Education and Lifetime Earnings in the United States: Estimates of Relationships Using Administrative Data Matched with the Survey of Income and Program Participation

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Abstract

There is widespread research and policy interest in differences in lifetime earnings by education. Utilizing data that matches respondents in the *Survey of Income and Program Participation* to their longitudinal earnings records in the Social Security Administration, we estimate the long-term effects of education on earnings. Our results reveal the persistent effects of education on earnings over different stages of the work-life and over a lifetime. Relative to having only a high school degree, men with a bachelor's degree earn about $903,000 more while women earn about $617,000 more over a 50-year work-life. These figures are reduced by about one-third after controlling for the probability of obtaining a bachelor's degree based on race/ethnicity, preparatory courses taken in high school, type of high school, and other characteristics. The net lifetime earnings benefit of a graduate degree is also substantial particularly in the later stage of the work-life when earnings tend to decline more rapidly for workers without a graduate degree. Other results suggest that the lifetime returns to a college degree are increasing for younger cohorts of men while lifetime earnings for younger cohorts of less educated men may actually be declining. The implications of these and other findings are discussed.

Keywords: Lifetime Earnings; Education; Semi-synthetic Cohort Method

Table 1. Sample Characteristics by Birth Cohort

	Total	Cohort 1	Cohort 2	Cohort 3	Cohort 4
Birth Years	1932-1969	1962-1969	1952-1959	1942-1949	1932-1939
Ages	20-69	20-39	30-49	40-59	50-69
Starting Year	1982 to 1989	1982 (age 20 for 1962 cohort) to 1989 (age 20 for 1969 cohort)	1982 (age 30 for 1952 cohort) to 1989 (age 30 for 1959 cohort)	1982 (age 40 for 1942 cohort) to 1989 (age 40 for 1949 cohort)	1982 (age 50 for 1932 cohort) to 1989 (age 50 for 1939 cohort)
Ending Year	2001 to 2008	2001 (age 39 for 1962 cohort) to 2008 (age 39 for 1969 cohort)	2001 (age 49 for 1952 cohort) to 2008 (age 49 for 1959 cohort)	2001 (age 59 for 1942 cohort) to 2008 (age 59 for 1949 cohort)	2001 (age 69 for 1932 cohort) to 2008 (age 69 for 1939 cohort)
Age in Year 2004	35-72	35-42	45-52	55-62	65-72
Male Sample Size	11,554	3,779	3,845	2,571	1,359
Female Sample Size	11.845	3,942	3,965	2,626	1,312

Table 2. Median 10- and 20-year Cumulative Earnings of Educational Subgroups by Gender and Life-Course Stage

	Men				Women			
	Cohort 1 (Age 20-39)	Cohort 2 (Age 30-49)	Cohort 3 (Age 40-59)	Cohort 4 (Age 50-69)	Cohort 1 (Age 20-39)	Cohort 2 (Age 30-49)	Cohort 3 (Age 40-59)	Cohort 4 (Age 50-69)
Total Workers								
20 Year Earnings ($)	675,035	918,539	1,009,853	708,889	404,209	507,319	563,995	371,935
10 Year Earnings ($)								
- 20s	230,977				164,065			
- 30s	429,038	419,664			237,825	213,726		
- 40s		492,856	534,793			292,243	268,829	
- 50s			482,211	487,888			293,464	239,718
- 60s				189,964				105,286
Less Than High School								
20 Year Earnings ($)	390,465	547,287	568,399	517,951	156,876	244,134	285,505	237,347
10 Year Earnings ($)								
- 20s	145,221				44,998			
- 30s	237,629	243,318			112,466	85,976		
- 40s		291,591	319,555			146,083	148,954	
- 50s			295,875	339,238			150,192	164,866
- 60s				130,936				72,013
High School Graduate								
20 Year Earnings ($)	559,150	740,753	850,824	589,256	309,339	384,651	442,942	305,266
10 Year Earnings ($)								
- 20s	222,437				123,924			
- 30s	337,114	357,061			184,053	150,436		
- 40s		395,794	436,563			223,704	215,953	
- 50s			390,686	420,127			225,173	201,457
- 60s				164,196				84,087
Some College								
20 Year Earnings ($)	658,361	858,227	942,198	709,704	367,751	474,424	522,914	398,739
10 Year Earnings ($)								
- 20s	239,830				153,796			
- 30s	412,279	394,577			218,513	198,699		
- 40s		467,822	487,313			271,972	256,969	
- 50s			444,847	497,739			271,302	263,486
- 60s				190,071				119,779
Bachelor Only								
20 Year Earnings ($)	872,978	1,262,031	1,304,636	1,011,612	544,834	692,365	730,942	513,175
10 Year Earnings ($)								
- 20s	244,038				210,418			
- 30s	612,187	575,983			337,273	297,044		
- 40s		684,787	672,810			395,754	352,805	
- 50s			625,325	694,262			388,380	357,383
- 60s				279,833				151,673
Graduate Degree								
20 Year Earnings ($)	960,202	1,618,162	1,639,610	1,253,310	676,237	895,268	995,431	755,466
10 Year Earnings ($)								
- 20s	225,743				215,245			
- 30s	724,199	675,701			472,657	379,979		
- 40s		951,255	811,042			520,390	491,540	
- 50s			827,461	821,416			525,331	532,092
- 60s				456,275				195,410

