Supplementary Education at College and Its Consequences for Individuals' Labor Market Outcomes in the United States

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Abstract: The current study seeks to expand our knowledge on extended education and its potential contribution to social inequality by examining socioeconomic disparities in supplementary education (SE) at college and its impact on labor market outcomes. Using data from the United States Education Longitudinal Study, logistic and linear regressions deliver the following main findings: (1) Socioeconomic status (SES) significantly affects SE participation, net of other factors. (2) With higher involvement in SE activities, neither employment nor income prospects significantly increase. (3) Low SES graduates are slightly more likely to benefit from SE than high SES graduates. (4) Among high-impact SE practices, only internships exert a positive effect on labor market outcomes.

Keywords: Supplementary education, social inequality, higher education, labor market outcomes

Introduction

Extended education is a broad field covering all kinds of learning outside regular school hours across the individual's life course. Until now, however, most research focused on school-aged children's extracurricular activities, including but not limited to school support programs, community-based after school classes, and supplementary education (Stecher, 2018; Stecher & Maschke, 2013). Few studies have considered extended education activities beyond primary and secondary education. The present article addresses this lack of research by examining supplementary education (henceforth SE) at college. SE at school refers to academic instruction outside regular school hours, especially high-impact activities termed "shadow education", i. e. fee-paying classes at cram and prep schools and private tutoring (Aurini, Davies, & Dierkes, 2013). Likewise, supplementation of formal education at college serves the same purpose: "to enhance the student's formal school career" (Stevenson & Baker, 1992, p. 1639). More explicitly, SE at college refers to those forms of non-regular educational activities meant to improve the student's academic progress and subsequent labor market outcomes, e. g. non-obligatory study abroad programs, research projects, or internships–also known as "high-impact educational practices" (Knouse & Fontenot, 2008; Waibel, Rüger, Ette, & Sauer, 2017).

In particular, the current study seeks to expand our knowledge on extended education and its potential contribution to social inequality by examining socioeconomic disparities in SE

1 Soo-yong Byun acknowledges support by the Ministry of Education of the Republic of Korea and the National Research Foundation of Korea (NRF-2020S1 A3 A2 A02091529) and by the Population Research Institute at Penn State University, which is supported by an infrastructure grant by the Eunice Kennedy Shriver National Institute of Child Health and Human Development (P2CHD041025). The views expressed in this article are those of the authors and do not necessarily reflect those of the granting agency.

use at college and its impact on the individuals' labor market outcomes. Past research on SE at the school level has shown that students from high socioeconomic status (SES) families are not only generally more likely to invest in SE, but they also tend to choose those forms and types of SE (e. g., private tutoring, cram school etc.) that often lead to significant advantages in educational attainment, i. e. above average academic achievement and entrance to more prestigious schools and universities (e. g., Buchmann, Condron, & Roscigno, 2010; Byun, 2014; Entrich, 2018). Similarly, research concerned with SE at college claims that social selectivity in access to high-impact educational practices (e. g., study abroad) would strengthen horizontal inequalities in educational and thus status attainment (Lingo, 2019; Netz & Finger, 2016), because of the significant effects for the individual's labor market outcomes (Knouse & Fontenot, 2008; Waibel et al., 2017). How far significant participation in different types of SE at college prove for future employment and income is all but clear, though. The scarcity of studies dealing explicitly with inequality in SE at college and its labor market returns leave us with rather inconclusive findings.

The United States is a particularly interesting case in this regard. Besides academic achievement in terms of high school GPA and SAT/ACT scores, extra-curricular activities (e. g., academic clubs, sports, music and arts) and SE (e. g., private tutoring and prep schools) continue to play a big role for college admission processes (Buchmann et al., 2010; Shulruf, 2010). American universities have a long tradition of active engagement of students in co-curricular activities as well (e. g., involvement in fraternities/sororities, sports/athletics, and clubs). Due to concerns about the quality of liberal higher education, in 2008 the *Association of American Colleges and Universities* (AAC&U) and its *Liberal Education and America's Promise* (LEAP) initiative started to promote the adaptation of a catalogue of specific high-impact educational practices deemed especially effective in preparing students for their careers in the 21st century. Among others, these practices include SE activities outside the core curriculum of upper classmen, most notably internships (within the US or abroad), collaborative assignments, undergraduate research projects, study abroad to foster global learning experiences, and capstones or senior projects (S. R. Johnson & Stage, 2018; Kuh, 2008; Riehle & Weiner, 2013). Even though these practices are now widely used across the US, it is neither clear whether family SES affects participation in these high-impact SE activities nor if positive outcomes for labor market transition and future income are expectable.

Hence, using data from the Educational Longitudinal Study of 2002 (ELS:2002) following 10th grade high school sophomores in the United States over a period of ten years into early adulthood (2002 to 2012), the current study addresses the following research questions:

1. Are there socioeconomic disparities in SE at college (after controlling for other variables)?
2. Does SE at college affect employment?
3. Does SE at college affect income?
4. Are there differences in the use and effects of SE at college according to type?

To answer these questions, we draw on cultural and social reproduction (Bourdieu & Passeron, 1977; Breen & Goldthorpe, 1997) and job-competition theories (Spence, 1973; Thurow, 1976), and derive testable hypotheses. Following an introduction to the ELS:2002 survey data and the variables, we predict the students' participation in SE and its impact on employment probability and early career income by means of logistic and linear regressions.

