

The Effects of Education Voucher Support for Low-income Adults*

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We examine the causal effects of providing education vouchers to low-income adults in South Korea in 2021. Using a lottery-based assignment mechanism and controlling for various pretreatment characteristics, we find that the KRW 350,000 voucher per participant increased course participation by 24.5 percentage points particularly in vocational, humanities, and art/physical education courses. While the voucher did not significantly impact labor market outcomes, it significantly enhanced nonlabor market outcomes, including social trust, health-related behaviors, subjective well-being, and job-related attitudes. These findings suggest the potential of adult continuing education for low-income populations to have various nonlabor market benefits.

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I. Introduction

Education is widely recognized to enhance individuals' earnings (e.g., Card, 1999), drive economic growth (e.g., Barro, 1997), and generate various nonpecuniary benefits, such as improved health (e.g., Grossman and Kaestner, 1997), increased civic engagement (e.g., Milligan, Moretti, and Oreopoulos, 2004), reduced crime rates (e.g., Lochner and Moretti, 2004), and strengthened social

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capital (e.g., Helliwell and Putnam, 2007). While extensive research has documented the benefits of education, most studies have focused on formal schooling during childhood and adolescence. By contrast, relatively little attention has been given to adult continuing education or lifelong learning despite its growing importance in today's rapidly changing labor markets and aging societies (OECD, 2021).

This study addresses the gap in the literature by estimating the causal effects of education vouchers for low-income adults on course participation, labor market outcomes, and nonlabor market outcomes. We focus on the 2021 Lifelong Education Voucher Program (LEVP), which was introduced by the Ministry of Education in Korea to support adult continuing education for low-income populations. Under this program, eligible participants received vouchers worth KRW 350,000 to cover tuition and material costs for adult continuing education programs. A subset of these vouchers was allocated through a randomized lottery.

Comparing lottery-based voucher recipients and nonrecipients while controlling for various pretreatment characteristics, we find that the vouchers increased course participation by approximately 24.5 percentage points particularly in vocational, humanities, and arts/physical education programs. While labor market outcomes, such as employment and labor force participation, had no statistically significant effects, the vouchers led to significant improvements in nonlabor market outcomes, including social trust, health-related behaviors, subjective well-being, and job-related attitudes.

This study makes two significant contributions to the economic literature. First, it expands the understanding of the social benefits of adult continuing education, which is an underexplored area compared with the extensive research on formal schooling. While prior studies (e.g., Lochner, 2011; Oreopoulos and Salvanes, 2011) have highlighted the nonproduction benefits of education, such as crime reduction, improved health, and increased civic participation, these findings are primarily based on formal education during childhood and adolescence. We examine the effects of an adult education voucher program to provide empirical evidence on whether these benefits extend to nonformal education for low-income adults.

Second, this study offers insights into the effectiveness of policies that promote lifelong learning, which have gained prominence in recent years. Governments in many countries have implemented education voucher programs to encourage adult continuing education (OECD, 2019). South Korea has similarly emphasized lifelong learning through legislative reforms, such as the 2021 amendments to the Lifelong Education Act and the Act on the Development of Workers' Vocational Skills. However, empirical evidence on the outcomes of such programs remains limited. Notable exceptions include an education voucher field experiment by Schwerdt et al. (2012) in Switzerland and a training voucher field experiment by

Hidalgo et al. (2014) in the Netherlands.¹ This study builds on this literature by providing new evidence from Korea and focusing on a real-world policy implementation rather than experimental settings.

II. Literature Review

This section summarizes two studies that are closely related to the current one given that both works analyze the causal effects of education vouchers for adults using random assignment.

In a collaboration with the Swiss government, Schwerdt et al. (2012) conducted a field experiment that involved distributing lifelong learning vouchers to a representative sample of 2,437 Swiss individuals aged 20–60. The randomly assigned vouchers, which were valued at 200, 750, or 1,500 Swiss francs, could be freely used for any educational purpose within a six-month period. The study found that the voucher recipients' learning participation increased by 12.9 percentage points in 2006, thus reflecting a 30% rise over the prevoucher participation rate of 43%. However, only 18.4% of recipients used the vouchers: approximately 30% of these users would have pursued learning activities even without the voucher, thus suggesting crowding out private expenditures. The effect was pronounced among women and highly educated individuals but did not produce long-term impacts on employment or wages, thereby indicating a largely short-term effect. Additionally, voucher-supported learning participation slightly reduced firm-financed training by 2.4 percentage points, which suggested a partial substitution from firm-specific to general skills investment.

Hidalgo et al. (2014) conducted a field experiment in the Netherlands that targeted workers in four industries (livestock and horticulture, food and beverages, potato, fruit and vegetable, and natural stone). Vouchers worth EUR 1,000 were randomly distributed to 639 workers out of a sample of 1,266. These vouchers, which were valid for two years, aimed to support vocational training. Results showed that voucher recipients increased their training participation by 8.6 percentage points in 2007 and by a cumulative 19.6 points over 2007–2008, thus representing a 44% rise compared with the control group's participation rate of 45%. Similar to the Swiss experiment, approximately 52% of voucher usage crowded out private training expenditures. While wages or employment in 2007 or 2008 had no statistically significant effects, the vouchers increased recipients' intentions to pursue further training with a 13.2-percentage-point rise in voluntary training plans and a 20-point increase in concrete plans for training within six months.

¹ In Korea, a few recent studies (Kim and Park, 2015; Kim, 2020) evaluated the employment effects of a training voucher program (Tomorrow Learning Card) and found insignificant or even negative effects.

III. Institutional Background

A. The 2021 Lifelong Education Voucher Program

The LEVP, which was introduced in 2018 and is ongoing as of 2025, is an educational initiative that has been designed to encourage self-directed lifelong learning among low-income adults. Overseen by the Ministry of Education and administered by the National Institute for Lifelong Education (NILE), the program provides vouchers worth KRW 350,000 per person to adults aged 19 or older who meet specific income eligibility criteria. In 2021, these criteria included the following: (i) recipients of Basic Livelihood Security benefits (hereafter referred to as Poverty Group), (ii) individuals in the near-poverty income bracket (hereafter referred to as Near-poverty Group), and (iii) members of households with income at or below 65% of the median income (hereafter referred to as Low-income Group). The vouchers can be used to cover course fees as well as costs for materials and textbooks. The KRW 350,000 value is roughly equivalent to the tuition for a single-semester course at a typical lifelong learning institution. Eligible institutions that are officially certified by NILE totaled 1,434 across the country as of November 2020. Most of these institutions are private academies (*hakwons*) or university-affiliated lifelong learning centers.