Table 3. Median Regressions of 10-year Cumulative Earnings for Men by Age

	Age 20-29 (Cohort 1)		Age 30-39 (Cohorts 1 & 2)		Age 40-49 (Cohorts 2 & 3)		Age 50-59 (Cohorts 3 & 4)		Age 60-69 (Cohort 4)	
	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.	Coeff.	Sig.
Education (Ref=HSG)										
LTHS	-.436	***	-.337	***	-.270	***	-.166	***	-.142	
	(.052)		(.040)		(.042)		(.045)		(.117)	
SC	.052		.116	***	.112	***	.093	**	.071	
	(.027)		(.021)		(.022)		(.030)		(.091)	
BA	.043		.428	***	.392	***	.366	***	.307	*
	(.037)		(.026)		(.028)		(.038)		(.124)	
GRAD	-.072		.578	***	.581	***	.584	***	.790	***
	(.044)		(.033)		(.033)		(.040)		(.130)	
Race (Ref=White)										
Black	-.302	***	-.287	***	-.220	***	-.134	**	-.145	
	(.036)		(.028)		(.032)		(.042		(.125)	
Hispanics	-.156	***	-.134	***	-.173	***	-.200	**	.461	*
	(.039)		(.033)		(.052)		(.060)		(.221)	
Others	-.145	*	-.147	**	-.173	**	-.090		-.396	
	(.061)		(.048)		(.052)		(.068)		(.217)	
Never married	-.263	***	-.316	***	-.379	***	-.355	***	-.176	
	(.028)		(.024)		(.031)		(.056)		(.204)	
Married before Age 18	.014		-.089		-.304	***	-.335	***	-.390	
	(.105)		(.075)		(.074)		(.096)		(.309)	
Birth Year	.017	***	-.005	**	.001		.010	***	-.012	
	(.005)		(.002)		(.002)		(.002)		(.015)	
Born in the South	-.034		-.078	***	-.058	**	-.040		-.052	
	(.025)		(.019)		(.020)		(.026)		(.080)	
Private High School	.039		.066	*	.025		-.017		-.176	
	(.040)		(.031)		(.032)		(.040)		(.128)	
College Prep	.059	*	.098	***	.140	***	.125	***	.228	*
	(.027)		(.020)		(.021)		(.028)		(.097)	
Math & Science AP	.054	*	.068	***	.052	**	.082	**	.226	**
	(.025)		(.019)		(.020)		(.026)		(.079)	
Constant	11.719	***	13.024	***	12.914	***	12.305	***	12.770	***
	(.185)		(.070)		(.088)		(.135)		(1.055)	
Sample Size	3.779		7,624		6,416		3,930		1,359	
Pseudo R-squared	.048		.123		.116		.096		.052	