Background

Social Inequality in Supplementary Education at College

Past international research clearly shows that, among individual and institutional factors, family SES strongly influences participation in SE at the primary and secondary education levels (Buchmann et al., 2010; Byun, 2014; Byun, Chung, & Baker, 2018; Entrich, 2018, 2019; Gerhards & Hans, 2013; Park, Buchmann, Choi, & Merry, 2016; Stevenson & Baker, 1992). Specifically, students from high SES families, i. e. where parents are highly educated, have high income, and/or a high occupational status, are generally more likely to participate in high impact SE activities such as private tutoring, lessons at cram schools, and study abroad, compared to students from lower SES families. Multivariate empirical studies controlling for demographic confounders have verified this influence of family SES on SE activities in many countries, including the United States (Buchmann et al., 2010; Byun et al., 2018; Byun & Park, 2012). With a few exceptions, research concerned with high-impact SE practices at college lacks such concrete findings. Whether college students study abroad, for example, depends largely on their families' economic, social and cultural capital (Lingo, 2019; Netz, Klasik, Entrich, & Barker, 2019; Simon & Ainsworth, 2012).[2]

Social reproduction theory (Bourdieu & Passeron, 1977) provides a useful framework for understanding socioeconomic disparities in SE use at any level of education. From this theoretical view, high SES families seek SE for advanced educational opportunities to reproduce their elite status for their children (Stevenson & Baker, 1992). Indeed, SE is increasingly seen as part of the upper middle-class families' strategies of "concerted cultivation" (Lareau, 1989) to increase their children's social mobility (Park et al., 2016; Park, Byun, & Kim, 2011). For example, Park et al. (2011) found that SE is an important strategy for high SES parents to enhance their children's academic success in Korea. Similar strategies were identified for Japan (Entrich, 2018) and the United States (Buchmann et al., 2010).

From a rational choice theory point of view (Boudon, 1974; Breen & Goldthorpe, 1997), investment in SE, as any other educational decision, is based on choices made by forward-looking, rationally acting individuals. However, the assessment of the costs, benefits and thus the likelihood to participate in SE clearly differ according to SES (Entrich, 2018; Lörz, Netz, & Quast, 2016). High SES students are not only more willing to take risks, but they are also more likely to realize the benefits of investing in SE at a relatively lower cost. In comparison, lower SES students can draw on less resources and show lower aspirations on average. The status maintenance motive is crucial in educational decision-making, and might also play a decisive role in the choice of SE. The higher the parental SES, the more individuals are anxious to achieve a similar status as their parents through investment in education (Breen & Goldthorpe, 1997).

SE describes strategies through which families may articulate their status maintenance intentions by promising to help students accumulate human capital of different sort. At school, SE promises to improve academic performance (i. e., GPA and achievement in national high stakes examinations such as the SAT) and through this increase the students' chances of entrance to high ranking, prestigious high schools and colleges. At college, SE consists of

2 Contrasting to other high-impact SE practices, study abroad has drawn more attention of scholars due to its rapid and continuous expansion over the last decades (1991/1992: 71,154; 2000/2001: 154,168; 2016/2017: 332,727; Luo & Jamieson-Drake, 2015; NCES, 2018).

several very promising educational activities which ought to have a high impact on academic success and future job opportunities as well (S. R. Johnson & Stage, 2018). Particularly internships, study abroad, and research projects are deemed highly effective for future job prospects.

The general increase in SE use in the United States indicates a growing interest in this type of human capital (S. R. Johnson & Stage, 2018; Park et al., 2016). This can be partly attributed to globalization, increasing demands on the labor market for future generations of workers, and higher insecurity due to increasing unemployment rates and more precarious, low wage work. At the same time, educational expansion at the upper secondary and tertiary education levels led to increased competition for attractive positions on the (international) labor market in almost all societies. In highly industrialized, 'schooled societies' such as the United States, the majority of children have access to the highest formal education (Baker, 2014).

According to effectively maintained inequality theory (EMI; Lucas, 2001), under these circumstances, "socioeconomically advantaged actors secure for themselves and their children some degree of advantage wherever advantages are commonly possible" (Lucas, 2001, p. 1652). This implies that investments are not limited to the vertical education level of children (e. g., highest degree attained), but include investment that seeks to enhance the quality of the total educational attainment of a student. The latter investment spectrum consists of a multitude of opportunities through which horizontal differences in educational attainment can be enhanced, such as attending higher ranking high schools and universities (Andrew, 2017), or choosing study programs that promise higher returns (Reimer & Pollak, 2010).

In addition, SE of different sort ought to contribute to quality differences in educational outcomes by directly leading to wider competencies and skills or through its effects on vertical and horizontal education level. Especially high-impact SE activities at the school level were found to significantly affect both these educational outcomes (Buchmann et al., 2010; Entrich, 2018). In contrast, SE at college is also believed to provide students with marketable skills (S. R. Johnson & Stage, 2018; Schmidt & Pardo, 2017), which then ought to increase high SES families' chances of maintaining a high status for their children.

Based on the above arguments, we expect to find socioeconomic disparities in SE use at college.

Hypothesis 1. The higher the SES of students, the higher the likelihood of students to participate in SE at college.

Furthermore, the aforementioned theories suggest that high SES families not only invest more in SE on average compared to lower SES families, but focus particularly on those types of SE promising higher educational returns and better labor market outcomes (Buchmann et al., 2010; Byun, 2014; Entrich, 2018, 2019; Netz & Finger, 2016). Accordingly, we expect considerable differences in the effects of SES on SE at college by type of SE. Research highlights that study abroad and internships are particularly helpful to secure more attractive jobs and higher income (Knouse & Fontenot, 2008; Partlo & Ampaw, 2018; Waibel et al., 2017). Less is known about the concrete impact of other less acknowledged types of SE at college on labor market outcomes. In the AAC&U outline of high-impact educational practices, Kuh (2008) ascribed all types of SE significant practical knowledge and marketable skills gains. But it is clear neither how far significant these types of SE enhance the student's labor market outcomes nor whether high or low SES students make more use of them.

