Online Appendix - Not For Publication

A Additional Figures and Tables

Figure A1: Selected Headlines about Lack of STEM Skills

10/04/1956

IL PROCESSO PRODUTTIVO E LA "RICERCA"

Più avvocati che ingegneri nell'epoca delle macchine

01/13/1957

All'Italia mancano i tecnici per la nuova era industriale

11/07/1963

Il grosso problema degli ingegneri insufficienti alle necessità moderne

Nel '60 in Italia si sono laureati 2500 ingegneri, contro 90 mila negli Stati Uniti e 120 mila nell'Urss - Da noi troppi esami e corsi ardui; soltanto il 25 % degli iscritti riesce a compiere il ciclo di studi in 5 anni - E' tempo d'adeguarci agli altri paesi sdoppiando il titolo in ingegnere-diplomato e dottore-ingegnere - La relazione del prof. Capetti

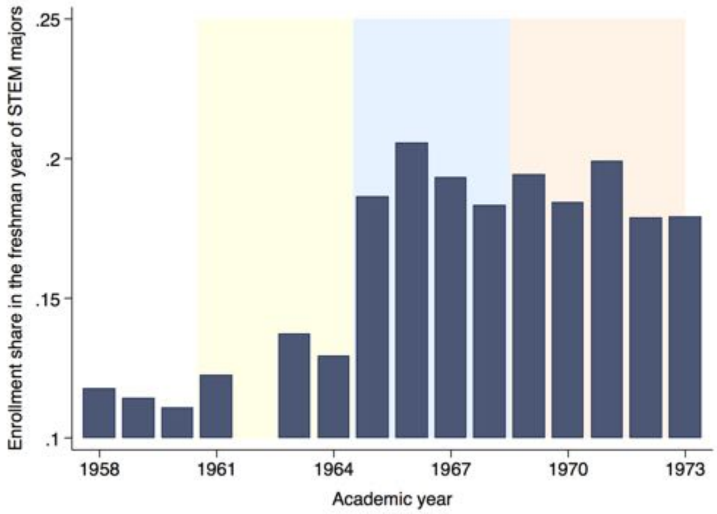
08/19/1967

Inchiesta statistica in quasi 10 mila aziende

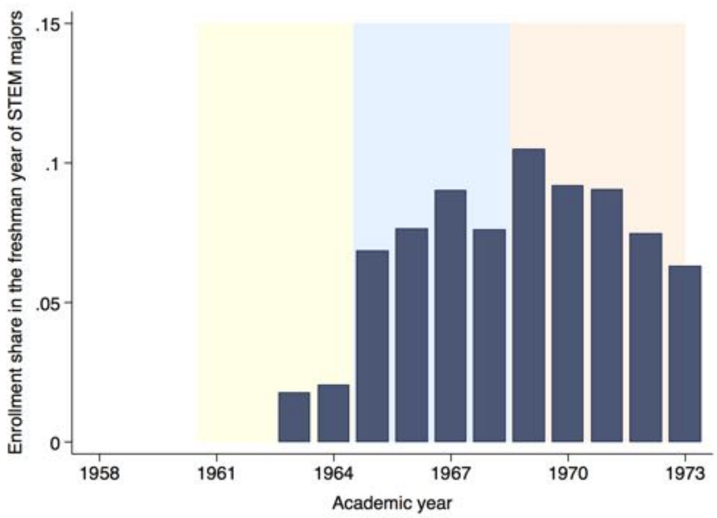
L'industria italiana ha bisogno di laureati più che di manovali

Notes: Headlines of the national newspaper *La Stampa* on the lack of STEM skills in the Italian economy, *http://www.lastampa.it/archivio-storico/*. 10/04/1956: "Too many lawyers and not enough engineers in the era of the machines." 01/13/1957: "Italy lacks technicians for the new industrial era." 11/07/1963: "The big problem of insufficient engineers for the modern necessities." 08/19/1967: "The Italian industry needs university graduates more than blue-collar workers."

Figure A2: Total Enrollment of University First-Year Students as STEM Majors in Italy



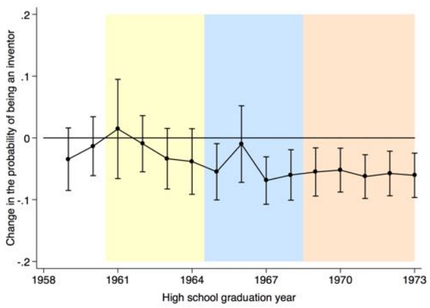
A. All Students



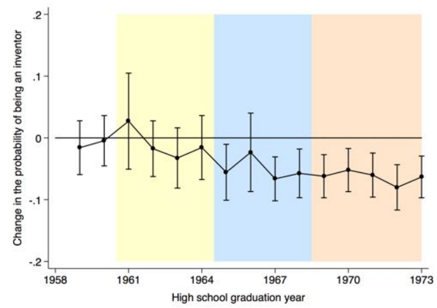
B. Industrial Students

Notes: These graphs show the enrollment change in university STEM majors. In the first panel, the total number of university freshmen students enrolled in STEM majors is divided by the total number of high school graduates in the corresponding year. The 1962 observation is missing. In the second panel, the total number of freshmen industrial students enrolled in STEM majors is divided by the total number of high school graduates. The 1961 and 1962 observations are missing. Data coverage: all Italian universities. Source: Annals of Education Statistics, ISTAT.

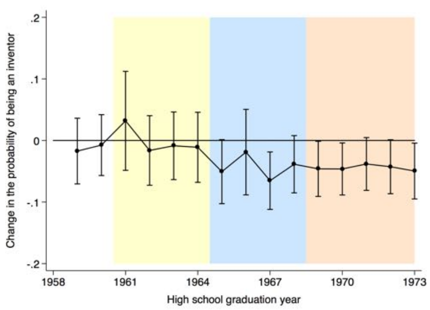
Figure A3: Cohort-Specific Variation in the Probability of Being a Patent Owner



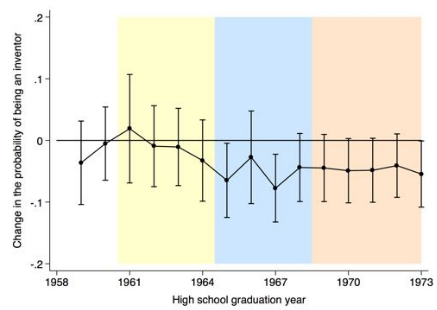
A. Top Industrial vs. Top Academic Students



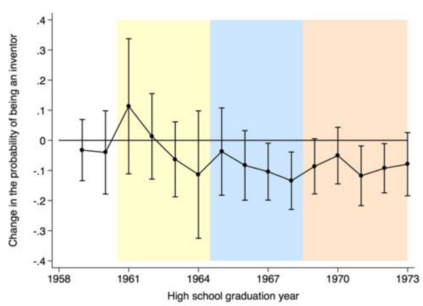
B. Top Industrial vs. Top Commercial Students



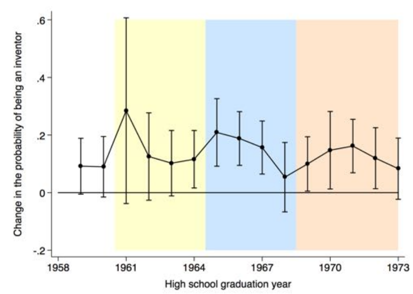
C. Top vs. Other Industrial Students



D. Top vs Other, Industrial vs. Academic Students



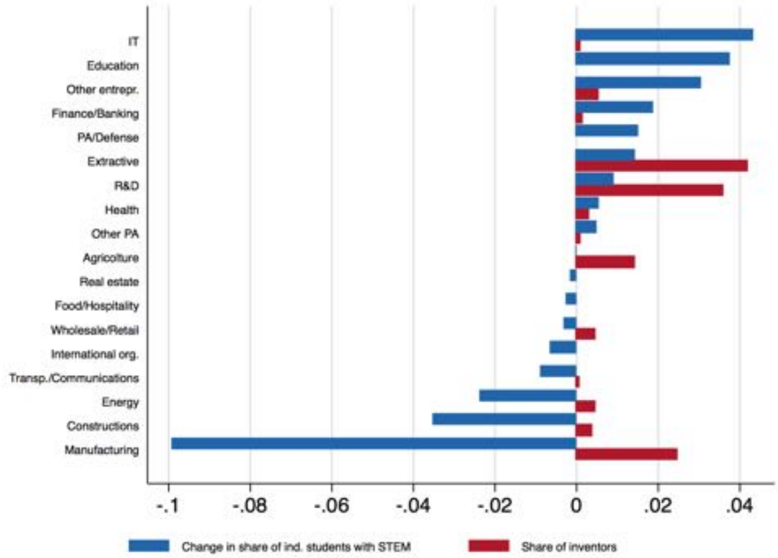
E. Matched,
Top Industrial vs. Top Academic Students



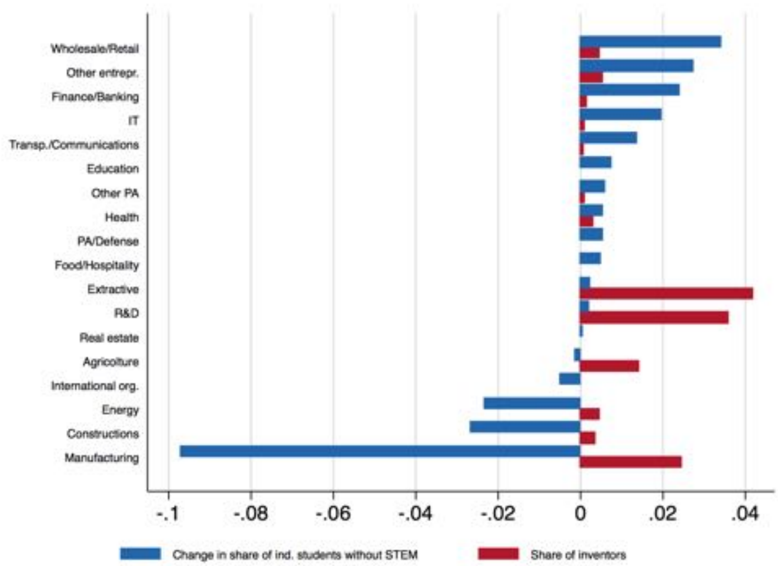
F. Matched,
Other Industrial vs. Top Academic Students

Notes: Panel A compares industrial and academic students, using only students in the top quartile of their HS class. Panel A compares top industrial and commercial students. Panel C compares top and other industrial students. Panel D compares industrial and academic students with different HS achievement. Panel E compares top (scoring in the top quartile of their high school class) industrial and academic students, using only the pre-period students matched to the post-period students with a STEM degree. Panel F compares other industrial and academic students, using only the pre-period students matched to the post-period students with a STEM degree.