Notes: Numbers within parenthesis are standard errors.
* < .05; ** < .01; *** < .001 (two-tailed tests)

Table 4. Median Regression of 10-year Cumulative Earnings for Women by Age

	Age 20-29 (Cohort 1)		Age 30-39 (Cohorts 1 & 2)		Age 40-49 (Cohorts 2 & 3)		Age 50-59 (Cohorts 3 & 4)		Age 60-69 (Cohort 4)	
	Coeffi.	Sig.	Coeffi.	Sig.	Coeffi.	Sig.	Coeffi.	Sig.	Coeffi.	Sig.
Education (Ref=HSG)										
LTHS	-.848	***	-.490	***	-.371	***	-.282	***	-.203	
	(.085)		(.068)		(.059)		(.066)		(.116)	
SC	.119	**	.166	***	.179	***	.163	***	.249	**
	(.039)		(.031)		(.027)		(.038)		(.081)	
BA	.322	***	.420	***	.405	***	.450	***	.409	**
	(.048)		(.0039)		(.036)		(.053)		(.119)	
GRAD	.291	***	.697	***	.708	***	.754	***	.570	***
	(.062)		(.047)		(.040)		(.057)		(.131)	
Race (Ref=White)										
Black	-.096	*	.118	**	.090	*	.212	***	.269	*
	(.047)		(.039)		(.037)		(.053)		(.110)	
Hispanics	-.106		.045		-.039		-.048		.026	
	(.059)		(.052)		(.052)		(.078)		(.184)	
Others	-.181	*	.024		-.051		-.097		.104	
	(.086)		(.072)		(.068)		(.094)		(.197)	
No. of Total Children	-.145	***	-.217	***	-.123	***	-.031	*	-.006	
	(.014)		(.011)		(.010)		(.013)		(.028)	
Never married	-.280	***	-.035		.118	**	.155	*	.072	
	(.046)		(.040)		(.043)		(.073)		(.191)	
Married before Age 18	-.526	***	-.012		.064		-.052		-.041	
	(.079)		(.056)		(.045)		(.058)		(.119)	
Birth Year	.018	**	-.009	***	-.006	**	-.003		-.032	*
	(.006)		(.002)		(.002)		(.003)		(.014)	
Born in the South	-.046		.009		-.088	***	-.121	***	.023	
	(.035)		(.029)		(.025)		(.035)		(.075)	
Private High School	.061		.007		.047		.016		.139	
	(.054)		(.044)		(.038)		(.051)		(.118)	
College Prep	.130	***	.122	***	.111	***	.105	**	.128	
	(.036)		(.029)		(.026)		(.038)		(.085)	
Math & Science AP	.102	**	.065	*	.038		.038		.183	*
	(.034)		(.029)		(.024)		(.033)		(.071)	
Constant	11.378	***	12.383	***	12.803	***	12.545	***	13.446	***
	(.256)		(.107)		(.112)		(.18)		(.988)	
Sample Size	3,942		7,907		6,591		3,938		1,312	
Pseudo R-squared	.102		.109		.092		.088		.049	

Notes: Numbers within parenthesis are standard errors.
* < .05; ** < .01; *** < .001 (two-tailed tests)