B. Selection and Random Assignment of Voucher Recipients

In the 2021 LEVP, recipients were selected by NILE from a pool of applicants based on a structured process, which is summarized in Table 1. A total of 26,662 applications were submitted in January 2021. Applicants were evaluated based on their statements of lifelong learning plans and their previous year's voucher usage history. Among them, the top-ranking 16,197 applicants were designated as priority recipients (referred to as the priority-in group in Table 1), while 998 applicants with the lowest scores were excluded (priority-out group in Table 1). The remaining 9,467 applicants, who were on the borderline for selection, participated in an online

[Table 1] Application and Selection Process for the 2021 LEVP

Selection Type	Applicants	Survey Population	Sample	
			N	%
Priority-in	16,197	12,883	4755	36.9
Priority-out	998	-	-	-
Lottery-in	4,803	4,488	1,197	26.7
Lottery-out	4,664	4,281	1,152	26.9
Total	26,662	22,041	7,104	32.8

Notes: Groups in bold correspond to the main sample in this study.

random lottery. This lottery resulted in an additional 4,803 recipients (lottery-in group in Table 1), while the remaining 4,664 applicants were not selected (lottery-out group in Table 1).

IV. Data

A. Online Survey

The LEVP was evaluated by conducting an online survey in October 2021. This survey targeted individuals from the priority-in, lottery-in, and lottery-out groups who had consented to the use of their personal information (denoted as survey population in Table 1). The survey link was sent directly to each respondent's mobile phone, which was accompanied by a small incentive (a KRW 4,000 coupon) to encourage participation. The questionnaire addressed various topics, including course participation before and after applying for the voucher program, labor market status, lifestyle attitudes, and demographic information. Out of 21,652 individuals invited to participate, 7,104 responded, thus yielding an overall response rate of 32.8%. The priority-in group had the highest response rate at 36.9% (4,755 out of 12,883), while the lottery-in and lottery-out groups showed similar response rates of 26.7% (1,197 out of 4,488) and 26.9% (1,152 out of 4,281), respectively.

B. Summary Statistics

Table 2 provides summary statistics for the sample of 7,104 respondents. Columns (1), (2), and (3) report the sample averages for the lottery-in, lottery-out, and priority-in groups, respectively.

Panel A of Table 2 summarizes the treatment variable for this study, which is an indicator for receiving a voucher. By definition, this variable takes a value of 1 for individuals in the lottery-in and priority-in groups and 0 for those in the lottery-out group.

Panel B of Table 2 presents the outcome variables for this study, which are categorized into three groups: course participation, labor market outcomes, and nonlabor market outcomes.

For the course participation, the related survey question was *"After applying for the 2021 Lifelong Education Voucher Program, did you attend any of the courses listed below? Please select all courses that you attended for at least one month from March 2021 to the present. Respond for both courses taken using the voucher and those taken without it."* Respondents selected from 23 course types listed in the questionnaire. Based on their responds, we defined an indicator for whether a respondent attended

any course. Additionally, six specific indicators were defined to represent course participation related to (i) basic literacy (e.g., basic Korean and math classes), (ii) degree-related courses (e.g., GEDs and university transfer exam preparation), (iii) vocational programs (e.g., certification exams and TOEIC/TOEFL preparation), (iv) humanities (e.g., history, literature, cooking, and flower arranging), (v) arts/physical education (e.g., music, art, and swimming), and (vi) civic education courses (e.g., human rights, environment, and leadership programs). The categorization of these course types is provided in Table A1 in the online appendix.

For labor market outcomes, the related survey question was “*Please select the option that best describes your current economic activity status: (a) Employed, (b) Unemployed, (c) Not engaged in economic activity due to retirement, education, housework, or other reasons.*” Based on their responds, we defined an indicator for employed (if option [a] was selected), unemployed (if option [b] was selected), and not in the labor force (if option [c] was selected).

For nonlabor market outcomes, the survey questions were adapted from the Benefits of Lifelong Learning project (European Lifelong Learning Indicators, 2014). The survey included the prompt, “*The following questions relate to your lifestyle attitudes. Please select the option that best reflects your opinion for each item.*” Respondents indicated their level of agreement with 19 items on a five-point Likert scale, where 1 = Strongly Disagree and 5 = Strongly Agree. The summarized wordings of the 19 items are presented in Panel B of Table 2, while the full wording of the questions is provided in Table A2 in the online appendix. Based on these responses, 19 indicator variables were defined. Each variable took a value of 1 if the respondent selected 4 or 5 (“Agree” or “Strongly Agree”) on the five-point scale and 0 otherwise.

Panel C of Table 2 summarizes the control variables, including respondents’ previous course participation, gender, age, educational attainment, region, and income eligibility type, for the lottery-in, lottery-out, and priority-in groups. Overall, the lottery-in and lottery-out groups exhibit similar characteristics across most dimensions, thus reinforcing the validity of the randomization process. For example, the lottery-in and lottery-out groups report identical rates of course participation in the previous year (23.7%); nearly identical proportions of females (74.1% vs. 73.9%); and comparable distributions across age categories, educational attainment levels, and regional representation.

By contrast, the priority-in group differs markedly from the lottery-in and lottery-out groups. For instance, the priority-in group demonstrates a substantially high rate of course participation in the previous year (36.6% compared with 23.7% in the lottery-based groups) and a significantly large proportion of younger individuals aged 19–39 (37.1% compared with 30.0% in the lottery-based groups).

Notably, some divergence exists in income eligibility types between the lottery-in and lottery-out groups. The lottery-in group has a small share in the Poverty Group

(45.4% vs. 49.8%) and the Near-poverty Group (17.8% vs. 20.8%), while it has a large share in the Low-income Group (36.8% vs. 29.3%).

C. Estimation Sample and Balancing Test

We restricted our estimation sample to the lottery-in and lottery-out groups. The priority-in group is excluded because all individuals in this group received the voucher, thus leaving no valid comparison group.

We assessed the comparability of the lottery-in and lottery-out groups by performing a balancing test on the pretreatment characteristics listed in Panel C of Table 2. Table 3 presents the results. Columns (1) and (2) report the sample averages of each pretreatment variable for the lottery-in and lottery-out groups, respectively, while columns (3) and (4) show the differences between the two groups and the corresponding p-values. Although most characteristics are well balanced, we find statistically significant differences in income eligibility types.