Figure A4: Distribution of Inventors across Industries in the Private Sector



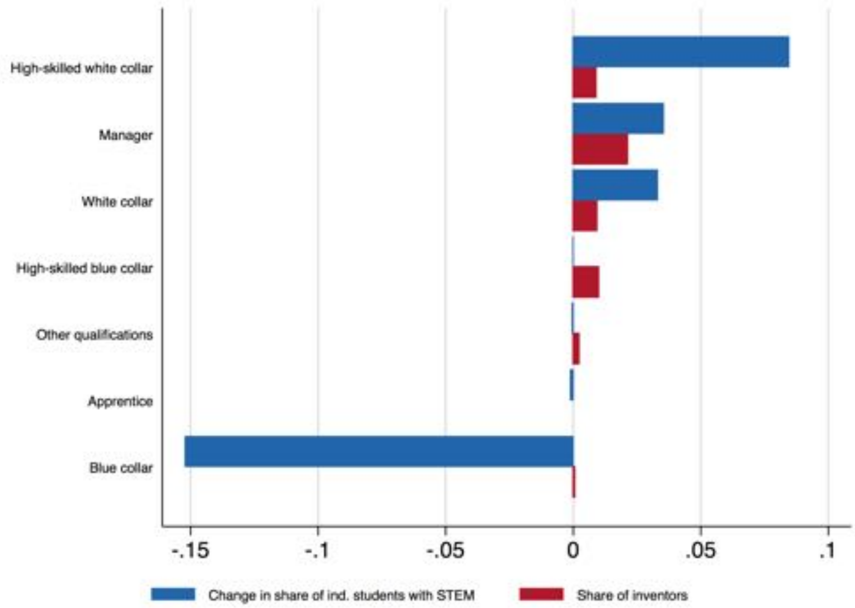
A. Change for Industrial Students with a STEM Degree



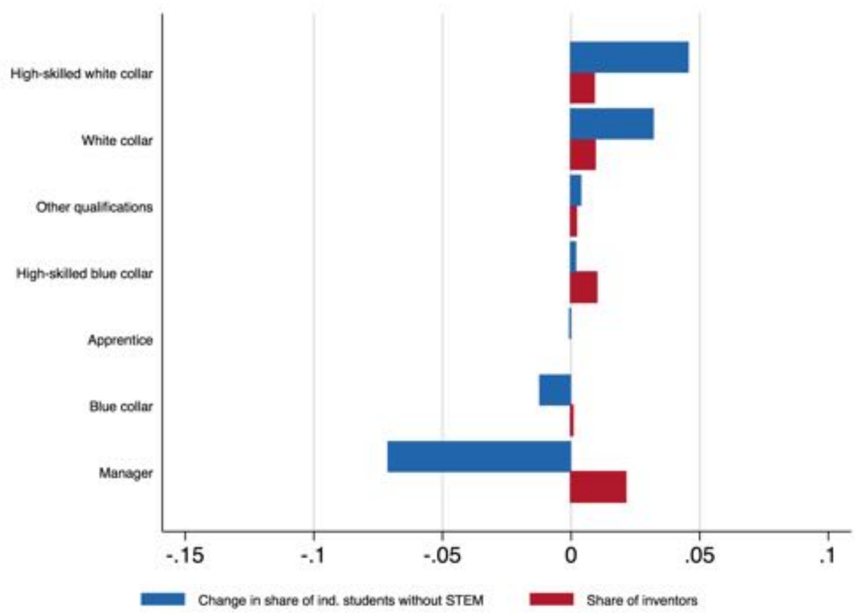
B. Change for Industrial Students without a STEM Degree

Notes: These graphs show how the distribution of industrial students across different industries in the private sector changed among cohorts who completed high school after 1961. Panel A shows how the distribution of industrial students who received a STEM degree after 1961 changed, relative to the pre-reform distribution. Panel B shows how the distribution of industrial students who did not receive a STEM degree after 1961 changed, relative to the pre-reform distribution. Share of inventors measures the percentage of inventors in each industry, pooling all available years of patent data (1968-2010).

Figure A5: Distribution of Inventors across Positions within the Private Sector



A. Change for Industrial Students with a STEM Degree



B. Change for Industrial Students without a STEM Degree

Notes: These graphs show how the distribution of industrial students across different positions within the private sector changed among cohorts who completed high school after 1961. Panel A shows how the distribution of industrial students who received a STEM degree after 1961 changed, relative to the pre-reform distribution. Panel B shows how the distribution of industrial students who did not receive a STEM degree after 1961 changed, relative to the pre-reform distribution. Share of inventors measures the percentage of inventors in each qualification, pooling all available years of patent data (1968-2010).

Table A1: Types of Occupation

Occupation	Description	Pension fund	Share of observations
Other private	Employees in the private sector (not included in any other category)	INPS	64.44
Entrepreneurs	Entrepreneurs (imprenditori commerciali)	INPS	5.88
Artisans	Artisans (imprenditori artigiani)	INPS	2.26
Fixed-term contractors	External contractors with fixed-term contracts	INPS	6.51
Farmers	Farmers	INPS	0.43
Other professionals	Other self-employed professionals not included in other categories	INPS	1.69
PA: Local gov.	Public employees of local governments	INPDAP	0.91
PA: Central gov.	Public employees of central government	INPDAP	1.94
PA: Higher ed.	Employees of universities	INPDAP	1.17
PA: Lower ed.	Employees of primary and secondary schools	INPDAP	0.09
PA: Health	Employees of hospitals (not doctors)	INPDAP	1.62
PA: Defense	Employees in the military or police forces	INPDAP	0.02
PA: Research	Employees of CNR (National Research Council)	INPDAP	0.06
PA: Other public	Public employees not included in other categories	INPDAP	0.09
Doctors	Medical doctors and dentists	ENPAM	6.44
Pharmacists	Pharmacists	ENPAF	0.47
Entertainment	Workers in the entertainment industry	ENPALS	0.67
TLC	Employees of TLC companies	Fondo telefonici	0.58
Railway Ind.	Employees of railway companies	Fondo ferrovieri	0.12
Journalists	Journalists	INPGI	0.14
Postal service	Employees of the national postal service	Fondo postali	0.10
Transport Ind.	Employees of local transportation companies	Fondo autoferrotramvieri	0.25
Psychologists	Psychologists	ENPAP	0.20
Veterinarians	Veterinarians	ENPAV	0.22
Chem., agron., geol.	Chemists, agronomists, and geologists	EPAP	0.04
Lawyers	Lawyers	Cassa forense	0.40
Accountants	Self-employed accountants with a commercial diploma	Cassa ragionieri	0.16
Tax collectors	Tax collectors	Fondo esattoriali	0.01
Priests	Priests	Fondo clero	0.10
Engineers	Self-employed engineers and architects	INARCASSA	0.60
Oil/Gas	Gas fitters	Fondo gasisti	0.02
Notaries	Notaries	Cassa del notariato	0.07
Nurses	Nurses (not employed in the public sector)	ENPAPI	0.01
Biologists	Biologists	ENPAB	0.03
Lab. consultants	Labor consultants	ENPACL	0.17
Chart. account.	Chartered accountants with a university degree in business economics	CNPADC	0.13
Airline Ind.	Employees of airline companies	Fondo volo	0.07
Ind. Technicians	High-skilled industrial technicians with an industrial diploma	EPPI	0.18
Surveyors	Surveyors	Cassa geometri	0.26
Energy	Employees of energy/electrical companies	Fondo elettrici	0.64

Notes: List of occupations with a description of included workers, type of pension fund, and share of employed workers. The data provided by INPS (the Italian Social Security) drives the categorization of occupations. Most private employees are lumped in the main category (Other private). Information on the specific pension fund to which each worker contributes allows us to identify the other thirty-nine categories.

Table A2: University STEM Graduation Rates of Industrial Students

	STEM (1)	STEM (2)	STEM (3)
	Panel A: Industrial vs. academic students		
Industrial x Post 1961	0.0404**	0.0467**	0.0503**
	(0.0175)	(0.0220)	(0.0210)
Industrial x Post 1965	0.1720***	0.1783***	0.1819***
	(0.0188)	(0.0231)	(0.0221)
Industrial x Post 1969	0.1665***	0.1728***	0.1764***
	(0.0147)	(0.0198)	(0.0186)
Industrial x 1959		-0.0006	
		(0.0268)	
Industrial x 1960		0.0193	
		(0.0281)	
Industrial x Pre-reform trend			0.0097
			(0.0140)
	Panel B: Industrial vs. commercial students		
Industrial x Post 1961	0.0368***	0.0433***	0.0445***
	(0.0104)	(0.0138)	(0.0133)
Industrial x Post 1965	0.1314***	0.1379***	0.1391***
	(0.0139)	(0.0165)	(0.0162)
Industrial x Post 1969	0.0811***	0.0875***	0.0888***
	(0.0102)	(0.0137)	(0.0132)
Industrial x 1959		0.0039	
		(0.0181)	
Industrial x 1960		0.0139	
		(0.0162)	
Industrial x Pre-reform trend			0.0071
			(0.0081)

	STEM (1)	STEM (2)	STEM (3)
	Panel C: Top vs. other industrial students		
Top x Post 1961	0.0815***	0.0997***	0.0917***
	(0.0255)	(0.0229)	(0.0246)
Top x Post 1965	0.1185***	0.1367***	0.1287***
	(0.0217)	(0.0191)	(0.0207)
Top x Post 1969	0.0959***	0.1141***	0.1061***
	(0.0181)	(0.0146)	(0.0165)
Top x 1959		0.0307	
		(0.0199)	
Top x 1960		0.0206	
		(0.0353)	
Top x Pre-reform trend			0.0098
			(0.0175)
	Panel D: Matched industrial vs. academic students		
Industrial x Post 1961	0.9680***	0.9815***	0.9620***
	(0.0150)	(0.0129)	(0.0189)
Industrial x Post 1965	0.9674***	0.9809***	0.9614***
	(0.0148)	(0.0131)	(0.0187)
Industrial x Post 1969	0.9682***	0.9815***	0.9622***
	(0.0144)	(0.0446)	(0.0185)
Industrial x 1959		0.0502	
		(0.0320)	
Industrial x 1960		-0.0156	
		(0.0130)	
Industrial x Pre-reform trend			-0.0063
			(0.0110)
University STEM graduation, 1958-1960	0.0189	0.0189	0.0189
Observations (panel A)	35,479	35,479	35,479
Observations (panel B)	27,497	27,497	27,497
Observations (panel C)	16,550	16,550	16,550
Observations (panel D)	4,718	4,718	4,718