Figure 1. Lifetime Earnings Trajectory by Education

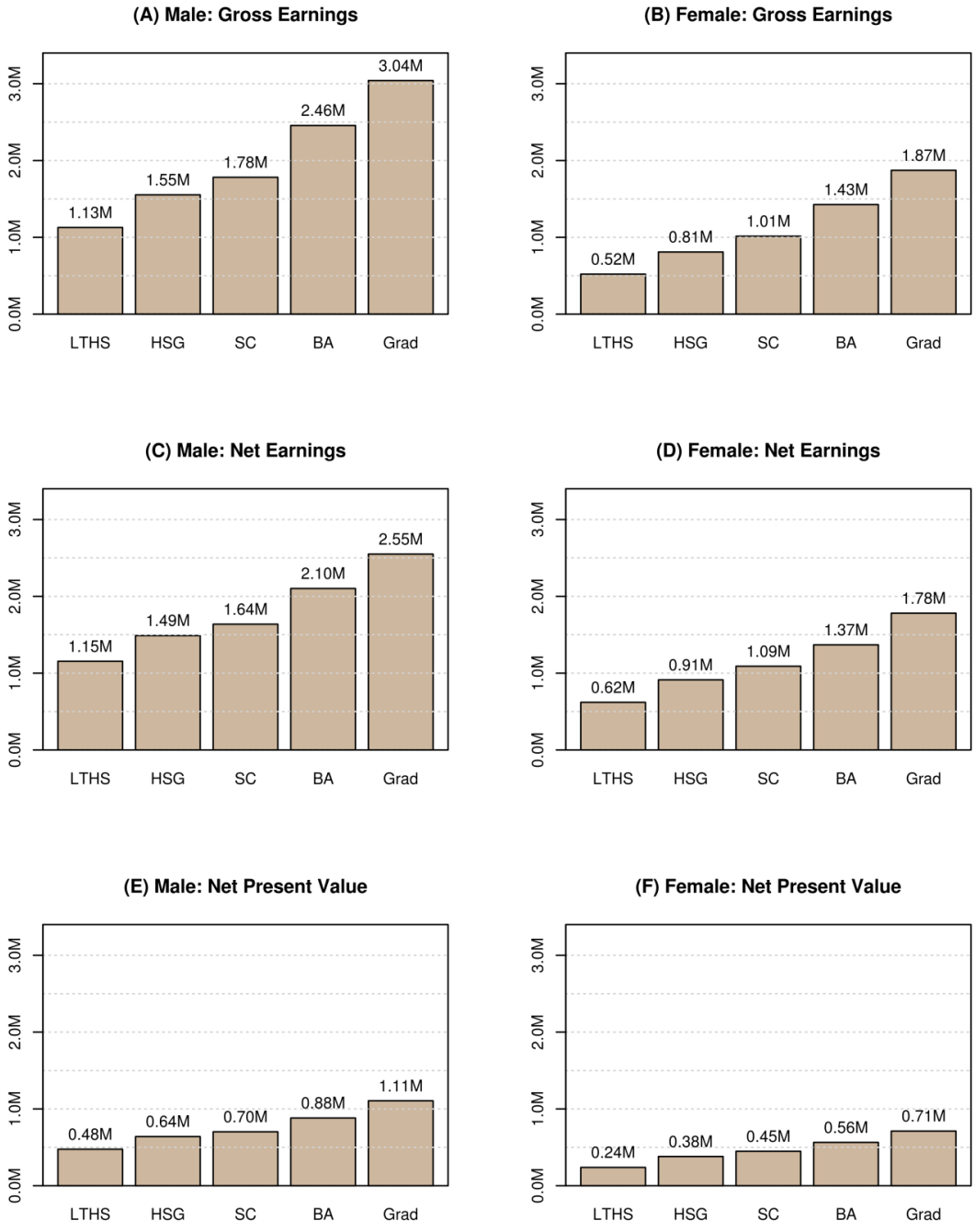

Figure 2. Fifty Year (Age 20 to Age 69) Lifetime Earnings by Education, Gross and Net

Notes: A synthetic cohort method is used to estimate lifetime earnings. Gross earnings are based on descriptive statistics without controlling for any covariates. For the estimates of net lifetime earnings and its present value, race/ethnicity, marital history, number of children, birth place, high school type, college preparation courses, and math and science AP courses are taken into account in median regression models. The present value is calculated at age 20 using a discount rate of 4 percent.