Given that individuals were randomly assigned to the lottery-in and lottery-out groups, any observed differences are likely driven by nonrandom survey response across the two groups. We account for these differences by comparing the lottery-in and lottery-out groups while controlling for income eligibility categories and other background characteristics. In addition, we conducted a robustness check using the nonparametric bounding method proposed by Lee (2009), which identifies treatment effects while allowing for nonrandom selection into the sample. As shown in the next section, the estimation results remain robust to the inclusion of control variables and the possibility of nonrandom sample selection.

[Table 2] Summary Statistics

Samples: Variables (below)	Lottery-in (1)	Lottery-out (2)	Priority-in (3)
A. Treatment variable:			
Voucher	1.000	0.000	1.000
B. Outcome variables:			
Course Participation			
Overall	0.778	0.530	0.888
Basic Literacy	0.013	0.016	0.009
Degree-related	0.091	0.067	0.166
Vocational	0.429	0.334	0.513
Humanities	0.220	0.132	0.227
Art/Physical Education	0.212	0.135	0.203
Civic	0.043	0.073	0.025
Labor Market Outcomes			
Employed	0.472	0.458	0.464
Unemployed	0.231	0.247	0.232
Not in the Labor Force	0.297	0.295	0.303

Nonlabor Market Outcomes			
Satisfied with my health	0.467	0.391	0.496
Maintain a healthy lifestyle	0.739	0.683	0.752
Pay attention to my health	0.793	0.753	0.808
Consider myself happy	0.533	0.458	0.558
Satisfied with my life	0.433	0.365	0.456
People are trustworthy	0.470	0.376	0.486
Trust decision-makers	0.473	0.424	0.480
Interested in politics	0.288	0.288	0.324
Respect others' viewpoints	0.739	0.692	0.769
Respect others' cultures	0.780	0.738	0.801
Feel part of my local community	0.529	0.498	0.566
Willing to volunteer	0.636	0.605	0.664
Have friends and colleagues	0.723	0.673	0.731
Interact with others	0.680	0.632	0.695
Opportunities to improve income	0.662	0.605	0.697
Opportunities for a different job	0.667	0.607	0.697
Willing to take on a new job	0.810	0.754	0.824
Feel positive about work	0.693	0.630	0.684
Can get others to listen to my opinions	0.510	0.484	0.534
C. Control variables:			
Course Participation in the Previous Year	0.237	0.237	0.366
Female	0.741	0.739	0.733
Age			
Aged 19–39	0.300	0.300	0.371
Aged 40–49	0.407	0.387	0.363
Aged 50 or above	0.293	0.313	0.266
Education Attainment			
Elementary School	0.015	0.015	0.010
Middle School	0.035	0.036	0.020
High School	0.357	0.346	0.256
Two-year College	0.218	0.230	0.213
Four-year College	0.307	0.313	0.414
Graduate School or above	0.068	0.059	0.087
Region			
Seoul Metropolitan Area	0.477	0.497	0.493
Gangwon, Jeju	0.047	0.037	0.046
Chungcheong Region	0.099	0.085	0.088
Jeolla Region	0.095	0.119	0.119
Gyeongsang Region	0.282	0.261	0.254
Income Eligibility Type			
Poverty Group	0.454	0.498	0.448
Near-poverty Group	0.178	0.208	0.185
Low-income Group	0.368	0.293	0.368
N	1,197	1,152	4,755

Notes: Sample averages for each variable are presented for the lottery-in group, the lottery-out group, and the priority-in group. The estimation sample for this study excludes the priority-in group.

[Table 3] Balancing Test Results

Samples: Variables (below)	Lottery-in (1)	Lottery-out (2)	Diff (3)	P-values (4)
Course Attendance in Last Year	0.237	0.237	0.000	0.987
Female	0.741	0.739	0.002	0.899
Age				
Aged 19–39	0.300	0.300	0.000	0.982
Aged 40–49	0.407	0.387	0.020	0.330
Aged 50 or above	0.293	0.313	-0.019	0.310
Education Attainment				
Elementary School	0.015	0.015	0.000	0.955
Middle School	0.035	0.036	-0.001	0.858
High School	0.357	0.346	0.010	0.599
Two-year College	0.218	0.230	-0.012	0.486
Four-year College	0.307	0.313	-0.006	0.756
Graduate School or above	0.068	0.059	0.009	0.390
Region				
Seoul Metropolitan Area	0.477	0.497	-0.020	0.324
Gangwon, Jeju	0.047	0.037	0.009	0.253
Chungcheong	0.099	0.085	0.014	0.257
Jeolla	0.095	0.119	-0.024*	0.064
Gyeongsang	0.282	0.261	0.021	0.251
Income Eligibility Type				
Poverty Group	0.454	0.498	-0.045**	0.030
Near-poverty Group	0.178	0.208	-0.030*	0.062
Low-income Group	0.368	0.293	0.075***	0.000
N	1,197	1,152		

Notes: Columns (1) and (2) show the sample averages of each pretreatment variable for the lottery-in and lottery-out groups, respectively. Columns (3) and (4) report the differences between the two groups and their p-values. Statistical significance levels are indicated as follows: 0.1 (*), 0.05 (**), and 0.01 (***).

V. Empirical Analysis

We estimated the causal effects of the voucher provision on the outcome variables through the following regression equation using the sample of 2,349 individuals, including 1,197 from the lottery-in group and 1,152 from the lottery-out group:

$$y_i = \beta_0 + \beta_1 \text{voucher}_i + \beta_2 x_i + \varepsilon_{it} . \tag{1}$$

In equation (1), y_i represents the outcome variables for individual i . voucher_i is an indicator variable that is equal to 1 if the individual received a voucher (i.e., belongs to the lottery-in group) and 0 otherwise (lottery-out group). x_i denotes the pretreatment characteristics of individual i , such as income eligibility type,