Hypothesis 2. The higher the SES of students, the higher the likelihood of students to concentrate on more promising types of SE, i. e. study abroad and internships, instead of less acknowledged types of SE.

Social Inequality in Labor Market Outcomes

In the same way that SE points to mechanisms of social reproduction during secondary school (Byun & Park, 2012; Entrich, 2018; Park et al., 2016), it indicates such mechanisms in the university setting, given that its participation is affected by SES and yields concrete benefits for status attainment. Signal and screening theories (Arrow, 1973; Spence, 1973) suggest that additional educational qualifications and competences are crucial to succeed in the competition for jobs. Extended human capital represented through SE enables applicants to signal their productivity potential beyond formal educational credentials. Similarly, such additional qualifications help employers in the hiring process, as these information enable them to identify the attributes they value in their workers and rank their applicants accordingly (Thurow, 1976).

As the number of applicants with the same formal education increases due to educational expansion, the vertical education level of these applicants (that is, their highest formal education) loses value. Research indicates that while the absolute value of education remains decisive for social positioning, i. e. labor market entry and income, the relative value of education is becoming increasingly important in schooled societies such as the United States (Bol, 2015; Olneck & Kim, 1989; Shavit & Park, 2016; Sørensen, 1979). Consequently, additional qualifications must serve as selection criteria for employers. Nowadays, students not only have to consider staying on in college for a Masters or Doctorate to increase their chances of entering better paid jobs in the future.

Besides the highest formal education degree attained, the level of their later income is also measured by horizontal educational attainment and competencies and skills gained from involvement in extended education. In particular the selectivity of the attended institution, the chosen major, their GPA and other visible factors (signals) that characterize college life affect employment prospects and income (Partlo & Ampaw, 2018; Schmidt & Pardo, 2017). These factors should explicitly include extended education investments. It remains doubtful whether extra- and co-curricular educational activities (e. g., involvement in clubs and fraternities/sororities, in sports, etc., but also work experience/work-study) impact labor market outcomes.

However, we highly suspect that those SE activities declared by the AAC&U as 'high-impact educational practices' (esp. internships, research projects, study abroad, capstone or senior projects; S. R. Johnson & Stage, 2018; Riehle & Weiner, 2013) serve as additional signals and thus selection criteria of employers and exert a positive significant impact on employment and income. Through involvement in SE, job applicants can spice up their resume by signaling that they possess wider competences and qualifications beyond conservative vertical and horizontal formal education. In sum, we expect students to invest in a combination of vertical, horizontal and supplemental education to increase their chances of entrance to attractive jobs and related higher income.

Hypothesis 3. A higher amount of SE at college is positively associated with a higher possibility of being employed and a higher income upon college graduation.

Research further suggests differential effects of SE according to type (Buchmann et al., 2010; Frick & Maihaus, 2016; Luo & Jamieson-Drake, 2015). In line with signal and screening theories, different types of SE ought to signal different productivity potential of job applicants. Given the same formal educational credentials, it depends on the kind of skills associated with the type of SE the applicant participated in. Hence, we expect different labor market outcomes of SE depending on its type.

Hypothesis 4. More promising types of SE, i. e. study abroad and internships, are more positively associated with a higher possibility of being employed and a higher income upon college graduation compared to less acknowledged types of SE.

Based on social reproduction, rational choice and EMI theories we expected high SES students to invest more in those types of SE which signal concrete marketable skills, indicating higher productivity potential. Hence, we expect high SES graduates to gain higher labor market returns from their investments in SE at college compared to lower SES graduates.

Hypothesis 5. SE at college leads to a higher likelihood of employment and higher income for high SES graduates compared to low SES graduates.

Method

Data and Sample

To test our hypotheses, we used data from ELS:2002 conducted by the National Center for Education Statistics in the United States. ELS:2002 collected information on a nationally representative sample of high school sophomores in the United States as they transitioned through high school into postsecondary education and/or employment (Lauff, Ingels, & Christopher, 2014). Specifically, in 2002, the base year of the study, a national probability sample of approximately 15,000 tenth-graders across about 800 public, Catholic, and private schools were surveyed. In addition to the student respondents, their parents, teachers, and principals completed the questionnaires. The first follow-up survey was conducted in 2004 when the majority of the sampled respondents were in 12th grade. The second follow-up survey was conducted in 2006 when many sample members had either enrolled in college or begun their careers. Finally, the third follow-up survey was conducted a decade later (i. e., 2012), when the former high school students were about 26 years old and most of those who had enrolled in college had graduated and started their careers (Lauff et al., 2014). For the current study, we restricted our analyses to approximately 8,000 respondents who participated in the base-year and all follow-up surveys and who ever enrolled in and completed their postsecondary education as of the third follow-up survey.

Measures

Outcome variables

We examined two labor market outcomes: employment status and earnings. Employment was measured by a dichotomous variable indicating whether a respondent who completed college was either employed (including both part-time and full-time) (= 1) or unemployed (= 0) as of the third follow-up interview. Earnings were measured by respondents' report on their earnings during the 2011 calendar year. In the regression analysis, we used the log of annual earnings as dependent variable.

