi}^{\infty} \bar{F}(w)\, dw$ from which we obtain,

$\frac{\partial \xi}{\partial \alpha} = \frac{\lambda}{\rho}\frac{\partial}{\partial \alpha}\int_{\xi}^{\infty} \bar{F}(w)\, dw = \frac{\lambda}{\rho}\int_{\xi}^{\infty} \frac{\partial \bar{F}(w)}{\partial \alpha} dw - \frac{\lambda}{\rho}\bar{F}(w)\frac{\partial \xi}{\partial \alpha}$

Thus,

$$\left[1 + \frac{\lambda}{\rho}\bar{F}(\xi)\right]\frac{\partial \xi}{\partial \alpha} = \frac{\lambda}{\rho}\int_{\xi}^{\infty} \frac{\partial \bar{F}(w)}{\partial \alpha} dw \qquad \textbf{(9)}$$

If wage offers have a Pareto distribution,

$\bar{F}(w) = \left(\frac{w_0}{w}\right)^{\alpha}$, $\alpha > 2$ and $w \geq w_0$

The left hand side of equation (9) is,

$\left[1 + \frac{\lambda}{\rho}\bar{F}(\xi)\right]\frac{\partial \xi}{\partial \alpha} = \left[1 + \frac{\lambda}{\rho}\left(\frac{w_0}{\xi}\right)^{\alpha}\right]\frac{\partial \xi}{\partial \alpha}$

The right hand side is,

$$\frac{\partial}{\partial \alpha}\bar{F}(\mathrm{w}) = (ln\, w_0)\; w_0^{\alpha}\, w^{-\alpha} - w_0^{\alpha}\; (ln\, w)\, w^{-\alpha} = A - B$$

$$\int A\ \mathrm{dw} - \int \mathrm{B}\ \mathrm{dw} = \frac{w_0^{\alpha}}{(\,\alpha - 1)\xi^{\alpha-1}}\left(\ln w_0 - \ln \xi - \frac{1}{\alpha\, - 1}\right)$$

Therefore,

$$\frac{\partial \log \theta}{\partial \log \sigma} = \frac{\lambda f(\xi)}{\sigma\theta}\frac{\partial \xi}{\partial \alpha} = \frac{\frac{1}{\sigma^2(\alpha-1)}\left(\frac{\lambda}{\rho}\right)\bar{F}(\xi)}{1+\left(\frac{\lambda}{\rho}\right)\bar{F}(\xi\,)}\left(\ln\frac{\mathrm{w}_0}{\xi} - \frac{1}{\alpha-1}\right) \quad \text{since } \theta = \lambda\bar{F}(\xi),$$

$$\frac{\partial \log \theta}{\partial \log \sigma} = \frac{1}{\sigma^2(\alpha\, - 1)}\ \frac{1}{\frac{1}{\theta/\rho} + 1}\left(\ln\left(\frac{\mathrm{w}_0}{\xi}\right) - \frac{1}{\alpha - 1}\right) \qquad \textbf{(10)}$$

First of all, it can be easily seen that the elasticity in equation (10) has a negative sign since $\xi \geq \mathrm{w}_0$, and $\alpha = 1/\sigma > 2$. The parameter value θ/ρ is likely to have a large value. Since θ is the probability of re-employment, suppose that average length of unemployment duration is 6 months then $\theta = 2$. Further, ρ is the discount rate. If we assume that the discount rate is 20%, $\rho = 0.2$ and θ/ρ is 10. The ratio θ/ρ has another interpretation as the ratio of the gap between reservation wage and non-labor income to the gap between expected wage and reservation wage. That is,

$$\frac{\theta}{\rho} = \frac{\xi - b}{x - \xi}$$

Since the gap between reservation wage and non-labor income should be greater than the gap between the expected wage and the reservation wage, the ratio θ/ρ is likely to have a large value. If not, a worker would not have a strong incentive to find a job. Lancaster and Chesher estimates the ratio between 3.2 and 3.5 (Table A-3 and A-4, p.1676). For simplicity, I assume that the ratio is approximately 3.3.

Since w_0 is the lower bound of wage distribution, under the assumption that the wage offer distribution is a Pareto family, I cannot estimate w_0. For simplicity I assume that $w_0 = \xi$. Under these set of assumptions, I obtain an elasticity estimate of 0.116 when $\sigma = 0.13$, as Lancaster and Chesher estimated.