[Table 4] Effects of Vouchers on Course Participation

Specification	(1) None	(2) Income	(3) Full
Voucher	0.248*** (0.019)	0.241*** (0.019)	0.245*** (0.018)
Near-poverty Group		-0.009 (0.026)	-0.014 (0.026)
Low-income Group		0.098*** (0.021)	0.065*** (0.021)
Course Participation in Last Year			0.245*** (0.019)
Female			-0.006 (0.022)
Aged 40–49			-0.023 (0.022)
Aged 50 or above			-0.028 (0.024)
Middle School			-0.037 (0.094)
High School			-0.008 (0.079)
Two-year College			0.056 (0.080)
Four-year College			0.136* (0.079)
Graduate School or above			0.122 (0.085)
Gangwon, Jeju			0.004 (0.043)
Chungcheong			-0.006 (0.032)
Jeolla			0.053* (0.030)
Gyeongsang			-0.015 (0.022)
Control Mean	0.503	0.503	0.503
N	2,349	2,349	2,349
R-squared	0.068	0.078	0.15

Notes: The OLS estimation results with an indicator for the overall course participation as the dependent variable are presented. Column (1) shows the results without any control variables. Column (2) provides the results when indicators for income eligibility types are included as control variables. Column (3) presents the results with additional controls for other pretreatment characteristics. Control Mean refers to the sample average of the dependent variable for the control group (i.e., the lottery-out group). Statistical significance levels are denoted as 0.1 (*), 0.05 (**), and 0.01 (***).

course participation in the last year, gender, age, education, and region. Finally, ε_{it} is the error term.

A. Impact on Course Participation

Table 4 reports the OLS estimation results for equation (1) with the dependent variable being defined as an indicator for participation in lifelong learning courses. Column (1) presents the bivariate regression results without incorporating any control variables. Column (2) introduces dummies for the income eligibility category to account for differences in income eligibility between the lottery-in and lottery-out groups, as highlighted in Table 2. Column (3) further controls for additional pretreatment characteristics, such as gender, age, region, educational attainment, and prior attendance in lifelong learning courses before the voucher program application.

Overall, the estimated coefficients for the voucher dummy remain largely unaffected by the inclusion of income category controls (column [2]) and additional background characteristics (column [3]). In our preferred specification, which is shown in column (3), receiving the voucher increased the probability of course participation by 24.5 percentage points, which is about 49% of the course participation rate among the control group (50.3%).

Table 5 presents the effects of vouchers on course participation by course type. The results are organized into six panels (A–F), which correspond to a specific course category: Panel A (Basic Literacy), Panel B (Degree-related), Panel C (Vocational), Panel D (Humanities), Panel E (Art/Physical Education), and Panel F (Civic Education). For each panel, the table reports the estimated coefficients for the voucher dummy across three specifications, as in Table 3: Column (1) with no controls, column (2) with income eligibility category controls, and column (3) with full controls. For brevity, we report only the estimated coefficients and their robust standard errors for the voucher dummy.

The results reveal that the estimated effects of vouchers remain consistent across all three specifications, thereby suggesting that the findings are robust to the inclusion of control variables. In our preferred specification (column [3]), vouchers increased attendance in vocational programs by 9.2 percentage points, humanities courses by 8.5 percentage points, and arts/physical education programs by 8.2 percentage points. These outcomes are all statistically significant at the 1% level. A marginally significant increase of 2.1 percentage points is observed for degree-related courses. By contrast, no significant effect is found for basic literacy courses, while a statistically significant negative effect of 3.1 percentage points is observed for civic education courses.

The decline in participation in civic education courses suggests a possible crowding-out effect. Given that these courses are typically free and offered by

government agencies or public institutions, individuals who optimize under time constraints may have substituted them with fee-based programs that are accessible through vouchers. However, as shown in Table 9, this negative effect is not robust to potential nonrandom sample selection bias, thus indicating that we cannot eliminate the possibility that the true effect is zero.

[Table 5] Effects of Vouchers on Course Participation by Course Type

Specification:	(1) None	(2) Income	(3) Full
A. Basic Literacy			
Voucher	-0.004 (0.005)	-0.004 (0.005)	-0.003 (0.005)
Control Mean	0.016	0.016	0.016
R-squared	0.000	0.004	0.014
B. Degree-related			
Voucher	0.024** (0.011)	0.022** (0.011)	0.021* (0.011)
Control Mean	0.067	0.067	0.067
R-squared	0.002	0.004	0.019
C. Vocational			
Voucher	0.094*** (0.020)	0.089*** (0.020)	0.092*** (0.020)
Control Mean	0.334	0.334	0.334
R-squared	0.009	0.014	0.052
D. Humanities			
Voucher	0.088*** (0.016)	0.084*** (0.016)	0.085*** (0.015)
Control Mean	0.132	0.132	0.132
R-squared	0.013	0.018	0.043
E. Art/Physical Education			
Voucher	0.078*** (0.016)	0.079*** (0.016)	0.082*** (0.016)
Control Mean	0.135	0.135	0.135
R-squared	0.010	0.011	0.021
F. Civic			
Voucher	-0.030*** (0.010)	-0.032*** (0.010)	-0.031*** (0.010)
Control Mean	0.073	0.073	0.073
R-squared	0.004	0.007	0.033
N	2,349	2,349	2,349

Notes: The OLS estimation results with indicators for course participation in specific course types (listed in Panels A–F) as the dependent variables are presented. Column (1) shows the results without any control variables. Column (2) provides the results when indicators for income eligibility types are included as control variables. Column (3) presents the results with additional controls for other pretreatment characteristics. Control Mean refers to the sample average of the dependent variable for the control group (i.e., the lottery-out group). Statistical significance levels are denoted as 0.1 (*), 0.05 (**), and 0.01 (***).

B. Impact on Labor Market Outcomes

Table 6 presents the estimated effects of vouchers on labor market outcomes, which are measured through three dependent variables: employment status (Panel A), unemployment status (Panel B), and being out of the labor force (Panel C). Table 5 reports the estimated coefficients for the voucher dummy variable across three specifications: Column (1) without controls, Column (2) with controls for income eligibility categories, and Column (3) with full controls, including demographic and background characteristics.

The results consistently show no statistically significant effects of vouchers on any of the labor market outcomes across all specifications. These findings suggest that the provision of vouchers did not have a measurable impact on recipients' employment status, unemployment status, and labor force participation.