Supplementary education

SE was measured by the number of high-impact educational activities in which the respondent reported participating as part of their postsecondary enrollment: (a) internship, co-op, field experience, student teaching, or clinical assignment; (b) research project with a faculty member outside of course or program requirements; (c) study abroad; (d) community-based project as part of a regular course; (e) culminating senior experience, such as a capstone course, senior project or thesis, or comprehensive exam; (f) a program in which the respondent was mentored. Note that this variable served as a dependent variable when examining the determinants of SE. Then, it served as the major explanatory variable when studying the effect of SE on employment and earnings.

Family SES

Family SES is a standardized composite score composed of five variables: (a) father's/guardian's education, (b) mother's/guardian's education, (c) annual family income, (d) father's/guardian's occupation, and (e) mother's/guardian's occupation.

Controls

Past research has found a number of factors that are associated with SE as well as employment status and earnings, including socio-demographics, pre-college (e. g., SE at high school) and college variables (e. g., levels and selectivity of postsecondary institutions) (e. g., Hout, 2012; Knouse & Fontenot, 2008; Lingo, 2019; Luo & Jamieson-Drake, 2015; Partlo & Ampaw, 2018; Schmidt & Pardo, 2017). Accordingly, in order to achieve undistorted effects of SE at college, we controlled for these variables, and provide a detailed description of these controls in Appendix A.

Analytic Strategies

First, we performed descriptive statistics for the variables included in our analyses. Second, we estimated a series of logistic regression models to more systematically examine socioeconomic differences in SE. To be specific, we first included family SES only (Model 1). We then included socio-demographic variables (Model 2), pre-college variables (Model 3), and college variables (Model 4) sequentially. Estimating these models help us understand the way in which family SES matters to SE.

Third, we estimated two logistic regression models to examine the effect of SE on employment. The first model included SE, family SES, and other controls to examine whether SE was significantly related to the likelihood of employment, controlling for other variables. The second model additionally included the interaction term between SE and family SES to examine who benefited more from SE in terms of family SES.

Fourth, we estimated three ordinary least squares (OLS) regression models to examine the effect of SE on earnings. The first model included SE, family SES, and other controls to examine whether SE was significantly related to earnings, controlling for other variables. The second model additionally introduced employment and occupation as additional controls. The final model additionally included the interaction term between SE and family SES to examine who benefited more from SE. Finally, we replicated these analyses for each type of SE.

For missing data (see Table 1 for the percentage of imputed data), we used multiple imputations. Specifically, following recommendations set forth by D. R. Johnson and Young (2011), we included all of the independent and dependent variables in the imputed model. While some research indicates that accurate results can be obtained from two to 10 imputations (Rubin, 1987; von Hippel, 2005), we generated 25 imputed datasets for each cycle in order to increase the precision and minimize the bias, using the Stata ICE module (Acock, 2012). In each imputed data set, missing values were replaced with a plausible random value drawn on observed values of all variables (von Hippel, 2005). We then conducted analyses with each of the 25 imputed data sets and averaged estimates across the 25 imputed data sets, using Rubin's (1987) rule. To produce unbiased estimates of population parameters, we used the panel weight for all sample members who responded in the third follow-up and responded in the base year.

Results

Descriptive Findings

Table 1. Unweighted Descriptive Statistics for the Variables Included in Analyses

Variable	M	SE	% of missing
Employment status	0.87	–	0.0
Early career earnings	10.00	1.00	8.6
Supplementary education at college	1.26	1.42	12.0
Family SES	0.16	0.74	0.0
Race			0.0
White	0.62	–	
Asian	0.09	–	
African American	0.11	–	
Hispanic	0.12	–	
Other	0.05	–	
Female	0.54	–	

Variable	M	SE	% of missing
Academic performance at high school	52.77	9.41	0.0
Supplementary education at high school	2.32	1.85	7.1
Highest education attained			0.0
Less than bachelor	0.51	–	
Bachelor degree	0.37	–	
Masters or higher	0.12	–	
Selectivity of college attained			1.3
Less than 4-year college	0.28	–	
Non-selective 4-year	0.16	–	
Selective 4-year	0.30	–	
Highly selective 4-year	0.26	–	
GPA at college	2.69	0.89	10.9
Occupation			2.6
Managers	0.12	–	
Professionals A/B	0.24	–	
Clerical	0.16	–	
Service	0.17	–	
Operative	0.05	–	
Sales	0.05	–	
School teacher	0.04	–	
Technical	0.07	–	
Other	0.10	–	
N	7,857		

Note. The estimates are an average of the results across 25 imputed datasets.
Source. U.S. Department of Education, National Center for Education Statistics, Educational Longitudinal Study of 2002

Table 1 presents descriptive statistics for the variables included in the analyses. To briefly describe the characteristics of our sample, out of 7,857 high school graduates who completed their college education, 87% were employed in 2011, and their average earnings were approximately 22,000 US dollars (i.e., $e^{10.0} = 22{,}004$). While the average number of students involved with SE was 1.26, 44.9% participated in internship, 10.6% in study abroad, 12.9% in research projects, 17.4% in community-based projects, 27.2% in culminating experiences, and 16.0% in mentoring programs (see Appendix B).

The average SES was .16, suggesting that those high school graduates included in our analyses came from relatively higher SES families, compared to all high school students who participated in ELS. In terms of race, 62% were white, 9% Asian, 11% African American, 12% Hispanic, and 5% others. When it came to gender, 54% were female.

The average of mathematics and reading standardized scores was approximately 53, which is slightly higher than the national mean (i.e., 50). Students participated on average in more than two types of SE at high school (i.e. 2.32 supplementary courses). For educational attainment, 51% had an associate's degree or other, 37% a bachelor's degree, and 12% an advanced degree. In terms of the selectivity of college, 28% enrolled in a less than 4-year college, 16% in a non-selective college, 30% in a selective 4-year college, and 26% in a highly selective college. The average college GPA was 2.69. Finally, 12% had managerial jobs, 24% professional jobs, and 17% service jobs.