Notes: The dependent variable is equal to 1 for the students who received a university STEM degree. Top is 1 for students who ranked in the top quartile of their school's grade distribution. Post 1961 is 1 for cohorts who graduated between 1961 and 1964, Post 1965 is 1 for cohorts who graduated between 1965 and 1968, and Post 1969 is 1 for cohorts who graduated between 1969 and 1973. The regressions include cohort fixed effects, gender, province of birth fixed effects, high school fixed effects, the high school standardized score, the average standardized score of the closest peers in high school, a dummy for home-schooled students, and a dummy for students who graduated high school at 19. Standard errors clustered by school and cohort in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table A3: Characteristics of Matched Students

	Top students			Other students		
	1958-1960	1961-1973	Diff.	1958-1960	1961-1973	Diff.
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A: Industrial students			
HS score	1.6829	1.7466	-0.0637	-0.1704	-0.2234	0.0530
			(0.0933)			(0.0894)
HS peers' mean score	0.1858	0.1340	0.0518	-0.0389	0.0139	-0.0528
			(0.0447)			(0.0371)
Home-schooled	0.0000	0.0034	-0.0034	0.0704	0.0279	0.0425
			(0.0024)			(0.0727)
HS grad at 19	0.9882	0.9949	-0.0067	0.9718	0.9834	-0.0116
			(0.0121)			(0.0118)
			Panel B: Academic students			
HS score	1.6643	1.6469	0.0174	-0.3063	-0.2948	-0.0115
			(0.0504)			(0.0282)
HS peers' mean score	0.0561	0.0676	-0.0115	0.0093	-0.0111	0.0204
			(0.0282)			(0.0198)
Home-schooled	0.0182	0.0166	0.0016	0.0228	0.0191	0.0037
			(0.0123)			(0.0090)
HS grad at 19	0.9909	0.9923	-0.0014	0.9577	0.9631	-0.0054
			(0.0071)			(0.0180)

Notes: This table shows the outcome of the process that matched post-reform students with a STEM degree to pre-reform students. For industrial students, we use the matching process to predict who in the pre-reform period would have received a STEM degree in the absence of any restriction to university enrollment. We match post-reform students with a STEM degree to pre-reform students, separately for each quartile of pre-collegiate ability and by pre-reform cohort. The matching is based on a 1-to-1 nearest neighbor algorithm, in which the calipers for each ability quartile are selected to equate the average STEM graduation rate observed in the post-period. Propensity scores are computed using the observable characteristics listed in the table: gender, high school score, the average score of high school peers, and a dummy for students who completed high school at 19 (the standard age of graduation). There is a concern that some academic students might have decided to enroll in other fields to avoid crowding into STEM majors after the reform, as documented by Bianchi (2017). Starting from the sample of academic students with a STEM degree, we then use a similar matching process to select academic students with a STEM degree in the pre-period who would have received a STEM degree also in the post-period. Standard errors clustered by high school and cohort in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A4: Probability of Becoming an Inventor and STEM degrees

	Inventor OLS (1)	Inventor IV (2)	Inventor OLS (3)	Inventor IV (4)	Inventor OLS (5)	Inventor IV (6)
	Panel A: Industrial vs. academic students					
STEM degree	0.0393***	-0.0330	0.0346***	-0.1391***	0.0409***	0.0374
	(0.0033)	(0.0270)	(0.0054)	(0.0358)	(0.0036)	(0.0298)
F statistic		58.63		58.39		33.92
	Panel B: Matched, Industrial vs. academic students					
STEM degree	0.0365		-0.0260		0.0828***	
	(0.0243)		(0.0330)		(0.0304)	
Sample	All	All	Top	Top	Other	Other
Pre-reform inventor share (Panel A)	0.0427	0.0427	0.0740	0.0740	0.0346	0.0346
Pre-reform inventor share (Panel B)	0.0897	0.0897	0.1176	0.1176	0.0563	0.0563
Observations (Panel A)	35,479	35,479	7,662	7,662	27,817	27,817
Observations (Panel B)	4,718	4,718	1,807	1,807	2,911	2,911

Notes. This table shows OLS and instrumental variable estimates of the effect of STEM education on the probability of becoming an inventor. The instrumental variables for receiving a STEM degree (STEM degree_i) are $\text{Industrial}_i \times \text{Post } 1961_t$, $\text{Industrial}_i \times \text{Post } 1965_t$, and $\text{Industrial}_i \times \text{Post } 1969_t$. The dependent variable, Inventor, is a dummy that equals one for students who patented at least once from 1968 to 2010. The regressions also include cohort fixed effects, gender, province of birth fixed effects, high school fixed effects, the high school standardized score, the average standardized score of the closest peers in high school, a dummy for home-schooled students, and a dummy for students who graduated high school at 19 (and likely never repeated a grade). Standard errors clustered by high school and cohort in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A5: Probability of Becoming an Inventor, Industrial vs. Commercial Students

	Inventor (1)	Inventor (2)	Inventor (3)	Inventor (4)	Inventor (5)	Inventor (6)
Industrial x Post 1961	-0.0044	-0.0058	-0.0039	-0.0057	-0.0060	-0.0082
	(0.0057)	(0.0073)	(0.0147)	(0.0188)	(0.0047)	(0.0083)
Industrial x Post 1965	-0.0081	-0.0095	-0.0420***	-0.0438**	-0.0007	-0.0030
	(0.0050)	(0.0067)	(0.0127)	(0.0176)	(0.0050)	(0.0085)
Industrial x Post 1969	-0.0217***	-0.0231***	-0.0559***	-0.0577***	-0.0133***	-0.0155*
	(0.0042)	(0.0061)	(0.0097)	(0.0158)	(0.0040)	(0.0079)
Industrial x Pre-reform trend		-0.0013		-0.0017		-0.0020
		(0.0047)		(0.0105)		(0.0052)
Sample	All	All	Top	Top	Other	Other
Pre-reform inventor share	0.0427	0.0427	0.0740	0.0740	0.0346	0.0346
Observations	27,497	27,497	5,865	5,865	21,632	21,632

Notes. This table shows the effect of the promotion of STEM education on the probability of becoming an inventor by comparing industrial to commercial students. The dependent variable, Inventor, is a dummy that equals 1 for students who patented at least once from 1968 to 2010. Post 1961 is 1 for cohorts who graduated between 1961 and 1964, Post 1965 is 1 for cohorts who graduated between 1965 and 1968, and Post 1969 is 1 for cohorts who graduated between 1969 and 1973. Pre-reform trend is a linear trend for pre-reform cohorts. Columns 3 and 4 restrict the sample to students who ranked in the top quartile of their school's grade distribution. Columns 5 and 6 restrict the sample to students who are not in the top ability quartile. Regressions also include cohort fixed effects, gender, province of birth fixed effects, high school fixed effects, the high school standardized score, the average standardized score of the closest peers in high school, a dummy for home-schooled students, and a dummy for students who graduated high school at 19 (and likely never repeated a grade). Standard errors clustered by high school and cohort in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table A6: Probability of Becoming an Inventor, Triple Differences

	Inventor (1)	Inventor (2)	Inventor (3)	Inventor (4)	Inventor (5)
Panel A: Top vs. other industrial students					
Top x Post 1961	0.0067	0.0032	0.0031	0.0065	0.0025
	(0.0158)	(0.0227)	(0.0226)	(0.0159)	(0.0220)
Top x Post 1965	-0.0346**	-0.0382*	-0.0382*	-0.0348**	-0.0388*
	(0.0137)	(0.0214)	(0.0214)	(0.0137)	(0.0207)
Top x Post 1969	-0.0359***	-0.0394**	-0.0394**	-0.0361***	-0.0400**
	(0.0109)	(0.0198)	(0.0197)	(0.0110)	(0.0189)
Top x Pre-reform trend		-0.0034			
		(0.0130)			
Panel B: Top vs. other, industrial vs. academic students					
Top x Industrial x Post 1961	0.0057	0.0057	0.0056	0.0051	0.0032
	(0.0186)	(0.0186)	(0.0186)	(0.0187)	(0.0269)
Top x Industrial x Post 1965	-0.0389**	-0.0389**	-0.0390**	-0.0396**	-0.0415
	(0.0164)	(0.0164)	(0.0164)	(0.0164)	(0.0255)
Top x Industrial x Post 1969	-0.0332**	-0.0332**	-0.0333**	-0.0339**	-0.0358
	(0.0140)	(0.0140)	(0.0140)	(0.0141)	(0.0240)
Top x Industrial x Pre-reform trend		-0.0032			
		(0.0061)			
Panel C: Top vs. other, industrial vs. commercial students					
Top x Industrial x Post 1961	0.0085	0.0085	0.0085	0.0083	0.0111
	(0.0157)	(0.0157)	(0.0157)	(0.0158)	(0.0227)
Top x Industrial x Post 1965	-0.0349**	-0.0349**	-0.0350**	-0.0352**	-0.0324
	(0.0145)	(0.0145)	(0.0145)	(0.0146)	(0.0219)
Top x Industrial x Post 1969	-0.0373***	-0.0373***	-0.0374***	-0.0376***	-0.0348*
	(0.0109)	(0.0109)	(0.0109)	(0.0109)	(0.0197)
Top x Industrial x Pre-reform trend		-0.0014			
		(0.0048)			
Inventor share, top students, 1958-1960	0.0740	0.0740	0.0740	0.0740	0.0740
Pre-trend by quartile of ability	No	No	Yes	No	No
Pre-trend by high school	No	No	No	Yes	No
Pre-trend by school and ability quartile	No	No	No	No	Yes