[Table 6] Effects of Vouchers on Labor Market Outcomes

Specification:	(1) None	(2) Income	(3) Full
A. Employed			
Voucher	0.014 (0.021)	0.001 (0.020)	0.003 (0.020)
Control Mean	0.458	0.458	0.458
R-squared	0.000	0.059	0.066
B. Unemployed			
Voucher	-0.015 (0.018)	-0.010 (0.018)	-0.012 (0.018)
Control Mean	0.247	0.247	0.247
R-squared	0.000	0.009	0.021
C. Not in the Labor Force			
Voucher	0.001 (0.019)	0.009 (0.019)	0.009 (0.019)
Control Mean	0.295	0.295	0.295
R-squared	0.000	0.035	0.042
N	2,349	2,349	2,349

Notes: The OLS estimation results with indicators for labor market status (listed in Panels A–C) as the dependent variables are presented. Column (1) shows the results without any control variables. Column (2) provides the results when indicators for income eligibility types are included as control variables. Column (3) presents the results with additional controls for other pretreatment characteristics. Control Mean refers to the sample average of the dependent variable for the control group (i.e., the lottery-out group). Statistical significance levels are denoted as 0.1 (*), 0.05 (**), and 0.01 (***).

C. Impact on Nonlabor Market Outcomes

Table 7 presents the estimated effects of vouchers on nonlabor market outcomes,

which cover various measures related to health, subjective well-being, social trust, civic engagement, and job-related attitudes. The table includes 19 outcome variables, which are each listed in the first column. The remaining columns report the estimated coefficients for the voucher dummy (column [1]), robust standard errors (column [2]), and the control group means of the dependent variables (column [3]). For conciseness, we report results from the fully controlled specification, which are aligned with column (3) of Tables 4, 5, and 6. Results from alternative specifications are available in Table A3 of the online appendix.

The results indicate that vouchers had statistically significant positive effects on several dimensions of health and well-being. For instance, receiving a voucher increased the likelihood of being satisfied with one’s health by 6.9 percentage points

[Table 7] Effects of Vouchers on Nonlabor Market Outcomes

Outcome Variables (below):	(1)	(2)	(3)
	Voucher Effects	Robust S.E.	Control Mean
Satisfied with my health	0.069***	(0.020)	0.391
Maintain a healthy lifestyle	0.059***	(0.019)	0.683
Pay attention to my health	0.040**	(0.017)	0.753
Consider myself happy	0.067***	(0.020)	0.458
Satisfied with my life	0.058***	(0.020)	0.365
People are trustworthy	0.090***	(0.020)	0.376
Trust decision-makers	0.047**	(0.021)	0.424
Interested in politics	0.000	(0.018)	0.288
Respect others’ viewpoints	0.045**	(0.019)	0.692
Respect others’ cultures	0.040**	(0.018)	0.738
Feel part of my local community	0.026	(0.020)	0.498
Willing to volunteer	0.028	(0.020)	0.605
Have friends and colleagues	0.043**	(0.019)	0.673
Interact with others	0.041**	(0.019)	0.632
Opportunities to improve income	0.050**	(0.020)	0.605
Opportunities for a different job	0.052***	(0.020)	0.607
Willing to take on a new job	0.052***	(0.017)	0.754
Feel positive about work	0.058***	(0.019)	0.630
Can get others to listen to my opinions	0.022	(0.021)	0.484

Notes: Each row represents the results of a separate regression analysis. The number of observations is 2,349 across all regression analyses. The dependent variable is an indicator that represents whether the respondent agreed with the statement listed in the first column. The treatment variable is a voucher indicator. Controls include pretreatment characteristics, such as income eligibility categories, gender, age, education, region, and prior-year course participation. Column (1) reports the OLS estimated coefficients for the voucher indicator, while column (2) provides robust standard errors of the OLS estimates. Control Mean refers to the sample average of the dependent variable for the control group (i.e., the lottery-out group). Statistical significance levels are indicated as 0.1 (*), 0.05 (**), and 0.01 (***).

and maintaining a healthy lifestyle by 5.9 percentage points, which are both significant at the 1% level. Additionally, vouchers increased the likelihood of considering oneself happy by 6.4 percentage points and being satisfied with life by 5.8 percentage points, thus highlighting the broad psychological benefits of the program.

In the domain of social trust and civic engagement, vouchers improved respondents' perceptions that people are trustworthy (4.7 percentage points, significant at the 5% level) and their willingness to trust decision-makers (4.0 percentage points, significant at the 10% level). Furthermore, vouchers increased respect for others' viewpoints and cultures by 4.5 and 4.4 percentage points, respectively, which are both significant at the 5% level.

In terms of job-related attitudes, vouchers were associated with high positivity toward work and willingness to take on new jobs with significant increases of 5.8 and 5.5 percentage points, respectively. However, the effects on opportunities for income improvement and the search for a different job were small in magnitude and not statistically significant.

Overall, the results suggest that the vouchers generated significant benefits beyond labor market outcomes particularly in the areas of health, subjective well-being, and social trust. These outcomes underscore the broad societal value of the education voucher support for low-income adults.

D. Robustness Check 1: Multiple Hypotheses Testing

Thus far, we have analyzed the effects of voucher provision on 29 outcome variables across three domains: seven related to course participation in Tables 4 and 5, three to labor market outcomes in Table 6, and 19 to nonlabor market outcomes in Table 7. Given that 29 null hypotheses of no voucher effect were tested individually, the risk of false positive due to multiple hypothesis testing arises. We address this issue by reevaluating the significance of the 29 voucher effects using the Romano-Wolf stepwise correction method (Romano and Wolf, 2005), which is implemented with 1,000 bootstrap repetitions.

Table 8 presents the results of this robustness check. Column (1) replicates the estimated coefficients from the full specification, as in column (3) of Tables 4, 5, and 6, and column (1) of Table 7. The asterisks denote the model p-values, which are shown in column (2). Column (3) reports the bootstrapped p-values based on the Romano-Wolf stepwise correction method. Voucher effects that remain statistically significant at the 10% level after applying the Romano-Wolf correction are highlighted in bold.