Determinants of Supplementary Education

Table 2 shows results from the OLS regression models that predict SE at college. Model 1, including only family SES, showed significant socioeconomic disparities in the number of high-impact supplementary activities the students involved in at college. That is, respondents from high SES families were involved in a significantly higher number of SE practices, compared to students from low SES families. These socioeconomic disparities remained significant, even after controlling for race and gender (Model 2).

In Model 3, where we additionally controlled for school performance and SE at high school, the size of the coefficient of family SES reduced from .40 to .22 (45 % reduction). Yet, the coefficient of family SES remained statistically significant. In Model 4, where we additionally took college variables into account, the size of the coefficient of family SES further reduced from .22 to .06 (73 % reduction), but remained statistically significant.

Before we examine the effect of SE on labor market outcomes, we briefly describe significant predictors of SE other than family SES, focusing on Model 4. African American and female respondents engaged in a significantly higher number of supplementary learning activities at college, compared to their white and male counterparts, respectively, when other variables were taken into account. The higher the number of SE used at high school, the higher the number of SE used at college. Respondents, who attained a bachelor's degree or higher and attended more selective college, were involved in a significantly higher number of supplementary learning activities at college, compared to their counterparts who attained an associate's degree and attended less than four-year college, respectively. Finally, college GPA significantly predicted the number of supplementary learning activities at college, even after controlling for other variables.

Table 2. Determinants of Supplementary Education at College

	Model 1			Model 2			Model 3			Model 4		
Variable	B		SE	B		SE	B		SE	B		SE
Family SES	0.41	***	0.03	0.40	***	0.03	0.22	***	0.03	0.06	*	0.03
Race												
White (Reference)												
Asian				0.12		0.06	0.12		0.06	-0.07		0.06
African American				-0.10		0.06	0.10		0.06	0.17	**	0.06
Hispanic				-0.14	*	0.06	0.05		0.06	0.05		0.06
Other				-0.14		0.09	-0.06		0.09	0.00		0.09
Female				0.35	***	0.04	0.28	***	0.04	0.16	***	0.04
Academic performance at high school							0.02	***	0.00	0.00		0.00
Supplementary education at high school							0.16	***	0.01	0.10	***	0.01
Highest education attained												
Less than bachelor (reference)												
Bachelor's degree										0.63	***	0.06
Masters or higher										0.91	***	0.09
Selectivity of college attained												
Less than four-year college (reference)												
Non-selective four-year college										0.05		0.05
Selective four-year college										0.13	*	0.06
Highly selective four-year college										0.38	***	0.07
GPA at college										0.26	***	0.02
Constant	1.12		0.02	0.97	***	0.03	-0.58	***	0.12	-0.20		0.12
R^{2a}	0.045			0.062			0.136			0.256		
N	7,857											

Note. The estimates are an average of the results across 25 imputed datasets.
Source. U.S. Department of Education, National Center for Education Statistics, Educational Longitudinal Study of 2002
a. R^2 is based on one complete and imputed dataset.
*** p < .001, ** p < .01, * p < .05 (two-tailed tests)

Effects of Supplementary Education on Labor Market Outcomes

Employment

Table 3. The Effects of Supplementary Education at College on the Likelihood of Employment

	Model 1			Model 2		
Variable	B	SE	OR	B	SE	OR
Supplementary education at college	0.04	0.04	1.04	0.04	0.04	1.04
Family SES	0.04	0.07	1.04	0.07	0.09	1.07
Supplementary education at college X family SES				-0.03 **	0.05	0.97
Controls						
Race						
White (Reference)						
Asian	-0.22	0.14	0.80	-0.22 ***	0.14	0.80
African American	-0.03	0.13	0.97	-0.03	0.13	0.97
Hispanic	-0.25 *	0.12	0.78	-0.25 *	0.12	0.78
Other	-0.33	0.19	0.72	-0.34 *	0.19	0.72
Female	-0.80 ***	0.09	0.45	-0.80 ***	0.09	0.45
Academic performance at high school	0.02 *	0.01	1.02	0.02 *	0.01	1.02
Supplementary education at high school	0.04	0.03	1.04	0.04	0.03	1.04
Highest education attained						
Less than bachelor (reference)						
Bachelor's degree	0.56 ***	0.14	1.76	0.56 ***	0.14	1.76
Masters or higher	0.48 *	0.20	1.62	0.49 ***	0.20	1.64
Selectivity of college attained						
Less than four-year college (reference)						
Non-selective four-year college	-0.09	0.12	0.91	-0.09	0.12	0.91
Selective four-year college	0.20	0.14	1.23	0.20	0.14	1.22
Highly selective four-year college	0.26	0.17	1.30	0.27	0.17	1.31
GPA at college	0.13 *	0.06	1.13	0.13	0.06	1.14
Constant	0.88 ***	0.29	–	0.88 ***	0.29	–
Log likelihood[a]	-689956.67			689903.32		
Pseudo R^{2a}	0.069			0.069		
N	7,857					

Note. The estimates are an average of the results across 25 imputed datasets.
Source. U.S. Department of Education, National Center for Education Statistics, Educational Longitudinal Study of 2002
a. R^2 is based on one complete and imputed dataset.
*** p < .001, ** p < .01, * p < .05 (two-tailed tests)

Table 3 shows results from the logistic regression models that estimate the effect of SE on the likelihood of employment. In Model 1, where we included all variables, we found that neither

SE nor family SES were significantly related to the likelihood of employment. However, in Model 2, where we additionally introduced the interaction term between SE and family SES, we found that there was a significant interaction effect of SE and family SES favoring respondents from low SES families. In other words, results showed that respondents from low SES families tended to benefit more from their participation in SE in terms of an increased likelihood of employment, compared to respondents from high SES families.