Notes. This table shows the effect of the promotion of STEM education on the probability of becoming an inventor of industrial students. Panel A shows difference-in-differences estimates that compare top and other industrial students (16,550 observations). Panel B shows difference-in-difference-in-differences estimates comparing industrial and academic students with different high school grades (35,479 observations). Panel C shows difference-in-difference-in-differences estimates comparing industrial and commercial students with different high school grades (27,497 observations). The dependent variable, Inventor, is a dummy that equals 1 for students who patented at least once from 1968 to 2010. Top is 1 for the students who ranked in the top quartile of their school's grade distribution. Post 1961 is 1 for cohorts who graduated between 1961 and 1964, Post 1965 is 1 for cohorts who graduated between 1965 and 1968, and Post 1969 is 1 for cohorts who graduated between 1969 and 1973. Pre-reform trend is a linear trend for pre-reform cohorts. Regressions also include cohort fixed effects, gender, province of birth fixed effects, high school fixed effects, the high school standardized score, the average standardized score of the closest peers in high school, a dummy for home-schooled students, and a dummy for students who graduated high school at 19 (and likely never repeated a grade). Standard errors clustered by high school and cohort in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A7: Patent Count and Number of Technological Fields

	OLS		Negative binomial		OLS		Negative binomial	
	Patent count	Number fields	Patent count	Number fields	Patent count	Number fields	Patent count	Number fields
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Industrial vs. academic students							
Industrial x Post 1961	-0.1316	-0.0186	-0.0045	0.0102	0.0292	0.0042	0.0441	0.0063
	(0.1681)	(0.0325)	(0.1021)	(0.0299)	(0.0619)	(0.0132)	(0.0525)	(0.0130)
Industrial x Post 1965	-0.2665	-0.0752**	-0.1158	-0.0307	0.0342	0.0196	0.0511	0.0168
	(0.1657)	(0.0310)	(0.0872)	(0.0265)	(0.0559)	(0.0125)	(0.0437)	(0.0115)
Industrial x Post 1969	-0.2636*	-0.0876***	-0.0846	-0.0354	-0.0363	-0.0040	0.0237	0.0067
	(0.1530)	(0.0275)	(0.0821)	(0.0256)	(0.0560)	(0.0115)	(0.0449)	(0.0112)
	Panel B: Industrial vs. commercial students							
Industrial x Post 1961	-0.1389	-0.0305	0.0039	0.0017	-0.0120	-0.0070	-0.0015	-0.0038
	(0.1632)	(0.0294)	(0.0327)	(0.0128)	(0.0537)	(0.0109)	(0.0577)	(0.0129)
Industrial x Post 1965	-0.3957**	-0.1011***	-0.0956	-0.0291*	-0.0501	-0.0048	-0.0376	-0.0023
	(0.1967)	(0.0319)	(0.0619)	(0.0152)	(0.0467)	(0.0104)	(0.0507)	(0.0117)
Industrial x Post 1969	-0.3328**	-0.1112***	-0.0423	-0.0259**	-0.0906**	-0.0248***	-0.0459	-0.0111
	(0.1552)	(0.0253)	(0.0266)	(0.0111)	(0.0452)	(0.0094)	(0.0516)	(0.0114)
	Panel C: Matched, Industrial vs. academic students							
Industrial x Post 1961	0.1205	-0.0020	0.3877	0.0745	1.2811**	0.1924***	1.0234**	0.1655**
	(0.3920)	(0.0959)	(0.5039)	(0.1238)	(0.5040)	(0.0690)	(0.4985)	(0.0751)
Industrial x Post 1965	-0.2929	-0.1568**	-0.3251	-0.1132	0.5466**	0.2020***	0.4941	0.1922***
	(0.3570)	(0.0747)	(0.3367)	(0.0821)	(0.2650)	(0.0560)	(0.3081)	(0.0507)
Industrial x Post 1969	-0.3265	-0.1535**	-0.2739	-0.1178	0.3790	0.1473***	0.4032	0.1202**
	(0.2414)	(0.0656)	(0.2787)	(0.0782)	(0.3007)	(0.0524)	(0.3280)	(0.0512)
Sample	Top	Top	Top	Top	Other	Other	Other	Other
Pre-reform mean dep. var. (panel A-B)	0.2116	0.0695	0.2116	0.0695	0.1736	0.0537	0.1736	0.0537
Pre-reform mean dep. var. (panel C)	0.5647	0.2471	0.5647	0.2471	0.3944	0.0704	0.3944	0.0704
Observations (panel A)	7,662	7,662	7,662	7,662	27,817	27,817	27,817	27,817
Observations (panel B)	5,865	5,865	5,865	5,865	21,632	21,632	21,632	21,632
Observations (panel C)	1,807	1,807	1,807	1,807	2,911	2,911	2,911	2,911

Notes. This table shows difference-in-differences and difference-in-difference-in-differences estimates of the effect of the promotion of STEM education on the number of patents and the number of technological fields. Standard errors clustered by high school and cohort in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A8: Patent Count and Technological Fields, Alternative Specifications

	OLS		Negative binomial	
	Patent count	Number fields	Patent count	Number fields
	(1)	(2)	(3)	(4)
Panel A: Top vs. other industrial students (N = 16,550)				
Top x Post 1961	-0.0778	-0.0106	0.0135	0.0011
	(0.1626)	(0.0291)	(0.0377)	(0.0105)
Top x Post 1965	-0.2059	-0.0710**	0.0099	-0.0298***
	(0.1592)	(0.0279)	(0.0659)	(0.0114)
Top x Post 1969	-0.2029	-0.0731***	-0.0213	-0.0243**
	(0.1542)	(0.0252)	(0.0350)	(0.0113)
Panel B: Top vs. other, industrial vs. academic students (N = 35,479)				
Top x Industrial x Post 1961	-0.1320	-0.0094	-0.0421	0.0011
	(0.1679)	(0.0324)	(0.0565)	(0.0138)
Top x Industrial x Post 1965	-0.2895*	-0.0800**	-0.1026*	-0.0364***
	(0.1655)	(0.0311)	(0.0531)	(0.0134)
Top x Industrial x Post 1969	-0.2093	-0.0716**	-0.0542	-0.0258**
	(0.1576)	(0.0281)	(0.0524)	(0.0121)
Panel C: Top vs. other, industrial vs. commercial students (N = 27,497)				
Top x Industrial x Post 1961	-0.1035	-0.0108	0.0075	0.0078
	(0.1647)	(0.0292)	(0.0629)	(0.0127)
Top x Industrial x Post 1965	-0.3198	-0.0822**	-0.1469	-0.0393*
	(0.1961)	(0.0323)	(0.1459)	(0.0207)
Top x Industrial x Post 1969	-0.2324	-0.0769***	-0.0308	-0.0223*
	(0.1583)	(0.0258)	(0.0618)	(0.0122)
Mean dep. var., 1958-1960	0.2116	0.0695	0.2116	0.0695

Notes. This table shows difference-in-differences and difference-in-difference-in-differences estimates of the effect of the promotion of STEM education on the number of patents and the number of technological fields. Standard errors clustered by high school and cohort in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table A9: Patent Count and Fields, Only Inventors

	OLS		Negative binomial		OLS		Negative binomial	
	Patent count	Number fields	Patent count	Number fields	Patent count	Number fields	Patent count	Number fields
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: Industrial vs. academic students							
Industrial x Post 1961	-3.0275	-0.0340	-1.5848	0.0400	2.0156	0.2848	1.9397	0.2034
	(2.6644)	(0.3904)	(1.8703)	(0.3214)	(1.8993)	(0.2437)	(1.6102)	(0.2383)
Industrial x Post 1965	-3.7182	0.0151	-3.6770	-0.4252	0.6981	0.0956	1.2816	0.0968
	(3.7175)	(0.5308)	(2.3891)	(0.3970)	(1.6560)	(0.2321)	(1.3545)	(0.2249)
Industrial x Post 1969	-2.2442	-0.3469	-1.2659	-0.4446	-1.4271	0.0663	-0.5597	0.0287
	(2.7902)	(0.4248)	(1.7991)	(0.3834)	(2.3235)	(0.2122)	(1.8591)	(0.1984)
	Panel B: Industrial vs. commercial students							
Industrial x Post 1961	-0.4808	-0.3036	-3.5624**	-0.2218	0.3138	-0.2004	2.9514	0.0332
	(1.7391)	(0.3655)	(1.6077)	(0.1958)	(1.7841)	(0.3152)	(2.7724)	(0.3584)
Industrial x Post 1965	-21.0997*	-3.5426**	-29.9035***	-3.1978***	0.9432	-0.1352	-1.2455	-0.4262
	(10.9561)	(1.3583)	(6.1958)	(0.4970)	(2.9279)	(0.4842)	(2.9503)	(0.3814)
Industrial x Post 1969	-2.5871	-0.4864	-1.3250	0.1175	1.4479	-0.0239	1.2334	-0.0826
	(1.8948)	(0.3456)	(1.5431)	(0.4153)	(1.8612)	(0.2657)	(2.7957)	(0.3600)
	Panel C: Matched, Industrial vs. academic students							
Industrial x Post 1961	1.4758	0.3502	0.5402	0.0858	4.8394	1.2168**	8.8683*	0.9999***
	(4.7831)	(1.0429)	(2.6179)	(0.4839)	(4.9055)	(0.4841)	(4.5164)	(0.3624)
Industrial x Post 1965	-0.6212	0.1187	-2.2927	-0.4378	3.6124	1.3691**	2.0021	0.9463***
	(7.4695)	(1.2667)	(3.6286)	(0.6404)	(4.5608)	(0.5682)	(3.5201)	(0.3062)
Industrial x Post 1969	2.5628	0.4109	-0.6669	-0.3546	1.7421	1.3546**	1.1664	0.8530***
	(3.8929)	(0.9643)	(2.3763)	(0.5857)	(5.2830)	(0.5363)	(3.9970)	(0.3168)
Sample	Top	Top	Top	Top	Other	Other	Other	Other
Pre-reform mean dep. var. (panel A-B)	4.84	1.76	4.84	1.76	5.02	1.56	5.02	1.56
Pre-reform mean dep. var. (panel C)	4.8	2.1	4.8	2.1	7	1.25	7	1.25
Observations (panel A)	247	247	247	247	587	587	587	587
Observations (panel B)	169	169	169	169	422	422	422	422
Observations (panel C)	121	121	121	121	194	194	194	194

Notes. This table shows difference-in-differences and difference-in-difference-in-differences estimates of the effect of the promotion of STEM education on the number of patents and the number of technological fields. Standard errors clustered by high school and cohort in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A10: Patent Count and Fields, Alternative Specifications, Only Inventors