Overall, most voucher effects remain statistically significant even after the Romano-Wolf correction. In the domain of course participation, the overall effect of vouchers on course participation is highly significant (adjusted p-value = 0.001). In

[Table 8] Robustness Check 1: Multiple Hypothesis Test Results

Outcome variables	Voucher Effects	P-values	
		Model	Romano-Wolf
	(1)	(2)	(3)
Course Participation			
Overall	0.245***	0.000	0.001
Basic Literacy	-0.003	0.487	0.937
Degree-related	0.021*	0.057	0.381
Vocational	0.092***	0.000	0.001
Humanities	0.085***	0.000	0.001
Art/Physical Education	0.082***	0.000	0.001
Civic	-0.031***	0.001	0.019
Labor Market Outcomes			
Employed	0.003	0.893	0.993
Unemployed	-0.012	0.501	0.937
Not in the Labor Force	0.009	0.623	0.937
Nonlabor Market Outcomes			
Satisfied with my health	0.069***	0.001	0.012
Maintain a healthy lifestyle	0.059***	0.002	0.028
Pay attention to my health	0.040**	0.022	0.253
Consider myself happy	0.067***	0.001	0.019
Satisfied with my life	0.058***	0.003	0.051
People are trustworthy	0.090***	0.000	0.001
Trust decision-makers	0.047**	0.022	0.253
Interested in politics	0.000	0.983	0.993
Respect others' viewpoints	0.045**	0.015	0.193
Respect others' cultures	0.040**	0.023	0.253
Feel part of my local community	0.026	0.196	0.744
Willing to volunteer	0.028	0.158	0.712
Have friends and colleagues	0.043**	0.020	0.246
Interact with others	0.041**	0.033	0.278
Opportunities to improve income	0.050**	0.010	0.147
Opportunities for a different job	0.052***	0.008	0.124
Willing to take on a new job	0.052***	0.002	0.038
Feel positive about work	0.058***	0.003	0.042
Can get others to listen to my opinions	0.022	0.273	0.827

Notes: Each row represents the results of a separate regression analysis. The number of observations is 2,349 across all regressions. The dependent variables are listed in the first column. The treatment variable is a voucher indicator. Controls include pretreatment characteristics, such as income eligibility categories, gender, age, education, region, and prior-year course participation. Column (1) reports the OLS estimated voucher effects, while column (2) provides the model p-values for these effects. Column (3) presents the bootstrapped p-values from the Romano-Wolf stepwise correction method, which is based on 1,000 bootstrap repetitions. Voucher effects are marked with asterisks if they are statistically significant based on the model p-values and are highlighted in bold if that are statistically significant at the 10% level based on the bootstrapped p-values.

addition, the positive impacts on specific course types, namely, vocational programs (adjusted p-value = 0.001), humanities (adjusted p-value = 0.001), and art/physical education (adjusted p-value = 0.001), retain significance. Similarly, in the nonlabor market domain, robust positive effects are observed for health-related outcomes, including satisfaction with health (adjusted p-value = 0.012), maintaining a healthy lifestyle (adjusted p-value = 0.035), and paying attention to health (adjusted p-value = 0.013). Other significant effects include improved happiness, willingness to take on a new job, and positive feelings about work.

However, a small number of estimated effects lose statistical significance following the Romano-Wolf correction. For example, the positive impact of vouchers on degree-related course enrollment is no longer statistically significant after correction (adjusted p-value = 0.195). Similarly, some nonlabor market outcomes, such as trust in decision-makers and respect for others' viewpoints, which appeared marginally significant before correction, fail to retain their significance when adjusted.

E. Robustness Check 2: Nonparametric Bounding

Another challenge to the internal validity of this study is nonrandom sample selection, which may arise from differences in survey response rates between the lottery-in and lottery-out groups. For instance, if voucher recipients were more (or less) likely to respond than nonrecipients, the estimated effects of the voucher would reflect not only the true voucher effect but also the biases caused by differences in the response rates between the two groups.

We address the issue of nonrandom sample selection by reestimating the voucher effects using the nonparametric bounding method proposed by Lee (2009). This approach estimates the upper and lower bounds of treatment effects while accounting for nonrandom sample selection. A central assumption of Lee's framework is that treatment has a monotonic effect on sample selection. In our context, this concept implies that receiving a voucher either consistently increases or decreases survey response rates.

Table 9 presents the results of applying Lee's (2009) nonparametric bounding method. The sample consists of 8,769 individuals, including 2,349 survey respondents (1,197 from the lottery-in group and 1,152 from the lottery-out group) and 6,420 nonrespondents (3,291 from the lottery-in group and 3,129 from the lottery-out group). Given that no information beyond lottery assignment was available for the nonrespondents, pretreatment characteristics, such as income eligibility and demographic backgrounds, could not be included as controls in this analysis. Consequently, the estimates in Table 9 align with the no-control specification presented in column (1) of Tables 4, 5, and 6.

Columns (1) and (2) of Table 9 report the lower bounds of the voucher effects

[Table 9] Robustness Check 2: Nonparametric Bounds Estimates

Outcome variables	Lower Bounds		Upper Bounds	
	Estimates	S.E.	Estimates	S.E.
	(1)	(2)	(3)	(4)
Course Attendance				
Overall	0.244***	(0.027)	0.252***	(0.025)
Basic Literacy	-0.004	(0.005)	0.005	(0.035)
Degree-related	0.024**	(0.011)	0.033	(0.035)
Vocational	0.091***	(0.023)	0.100***	(0.031)
Humanities	0.087***	(0.016)	0.096***	(0.035)
Art/Physical Education	0.076***	(0.016)	0.085**	(0.035)
Civic	-0.031***	(0.010)	-0.022	(0.034)
Labor Market Outcomes				
Employed	0.010	(0.026)	0.019	(0.028)
Unemployed	-0.017	(0.020)	-0.008	(0.032)
Not in the Labor Force	-0.001	(0.022)	0.008	(0.031)
Nonlabor Market Outcomes				
Satisfied with my health	0.072***	(0.025)	0.081***	(0.030)
Maintain a healthy lifestyle	0.049	(0.031)	0.058***	(0.022)
Pay attention to my health	0.033	(0.032)	0.042**	(0.019)
Consider myself happy	0.071***	(0.026)	0.080***	(0.028)
Satisfied with my life	0.064***	(0.024)	0.073**	(0.030)
People are trustworthy	0.091***	(0.024)	0.100***	(0.030)
Trust decision-makers	0.045*	(0.026)	0.054*	(0.029)
Interested in politics	-0.003	(0.021)	0.006	(0.032)
Respect others' viewpoints	0.041	(0.031)	0.050**	(0.022)
Respect others' cultures	0.036	(0.032)	0.045**	(0.020)
Feel part of my local community	0.026	(0.027)	0.035	(0.027)
Willing to volunteer	0.025	(0.029)	0.034	(0.025)
Have friends and colleagues	0.044	(0.031)	0.053**	(0.022)
Interact with others	0.042	(0.030)	0.051**	(0.024)
Opportunities to improve income	0.051*	(0.029)	0.060**	(0.024)
Opportunities for a different job	0.054*	(0.029)	0.063***	(0.024)
Willing to take on a new job	0.049	(0.032)	0.058***	(0.019)
Feel positive about work	0.058*	(0.030)	0.066***	(0.024)
Can get others to listen to my opinions	0.021	(0.027)	0.030	(0.028)

Notes: The table reports estimation results from Lee's (2009) nonparametric bounding method.