Before we turn to results for the effect of SE on earnings, we briefly summarize significant predictors of employment other than SE and family SES, focusing on Model 1. Respondents with Hispanic background were less likely than their white counterparts to be employed, controlling for other variables. Being female was associated with the decreased likelihood of employment. Academic performance at both high school and college had a positive effect on the likelihood of employment, even after controlling for other variables. Attaining a bachelor's or higher degree was associated with the increased likelihood of employment.

Table 4. The Effect of Supplementary Education at College on Earnings

	Model 1		Model 2		Model 3	
Variable	B	SE	B	SE	B	SE
Supplementary education at college	0.02	0.01	0.01	0.01	0.01	0.01
Family SES	0.03	0.02	0.02	0.02	0.03	0.03
Supplementary education at college X family SES					0.00	0.01
Controls						
Race						
White (Reference)						
Asian	-0.01	0.05	0.01	0.05	0.01	0.05
African American	-0.15 **	0.05	-0.14 **	0.05	-0.14 **	0.05
Hispanic	-0.05	0.05	-0.04	0.05	-0.03	0.04
Other	-0.15 *	0.07	-0.11 *	0.06	-0.11	0.06
Female	-0.33 ***	0.03	-0.18 ***	0.03	-0.18 ***	0.03
Academic performance at high school	0.01 ***	0.00	0.01 **	0.00	0.01 **	0.00
Supplementary education at high school	0.04 ***	0.01	0.03 ***	0.01	0.03 ***	0.01
Highest education attained						
Less than bachelor (reference)						
Bachelor's degree	0.26 ***	0.04	0.17 ***	0.04	0.17 ***	0.04
Masters or higher	0.02	0.06	-0.09	0.06	-0.09	0.06
Selectivity of college attained						
Less than four-year college (reference)						
Non-selective four-year college	-0.09	0.05	-0.09	0.05	-0.09	0.05
Selective four-year college	-0.05	0.05	-0.08	0.05	-0.08	0.05
Highly selective four-year college	-0.01	0.06	-0.05	0.05	-0.05	0.05
GPA at college	0.11 ***	0.02	0.09 ***	0.02	0.09 ***	0.02
Employed			0.76 ***	0.06	0.76 ***	0.06
Occupation						
Managers			0.49 ***	0.05	0.49 ***	0.05

	Model 1		Model 2		Model 3	
Variable	B	SE	B	SE	B	SE
Professionals A/B			0.43 ***	0.05	0.44 ***	0.05
Clerical			0.23 ***	0.05	0.23 ***	0.05
Service (reference)						
Operative			0.30 **	0.07	0.30 **	0.07
Sales			0.25 ***	0.07	0.25 ***	0.07
School teacher			0.30 ***	0.07	0.30 ***	0.07
Technical			0.42 ***	0.06	0.42 ***	0.06
Other			0.36 ***	0.05	0.36 ***	0.05
Constant	9.30 ***	0.10	8.54 ***	0.11	8.54 ***	0.11
R^{2a}	0.111		0.210		0.210	
N	7,857					

Note. The estimates are an average of the results across 25 imputed datasets.
Source. U.S. Department of Education, National Center for Education Statistics, Educational Longitudinal Study of 2002
a. R^2 is based on one complete and imputed dataset.
*** p < .001, ** p < .01, * p < .05 (two-tailed tests)

Earnings

Table 4 shows results from the OLS regression models that estimate the effect of SE on earnings. In Model 1, where we included all variables, we found no significant effect of SE on earnings. In Model 2, where we additionally controlled for employment status and occupation, results remained the same. In Model 3, where we additionally introduced the interaction term between SE and family SES, we did not find a significant interaction effect either.

Before we discuss results from supplement analyses for each type of SE, we briefly describe other significant predictors of earnings, focusing on Model 2. Black respondents earned significantly less, compared to their white counterparts, controlling for other variables. Female respondents also earned significantly less, compared to their male counterparts. Both academic performance and SE at high school significantly predicted earnings, even after controlling for other variables. Attaining a bachelor's or higher degree was associated with an increase in earnings. College GPA was positively associated with earnings. Being employed was associated with higher earnings. Respondents having service occupations showed the lowest earnings.

Determinants and Effects of SE by Type

Thus far, we focused on the (total) number of high-impact SE activities that students were engaged in at college. Although this measure is useful, it might obscure potential heterogeneity in the determinants and effects of SE across different types. To address this issue, we conducted a series of supplementary analyses to examine how socioeconomic disparities in

Table 5. Predictors of Supplementary Education at College by Type

	Internship				Study abroad				Research project			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
Variable	B	SE	B	SE	B	SE	B	SE	B	SE	B	SE
Family SES	0.40 ***	0.04	0.03	0.05	0.87 ***	0.08	0.34 ***	0.09	0.35 ***	0.07	0.12	0.08
Controls	No		Yes		No		Yes		No		Yes	
Pseudo R^{2a}	0.014		0.117		0.051		0.163		0.008		0.053	
N	7,857											

	Community-based project				Culminating senior experience				Mentoring program			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
Variable	B	SE	B	SE	B	SE	B	SE	B	SE	B	SE
Family SES	0.36 ***	0.05	0.04	0.06	0.60 ***	0.05	0.05	0.06	0.23 ***	0.06	0.01	0.06
Controls	No		Yes		No		Yes		No		Yes	
Pseudo R^{2a}	0.011		0.087		0.028		0.183		0.003		0.046	
N	7,857											