Appendix Table 1. Descriptive Statistics by Birth Cohort

	Cohort 1 (Age 20-39)	Cohort 2 (Age 30-49)	Cohort 3 (Age 40-59)	Cohort 4 (Age 50-69)
A. Male Workers (N)				
Education (%)				
Less Than High School	4.9	4.4	5.1	12.6
High School Graduate	26.8	27.2	23.5	30.3
Some College	36.6	38.3	35.1	30.9
Bachelor Degree	22.5	19.9	19.7	13.0
Graduate Degree	9.2	10.2	11.2	12.2
College Preparation Course (%)				
Math or Science AP Courses (%)				
Attended Private High School (%)				
Race (%)				
White	78.1	82.9	86.0	85.8
Black	10.3	9.1	7.2	9.1
Hispanics	8.4	5.4	4.0	2.6
Others	3.2	2.7	2.8	3.2
Other Demographic Variables				
Never Married by Year 2004 (%)	18.0	11.9	5.1	3.2
Married Before Age 18 (%)	1.1	1.3	1.4	1.3
B. Female Workers				
Education (%)				
Less Than High School	3.6	3.8	4.3	12.2
High School Graduate	23.6	25.6	27.8	36.0
Some College	40.5	39.8	39.3	31.5
Bachelor Degree	22.7	18.7	15.0	11.1
Graduate Degree	9.6	12.1	13.6	9.1
College Preparation Course (%)				
Math or Science AP Courses (%)				
Attended Private High School (%)				
Race (%)				
White	75.5	80.8	83.6	82.1
Black	14.2	11.8	9.4	11.5
Hispanics	7.2	4.8	4.4	3.5
Others	3.1	2.6	2.6	2.9
Other Demographic Variables				
Never Married by Year 2004 (%)	15.7	9.4	5.9	3.6
Married Before Age 18 (%)	3.8	6.4	7.3	9.2

Appendix Table 2. Propensity Score Estimates of College Degree on 10-year Cumulative Earnings by Cohort

	Male Workers				Female Workers			
	Cohort 1 (Age 20-39)	Cohort 2 (Age 30-49)	Cohort 3 (Age 40-59)	Cohort 4 (Age 50-69)	Cohort 1 (Age 20-39)	Cohort 2 (Age 30-49)	Cohort 3 (Age 40-59)	Cohort 4 (Age 50-69)
Mean 10 year Log Cumulative Earnings for the Treated (i.e., College Graduates)								
- 20s	12.317				12.154			
- 30s	13.301	13.215			12.543	12.395		
- 40s		13.479	13.436			12.778	12.606	
- 50s			13.390	13.470			12.763	12.662
- 60s				12.499				11.680
Mean 10 year Log Cumulative Earnings for the Controlled (i.e., High School Graduates)								
- 20s	12.344				11.654			
- 30s	12.798	12.778			11.958	11.780		
- 40s		12.946	13.003			12.264	12.134	
- 50s			12.827	13.040			12.224	11.956
- 60s				11.978				11.198
Average Treatment Effects for the Treated in terms of 10-year Log Cumulative Earnings								
- 20s	-.027				.501***			
- 30s	.503***	.437***			.585***	.614***		
- 40s		.533***	.434***			.514***	.472***	
- 50s			.563***	.430***			.539***	.707***
- 60s				.522*				.482***

Notes: Because high school dropouts do not have a possibility of going to college, we exclude them from the PS estimation. For simplicity, we also exclude those who have some college education without a bachelor's degree. All estimates use bootstrap standard errors. Matching is conducted using the nearest neighborhood method. We also produced estimates using the kernel based matching method obtaining similar results. Using the results in Appendix Table 2, we estimate the expected 50-year lifetime earnings for the treated (i.e., college graduates) and for the controlled (i.e., high school graduates). However, the anti-log of the mean of logged earnings is not equal to the mean of actual earnings when using the PSM results. We therefore cannot infer the lifetime earnings directly from transforming the estimated logged earnings in Table 5. To overcome this problem, we estimate the relative earnings of college graduates (BA+) compared to high school graduates by utilizing the earnings information in Table 2 and the average treatment effect for the treated in Appendix Table 2. We use the estimated median earnings of high school graduates from Table 2, and then multiply it with the exponentiated value of the average treatment effect for the treated from Table 5 to infer the 10-year earnings of college graduates. The estimated lifetime earnings gap is thus a counterfactual estimation.

* < .05; ** < .01; *** < .001 (two-tailed tests)