But the Korean data on wage distribution suggests a much larger value of σ which is approximately 0.35. With these values I obtain elasticity estimates of approximately 0.5. Further assume that θ/ρ has a very large value, then I obtain elasticity estimates of approximately 0.6 as given below. With such elasticity values, the effect of increase in wage distribution variance on unemployment duration is estimated as small values in the magnitudes of 2 to 4%, which is much smaller than the total actual increase. But a large value of σ magnifies the effect of decrease in job offer arrival rates. Given $\sigma = 0.33$ and $\partial \log \xi / \partial \log \lambda = 0.1$, the elasticity of duration length with respect to $\lambda = 0.7$ and a 30% decrease would have generated a 20% increase in unemployment duration!

TABLE. 5. STANDARD DEVIATION OF REAL HOURLY WAGE DISTRIBUTION: 1995-2010

	Men 25~29			Men 30~34		
	1995	2000	2010	1995	2000	2010
Coefficient of variation	0.29	0.35	0.41	0.34	0.43	0.48
Standard deviation σ	0.32	0.34	0.35	0.33	0.35	0.36
Elasticity *	0.44	0.58	0.61	0.55	0.61	0.65
$\Delta\sigma(\%)$	-	6.2	3.1	-	3.1	3.1
$\Delta\theta(\%)$	-	-3.6	-1.9	-	-1.9	-2.0

Notes: * derived under the assumption that $\theta/\rho = 10$.

Source: Author's calculation from the Ministry of Employment and Labor, Survey on Labor Conditions by Types of Employment data sets.

V. Comments and Directions of Future Research

Under an ideal data condition, both the wage offer and duration distribution is fully identified. Eckstein and van den Berg give the following joint density function of wage and duration (w_i, τ_i). (equation 6)

$$\mathrm{P}(\tau_i, w_i) = g(\tau_i) f(w_i | w_i > w^*) = (1 - F(w^*)\, e^{-\lambda(1-F(w^*))\tau_i} \lambda \frac{f(w_i)}{1 - F(w^*)}$$

However, given the data conditions and considering the changes in the labor market during the decade, I believe that an analytical approach is more fruitful in analyzing the causes of youth employment rate drop. As we see from the real world events, the youth tends to have short and temporary jobs recently with shorter unemployment durations compared with a decade ago while their employment rate continues to drop.

The job search model implies that the youth employment rate drop can be explained as a result of optimizing behavior on the part of the youth rather than a 'mismatch' given the supply and demand conditions of the labor market. A jobless young man may have a high reservation wage and invest in his own skills not because he is unwilling to get a mediocre job but because he is optimizing his job search behavior under the conditions bestowed to him.

In this paper, I tried to use the standard job search models of Lancaster-Chesher and Eckstein-van den Berg and derive whether parameter changes can explain the employment rate drop among the young men in the 2000s. A preliminary and rough calculation shows that out of the 30% drop, about 20% can be explained by the decreased level of business growth dynamism and the remaining 10% may be the result of widened wage distribution. Such a result heavily depends upon the distributional assumption that Lancaster and Chesher used – that is, the wage offer distribution belongs to a Pareto family. Mortensen (1986) mentions that the effects of wage dispersion on re-employment probability is generally uncertain (p.865) but this is a very general result in a nonparametric context. If the wage distribution is nested in a parametric family of distribution it is likely that the growth of wage variance have contributed to the youth employment rate drop in Korea in the 2000s. Bae(2014) in fact presents an empirical evidence that can support such a claim. He finds that a widening wage gap did have extended job

search spells of the youth. In a practical sense, I think it is sufficient to show the negative elasticity of re-employment probability with respect to wage distribution variance since we do know that wage distributions can be approximated by a mixture of normal distributions. Still, I think that a more careful empirical work is needed in wage distribution parameters and reservation wages. So far, I find that survey data on reservation wages are very imprecise. Some surveys report very low reservations wages and other report reservation wages as high as the mean wages.

However, the search model analysis gives us a very clear policy implications. In order to mitigate youth employment problem, business growth dynamism need to be enhanced and quality jobs need to be created so that the wage distribution a job seeker is faced with can be narrowed. The policy directions implies a concrete set of policies. I think such is the benefit of taking an analytical approach to the youth unemployment problem.

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