	OLS		Negative binomial	
	Patent count	Number fields	Patent count	Number fields
	(1)	(2)	(3)	(4)
Panel A: Top vs. other industrial students (N = 557)				
Top x Post 1961	-1.3590	-0.1655	-0.5581	-0.2406
	(2.6264)	(0.2486)	(1.4015)	(0.2043)
Top x Post 1965	-0.5698	-0.0606	0.5513	-0.1246
	(2.8921)	(0.2973)	(1.4372)	(0.2407)
Top x Post 1969	-1.5401	-0.2394	0.0589	-0.1889
	(2.8637)	(0.2438)	(1.4329)	(0.1970)
Panel B: Top vs. other, industrial vs. academic students (N = 834)				
Top x Industrial x Post 1961	-3.3545	-0.0700	-3.3149	-0.1522
	(2.8509)	(0.3996)	(2.1289)	(0.3501)
Top x Industrial x Post 1965	-3.4335	-0.1238	-3.9375*	-0.4321
	(3.6413)	(0.5094)	(2.3632)	(0.4301)
Top x Industrial x Post 1969	-1.9403	-0.4962	-0.2696	-0.4008
	(3.2091)	(0.4307)	(2.4381)	(0.4034)
Panel C: Top vs. other, industrial vs. commercial students (N = 591)				
Top x Industrial x Post 1961	-0.9332	-0.1956	-5.2817*	-0.1814
	(6.2144)	(0.9415)	(3.1709)	(0.3919)
Top x Industrial x Post 1965	-22.2802***	-2.3927**	-16.6044*	-1.9620*
	(8.4198)	(0.9540)	(9.5941)	(1.0936)
Top x Industrial x Post 1969	-3.2359	-0.2502	-2.4220	0.2259
	(2.0181)	(0.6292)	(3.3014)	(0.5226)
Mean dep. var., 1958-1960	4.84	1.76	4.84	1.76

Notes. This table shows difference-in-differences and difference-in-difference-in-differences estimates of the effect of the promotion of STEM education on the number of patents and the number of technological fields. Standard errors clustered by high school and cohort in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A11: Probability of Becoming an Inventor of Non-Industrial Students

	Inventor	Inventor	Patent count	Patent count	Number fields	Number fields
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A: Academic students			
Top x Post 1961	0.0014	0.0019	0.0583	0.0306	-0.0015	-0.0117
	(0.0100)	(0.0145)	(0.0515)	(0.0514)	(0.0155)	(0.0209)
Top x Post 1965	0.0043	0.0049	0.0874*	0.0598	0.0101	-0.0001
	(0.0089)	(0.0137)	(0.0508)	(0.0496)	(0.0139)	(0.0197)
Top x Post 1969	-0.0023	-0.0017	-0.0017	-0.0293	-0.0020	-0.0122
	(0.0088)	(0.0138)	(0.0367)	(0.0348)	(0.0128)	(0.0190)
Top x Pre-reform trend		0.0006		-0.0268		-0.0099
		(0.0090)		(0.0472)		(0.0142)
			Panel B: Commercial students			
Top x Post 1961	-0.0025	-0.0077	0.0134	0.0011	-0.0019	-0.0077
	(0.0040)	(0.0068)	(0.0121)	(0.0133)	(0.0046)	(0.0070)
Top x Post 1965	0.0019	-0.0033	0.1272	0.1149	0.0149	0.0091
	(0.0053)	(0.0075)	(0.1211)	(0.1181)	(0.0167)	(0.0171)
Top x Post 1969	0.0008	-0.0044	0.0155	0.0032	0.0013	-0.0045
	(0.0039)	(0.0067)	(0.0123)	(0.0137)	(0.0043)	(0.0069)
Top x Pre-reform trend		-0.0047		-0.0111		-0.0052
		(0.0037)		(0.0068)		(0.0037)

Notes: Panel A uses data of academic students (18,929 observations), while panel B uses data of commercial students (10,497 observations). The dependent variable Inventor is 1 if the student developed at least one patent, Patent count is the number of patents developed, and Number fields is the number of different technological fields (classes of invention) per inventor. Top is 1 for the students who ranked in the top quartile of their school's grade distribution. Post 1961 is 1 for cohorts who graduated between 1961 and 1964, Post 1965 is 1 for cohorts who graduated between 1965 and 1968, and Post 1969 is 1 for cohorts who graduated between 1969 and 1973. Pre-reform trend is a linear pre-reform trend. The regressions also include cohort fixed effects, gender, province of birth fixed effects, high school fixed effects, the high school standardized score, the average standardized score of the closest peers in high school, a dummy for home-schooled students, and a dummy for students who graduated high school at 19 (and likely never repeated a grade). Standard errors clustered by high school and cohort in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table A12: Effects on Innovation, Robustness Checks

	Inventor (1)	Inventor (2)	Inventor (3)	Inventor (4)	Inventor (5)	Inventor (6)	Inventor (7)	Inventor (8)	Inventor (9)	Inventor (10)
Panel A: Industrial vs. academic students										
Industrial x Post 1961	0.0171	-0.0215*	-0.0085	-0.0058		0.0049	-0.0001	-0.0036	-0.0019	
	(0.0321)	(0.0115)	(0.0152)	(0.0180)		(0.0161)	(0.0047)	(0.0048)	(0.0056)	
Industrial x Post 1965	-0.0254	-0.0342***	-0.0476*	-0.0385***		0.0281*	0.0138***	0.0132**	0.0127**	
	(0.0269)	(0.0103)	(0.0248)	(0.0142)		(0.0149)	(0.0049)	(0.0066)	(0.0063)	
Industrial x Post 1969	-0.0301	-0.0428***		-0.0432***		0.0110	-0.0005		-0.0010	
	(0.0256)	(0.0088)		(0.0113)		(0.0142)	(0.0041)		(0.0051)	
Panel B: Industrial vs. commercial students										
Industrial x Post 1961	0.0172	-0.0143	-0.0136	0.0002		-0.0063	-0.0038	-0.0073*	-0.0038	
	(0.0287)	(0.0106)	(0.0136)	(0.0150)		(0.0149)	(0.0035)	(0.0038)	(0.0043)	
Industrial x Post 1965	-0.0501*	-0.0357***	-0.0594**	-0.0428***		0.0033	0.0048	0.0019	-0.0020	
	(0.0268)	(0.0099)	(0.0242)	(0.0123)		(0.0139)	(0.0041)	(0.0061)	(0.0050)	
Industrial x Post 1969	-0.0578***	-0.0465***		-0.0586***		-0.0097	-0.0066**		-0.0134***	
	(0.0223)	(0.0084)		(0.0090)		(0.0131)	(0.0031)		(0.0039)	
Panel C: Matched, Industrial vs. academic students										
Industrial x Post 1961	0.0469	-0.0438	-0.0452		-0.0972	0.0966*	0.0354	0.0814*		0.0410
	(0.0674)	(0.0406)	(0.0492)		(0.0900)	(0.0577)	(0.0316)	(0.0430)		(0.0383)
Industrial x Post 1965	-0.0513	-0.0776***	-0.0471		-0.1451*	0.1263***	0.0597**	0.1471***		0.0737**
	(0.0441)	(0.0262)	(0.0748)		(0.0859)	(0.0412)	(0.0272)	(0.0465)		(0.0303)
Industrial x Post 1969	-0.0515	-0.0777***			-0.1663**	0.0731*	0.0125			0.0342
	(0.0449)	(0.0241)			(0.0833)	(0.0438)	(0.0250)			(0.0297)
Specification	Probit	29-56	Pre-1966	Weights	61-65 Matching	Probit	29-56	Pre-1966	Weights	61-65 Matching
Sample	Top	Top	Top	Top	Top	Other	Other	Other	Other	Other

Notes. This table shows additional evidence on the effect of the promotion of STEM education on the probability of becoming an inventor. Columns 1 and 6 show marginal effects from a probit regression. Columns 2 and 7 consider only the inventors who developed at least one patent between the ages of 29 and 56. Columns 3 and 8 restrict the sample to cohorts who completed high school before 1966. Columns 4 and 9 use sampling weights to keep the average student characteristics constant at the pre-reform levels. Columns 5 and 10 use an alternative matching process that uses only STEM graduates belonging to the cohorts between 1961 and 1965. Standard errors clustered by high school and cohort in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A13: Changes in Parental Characteristics

Dependent variable	Change	Obs.	Dependent variable	Change	Obs.
		Individual characteristics			
Female	0.0079	1,464	Number of siblings	0.2136	1,005
	(0.0287)			(0.1925)	
Paternal characteristic			Maternal characteristic		
High school or higher	0.0264	1,362	High school or higher	-0.0568*	1,368
	(0.0333)			(0.0288)	
Manager	0.0064	1,066	Manager	0.0000	1,072
	(0.0261)			(0.0000)	
Entrepreneur	-0.0075	1,066	Entrepreneur	-0.0056	1,072
	(0.0218)			(0.0093)	
Blue-collar worker	-0.0119	1,066	Blue-collar worker	-0.0382	1,072
	(0.0336)			(0.0281)	
Teacher	0.0006	1,066	Teacher	-0.0051	1,072
	(0.0129)			(0.0223)	
Public employee	0.0186	966	Public employee	0.1366	277
	(0.0474)			(0.0949)	
Industrial sector	-0.0494	966	Industrial sector	-0.1065	277
	(0.0386)			(0.0864)	
Born abroad	0.0099	308	Born abroad	-0.0131	306
	(0.0102)			(0.0092)	

Notes. This table shows difference-in-differences coefficients β_1 from the equations Parental char.$_{iat} = \beta_0 + \beta_1[\text{Technical}_i \times \text{Post}_t] + \beta_2\text{Technical}_i + \gamma_t + \zeta_a + \kappa_i + u_{iat}$. Technical$_i$ is equal to 1 for technical students. Post$_t$ is equal to 1 for students who enrolled in high school after 1961. γ_t are birth cohort fixed effects. ζ_a are survey year fixed effects. κ_i are fixed effects for the geographical region of birth.
Source: 2008, 2010, 2012, and 2014 waves of the Survey of Household Income and Wealth. Sample selection: born between 1939 and 1954, academic or technical high school diploma. *** p<0.01, ** p<0.05, * p<0.1.

