Does Learning Matter for Wages in Korea? International Comparison of Wage Returns to Adult Education and Training[†]

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This study compares the wage equation in Korea to those in other countries, focusing on the wage returns to adult education and training (AET) participation. It is found that the wage compensation structure in Korea is associated mainly with job characteristics such as tenure and workplace size rather than with worker characteristics such as AET participation and cognitive abilities. It is also found that Korea's AET participation is skewed toward non-job-related AET, relative to the situations in other countries. These findings imply that the link between a worker's productivity and wage should be strengthened in order to incentivize workers to invest in AET relevant to the labor market.

Key Word: Adult Education and Training, Lifelong Learning, Wage Education. Skills
JEL Code: J24, J31, P46

I. Introduction

In recent years, there has been growing interest in subsidizing adult education and training (henceforth AET) to facilitate individuals' efforts to adapt to the rapid technological progress. For example, the French government has implemented what is termed the Compte Personnel de Formation (Individual Learning Account when translated into English) since 2015, where a certain amount to be spent on training expenses is deposited annually to all workers and to the unemployed. The Singapore government has also promoted their SkillsFuture Credit since 2016, which provides all citizens over the age of 25 with a learning voucher. According to data from the OECD (2019), similar programs, albeit on a smaller scale, are in place in a number of advanced economies, including the U.S., Germany, and Scotland in the U.K.

The ongoing digital transformation by COVID-19 and the resulting labor market mobility are expected to reinforce the argument for subsidizing AET participation. Indeed, Korea's AET legislation (the Lifelong Education Act and the Workers Vocational Competency Development Act) was amended in 2021 to allow the government to offer financial support for AET participation to all adult citizens. However, before considering the expansion of financial support, it is necessary to examine whether and the degree to which AET participation is compensated for in the labor market. Human capital theory predicts that the wage return to education and training is a major factor determining a worker's participation in such programs. To the extent that AET participation is less valued in the labor market, expanding government support for it may result in subsidizing education and training that are less relevant to the labor market.

This study estimates and compares the wage returns to AET participation in Korea relative to those in other countries. For the purpose, the study employs data from the OECD Survey of Adult Skills, designed to measure the cognitive skills of nationally representative groups 16 to 65 years old across countries, collecting various types of information about the respondents, including their education and training history and their labor market outcomes. This feature of the dataset allows the mitigation of the potential ability bias problem when estimating the wage returns to AET participation by directly controlling for the respondents' cognitive abilities as measured in the survey. Using the data, I find evidence that Korea's true wage return to AET participation is likely negligible and that the wage compensation structure in Korea is primarily determined by job tenure and workplace size relative to those in other major countries such as the U.S., Japan, and Germany.

This study contributes to the literature (e.g., Hanushek *et al*., 2015; Lee *et al*., 2015; Kim, 2019) on estimating wage equations by country with its use of data from the OECD Survey of Adult Skills. Although previous studies focused on estimating the wage returns to cognitive skills as measured in the survey, the present study mainly examines wage returns to AET participation, which has not been discussed in the literature. Additionally, this study employs a range of information pertaining to worker characteristics (e.g., type of employment contract, workplace size, and years of tenure) when estimating wage equations, unlike previous studies that focused exclusively on basic worker characteristics such as age, gender, years of schooling, and years of labor market experience. Estimating wage equations with extended worker characteristics enables a unique comparison of Korea's wage compensation structure with those of other countries; such a comparison may have important policy implications but remains unreported thus far in the literature.

The remainder of this paper proceeds as follows. Chapter II introduces the OECD Survey of Adult Skills and defines the samples and variables used in the analysis. Chapter III compares AET participation rates and wage returns to AET participation as well as the determinants of AET participation in Korea with those in other countries. Chapter IV summarizes the results and draws conclusions based on them.

II. Data

The data for this study are from the OECD Survey of Adult Skills, which is a

cross-sectional survey of nationally representative samples of the 16-to-65-year-old population in 33 countries, including Korea. The survey was conducted in 24 countries, including Korea from August of 2011 to March of 2012, followed by an additional survey in nine countries from April of 2014 to March of 2015. In this study, all 33 countries are analyzed, but detailed regression analysis results are presented only for four major countries (Korea, the U.S., Japan, and Germany).[1]

Although the main objective of the OECD Survey of Adult Skills is to measure cognitive skills such as literacy, numeracy, and the computer-based problem-solving skills of the adult population,[2] it also collects data on respondents' demographic backgrounds, educational attainment, job characteristics, and labor market outcomes.[3] This allows valid estimates of the wage returns to AET participation after controlling for various characteristics that may affect wages, including a worker's cognitive abilities, for a representative sample of each country.

The sample for this study is restricted in the following way. Initially, a total of 208,620 individuals were observed in the OECD Survey of Adult Skills data. Among them, I dropped 28,383 individuals who were still in their first cycle of formal school education as of the survey date. In other words, I restricted the sample to the adult education/training population (or AET population) defined by the survey. In addition, I removed 1,378 individuals for whom the key variables of this study, AET participation status and corresponding job relevance, are missing. The resulting sample consists of 178,859 individuals.