Note. The estimates are an average of the results across 25 imputed datasets.
Source. U.S. Department of Education, National Center for Education Statistics, Educational Longitudinal Study of 2002
a. R^2 is based on one complete and imputed dataset.
*** p < .001, ** p < .01, * p < .05 (two-tailed tests)

Table 6. The Effects of Supplementary Education at College on the Likelihood of Employment by Type

	Internship			
	Model 1		Model 2	
Variable	B	SE	B	SE
Internship	0.13	0.11	0.13	0.11
Study abroad	-0.21	0.18	-0.20	0.19
Research project	-0.14	0.16	-0.14	0.16
Community-based project	-0.06	0.15	-0.06	0.15
Culminating senior experience	0.14	0.14	0.16	0.15
Mentoring program	0.04	0.14	0.03	0.14
Family SES	0.05	0.07	0.06	0.09
Internship X family SES			0.08	0.15
Study abroad X family SES			-0.01	0.24
Research project X family SES			-0.07	0.20
Community-based project X family SES			-0.06	0.19
Culminating senior experience X family SES			-0.13	0.20
Mentoring program X family SES			-0.01	0.21
Controls	Yes		Yes	
Pseudo R^{2a}	0.069		0.070	
N	7,857			

Note. The estimates are an average of the results across 25 imputed datasets.
Source. U.S. Department of Education, National Center for Education Statistics, Educational Longitudinal Study of 2002
a. R^2 is based on one complete and imputed dataset.
*** p < .001, ** p < .01, * p < .05 (two-tailed tests)

SE and its effects on employment and earnings differed by type. We present these results in Table 5, 6, and 7.

To briefly summarize, we found significant socioeconomic disparities in all types of SE before taking into account other variables (Table 5, Model 1). However, we found significant socioeconomic disparities only in participation in study abroad and research projects after taking into account other variables (Table 5, Model 2). In terms of the effects on employment, we found that none of the forms of SE at college were significantly related to the likelihood of employment (Table 6, Model 1). When it came to the interaction effect of SE and family SES, we also did not find any significant interaction effect for either type of SE (Table 6, Model 2).

Finally, for the effects on earnings, we found that only participation in internship was positively related to earnings, controlling for other variables (Table 7, Model 1). Once we additionally controlled for employment status and occupation, participation in internship remained significant (Table 7, Model 2). Yet, we did not find significant interaction effects of SE and family SES for any type of supplementary activity at college (Table 7, Model 3).

Table 7. The Effects of Supplementary Education at College on Earnings by Type

	Model 1		Model 2		Model 3	
Variable	B	SE	B	SE	B	SE
Internship	0.08	* 0.03	0.06	* 0.03	0.06	* 0.03
Study abroad	-0.04	0.05	-0.03	0.05	-0.03	0.05
Research project	0.00	0.05	0.00	0.05	0.00	0.05
Community-based project	-0.04	0.04	-0.05	0.04	-0.05	0.04
Culminating senior experience	0.03	0.04	0.04	0.04	0.04	0.04
Mentoring program	0.01	0.04	-0.02	0.04	-0.02	0.04
Family SES	0.04	0.02	0.02	0.03	0.02	0.03
Internship X family SES			-0.01	0.04	-0.01	0.04
Study abroad X family SES			0.00	0.06	0.00	0.06
Research project X family SES			0.01	0.06	0.01	0.06
Community-based project X family SES			0.01	0.05	0.01	0.05
Culminating senior experience X family SES			-0.06	0.05	-0.06	0.05
Mentoring program X family SES			0.10	0.05	0.10	0.05
Controls	Yes		Yes		Yes	
Employment status and occupation	No		Yes		Yes	
R^{2a}	0.112		0.211		0.212	
N	7,857					

Note. The estimates are an average of the results across 25 imputed datasets.
Source. U.S. Department of Education, National Center for Education Statistics, Educational Longitudinal Study of 2002
a. R^2 is based on one complete and imputed dataset.
*** p < .001, ** p < .01, * p < .05 (two-tailed tests)

Discussion

Using data from ELS:2002, we found significant socioeconomic differences in SE at college. This finding is consistent with literature that documents socioeconomic disparities in shadow education at the levels of primary and secondary education in general (Baker, Akiba, LeTendre, & Wiseman, 2001; Byun et al., 2018; Entrich, 2018; Stevenson & Baker, 1992) and for the United States in particular (Buchmann et al., 2010; Byun & Park, 2012). The finding extends our knowledge by demonstrating that family SES continues to matter for SE participation beyond secondary education (confirming hypothesis 1). Additionally, we found that the size of socioeconomic disparities in SE at college varied, depending on its type. For example, our differentiated analyses showed that while there were significant socioeconomic differences in SE regardless of its type, the socioeconomic gap was more evident for study abroad (the only type of high-impact supplementary education at college for which such

disparities were investigated and reported in prior research; Lingo, 2019; Luo & Jamieson-Drake, 2015; Netz et al., 2019) than for other types of SE (partly confirming hypothesis 2).

Furthermore, our study showed the way in which family SES affects SE at college. For example, our analyses showed that much of the effect of family SES on SE at college was explained by respondents' pre- and college experiences. This finding suggests that family SES not only directly affects children's SE at college, but also indirectly affects it through children's various pre- and college experiences. An interesting finding is that SE at high school significantly predicted SE at college even after controlling for other variables. This finding suggests that reliance on SE at the lower levels of education may continue at the upper level of education.