Table A14: Effects on Innovation, Robustness Checks for Alternative Specifications

	Inventor (1)	Inventor (2)	Inventor (3)	Inventor (4)
Panel A: Top vs. other industrial students				
Top x Post 1961	0.0073	0.0031	0.0086	-0.0093
	(0.0151)	(0.0157)	(0.0171)	(0.0112)
Top x Post 1965	-0.0465***	-0.0449**	-0.0360**	-0.0359***
	(0.0153)	(0.0194)	(0.0149)	(0.0101)
Top x Post 1969	-0.0391***		-0.0354***	-0.0355***
	(0.0117)		(0.0117)	(0.0085)
Panel B: Top vs. other, industrial vs. academic students				
Top x Industrial x Post 1961	0.0081	0.0017	0.0035	-0.0171
	(0.0217)	(0.0187)	(0.0197)	(0.0132)
Top x Industrial x Post 1965	-0.0524***	-0.0526**	-0.0423**	-0.0448***
	(0.0197)	(0.0224)	(0.0176)	(0.0119)
Top x Industrial x Post 1969	-0.0364***		-0.0348**	-0.0394***
	(0.0173)		(0.0149)	(0.0102)
Panel C: Top vs. other, industrial vs. commercial students				
Top x Industrial x Post 1961	0.0202	0.0055	0.0108	-0.0059
	(0.0194)	(0.0156)	(0.0163)	(0.0115)
Top x Industrial x Post 1965	-0.0418**	-0.0471**	-0.0324**	-0.0370***
	(0.0198)	(0.0206)	(0.0153)	(0.0117)
Top x Industrial x Post 1969	-0.0347**		-0.0375***	-0.0372***
	(0.0147)		(0.0116)	(0.0093)
Specification	Probit	Pre-1966	Weights	29-56

Notes. This table shows additional evidence on the effect of the promotion of STEM education on the probability of becoming an inventor. Column 1 shows marginal effects from a probit regression. Column 2 restricts the sample to cohorts who completed high school before 1966. Column 3 uses sampling weights to keep the average student characteristics constant at the pre-reform levels. Column 4 considers only the inventors who developed at least one patent between the age of 29 and 56. Standard errors clustered by high school and cohort in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A15: Probability of Becoming an Inventor, US Patents

	Inventor (1)	C–W patents (2)	Inventor (3)	C–W patents (4)	Inventor (5)	C–W patents (6)
			Panel A: Industrial vs. academic students			
Industrial x Post 1961	-0.0026	0.0077	-0.0076	-0.1030	-0.0017	0.0270
	(0.0046)	(0.1282)	(0.0117)	(0.3021)	(0.0040)	(0.1426)
Industrial x Post 1965	-0.0014	-0.1087	-0.0039	-0.1367	-0.0014	-0.1138
	(0.0037)	(0.1010)	(0.0091)	(0.2828)	(0.0038)	(0.1233)
Industrial x Post 1969	-0.0074**	-0.1562	-0.0137*	-0.1914	-0.0056	-0.1435
	(0.0034)	(0.1001)	(0.0075)	(0.2754)	(0.0036)	(0.1254)
			Panel B: Industrial vs. commercial students			
Industrial x Post 1961	-0.0034	-0.0169	-0.0050	-0.0959	-0.0038	-0.0107
	(0.0043)	(0.1154)	(0.0099)	(0.2668)	(0.0035)	(0.1236)
Industrial x Post 1965	-0.0085**	-0.2221***	-0.0148	-0.3068	-0.0075**	-0.2093**
	(0.0035)	(0.0844)	(0.0089)	(0.2675)	(0.0033)	(0.1002)
Industrial x Post 1969	-0.0124***	-0.2457***	-0.0197***	-0.3689	-0.0108***	-0.2199**
	(0.0032)	(0.0827)	(0.0067)	(0.2501)	(0.0031)	(0.1020)
			Panel C: Matched, Industrial vs. academic students			
Industrial x Post 1961	0.0605**	2.1984***	0.0620	1.9570**	0.0477*	2.4805**
	(0.0289)	(0.6720)	(0.0426)	(0.8613)	(0.0280)	(1.2032)
Industrial x Post 1965	0.0354**	0.7425**	0.0026	0.6777	0.0528**	0.8385
	(0.0177)	(0.3519)	(0.0299)	(0.5321)	(0.0212)	(0.5349)
Industrial x Post 1969	0.0138	0.5277	-0.0168	0.3220	0.0368*	0.7505
	(0.0147)	(0.3584)	(0.0249)	(0.4300)	(0.0197)	(0.5880)
Sample	All	All	Top	Top	Other	Other
Pre-reform dep. var. (panels A-B)	0.0183	0.3409	0.0237	0.4379	0.0169	0.3157
Pre-reform dep. var. (panel C)	0.0321	0.3333	0.0353	0.2823	0.0282	0.3944
Observations (panel A)	35,479	35,479	7,662	7,662	27,817	27,817
Observations (panel B)	27,497	27,497	5,865	5,865	21,632	21,632
Observations (panel C)	4,718	4,718	1,807	1,807	2,911	2,911

Notes. This table shows the effect of the promotion of STEM education on the probability of developing at least one patent issued by the US Patent Office. The source of US patent data is the NBER US Patent Citation Data File (Hall, Jaffe and Trajtenberg, 2001). Columns 3 and 4 restrict the sample to students who ranked in the top quartile of their school's grade distribution. Columns 5 and 6 restrict the sample to students who are not in the top ability quartile. The regressions also include cohort fixed effects, gender, province of birth fixed effects, high school fixed effects, the high school standardized score, the average standardized score of the closest peers in high school, a dummy for home-schooled students, and a dummy for students who graduated high school at 19 (and likely never repeated a grade). Standard errors clustered by high school and cohort in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A16: Unverified Inventors

	Inventor Verified (1)	Inventor Pr > 90% (2)	Inventor Pr> 75% (3)	Inventor Pr >60% (4)	Inventor Pr> 50% (5)	Inventor Pr >40% (6)	Inventor Pr >25% (7)	Inventor All (8)
	Panel A: Top industrial vs. top academic students							
Industrial x Post 1961	-0.0002	-0.0002	-0.0002	-0.0002	-0.0008	-0.0007	0.0011	0.0344
	(0.0172)	(0.0172)	(0.0172)	(0.0171)	(0.0171)	(0.0173)	(0.0174)	(0.0221)
Industrial x Post 1965	-0.0317**	-0.0317**	-0.0317**	-0.0307**	-0.0268*	-0.0272*	-0.0175	-0.0124
	(0.0144)	(0.0144)	(0.0144)	(0.0142)	(0.0145)	(0.0147)	(0.0150)	(0.0222)
Industrial x Post 1969	-0.0403***	-0.0403***	-0.0403***	-0.0398***	-0.0394***	-0.0374***	-0.0342***	-0.0534***
	(0.0120)	(0.0120)	(0.0120)	(0.0119)	(0.0120)	(0.0122)	(0.0127)	(0.0194)
	Panel B: Top industrial vs. top commercial students							
Industrial x Post 1961	-0.0039	-0.0039	-0.0039	-0.0038	-0.0031	-0.0030	-0.0015	0.0269
	(0.0147)	(0.0147)	(0.0147)	(0.0146)	(0.0147)	(0.0148)	(0.0152)	(0.0224)
Industrial x Post 1965	-0.0420***	-0.0420***	-0.0420***	-0.0407***	-0.0357***	-0.0330**	-0.0242*	-0.0300
	(0.0127)	(0.0127)	(0.0127)	(0.0124)	(0.0128)	(0.0129)	(0.0133)	(0.0214)
Industrial x Post 1969	-0.0559***	-0.0559***	-0.0559***	-0.0563***	-0.0551***	-0.0523***	-0.0496***	-0.0758***
	(0.0097)	(0.0097)	(0.0097)	(0.0096)	(0.0098)	(0.0102)	(0.0108)	(0.0199)
	Panel C: Top vs. other industrial students							
Top x Post 1961	0.0067	0.0066	0.0066	0.0061	0.0056	0.0053	0.0064	0.0271
	(0.0158)	(0.0159)	(0.0159)	(0.0159)	(0.0159)	(0.0158)	(0.0156)	(0.0216)
Top x Post 1965	-0.0346**	-0.0347**	-0.0347**	-0.0336**	-0.0300**	-0.0284**	-0.0268**	-0.0393*
	(0.0137)	(0.0137)	(0.0137)	(0.0135)	(0.0138)	(0.0139)	(0.0134)	(0.0202)
Top x Post 1969	-0.0359***	-0.0361***	-0.0363***	-0.0359***	-0.0359***	-0.0351***	-0.0350***	-0.0451**
	(0.0109)	(0.0109)	(0.0109)	(0.0110)	(0.0110)	(0.0110)	(0.0106)	(0.0185)
	Panel D: Top vs. other, industrial vs. academic students							
Top x Industrial x Post 1961	0.0057	0.0056	0.0056	0.0051	0.0037	0.0028	0.0066	0.0349
	(0.0186)	(0.0186)	(0.0186)	(0.0187)	(0.0187)	(0.0187)	(0.0185)	(0.0248)
Top x Industrial x Post 1965	-0.0389**	-0.0390**	-0.0390**	-0.0376**	-0.0348**	-0.0361**	-0.0291*	-0.0320
	(0.0164)	(0.0164)	(0.0164)	(0.0162)	(0.0164)	(0.0167)	(0.0160)	(0.0233)
Top x Industrial x Post 1969	-0.0332**	-0.0335**	-0.0331**	-0.0328**	-0.0329**	-0.0334**	-0.0323**	-0.0352
	(0.0140)	(0.0140)	(0.0140)	(0.0140)	(0.0140)	(0.0141)	(0.0137)	(0.0217)
	Panel E: Matched, Top industrial vs. top academic students							
Industrial x Post 1961	-0.0044	-0.0044	-0.0044	-0.0044	-0.0032	-0.0036	0.0019	0.0882
	(0.0501)	(0.0501)	(0.0501)	(0.0501)	(0.0501)	(0.0501)	(0.0511)	(0.0627)
Industrial x Post 1965	-0.0679**	-0.0679**	-0.0679**	-0.0679**	-0.0513	-0.0555	-0.0377	0.0254
	(0.0334)	(0.0334)	(0.0334)	(0.0334)	(0.0353)	(0.0356)	(0.0385)	(0.0426)
Industrial x Post 1969	-0.0629**	-0.0629**	-0.0629**	-0.0629**	-0.0614**	-0.0620**	-0.0687**	-0.0516
	(0.0296)	(0.0296)	(0.0296)	(0.0296)	(0.0295)	(0.0295)	(0.0329)	(0.0401)
Number of Inventors	869	870	874	880	901	934	1,067	2,399

Notes: Different columns include a different amount of unverified inventors (inventors whose patents could not be verified though the fiscal code or an internet search) in the sample. Column 1 includes only the verified inventors, column 2 all the inventors with an estimated probability above 90 percent, column 3 above 75 percent, column 4 above 60 percent, column 5 above 50 percent, column 6 above 40 percent, and column 7 above 25 percent. Column 8 includes all unverified inventors. Standard errors clustered by high school and cohort in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A17: Changes in Occupation, Multinomial Logit