Table 1 presents descriptive statistics of the sample for this study. The main variable of interest is the AET participation status or whether the respondent participated in education or training within the last 12 months. The variable covers not only formal courses for the purpose of obtaining degrees or certificates but also informal courses such as open and distance education, on-the-job training, seminars and workshops, and other courses and private lessons. According to Table 1, approximately 44.7% of the respondents reported that they had participated in education and/or training within the last 12 months. For those who thus responded positively (i.e., that they had participated in education (or training) courses within the last 12 months), the survey inquired further as to whether the courses were job-related.[4] Job relevance was assessed to determine whether the main content of the participated education and/or training is to improve one's employability and/or job performance, not necessarily related to a specific job. Table 1 also shows that approximately 37.3% of the respondents reported that they had participated in job-related courses, while about 7.4% reported their participation in non-job-related education.

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[1] The OECD Survey of Adult Skills is a biennial survey. The second round of the survey will begin in 2022. This study has a limitation in that it relied on data from the first round of the survey, which is the most recently available data but which may not accurately reflect the current state of the labor market in each country, including Korea.

[2] In that sense, the OECD Survey of Adult Skills can be understood as an extension of the OECD Program for International Student Assessment (PISA), which measures academic achievement in the areas of reading, math, and science of 15-year-olds in major countries.

[3] As of today, to the best of the author's knowledge, the OECD Survey of Adult Skills is the only data source that collects education history and labor market outcomes across countries in a consistent manner.

[4] The OECD Survey of Adult Skills only queries participants about the job-relevance of AET participation only in relation to the last act of participation among those reported by them. Due to this survey structure, job-related AET participation and non-job-related AET participation are mutually exclusive in the data used here.

TABLE 1—SUMMARY STATISTICS

Variables (units)	N	Mean	SD
Adult education and training (yes=1)	178,859	0.447	0.497
Job-related AET	178,859	0.373	0.484
Non-job-related AET	178,859	0.074	0.262
Hourly wage (log)	101,513	3.851	2.095
Female (yes=1)	178,859	0.506	0.500
Age (years)	178,859	42.97	12.46
Schooling (years)	176,847	12.62	3.430
Numeracy score (10 percentile scores)	178,809	4.846	2.911
Tenure (years)	109,659	9.016	9.435
Permanent contract (yes=1)	107,465	0.624	0.484
Public sector (yes=1)	128,069	0.211	0.408
Workplace size (yes=1)			
10 workers or less	108,987	0.247	0.431
11~50 workers	108,987	0.293	0.455
51~250 workers	108,987	0.237	0.425
251~1,000 workers	108,987	0.130	0.336
1,001 workers or more	108,987	0.094	0.292
Occupation (yes=1)			
Armed forces	126,409	0.005	0.071
Senior officials & managers	126,409	0.086	0.280
Professionals	126,409	0.186	0.389
Technicians & associate professionals	126,409	0.152	0.359
Clerks	126,409	0.092	0.289
Service workers & Sales workers	126,409	0.186	0.389
Skilled agricultural & fishery workers	126,409	0.020	0.141
Craft & related trades workers	126,409	0.116	0.320
Machine operators & assemblers	126,409	0.082	0.274
Elementary occupations	126,409	0.076	0.264
Industry (yes=1)			
Agriculture, forestry & fishing	126,034	0.027	0.163
Mining & quarrying	126,034	0.005	0.073
Manufacturing	126,034	0.158	0.365
Electricity, gas, & steam supply	126,034	0.007	0.086
Water, sewerage, & waste	126,034	0.007	0.082
Construction	126,034	0.075	0.263
Wholesale & retail trade	126,034	0.134	0.340
Transportation & storage	126,034	0.057	0.231
Accommodation & food service	126,034	0.047	0.212
Information & communication	126,034	0.035	0.184
Financial & insurance	126,034	0.034	0.181
Real estate	126,034	0.010	0.101
Professional, scientific & technical	126,034	0.048	0.213
Administrative & support service	126,034	0.045	0.208
Public administration & defense	126,034	0.066	0.249
Education	126,034	0.081	0.273
Health & social work	126,034	0.110	0.313
Arts, entertainment & recreation	126,034	0.017	0.130
Other service	126,034	0.028	0.165
Households as employers	126,034	0.007	0.083
Extraterritorial organizations & bodies	126,034	0.000	0.011

Note: 1) The units of each variable are indicated in parentheses, 2) All statistics are calculated using sampling weights.

Source: Data from the OECD Survey of Adult Skills.

The other variables used in this study include each respondent's hourly wage (in natural log), gender, age, years of schooling, cognitive ability measure (numeracy score), years of current employer tenure, employment contract type (permanent or temporary), sector (public or private), workplace size (five categories), occupation (ten categories), and industry (21 categories). The numeracy score, measured by a test in the survey, was used as a proxy for a respondent's cognitive ability. This study sets the unit of the numeracy score to 10 percentile scores computed within the respondent's own country. When estimating the wage returns to adult education and training, I further restricted the sample to 98,115 workers for whom hourly wages and all of the characteristics in Table 1 could be observed. Descriptive statistics for the restricted sample are presented in Table A1 in the appendix.