With respect to the effect of SE on labor outcomes, we did not find significant effects for both employment and earnings (contrasting to hypothesis 3). However, we did find significant interaction effects of SE and family SES on employment, suggesting that respondents from low SES families tended to benefit more in terms of the increased likelihood of employment, compared to their counterparts from high SES families (contrasting to hypothesis 5). These findings suggest that although students from low SES families have fewer opportunities for SE at college, they tend to benefit more from their participation in SE. These results are in line with findings from Entrich (2018), reporting stronger effects of SE at high school on the transition to college for low SES students in Japan. Similarly, SE at college indicates a compensatory effect for low SES graduates, who may use SE to overcome their status disadvantages and secure a more advantageous employment. The additionally found effects of SE at high school on SE at college imply that low SES students may be more inclined to use SE at college if they have experience with this kind of extra-curricular involvement and thus appreciate the value of such an additional investment.

Yet, our differential analyses showed a somewhat different picture. That is, while we found significant main effects on earnings only for internship (partly confirming hypothesis 4), we did not find significant interaction effects for all types of SE considered in the study. Although more research is needed to understand these contradictory findings, these results suggest complexities in the nature and effect of SE by type. In this regard, our findings are in line with past findings on SE at school, which found heterogeneity in the effect of shadow education on academic achievement and access to higher ranking educational institutions, depending on its type (Buchmann et al., 2010; Byun, 2014; Entrich, 2018; Stevenson & Baker, 1992).

The present study has several limitations that need to be addressed in future research. First, while the results of our study raise doubts about AAC&U's officially postulated highly effective nature of SE at college, it remains to be answered under what conditions certain types of SE actually benefit students. Future studies should investigate the conditions under which SE investments can become effective, i. e. when which type of SE may benefit the students' labor market outcomes, by focusing on differences in occupations, study majors and the like. Also, different measures of labor market outcomes should be considered. Our focus on employment and annual income is well-suited to show how well college graduates fare in their early careers overall. But there may exist considerable differences in the wage levels of graduates. Second, the current study focused on those ELS high school graduates who enrolled in and completed postsecondary education and their earlier labor market outcomes at the age of 26. Therefore, their employment status and earnings could be subject to change, rather than being fixed and permanent. In addition, we found that many of ELS high school

graduates (about 20 %) were still in college at the age of 26. Accordingly, our findings should be interpreted with caution.

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Appendix A. Description of Variables Included in Analyses

Variable	Description
Employment status	Respondent's employment status in 2012, i. e. third follow-up interview in terms of the number and type (full-time v. part-time) of job(s) they were working (0 = not working, 1 = working)
Early career earnings	Respondent's income from employment during the 2011 calendar year
Supplementary education at college	Sum score indicating the number of high-impact educational activities in which the respondent reported participating as a part of their postsecondary enrollment: (a) Internship, co-op, field experience, student teaching, or clinical assignment; (b) research project with a faculty member outside of course or program requirements; (c) study abroad; (d) community-based project as part of a regular course; (e) culminating senior experience, such as a capstone course, senior project or thesis, or comprehensive exam; (f) a program in which the respondent was mentored
Family SES	A standardized composite score composed of five variables: (a) father's education, (b) mother's education, (c) annual family income, (d) father's occupation, and (e) mother's occupation
Race	Respondent's indicated race (white, Asian, African American, Hispanic, and others)
Gender	Respondent's indicated gender (0 = male, 1 = female)
Academic performance at high school	Respondent's test score in 10th grade on mathematics and reading, which is scaled to a national mean of 50 and standard deviation of 10.
Supplementary education at high school	Sum score indicating the number of the respondent's involvement in SAT and/or ACT preparation courses based on the following items:

Variable	Description
	(a) SAT/ACT course at high school; (b) course offered by a commercial test preparation service; (c) private one-to-one tutoring; (d) test preparation books; (e) test preparation video tape; (f) test preparation computer program
Highest education attained	Ordinal variable based upon the respondent's highest achieved level of education as of 2012 (1 = less than bachelor, 2 = bachelor's degree, 3 = master's degree or higher
Selectivity of college	Indicates the highest level of admissions selectivity among all postsecondary institutions attended by the respondent, based on the Carnegie Classification 2010 (Undergraduate Profile): "highly selective" 4-year institutions refer to those whose first-year students' test scores places them in roughly the top fifth of baccalaureate institutions; "moderately selective" 4-year institutions refer to those whose first-year students' test scores places them in roughly the middle two-fifths of baccalaureate institutions; "inclusive" 4-year institutions either did not report test score data, or their scores indicate that they extend educational opportunity to a wide range of students with respect to academic preparation and achievement
GPA	Respondent's known grade-point average (GPA) at all known postsecondary institutions attended as of June 2013
Occupation	SEI-based code for respondent's current/most recent job (1 = Managers, 2 = Professionals A/B, 3 = Clerical, 4= Service, 5 = Operative, 6 = Sales, 7 = School teacher, 8 = Technical, 9 = others (e.g., Craftsperson, Laborer, Military, Protective Service)

Appendix B. Percentage of Supplementary Education at College by Type

Variable	%
Internship	44.9
Study abroad	10.6
Research project	12.9
Community-based project	17.4
Culminating senior experience	27.2
Mentoring program	16.0
N	7,857

Note. The estimates are an average of the results across 25 imputed datasets. Numbers do not add up to 100% because students could participate in multiple supplementary learning activities.
Source. U.S. Department of Education, National Center for Education Statistics, Educational Longitudinal Study of 2002