	Baseline (1)	Public (2)	Entrepreneurs (3)	S-e prof. (4)	Baseline (5)	Public (6)	Entrepreneurs (7)	S-e prof. (8)
				Panel A: Industrial vs. academic students				
Industrial x Post 1961	0.0465**	-0.0545***	-0.0017	0.0098	0.0390***	-0.0173***	-0.0116	-0.0100***
	(0.0211)	(0.0116)	(0.0164)	(0.0076)	(0.0132)	(0.0039)	(0.0125)	(0.0034)
Industrial x Post 1965	0.0572***	-0.0905***	0.0189*	0.0144	0.0501***	-0.0501***	0.0063	-0.0063**
	(0.0213)	(0.0128)	(0.0164)	(0.0076)	(0.0125)	(0.0049)	(0.0115)	(0.0032)
Industrial x Post 1969	0.1224***	-0.1634***	0.0252**	0.0157	0.1012***	-0.1262***	0.0282***	-0.0032
	(0.0194)	(0.0114)	(0.0153)	(0.0072)	(0.0119)	(0.0055)	(0.0107)	(0.0030)
				Panel B: Matched, Industrial vs. academic students				
Industrial x Post 1961	0.0443	-0.0151	-0.0688***	0.0395**	0.0920*	0.0595*	-0.1646***	0.0131
	(0.0397)	(0.0251)	(0.0262)	(0.0193)	(0.0555)	(0.0316)	(0.0386)	(0.0199)
Industrial x Post 1965	0.0462	0.0017	-0.0726***	0.0247*	0.1589***	0.0064	-0.1727***	0.0074
	(0.0374)	(0.0239)	(0.0266)	(0.0129)	(0.0426)	(0.0196)	(0.0377)	(0.0105)
Industrial x Post 1969	0.0666*	0.0107	-0.0881***	0.0108	0.1068**	0.0472	-0.1515***	-0.0025
	(0.0358)	(0.0212)	(0.0273)	(0.0146)	(0.0517)	(0.0379)	(0.0373)	(0.0123)
Sample	Top	Top	Top	Top	Other	Other	Other	Other
Pre-reform dep. var. (panel A)	0.92	0.01	0.05	0.02	0.89	0.01	0.09	0.01
Pre-reform dep. var. (panel B)	0.93	0.01	0.04	0.02	0.92	0.01	0.05	0.02
Observations (panel A)	235,082	235,082	235,082	235,082	803,597	803,597	803,597	803,597
Observations (panel B)	59,122	59,122	59,122	59,122	93,312	93,312	93,312	93,312

Notes. This table shows the effect of the promotion of STEM education on the occupation choice. The coefficients are marginal effects calculated from the estimation of a multinomial logit model. The dependent variable is a categorical variable that identifies four groups of occupations. Group 1 (columns 1 and 5) is the baseline and gathers all occupations not included in other groups. Group 2 (columns 2 and 6) groups all occupations in the public sector: all occupations that pay pension contributions to INPDAP in Table A1. Group 3 (columns 3 and 7) identifies entrepreneurs: Entrepreneurs and Artisans in Table A1. Group 4 (columns 4 and 8) identifies self-employed professionals: variable S-e prof. in Table 5; "Engineers" + "Other professionals" in Table A1. Post 1961 is 1 for cohorts who graduated between 1961 and 1964, Post 1965 is 1 for cohorts who graduated between 1965 and 1968, and Post 1969 is 1 for cohorts who graduated between 1969 and 1973. Columns 1 to 4 restrict the sample to students who ranked in the top quartile of their school's grade distribution. Columns 5 to 8 restrict the sample to students who ranked in the bottom three quartiles of their school's grade distribution. Standard errors clustered by student in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A18: Changes in Occupation, Instrumental Variables

	S-e prof. OLS (1)	S-e prof. IV (2)	S-e prof. OLS (3)	S-e prof. IV (4)
Panel A: Industrial vs. academic students				
STEM degree	0.0228***	0.0350**	0.0163***	0.0192
	(0.0035)	(0.0138)	(0.0024)	(0.0138)
F statistic		87.28		96.90
Panel B: Matched, Industrial vs. academic students				
STEM degree	0.0333***		-0.0144	
	(0.0119)		(0.0105)	
Sample	Top	Top	Other	Other
Pre-reform inventor share (Panel A)	0.0049	0.009	0.008	0.008
Pre-reform inventor share (Panel B)	0.004	0.004	0.007	0.007
Observations (Panel A)	234,961	234,961	802,657	802,657
Observations (Panel B)	59,122	59,122	93,272	93,272

Notes. This table shows OLS and instrumental variable estimates of the effect of STEM education on the probability of becoming a self-employed professional. The instrumental variables for receiving a STEM degree (STEM degree$_i$) are Industrial$_i$ × Post 1961$_t$, Industrial$_i$ × Post 1965$_t$, and Industrial$_i$ × Post 1969$_t$. The dependent variable, Inventor, is a dummy that equals one for students who patented at least once from 1968 to 2010. The regressions also include cohort fixed effects, gender, province of birth fixed effects, high school fixed effects, the high school standardized score, the average standardized score of the closest peers in high school, a dummy for home-schooled students, and a dummy for students who graduated high school at 19 (and likely never repeated a grade). Standard errors clustered by high school and cohort in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A19: Industries within the Private Sector

	Manufacturing (1)	R&D (2)	Top pay (3)	Manufacturing (4)	R&D (5)	Top pay (6)
	Panel A: Industrial vs. academic students					
Industrial x Post 1961	-0.1396**	-0.0067	0.0367	-0.0174	0.0116	0.0248
	(0.0555)	(0.0100)	(0.0381)	(0.0306)	(0.0073)	(0.0233)
Industrial x Post 1965	0.0048	0.0014	0.0121	0.0241	0.0181**	-0.0100
	(0.0534)	(0.0057)	(0.0372)	(0.0290)	(0.0077)	(0.0223)
Industrial x Post 1969	-0.0184	0.0037	0.0170	0.0497*	0.0167**	-0.0028
	(0.0498)	(0.0048)	(0.0351)	(0.0272)	(0.0068)	(0.0215)
	Panel B: Matched, Industrial vs. academic students					
Industrial x Post 1961	-0.3373***	-0.0010	0.0617	-0.0391	0.0769*	0.0229
	(0.0943)	(0.0193)	(0.0555)	(0.1028)	(0.0421)	(0.0560)
Industrial x Post 1965	-0.1433*	0.0126	0.0828*	0.0010	0.0527**	0.0276
	(0.0770)	(0.0164)	(0.0487)	(0.0745)	(0.0205)	(0.0405)
Industrial x Post 1969	-0.1563**	0.0070	0.0859*	0.0295	0.0384**	0.0214
	(0.0695)	(0.0115)	(0.0442)	(0.0718)	(0.0176)	(0.0404)
Sample	Top	Top	Top	Other	Other	Other
Pre-reform dep. var. (panel A)	0.6224	0.0000	0.1198	0.6286	0.0025	0.1195
Pre-reform dep. var. (panel B)	0.7622	0.0000	0.0458	0.7551	0.0000	0.0307
Observations (panel A)	76,315	76,315	76,315	261,189	261,189	261,189
Observations (panel B)	25,528	25,528	25,528	42,274	42,274	42,274

Notes. This table shows the effect of the promotion of STEM education on the industry choice. Dependent variables: R&D is a dummy for research–intensive industries, Manufacturing is a dummy for all manufacturing industries, Top pay is a dummy for the five industries with the highest average salaries for workers with STEM degrees (energy, food/hospitality, transportation/communications, finance/banking, and international organizations). Post 1961 is 1 for cohorts who graduated between 1961 and 1964, Post 1965 is 1 for cohorts who graduated between 1965 and 1968, and Post 1969 is 1 for cohorts who graduated between 1969 and 1973. Columns 4 to 6 restrict the sample to students who ranked in the top quartile of their school's grade distribution. The regressions include cohort and calendar year fixed effects, gender, province of birth fixed effects, high school fixed effects, the HS score, the average standardized score of the closest peers in high school, a dummy for home-schooled students, and a dummy for students who graduated high school at 19. Standard errors clustered by student in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A20: Positions within the Private Sector

	Top pos. (1)	Manager (2)	Top pos. (3)	Manager (4)	Top pos. (5)	Manager (6)	Top pos. (7)	Manager (8)
	Panel A: Industrial vs. academic students							
Industrial x Post 1961	-0.0409	-0.0530	-0.0435	-0.0681	0.0140	0.0080	0.0062	0.0104
	(0.0316)	(0.0330)	(0.0480)	(0.0509)	(0.0144)	(0.0149)	(0.0245)	(0.0262)
Industrial x Post 1965	0.0588*	0.0548*	0.0156	0.0223	0.0650***	0.0466***	0.0665***	0.0466*
	(0.0307)	(0.0320)	(0.0461)	(0.0492)	(0.0138)	(0.0142)	(0.0231)	(0.0247)
Industrial x Post 1969	0.0539*	0.0325	0.0075	-0.0174	0.0385***	0.0286**	0.0175	0.0170
	(0.0287)	(0.0295)	(0.0427)	(0.0449)	(0.0129)	(0.0131)	(0.0216)	(0.0229)
	Panel B: Matched, Industrial vs. academic students							
Industrial x Post 1961	0.0702	0.0354	0.0995	0.0519	0.2661***	0.2808***	0.3063***	0.3718***
	(0.0642)	(0.0698)	(0.0934)	(0.1091)	(0.0548)	(0.0602)	(0.0819)	(0.0982)
Industrial x Post 1965	0.1742***	0.1640***	0.1593**	0.1669*	0.3183***	0.2842***	0.3012***	0.2766***
	(0.0552)	(0.0591)	(0.0796)	(0.0906)	(0.0406)	(0.0435)	(0.0684)	(0.0788)
Industrial x Post 1969	0.1866***	0.1257**	0.1481*	0.0960	0.2732***	0.2496***	0.2524***	0.2557***
	(0.0524)	(0.0560)	(0.0769)	(0.0865)	(0.0389)	(0.0415)	(0.0656)	(0.0752)
Sample	Top	Top	Top	Top	Other	Other	Other	Other
Industry f.e.	No	No	Yes	Yes	No	No	Yes	Yes
Pre- reform dep. var. (panel A)	0.2321	0.2182	0.2321	0.2182	0.1486	0.1375	0.1486	0.1375
Pre- reform dep. var. (panel B)	0.2271	0.2075	0.2271	0.2075	0.1462	0.1295	0.1462	0.1295
Observations (Panel A)	161,759	161,759	75,901	75,901	616,783	616,783	259,411	259,411
Observations (Panel B)	45,258	45,258	25,433	25,433	75,347	75,347	42,054	42,054