III. Empirical Analysis

A. *Adult Education and Training (AET) Participation Rates*

Before estimating the wage returns to the AET participation, I begin by comparing the AET participation rates by country. Columns (1), (2), and (3) of Table 2 present the participation rates of all AET, job-related AET, non-job-related AET, respectively. Numbers in square brackets in each column indicate the ranking of a given country out of all 33 countries. Column (4) in Table 2 indicates the number of observations for each country. The countries in Table 2 are arranged in descending order of their AET participation rates in column (1). All statistics in Table 2 were computed using the sampling weights of the OECD Survey of Adult Skills.

Column (1) in Table 2 shows that Anglo-Saxon and Scandinavian countries tend to have high AET participation rates. New Zealand (66.8%) has the highest AET participation rate among the 33 countries, followed by Denmark (66.1%) and Finland (65.9%). On the other hand, the AET participation rates in eastern and southern European countries are relatively low. Russia (19.9%) has the lowest rate, followed by Greece (20.5%), Turkey (22.8%), and Italy (24.3%). The AET participation rate of Korea is 50.0%, placing Korea 16th among the 33 countries, similar to the rate of Israel (50.4%) and Austria (48.8%).

Comparing columns (2) and (3) of Table 2, it can be seen that Korea's AET participation tends to be biased toward non-job-related AET. In Korea, 38.0% of the Respondents reported that they had participated in job-related AET, ranking the country 21st out of the 33 countries. On the other hand, 12.0% reported that they had participated in non-job-related AET, second highest out of the 33 countries. To summarize the results in Table 2, AET participation of Korea, relative to the rates of other countries, tends to be skewed toward AET with low job relevance. Table A2 in the appendix shows replicated results relative to those in Table 2 for the restricted sample of 98,115 workers for which the wage equations are estimated in the following sub-section. The results in Table A2 also confirm that AET participation by Korean workers is skewed toward non-job-related AET.

TABLE 2—ADULT EDUCATION AND TRAINING (AET) PARTICIPATION RATE

	AET		Job-related AET		Non-job-related AET		N
New Zealand	0.668	[1]	0.574	[2]	0.094	[9]	5,266
Denmark	0.661	[2]	0.580	[1]	0.081	[15]	6,519
Finland	0.659	[3]	0.553	[4]	0.106	[8]	4,834
Sweden	0.653	[4]	0.525	[6]	0.129	[1]	3,878
Netherlands	0.643	[5]	0.529	[5]	0.114	[5]	4,449
Norway	0.638	[6]	0.560	[3]	0.078	[16]	4,198
United State	0.596	[7]	0.505	[7]	0.090	[11]	4,326
Canada	0.576	[8]	0.487	[9]	0.089	[13]	23,711
Singapore	0.566	[9]	0.478	[11]	0.088	[14]	4,560
England (UK)	0.556	[10]	0.489	[8]	0.066	[23]	4,706
Australia	0.550	[11]	0.484	[10]	0.065	[25]	6,815
Germany	0.531	[12]	0.457	[12]	0.074	[19]	4,611
Estonia	0.527	[13]	0.417	[15]	0.110	[6]	6,634
Ireland	0.505	[14]	0.430	[13]	0.074	[18]	5,414
Israel	0.504	[15]	0.388	[20]	0.116	[3]	4,444
Korea	0.500	[16]	0.380	[21]	0.120	[2]	5,783
Czech Republic	0.488	[17]	0.422	[14]	0.067	[22]	4,949
Austria	0.488	[18]	0.398	[17]	0.090	[12]	4,474
Northern Ireland (UK)	0.487	[19]	0.415	[16]	0.071	[20]	3,409
Belgium	0.482	[20]	0.390	[19]	0.092	[10]	4,316
Slovenia	0.481	[21]	0.365	[22]	0.116	[4]	4,623
Chile	0.471	[22]	0.394	[18]	0.077	[17]	4,481
Spain	0.462	[23]	0.353	[23]	0.109	[7]	5,332
Japan	0.419	[24]	0.352	[24]	0.068	[21]	4,646
Cyprus	0.376	[25]	0.316	[25]	0.060	[27]	3,964
France	0.358	[26]	0.316	[26]	0.042	[30]	6,167
Poland	0.351	[27]	0.287	[28]	0.064	[26]	6,361
Lithuania	0.334	[28]	0.274	[29]	0.059	[28]	4,626
Slovak Republic	0.328	[29]	0.292	[27]	0.036	[33]	4,955
Italy	0.243	[30]	0.201	[30]	0.042	[32]	4,254
Turkey	0.228	[31]	0.162	[32]	0.066	[24]	4,742
Greece	0.205	[32]	0.162	[31]	0.042	[29]	4,449
Russian Federation	0.199	[33]	0.157	[33]	0.042	[31]	2,963
Total	0.447		0.373		0.074		178,859

Note: 1) Countries are listed in descending order of the adult education and training (AET) participation rate, 2) Numbers in brackets denote the ranking of a given country's AET participation rate among the 33 countries listed.

Source: Data from the OECD Survey of Adult Skills.