Each row presents the lower and upper bounds for the causal effects of vouchers on the outcome variables listed in the first column. The treatment variable is a voucher indicator. Columns (1) and (2) display the lower bounds and their standard errors, while columns (3) and (4) show the upper bounds and their standard errors. The analysis is based on 8,769 observations, which comprise 2,349 survey respondents and 6,420 nonrespondents. Voucher effects for which the upper and lower bounds are statistically significant at the 10% level are highlighted in bold. Statistical significance levels are indicated as 0.1 (*), 0.05 (**), and 0.01 (***).

and their standard errors. Meanwhile, columns (3) and (4) present the upper bounds and their standard errors. Cases where both bounds are statistically significant at the 10% level are highlighted in bold. Overall, the potential bias from the nonrandom sample selection appears to be negligible. Most voucher effects reported in Table 8 remain robust in Table 9. The only notable exception is the effect on civic education participation. The estimated causal effect of voucher provision on civic course participation ranges from -0.031 to -0.022 with the upper bound of -0.022 being statistically insignificant. This outcome indicates that, after accounting for potential nonrandom sample selection bias, evidence is insufficient to conclude that voucher provision reduces civic education participation.

VI. Conclusion

This study examines the causal effects of providing education vouchers to low-income adults in South Korea through the 2021 LEVP. We identify these effects by employing a lottery-based voucher assignment design while controlling for pretreatment characteristics. We analyze 29 outcome variables spanning course attendance, labor market outcomes, and nonlabor market outcomes. Given that nonrandom survey response can introduce bias, we conduct multiple hypothesis testing and apply a nonparametric bounding method as robustness checks.

Our main findings are summarized as follows. First, the provision of vouchers significantly increased course attendance. Recipients were 24.5 percentage points more likely to participate in lifelong learning courses than nonrecipients, thus representing a 49% increase relative to the control group. The strongest effects were observed in vocational programs, humanities courses, and art/physical education programs. Meanwhile, the impact on degree-related and civic education courses was largely insignificant. Second, the vouchers had no statistically significant effect on labor market outcomes, such as employment, unemployment, and labor force participation. Third, the vouchers generated substantial benefits in nonlabor market domains. Recipients reported improved health-related outcomes, including increased satisfaction with their health and heightened attention to maintaining a healthy lifestyle. Measures of subjective well-being, such as happiness and life satisfaction, also showed significant improvements. Additionally, social trust increased among voucher recipients. Job-related attitudes, including a positive outlook on work and a strong willingness to take on new jobs, were also positively affected.

Our finding that vouchers did not improve labor market outcomes aligns with prior experimental studies on education and training vouchers conducted in Switzerland and the Netherlands in the 2000s (Schwerdt, 2012; Hidalgo et al., 2014). However, our finding that vouchers enhance nonlabor market outcomes

represents a novel contribution that has not been documented in previous research. This outcome suggests that discussions on the nonproduction benefits of education, which are traditionally centered on formal schooling (e.g., Lochner, 2011), can be extended to adult nonformal education as well.

Notably, the voucher effects analyzed in this study capture only short-term impacts within the year of provision. Moreover, the program specifically targeted low-income adults in South Korea. These factors should be taken into account when interpreting the results. Further research is needed to assess whether similar effects persist beyond the voucher year and whether comparable programs implemented in different contexts or among different demographic groups produce similar outcomes. Additionally, understanding how policymakers can optimize voucher programs to maximize nonlabor market benefits remains an important avenue for future research. Despite growing interest in adult nonformal education, this area remains relatively underexplored compared with research on formal education during school years. We hope this study contributes to expanding research on this important topic.

Appendix

[Table A1] Categorization of Course Type

Categorization	Course Type
Basic Literacy	Basic Literacy (e.g., basic Korean and math classes)
Degree-related	GEDs (e.g. for elementary, middle, and high school diplomas) Preparation Courses for Further Education (e.g., university transfer exam preparation) Supplementary Education for Higher Education (e.g., academic credit bank system, self-directed degree program)
Vocational	Language Certification (e.g., TOEIC, TOEFL) Computer Certification (e.g., word processor) Certification Courses (e.g., real estate agent, caregiver) Employment and Entrepreneurship Preparation (e.g., civil service exam preparation) Job Skill Training (e.g., job training, workshops) Fourth Industrial Revolution (e.g., AI, big data)
Humanities	Economics and Business (e.g., funds, financial planning, real estate) General Foreign Language (e.g., practical foreign languages) General Computer (e.g., information and internet literacy education) Religious Education (e.g., Bible, Buddhist scripture study) Humanities and Liberal Arts (e.g., history, philosophy, art history, literature courses) Home and Family Life (e.g., cooking, flower arranging, etiquette training) Health and Medical (e.g., health education, smoking cessation, medical life education)
Art and Physical	Music (e.g., piano, flute, singing classes) Art (e.g., balloon art, photography, crafts) Sports (e.g., swimming, dance, aerobics, badminton, etc.)
Civic	Leadership (e.g., village leader, community council member training) Citizen Participation Education (e.g., civic, human rights, peace, environmental education) Environmental and Ecological (e.g., natural science, environmental, ecological studies, etc.)

[Table A2] Comparison of Full and Summarized Survey Question Wording

Summarized Wordings	Full Wordings
Satisfied with my health.	I am satisfied with my physical health.
Maintain a healthy lifestyle.	I make an effort to maintain a healthy lifestyle.
Pay attention to my health.	I pay close attention to my health.
Consider myself happy.	I consider myself a happy person.
Satisfied with my life.	I am satisfied with my overall life.
People are trustworthy.	Generally, I think people are trustworthy.
Trust decision-makers.	I trust decision-makers.
Interested in politics.	I am interested in political matters.
Respect others' viewpoints.	I respect the viewpoints of others.
Respect others' cultures.	I respect the cultures of other people.
Feel part of my local community.	I feel that I am a part of my local community.
Willing to volunteer.	I am willing to participate in voluntary activities.
Have friends and colleagues.	I have friends and colleagues I can rely on.
Interact with others.	I interact and communicate with other people.
Opportunities to improve income.	I believe I have opportunities to improve my income.
Opportunities for a different job.	I think I have the opportunity to pursue a different job or career.
Willing to take on a new job.	If given the opportunity for a new job, I am willing to take on the challenge.
Feel positive about work.	I feel positive about my work and professional life.
Can get others to listen to my opinions.	I know how to get others to pay attention to my opinions.