Notes. This table shows the effect of the promotion of STEM education on the position held within a firm. Dependent variables: Top pos. is a dummy for the two highest positions of manager and higher-level white collar (*quadro* in Italian), and Manager is a dummy for workers in a managerial position. Columns 3, 4, 7, and 8 control for industry fixed effects to capture position changes within the same industries in the private sector. Post 1961 is 1 for cohorts who graduated between 1961 and 1964, Post 1965 is 1 for cohorts who graduated between 1965 and 1968, and Post 1969 is 1 for cohorts who graduated between 1969 and 1973. Columns 5 to 8 restrict the sample to students who ranked in the top quartile of their school's grade distribution. The regressions include cohort and calendar year fixed effects, gender, province of birth fixed effects, high school fixed effects, the HS score, the average standardized score of the closest peers in high school, a dummy for home-schooled students, and a dummy for students who graduated high school at 19. Standard errors clustered by student in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

B Comparative statics

Comparative static 1:

$$P(i=1,\ d=1) - P(i=1,\ d=0)$$
$$= \frac{e^{w_d+g(a,\,1)}\cdot(e^{w_{hs}+g(a,\,0)}+e^{w_{hs}})-e^{w_{hs}+g(a,\,0)}\cdot(e^{w_d+g(a,\,1)}+e^{w_d}+e^{w_n-c(a)})}{(e^{w_d+g(a,\,1)}+e^{w_d}+e^{w_n-c(a)})\cdot(e^{w_{hs}+g(a,\,0)}+e^{w_{hs}})}$$

Focusing on the numerator:

$$e^{w_d+g(a,\,1)}\cdot\left(e^{w_{hs}+g(a,\,0)}+e^{w_{hs}}\right)-e^{w_{hs}+g(a,\,0)}\cdot\left(e^{w_d+g(a,\,1)}+e^{w_d}+e^{w_n-c(a)}\right)$$

If the non-STEM sector is not an option, $P(i=1,\ d=1) > P(i=1,\ d=0)$ if $g\,(a,\,1) > g\,(a,\,0)$. If the non-STEM sector is an option, $P(i=1,\ d=1) > P(i=1,\ d=0)$ if $e^{w_d}\cdot\left(e^{g(a,\,1)-g(a,\,0)}-1\right) > e^{w_n-c(a)}$.

Comparative static 2:

$$P(\text{Non-STEM},\ d=1) - P(\text{Non-STEM},\ d=0) = \frac{e^{w_n-c(a)}}{\left(e^{w_d+g(a,\,1)}+e^{w_d}+e^{w_n-c(a)}\right)}$$

The derivative with respect to natural ability is:

$$\frac{\partial P(\text{Non-STEM},\ d=1)}{\partial a} = \frac{e^{w_n-c(a)}\cdot\left(-\frac{\partial c(a)}{\partial a}\cdot\left(e^{w_d+g(a,\,1)}+e^{w_d}\right)-\frac{\partial g(a,\,1)}{\partial a}\cdot e^{w_d+g(a,\,1)}\right)}{\left(e^{w_d+g(a,\,1)}+e^{w_d}+e^{w_n-c(a)}\right)^2}$$

The derivative is positive if $-\frac{\partial c(a)}{\partial a} > \frac{\partial g(a,\,1)}{\partial a}\cdot\frac{e^{g(a,\,1)}}{(e^{g(a,\,1)}+1)}$.

C Curriculum change in STEM majors

Pursuing a university STEM education affected how students sorted into different occupations. In addition, the human capital acquired in STEM majors changed the technological areas in which the industrial students patented. All these effects are large and significant only among the cohorts who completed high school after 1965, although university STEM graduation rates increased from 1961. In this subsection, we explore a potential explanation for a delay in the effect of STEM education.

Industrial high schools heavily focused on applied STEM disciplines at the expense of theoretical STEM education. As a result, industrial students who enrolled in STEM majors had good practical skills, but lacked a solid theoretical foundation in most STEM areas. To analyze the performance of industrial students during their university studies, we divided all courses in university STEM majors in two categories: industrial, which were directly related to the disciplines taught by industrial high schools, and academic, which required more theoretical or advanced skills.[22] We then estimated the following specification:

$$g_{icp} = \alpha + \beta_c + \gamma_p + \delta\,(\text{Industrial student}_i \times \text{Industrial course}_c) + \eta X_{ip} + u_{icp}, \qquad (7)$$

where g_{icp} is the standardized grade of student i in the STEM course c in academic year p. Industrial student$_i$ is equal to 1 if student i received an industrial high school diploma. Industrial course$_c$ is equal to 1 if the course is related to a discipline taught in industrial high schools. X_{ip} denotes student characteristics, such as year of high school graduation fixed effects, gender, and pre-collegiate achievement. β_c are course fixed effects and γ_p are academic year fixed effects. The sample includes academic and industrial students who completed high school between 1958 and 1973 and were enrolled in a STEM major between 1961 and 1977.

The estimated coefficient of Industrial student$_i$ $\times$ Industrial course$_c$ indicates that industrial students scored 0.12 standard deviations above academic students in industrial courses, after controlling for other course and student characteristics (table C1, panel A, column 1). This result is due to the fact that industrial students scored 0.11 standard deviations above the mean in industrial courses (Table C1, panel A, column 3), while academic students

[22] Based on the disciplines taught in industrial high schools, we used the following keywords to identify industrial courses: aerodinamica, aeromobili, aeronautica, aerotecnica, antenne, architettura, caldaie, cantieri, centrali, chimica, chimiche, comunicazione, controlli automatici, controlli dei processi, costruttivi, costruzione, costruzioni, disegno, elettriche, elettro, elettronica, elettronici, elettronico, elettrotecnica, elicotteri, estimo, fondazioni, forni, idraulica, idrologia, impianti, infrastrutture, macchinari, macchine, materiali, meccanica, meccaniche, metalli, metallo, motori, plastiche, progetti, progetto, programmazione, propulsione, propulsori, radiochimica, radiotecnica, reattori, regolazione, rilevatori, siderurgia, sintesi, speciali, sismica, sistemi operativi, statica, struttura, strutture, strutturistica, tecnologia, tecnologie, tensioni, topografia. In the engineering major, for example, technical drawing is an industrial course and introductory math is an academic course.

scored only 0.04 standard deviations below the mean (Table C1, panel A, column 4). This finding suggests that industrial students might have experienced a lower accumulation of human capital in STEM majors, because they lacked the necessary preparation to thrive in academic courses.[23]

Beginning in 1969, students were freer to choose courses that were more in line with their precollegiate skills, rather than having to comply with a rigid curriculum. To test the effect of the 1969 reform on the course choice, we estimated the following specification:

$$\text{Share industrial courses}_{ip} = \alpha + \gamma_p + \sum_p \delta_p \left(\text{Industrial student}_i \times \gamma_p\right) + \eta X_{ip} + u_{ip}, \quad (8)$$

where Share industrial courses_{ip} is the share of industrial courses attended by student i in the academic year p, γ_p are academic year fixed effects, and X_{ip} are student characteristics.

The difference-in-differences coefficients of Industrial $\text{student}_i \times \gamma_p$ indicate that the share of industrial courses in the curriculum of industrial students increased by 7.53 percentage points between 1969 and 1977 (Table C1, panel B, column 1). This effect is the result of two diverging trends. After 1969 industrial students increased the share of industrial courses by 8.05 percentage points (Table C1, panel B, column 3), while academic students reduced it by 1.07 percentage points (Table C1, panel B, column 4). Although this finding indicates that both academic and industrial students switched to more favorable courses after 1969, the change was much larger among industrial students, whose human capital accumulation was plausibly more penalized by the rigid curricula.

A greater flexibility in choosing courses benefited students who entered into STEM majors after 1969, as well as those who were enrolled at the time of the implementation. To prove this point, we estimate equation 8 including only the students who completed high school before 1969. In this case, the industrial students increased the share of industrial courses in their curricula by 3.53 percentage points between 1969 and 1977 (Table C1, panel B, column 2).

This course–level analysis suggested that industrial students might have accumulated more human capital after 1969, when they could select a higher number of industrial courses.

[23] The share of academic courses was equal to 55 percent in an average academic year.

The same post-1965 cohorts who benefited from a flexible curriculum experienced a change in their innovative output and in their occupational sorting.

Table C1: Industrial Courses and Curriculum Change

	Industrial vs. academic	Pre-1969 cohorts	Industrial students	Academic students	Top vs. other industrial	Top vs. other academic
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A: Grades in different STEM courses			
Industrial student x Industrial course	0.1216***	0.1616***				
	(0.0144)	(0.0194)				
Industrial course			0.1136***	-0.0409***		
			(0.0108)	(0.0072)		
Top x Industrial course					-0.0407	0.0550*
					(0.0430)	(0.0305)
			Panel B: Share of industrial courses in the curriculum			
Industrial student x 1965–1968	0.0245	0.0145				
	(0.0163)	(0.0163)				
Industrial student x 1969-1977	0.0753***	0.0353**				
	(0.0154)	(0.0161)				
1965–1968			0.0231	-0.0067		
			(0.0157)	(0.0050)		
1969-1977			0.0805***	-0.0107**		
			(0.0152)	(0.0043)		
Top x 1965–1968					-0.0040	0.0029
					(0.0536)	(0.0177)
Top x 1969-1977					-0.0035	0.0161
					(0.0524)	(0.0144)
Observations (panel A)	136,275	93,363	38,297	97,978	38,297	97,978
Observations (panel B)	27,786	18,970	8,294	19,492	8,294	19,492

Notes: Panel A shows how industrial students performed in the industrial courses (close to the curriculum of industrial high schools) of STEM majors. The unit of analysis is a student i in the STEM course c and the academic year p (academic years from 1961 to 1977). Panel B shows how the share of industrial courses increased after 1969 among industrial students. The unit of analysis is a student i in the academic year a (1960–1977). The dependent variable is the standardized course grade in panel A and the share of industrial courses in each academic year in panel B. Standard errors clustered by student in parentheses, *** p<0.01, ** p<0.05, * p<0.1.