B. *Estimating Wage Returns to the AET Participation*

In order to estimate the wage returns to AET participation across countries, I consider the following regression equation:

$$(1) \qquad \ln(wage_{ic}) = \beta_0 + \beta_1 AET_{ic} + X_{ic}\gamma + \delta_c + \varepsilon_{ic}$$

where $\ln(wage_{ic})$ indicates the natural logarithm of the hourly wage rate of worker i in country c, AET_{ic} is an indicator for whether worker i reported any

participation in AET within the last 12 months,[5] X_{ic} denotes a vector of covariates of worker i, in this case gender, age, years of schooling, years of current employer tenure, a dummy for permanent-contract worker, numeracy scores in units of ten percentile scores within country c, a dummy for public-sector worker, a list of dummies for the size of the workplace (less than ten workers, 11~250 workers, 251~1000 workers, 1001 workers or more), a list of dummies for ten occupation categories, and a list of dummies for 21 industry categories. δ_c represent a list of dummies for each country c, or country fixed effects. Finally, ε_{ic} is an error term.

β_1 in equation (1) identifies the difference in log hourly wages between those who participated in AET and those who did not participate in AET within country c, controlling for the worker characteristics included in X_{ic}. I estimate equation (1) with the ordinary least square (OLS) method, clustering standard errors at the country level.

The estimation result of equation (1) is summarized in column (1) of Table 3. I found that AET participation is associated with a 7.0% increase in hourly wages, conditional on the country and the worker characteristics. Columns (2) to (5) of Table 3 show the estimation results of equation (1) for Korea and for the three major countries of the U.S., Japan, and Germany, respectively. The estimated wage return to AET participation is 11.4% in Korea, which is higher than those of the 33 countries (7.0%) higher than Germany (8.0%), and similar to that of Japan (11.3%). The estimated wage return to AET participation in the U.S. is statistically insignificant.

Figure 1 shows the distribution of the β_1 estimates in equation (1) across all 33 countries, including the four major countries analyzed in Table 3. Korea's estimate (0.114) is denoted by the vertical line. It can be seen that the estimate for Korea is located in the upper part of the distribution. This suggests that Korea's estimated wage return to AET participation tends to be larger than those of other countries.

Although equation (1) controls for various worker characteristics, including a worker's cognitive ability, there may be unobserved factors that affect both hourly wages and AET participation. This can lead to selection bias in β_1 in equation (1). In other words, based on the estimation results in Table 3, it is difficult to distinguish whether AET participation increases hourly wages or whether high- wage workers are more likely to participate in AET than low-wage workers.

Considering the potential endogenous selection into AET participation, I estimate the following regression equation:

$$(2) \qquad \ln(wage_{ic}) = \theta_0 + \theta_1 AETJR_{ic} + \theta_2 AET_{ic} + X_{ic}\pi + \rho_c + \omega_{ic}$$

where $AETJR_{ic}$ is an indicator for whether worker i reported that he or she had participated in job-related AET within the last 12 months. All other variables and the parameters in equation (2) are defined as those in equation (1). Unlike equation (1), equation (2) includes $AETJR_{ic}$ as an additional explanatory variable. With the inclusion of $AETJR_{ic}$, θ_2 in equation (2) identifies the difference in log hourly

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[5]It should be noted that equation (1) ignores differences in AET intensity (e.g., duration), quality, or any other AET experience longer than 12 months ago.

TABLE 3—WAGE RETURNS TO AET PARTICIPATION

Country	(1) All	(2) Korea	(3) U.S.	(4) Japan	(5) Germany
AET	0.070*** (0.012)	0.114*** (0.029)	-0.013 (0.031)	0.113*** (0.026)	0.082*** (0.019)
Female	-0.125*** (0.016)	-0.219*** (0.032)	-0.075 (0.047)	-0.252*** (0.030)	-0.072*** (0.022)
Age	0.005*** (0.001)	0.004** (0.002)	0.007*** (0.001)	0.003** (0.001)	0.004*** (0.001)
Schooling	0.031*** (0.003)	0.032*** (0.006)	0.043*** (0.007)	0.015*** (0.005)	0.033*** (0.006)
Tenure	0.009*** (0.001)	0.020*** (0.002)	0.008*** (0.002)	0.010*** (0.002)	0.010*** (0.001)
Permanent	0.051*** (0.012)	0.098*** (0.027)	0.026 (0.027)	0.156*** (0.030)	0.216*** (0.037)
Numeracy	0.023*** (0.002)	0.008 (0.005)	0.027*** (0.007)	0.022*** (0.005)	0.022*** (0.004)
Public	-0.073*** (0.018)	-0.053 (0.040)	-0.067 (0.042)	0.019 (0.057)	0.069** (0.029)
11~50 workers	0.071*** (0.018)	-0.005 (0.034)	0.108*** (0.039)	0.061* (0.036)	0.059* (0.035)
51~250	0.121*** (0.013)	0.050 (0.040)	0.189*** (0.039)	0.123*** (0.035)	0.139*** (0.034)
251~1,000	0.198*** (0.026)	0.076 (0.048)	0.290*** (0.085)	0.216*** (0.040)	0.217*** (0.037)
1,001 or more	0.284*** (0.020)	0.256*** (0.048)	0.348*** (0.051)	0.282*** (0.065)	0.332*** (0.039)
Occupation	Y	Y	Y	Y	Y
Industry	Y	Y	Y	Y	Y
Country	Y	N	N	N	N
Observations	98,155	2,961	2,249	3,127	3,081
R-squared	0.923	0.321	0.418	0.285	0.473

Note: 1) The dependent variable is the natural logarithm of hourly wage, 2) All statistics are calculated using sampling weights, 3) Robust standard errors are in parentheses, 4) In column (1), country fixed effects are additionally controlled and the standard errors are clustered at the country level.