[Table A3] Effects of Vouchers on Nonlabor Market Outcomes

Specification (right):	(1) None	(2) Income	(3) Full
Satisfied with my health			
Voucher	0.076*** (0.020)	0.067*** (0.020)	0.069*** (0.020)
Control Mean	0.391***	0.391***	0.391***
R-squared	0.006	0.023	0.040
Maintain a healthy lifestyle			
Voucher	0.055*** (0.019)	0.055*** (0.019)	0.059*** (0.019)
Control Mean	0.683***	0.683***	0.683***
R-squared	0.004	0.004	0.029
Pay attention to my health			
Voucher	0.039** (0.017)	0.039** (0.017)	0.040** (0.017)
Control Mean	0.753***	0.753***	0.753***
R-squared	0.002	0.004	0.020
Consider myself happy			
Voucher	0.075*** (0.021)	0.066*** (0.021)	0.067*** (0.020)
Control Mean	0.458***	0.458***	0.458***
R-squared	0.006	0.022	0.044
Satisfied with my life			
Voucher	0.067*** (0.020)	0.058*** (0.020)	0.058*** (0.020)
Control Mean	0.365***	0.365***	0.365***
R-squared	0.005	0.025	0.058
People are trustworthy			
Voucher	0.094*** (0.020)	0.089*** (0.020)	0.090*** (0.020)
Control Mean	0.376***	0.376***	0.376***
R-squared	0.009	0.015	0.032
Trust decision-makers			
Voucher	0.049** (0.021)	0.046** (0.021)	0.047** (0.021)
Control Mean	0.424***	0.424***	0.424***
R-squared	0.002	0.006	0.019
Interested in politics			
Voucher	0.000 (0.019)	−0.000 (0.019)	0.000 (0.018)
Control Mean	0.288***	0.288***	0.288***
R-squared	0.000	0.003	0.052
Respect others' viewpoints			
Voucher	0.048**	0.044**	0.045**

	(0.019)	(0.019)	(0.019)
Control Mean	0.692***	0.692***	0.692***
R-squared	0.003	0.006	0.029
Respect others' cultures			
Voucher	0.042**	0.038**	0.040**
	(0.018)	(0.018)	(0.018)
Control Mean	0.738***	0.738***	0.738***
R-squared	0.002	0.009	0.030
Feel part of my local community			
Voucher	0.031	0.024	0.026
	(0.021)	(0.021)	(0.020)
Control Mean	0.498***	0.498***	0.498***
R-squared	0.001	0.009	0.037
Willing to volunteer			
Voucher	0.031	0.026	0.028
	(0.020)	(0.020)	(0.020)
Control Mean	0.605***	0.605***	0.605***
R-squared	0.001	0.006	0.026
Have friends and colleagues			
Voucher	0.050***	0.041**	0.043**
	(0.019)	(0.019)	(0.019)
Control Mean	0.673***	0.673***	0.673***
R-squared	0.003	0.034	0.054
Interact with others			
Voucher	0.048**	0.039**	0.041**
	(0.020)	(0.019)	(0.019)
Control Mean	0.632***	0.632***	0.632***
R-squared	0.003	0.032	0.048
Opportunities to improve income			
Voucher	0.057***	0.049**	0.050**
	(0.020)	(0.020)	(0.020)
Control Mean	0.605***	0.605***	0.605***
R-squared	0.003	0.020	0.040
Opportunities for a different job			
Voucher	0.060***	0.051***	0.052***
	(0.020)	(0.020)	(0.020)
Control Mean	0.607***	0.607***	0.607***
R-squared	0.004	0.028	0.051
Willing to take on a new job			
Voucher	0.056***	0.052***	0.052***
	(0.017)	(0.017)	(0.017)
Control Mean	0.754***	0.754***	0.754***
R-squared	0.005	0.013	0.031
Feel positive about work			
Voucher	0.063***	0.059***	0.058***

	(0.019)	(0.019)	(0.019)
Control Mean	0.630***	0.630***	0.630***
R-squared	0.004	0.020	0.040
Can get others to listen to my opinions			
Voucher	0.025	0.022	0.022
	(0.021)	(0.021)	(0.021)
Control Mean	0.484***	0.484***	0.484***
R-squared	0.001	0.009	0.032
N	2,349	2,349	2,349

Notes: The OLS estimation results with indicators for non-labor market outcomes as the dependent variables are presented. Column (1) shows the results without any control variables. Column (2) provides the results when indicators for income eligibility types are included as control variables. Column (3) presents the results with additional controls for other pre-treatment characteristics. Control Mean refers to the sample average of the dependent variable for the control group (i.e., the lottery-out group). Statistical significance levels are denoted as follows: 0.1 (*), 0.05 (**), and 0.01 (***).

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저소득 성인에 대한 교육 바우처 지원의 효과*

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초 록 본 연구는 2021년 한국의 저소득 성인을 대상으로 교육 바우처를 제공한 정책의 인과적 효과를 분석한다. 바우처 지급이 무작위 추첨으로 결정된 집단을 대상으로 각종 사전적 특성을 통제하여 분석한 결과, 1인당 35만원의 바우처 지급은 교육과정 참여율을 24.5% 포인트 증가시킨 것으로 추정되었다. 특히 직업능력개발, 인문교양, 예체능 강좌 참여 증가가 두드러지게 관찰되었다. 바우처 지급은 노동시장 성과에는 유의한 영향을 미치지 않았으나, 사회적 신뢰, 건강 관련 행동, 삶의 만족도, 직업 관련 태도 등의 비노동시장 성과를 향상시키는 효과가 관찰되었다. 이상의 결과는 저소득 성인의 평생교육 참여가 비노동시장 성과를 향상시키는 사회적 편익을 가질 가능성을 시사한다.

핵심 주제어: 성인 교육, 평생학습, 바우처, 비노동시장 성과

경제학문헌목록 주제분류: I21, J24, D64

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