Source: Data from the OECD Survey of Adult Skills.
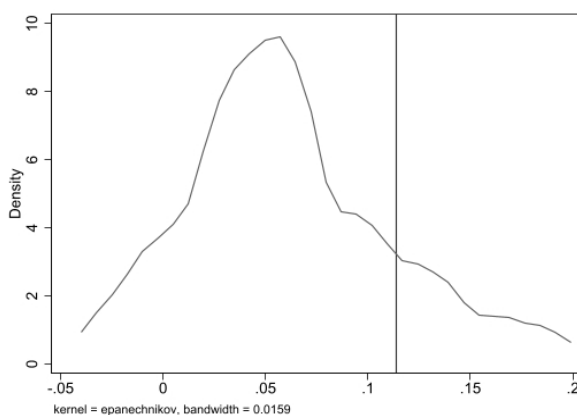

FIGURE 1. DISTRIBUTION OF WAGE RETURNS TO AET PARTICIPATION ACROSS 33 COUNTRIES

Note: The wage return estimate in Korea (0.114) is indicated by the vertical line.

Source: Data from the OECD Survey of Adult Skills.

wages between those who participated in *non-job-related* AET and those who did not participate in any type of AET within country c, controlling for the worker characteristics in X_{ic}, θ_1 in equation (2) identifies the difference in log hourly wages between those who participated in *job-related* AET and those who participated in *non-job-related* AET after controlling for the other covariates. Put differently, θ_1 refers to the additional wage returns that receiving *job-related* AET has over *non-job-related* AET participation. It may be reasonable to assume that receiving *job-related* AET will be better compensated in terms of wages than *non-job-related* AET in the labor market. Thus, if AET indeed causally increases hourly wages, any potential wage effect of *job-related* AET would be greater than that of *non-job-related* AET, and thus θ_1 is likely to be positive. In other words, a finding that θ_1 is close to zero for a given country suggests that the true wage return to AET participation is likely negligible for that country.

Column (1) of Table 4 summarizes the estimation results of equation (2) for the

TABLE 4—WAGE RETURNS TO AET PARTICIPATION BY JOB RELEVANCE

Country	(1) All	(2) Korea	(3) U.S.	(4) Japan	(5) Germany
AET, job-related	0.088***	-0.006	0.113***	0.028	0.074**
	(0.023)	(0.039)	(0.042)	(0.050)	(0.030)
AET	-0.008	0.119***	-0.114**	0.089*	0.016
	(0.030)	(0.044)	(0.047)	(0.050)	(0.033)
Female	-0.123***	-0.219***	-0.072	-0.251***	-0.068***
	(0.026)	(0.032)	(0.047)	(0.030)	(0.022)
Age	0.005***	0.004**	0.007***	0.003**	0.004***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Schooling	0.031***	0.032***	0.043***	0.015***	0.032***
	(0.004)	(0.006)	(0.007)	(0.005)	(0.006)
Tenure	0.008***	0.020***	0.008***	0.010***	0.010***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.001)
Permanent	0.050	0.098***	0.025	0.156***	0.215***
	(0.035)	(0.027)	(0.027)	(0.030)	(0.037)
Numeracy	0.023***	0.008	0.027***	0.022***	0.022***
	(0.002)	(0.005)	(0.007)	(0.005)	(0.004)
Public	-0.073	-0.053	-0.065	0.020	0.070**
	(0.050)	(0.040)	(0.042)	(0.057)	(0.029)
11~50 workers	0.071***	-0.005	0.111***	0.061*	0.058*
	(0.010)	(0.034)	(0.039)	(0.036)	(0.035)
51~250	0.119***	0.050	0.190***	0.123***	0.138***
	(0.013)	(0.040)	(0.039)	(0.035)	(0.034)
251~1,000	0.196***	0.076	0.288***	0.216***	0.215***
	(0.025)	(0.048)	(0.085)	(0.040)	(0.037)
1,001 or more	0.282***	0.256***	0.350***	0.282***	0.330***
	(0.020)	(0.048)	(0.051)	(0.065)	(0.039)
Occupation	Y	Y	Y	Y	Y
Industry	Y	Y	Y	Y	Y
Country	Y	N	N	N	N
Observations	98,155	2,961	2,249	3,127	3,081
R-squared	0.923	0.321	0.420	0.285	0.474

Note: 1) The dependent variable is the natural logarithm of hourly wage, 2) All statistics are calculated using sampling weights, 3) Robust standard errors are in parentheses, 4) In column (1), country fixed effects are additionally controlled and the standard errors are clustered at the country level.

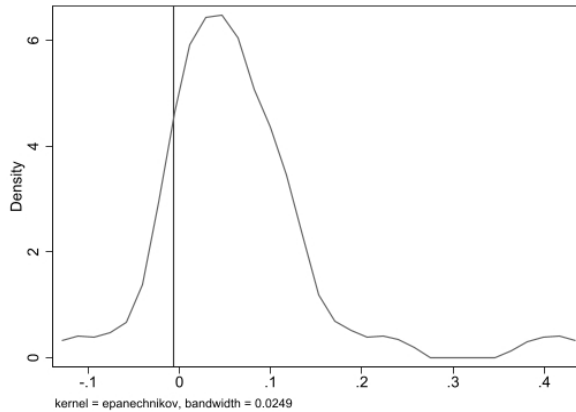*Source*: Data from the OECD Survey of Adult Skills.

FIGURE 2. DISTRIBUTION OF ADDITIONAL WAGE RETURNS TO JOB-RELATED AET PARTICIPATION OVER
NON-JOB-RELATED AET PARTICIPATION ACROSS 33 COUNTRIES

Note: The additional wage return estimate in Korea (-0.006) is indicated by the vertical line.

Source: Data from the OECD Survey of Adult Skills.

entire sample from 33 countries. The estimated θ_1 is -0.008 and is statistically insignificant, indicating that workers who received non-job-related AET earned as much as those who did not participate in any AET. On the other hand, the estimated θ_1 is 0.088 and statistically significant at the 1% level, implying that workers who received job-related AET earned about 8.8% more than those who participated in non-job-related AET. The fact that job-related AET is better compensated than non-job-related AET suggests that there is a positive wage return to AET participation.

The country-specific results in columns (3) to (5) for the U.S., Japan, and Germany also suggest that there are positive wage returns to AET participation in each of the three countries. The estimated values of θ_1, capturing the additional wage return to job-related AET over non-job-related AET, are all positive, despite the imprecise estimation for Japan. The size of the additional wage returns of receiving job-related AET over non-job-related AET is largest in the U.S. at 11.3%, with German also at 8.2%; in Japan, although statistically insignificant, at 2.8% the size is non-negligible.

In contrast, the result for Korea in column (2) reveals that there is no additional wage return of receiving job-related AET over non-job-related AET. The estimated θ_1 is -0.006, which is close to zero and statistically insignificant. This indicates that workers who received job-related AET earn just as much as workers who received non-job-related AET in Korea, which casts doubt on the existence of a positive wage return to AET participation in Korea.

Figure 2 presents the distribution of the θ_1 estimates in equation (2) across all 33 countries, with Korea's estimate (-0.006) represented by the vertical line. This figure shows that the estimate for Korea is relatively close to the bottom of the distribution, suggesting that the additional wage return on job-related AET participation over non-job-related AET participation in Korea is typically lower than in many other countries.

C. *Korea's Unique Wage Compensation Structure*

The estimation results in Table 4 also reveal several differences in the estimated wage equations between Korea and other countries. First, the estimated wage returns to job tenure in Korea are substantially greater than those of the major countries. It is estimated that an additional year of job tenure is associated with approximately a 2.0% increase in the hourly wage in Korea, more than double the corresponding amount for all 33 countries (0.8%) and in the U.S. (0.8%), Japan (1.0%), and Germany (1.0%).

Second, the estimated wage returns to cognitive ability (numeracy score) in Korea are substantially smaller than those of the other countries. When a worker's cognitive ability increases by ten percentile scores, hourly wages tend to increase by 2.7% in the U.S., 2.2% in Japan and Germany, and 2.3% in the 33 countries as a whole. On the other hand, there is no statistically significant increase in hourly wage in Korea. Third, the estimated wage returns to the workplace size in Korea show a more extreme pattern than those in other countries. Looking at the results for the 33 countries in column (1) of Table 4, hourly wages tend to increase gradually as the workplace size increases. Compared to the reference group of workers in workplaces with fewer than ten employees, the estimated wage returns to working in firms with eleven to 50 employees, those with 51 to 250 employees, those with 251 to 1,000 employees, and those with 1,001 or more employees are 7.1%, 11.9%, 19.6%, and 28.2%, respectively. Similar corresponding wage gap patterns according to the workplace size are confirmed in the cases of the U.S., Japan, and Germany. On the other hand, the results for Korea in column (2) show that only workers in workplaces with 1,001 or more employees show a statistically significant wage premium of 25.6% compared to the reference group, while the hourly wage levels of workers at smaller workplaces are statistically insignificant relative to those of the reference group.

D. *Characteristics of AET Participating Workers*

To summarize the main findings thus far, although Korea has a larger wage gap according to AET participation (Table 3), it is unclear whether AET participation in Korea causally increases hourly wages (Table 4). This suggests the possibility that high-wage workers tend to participate more actively in AET than low-wage workers in Korea. To compare the characteristics of workers participating in AET in Korea with the corresponding rates in other countries, I estimate the following regression equation:

$$(3) \qquad AET_{ic} = \alpha + X_{ic}\tau + \mu_c + \varphi_{ic}$$

where AET_{ic} and X_{ic} are correspondingly defined as in equations (1) and (2). μ_c and φ_{ic} are country fixed effects and the error term, respectively. I estimate equation (3) with the OLS method or the linear probability model, clustering standard errors at the country level.

Column (1) in Table 5 summarizes the OLS estimation results for the entire sample

from 33 countries. The results generally show that the AET participation rate is higher for men than for women, higher among the younger than the elderly, higher as the levels of education and cognitive skills increase, and higher among those employed in the public sector and/or large-sized workplaces. These results are generally consistent with economic theory or empirical findings. For example, human capital theory predicts that younger workers have a greater incentive to participate in education because they have a longer period to recoup the human capital investment. The theory also predicts that on-the-job training investments more commonly occur in stable employment relationships, often characterized as those in public sector and/or large enterprises. It has also been reported that college graduates are the most active AET participants in most countries (OECD, 2021).

The country-specific results in columns (2) to (5) in Table 5 reveal that Korea's AET participation is mainly associated with job characteristics, rather than worker characteristics, relative to other countries. First, permanent-contract workers in Korea are approximately 4% points more likely to participate in AET than temporary-contract workers, whereas no statistically significant difference was observed for the other major countries assessed here. Second, the gap in the AET

TABLE 5—DETERMINANTS OF AET PARTICIPATION

Country	(1) All	(2) Korea	(3) U.S.	(4) Japan	(5) Germany
Female	-0.023**	0.007	-0.019	-0.053**	-0.022
	(0.009)	(0.020)	(0.021)	(0.021)	(0.021)
Age	-0.004***	-0.004***	-0.001	-0.003***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Schooling	0.017***	0.031***	0.022***	0.025***	0.010**
	(0.003)	(0.004)	(0.005)	(0.005)	(0.005)
Tenure	0.001	0.005***	-0.001	0.002*	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Permanent	0.008	0.040**	-0.017	-0.001	-0.019
	(0.009)	(0.020)	(0.021)	(0.022)	(0.024)
Numeracy	0.016***	0.008**	0.021***	0.010***	0.020***
	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)
Public	0.035**	0.100***	0.062**	0.020	0.019
	(0.017)	(0.029)	(0.029)	(0.040)	(0.028)
Size: 11~50	0.059***	0.133***	0.037	0.054**	0.024
	(0.011)	(0.023)	(0.032)	(0.023)	(0.027)
51~250	0.106***	0.196***	0.070**	0.074***	0.107***
	(0.013)	(0.028)	(0.033)	(0.026)	(0.029)
251~1,000	0.133***	0.214***	0.050	0.120***	0.137***
	(0.025)	(0.031)	(0.037)	(0.033)	(0.032)
1,001 or more	0.161***	0.311***	0.099***	0.081**	0.139***
	(0.026)	(0.030)	(0.037)	(0.040)	(0.036)
Occupation	Y	Y	Y	Y	Y
Industry	Y	Y	Y	Y	Y
Country	Y	N	N	N	N
Observations	98,155	2,961	2,249	3,127	3,081
R-squared	0.234	0.302	0.198	0.172	0.215

Note: 1) The dependent variable is an indicator for AET participation within the last 12 months, 2) All statistics are calculated using sampling weights, 3) Robust standard errors are in parentheses, 4) In column (1), country fixed effects are additionally controlled and the standard errors are clustered at the country level.

Source: Data from the OECD Survey of Adult Skills.

participation rate between public and private sector workers tends to be substantially larger in Korea (about 10.0% points) than in the three major countries (about 6.2% points in the U.S.; statistically insignificant in Japan and Germany). Third, the disparity in AET participation rates by workplace size is significantly greater in Korea than in the three major countries. The gap in the AET participation rate between workplaces with more than 1,000 employees and those with ten or fewer employees amounts to approximately 31.1% points in Korea but only 9.9% points in the U.S., 8.1% points in Japan, and 13.9% points in Germany. Park (2019) argued that because government subsidies for AET in Korea are mainly financed by the Employment Insurance Fund, AET participation is biased toward permanent-contract workers in the public sector and at large corporations, where the employment insurance coverage rate is high. The finding that AET participation in Korea is largely concentrated among permanent-contract workers in the public sector and/or large-sized workplaces, as shown in Table 5, may be related to the country's AET financing structure, as indicated in Park (2019).

IV. Conclusion

There are three important findings from this study. First, AET participation in Korea tends to be skewed toward non-job-related AET relative to other countries. Second, the wage return to AET participation is unclear in Korea compared to other major countries such as the U.S., Japan, and Germany. It was also found that the wage structure in Korea is mainly linked to job characteristics such as job tenure and workplace size rather than to worker characteristics such as a worker's cognitive ability and his/her participation in AET, compared to the situations in the other major countries. Finally, the main participants in AET in Korea are permanent-contract workers in the public sector and/or at large-scale workplaces.

The wage compensation structure in Korea as observed in this study may explain why the country's AET participation lacks relevance to the labor market. Because job-related AET is not sufficiently compensated for in the labor market, a worker may not be fully incentivized to participate in job-related AET, leading to skewed participation in non-job-related AET. This implies that in order to incentivize workers to acquire knowledge and skills relevant to the rapidly changing labor market, it is not enough to expand financial support for AET alone; the link between worker productivity and labor market compensation, i.e., wages, must also be strengthened.

APPENDIX

TABLE A1—SUMMARY STATISTICS FOR THE RESTRICTED SAMPLE

Variables (units)	N	Mean	SD
Adult education and training (yes=1)	98,155	0.569	0.495
Job-related AET	98,155	0.506	0.500
Non-job-related AET	98,155	0.063	0.243
Hourly wage (log)	98,155	3.902	2.126
Female (yes=1)	98,155	0.463	0.499
Age (years)	98,155	41.20	11.44
Schooling (years)	98,155	13.29	3.120
Numeracy score (10 percentile scores)	98,155	9.012	9.403
Tenure (years)	98,155	0.635	0.481
Permanent contract (yes=1)	98,155	5.269	2.881
Public sector (yes=1)	98,155	0.248	0.432
Workplace size (yes=1)			
10 workers or less	98,155	0.232	0.422
11~50 workers	98,155	0.300	0.458
51~250 workers	98,155	0.243	0.429
251~1,000 workers	98,155	0.131	0.337
1,001 workers or more	98,155	0.094	0.292
Occupation (yes=1)			
Armed forces	98,155	0.005	0.072
Senior officials & managers	98,155	0.075	0.264
Professionals	98,155	0.196	0.397
Technicians & associate professionals	98,155	0.156	0.363
Clerks	98,155	0.103	0.304
Service workers & Sales workers	98,155	0.182	0.386
Skilled agricultural & fishery workers	98,155	0.009	0.092
Craft & related trades workers	98,155	0.109	0.312
Machine operators & assemblers	98,155	0.087	0.282
Elementary occupations	98,155	0.078	0.268
Industry (yes=1)			
Agriculture, forestry & fishing	98,155	0.014	0.118
Mining & quarrying	98,155	0.006	0.079
Manufacturing	98,155	0.175	0.380
Electricity, gas, & steam supply	98,155	0.008	0.091
Water, sewerage, & waste	98,155	0.007	0.085
Construction	98,155	0.065	0.247
Wholesale & retail trade	98,155	0.129	0.335
Transportation & storage	98,155	0.058	0.234
Accommodation & food service	98,155	0.046	0.208
Information & communication	98,155	0.036	0.185
Financial & insurance	98,155	0.034	0.181
Real estate	98,155	0.006	0.079
Professional, scientific & technical	98,155	0.042	0.200
Administrative & support service	98,155	0.043	0.202
Public administration & defense	98,155	0.076	0.265
Education	98,155	0.093	0.290
Health & social work	98,155	0.121	0.327
Arts, entertainment & recreation	98,155	0.014	0.118
Other service	98,155	0.022	0.146
Households as employers	98,155	0.005	0.068
Extraterritorial organizations & bodies	98,155	0.000	0.011

Note: 1) The units of each variable are indicated in parentheses, 2) All statistics are calculated using sampling weights.

Source: Data from the OECD Survey of Adult Skills.

TABLE A2—AET PARTICIPATION RATE FOR THE RESTRICTED SAMPLE

	AET		Job-related AET		Non-jon-related AET		N
Finland	0.777	[1]	0.687	[3]	0.090	[7]	3,120
New Zealand	0.767	[2]	0.699	[2]	0.069	[15]	3,129
Netherlands	0.764	[3]	0.671	[4]	0.093	[6]	2,849
Denmark	0.762	[4]	0.702	[1]	0.060	[24]	4,156
Sweden	0.740	[5]	0.628	[9]	0.113	[2]	2,706
England (UK)	0.727	[6]	0.670	[5]	0.057	[25]	2,406
Norway	0.723	[7]	0.658	[6]	0.065	[19]	2,679
United State	0.706	[8]	0.633	[8]	0.072	[13]	2,249
Australia	0.697	[9]	0.642	[7]	0.055	[26]	4,078
Northern Ireland (UK)	0.687	[10]	0.616	[10]	0.071	[14]	1,585
Canada	0.682	[11]	0.606	[11]	0.076	[12]	14,204
Singapore	0.660	[12]	0.581	[13]	0.079	[10]	3,085
Ireland	0.651	[13]	0.590	[12]	0.061	[22]	2,668
Estonia	0.641	[14]	0.537	[16]	0.104	[4]	3,755
Czech Republic	0.626	[15]	0.559	[14]	0.067	[18]	2,454
Israel	0.625	[16]	0.507	[19]	0.118	[1]	2,206
Korea	0.604	[17]	0.506	[20]	0.098	[5]	2,961
Germany	0.604	[18]	0.541	[15]	0.063	[21]	3,081
Spain	0.602	[19]	0.515	[18]	0.087	[9]	2,367
Slovenia	0.592	[20]	0.486	[23]	0.106	[3]	2,182
Austria	0.591	[21]	0.504	[21]	0.087	[8]	2,696
Chile	0.588	[22]	0.528	[17]	0.060	[23]	2,153
Belgium	0.577	[23]	0.501	[22]	0.077	[11]	2,610
Poland	0.507	[24]	0.439	[25]	0.067	[16]	3,114
Japan	0.496	[25]	0.443	[24]	0.053	[28]	3,127
Cyprus	0.485	[26]	0.439	[26]	0.046	[29]	2,071
Slovak Republic	0.468	[27]	0.430	[27]	0.038	[31]	2,429
France	0.458	[28]	0.428	[28]	0.030	[32]	3,524
Lithuania	0.441	[29]	0.377	[29]	0.063	[20]	2,648
Turkey	0.427	[30]	0.360	[30]	0.067	[17]	1,448
Greece	0.371	[31]	0.316	[31]	0.055	[27]	1,187
Italy	0.335	[32]	0.306	[32]	0.029	[33]	1,816
Russian Federation	0.270	[33]	0.230	[33]	0.040	[30]	1,412
Total	0.569		0.506		0.063		98,155

Note: 1) Countries are listed in descending order of the adult education and training (AET) participation rate, 2) Numbers in brackets denote the ranking of a given country's AET participation rate among the 33 countries listed.

Source: Data from the OECD Survey of Adult Skills.

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