This is the **online Appendix** to the paper “On the Intergenerational Transmission of STEM Education among Graduate Students” by D. Chise, M. Fort and C. Monfardini.

A Appendix - Classification of fields of study

In this paper, we classify STEM disciplines using the definition provided by the EU Commission in 2015, based on Eurostat’s Classification of Fields of Education and Training (1999). This classification from Eurostat relies in turn on the International Standard Classification of Education (ISCED 1997) developed by Unesco. ISCED has been revised several times, with the latest revision in 2013 focusing exclusively on fields of education and training (ISCED-F) and applied to EU data collections starting from 2016. In order to adhere to this up-to-date classification, we modified the grouping of the STEM macro categories provided by the EU 2015 report. The equivalent STEM fields of study can be classified in the following 3 categories: (i) Natural sciences, mathematics and statistics; (ii) Information and Communication Technologies; (iii) Engineering, manufacturing and construction.² Differently from the EU, we include architecture among STEM disciplines since in Italy university programs in architecture are usually part of the department of Engineering and have many similarities with civil engineering studies.³ On the other hand, consistently with the EU’s decision, we do not consider health degrees as STEM, although some studies do the opposite. This decision was taken based on considerations on the historical evolution of the perception of different jobs as well as on the presence of women in these occupations. While science has historically been viewed as non-communicative, research-oriented and a highly technical occupation, medicine has been associated with personal care involving direct human contact, having an overall equal distribution of men and women.⁴ As a robustness check, we re-run the estimation classifying health studies as a STEM field for both parents and students and our results remain very similar (see Section 5).

The Italian university system is organised in three cycles, according to the Bologna framework adopted in 1999: the main academic degrees are the so-called *Laurea* (1st cycle) which is the equivalent of a bachelor’s degree, the so-called *Laurea magistrale* (2nd cycle) - the equivalent of a master’s degree, and the so-called *Dottorato di Ricerca* (3rd cycle) - the equivalent of a PhD. In our study we include students who achieved both 1st and 2nd cycle degrees. The Italian university degrees are classified into groups called “classi

²The original fields as indicated by the European Commission can be found in a report available on line at <https://publications.europa.eu/en/publication-detail/-/publication/60500ed6-cbd5-11e5-a4b5-01aa75ed71a1/language-en>

³Most of the alternative STEM definitions include architecture and so does EU Skills Panorama 2014 (2015) in its analytical highlight on STEM skills.

⁴We thank E. Luppi for the useful comments and suggestions.

di laurea”, established by the Italian Ministry of Education (MIUR) according to the general educational objectives they share and core learning activities they must include. The MIUR has updated the correspondence between the Italian “classi di laurea” and the ISCED-F 2013 classification in 2016. This enabled us to give a very precise and up-to-date definition of which courses can be labeled as STEM according to the European Commission’s guidelines, as we illustrate in section A.1 below.

A.1 Classification of students’ fields of study

Almalaurea has their own classification of students’ degrees into broad fields of study. Overall, there are sixteen broad fields of study: scientific, chemical-pharmaceutical, geo-biological, medical, engineering, architecture, agrarian-veterinarian, economical-statistical, political-sociological, legal, literary, linguistics, teaching, psychological, physical education, defence and security. For our analysis, the differentiation between STEM and non-STEM fields is crucial. While some of the Almalaurea groups can be entirely classified as either STEM or non-STEM, most of them contain both STEM and non-STEM degrees. Departing from the Almalaurea classification, we use the definition of STEM ISCED fields and the mapping between these fields and the Italian degrees provided by the MIUR, as mentioned above. We have re-assigned some of the degrees in the original Almalaurea groups in order to obtain groups that contain either STEM or non-STEM degrees only. Due to sample size considerations, we have further aggregated some of these sixteen newly created groups and ended up with ten categories, out of which three are STEM and seven are non-STEM, as displayed in Table A-1. The detailed list of the degrees that form each of our newly created categories (i.e. fields of study) is illustrated in Table A-2 (for STEM fields) and Table A-3 (for non-STEM fields), together with their original Almalaurea classification.⁵

A.2 Classification of parents’ fields of study

Information on parents degree in our dataset is survey data reported by students in the form of free text. These data have not undergone any classification by Almalaurea. We cleaned and classified the parents’ degrees through an own-build procedure, mirroring the classification of the students’ degrees. However, given that the parents obtained their qualification

⁵Consistently with our sample selection, only 3-years cycle degrees (i.e. “Laurea”) and 5-years cycle degrees (i.e. “Laurea magistrale a ciclo unico”) are displayed in the list.

before the Bologna process and have the so-called “vecchio ordinamento” degrees,⁶ we cannot classify them according to the new “classi di laurea” introduced in 1999. We therefore classified parents’ degrees into the same broad fields of studies used for the students. We resorted to text mining techniques to clean the data and assign each degree to a specific group based on the words characterizing the field. Following the same logic as described for students’ classification in Appendix A.1, we proceeded with a three-steps approach: we first assigned the degrees to one of the sixteen fields of study defined by AlmaLaurea, afterwards we altered the structure of some of these sixteen groups and re-assigned degrees to create pure STEM and non-STEM groups, lastly we aggregated some groups into ten final categories for the father (Table A-4) and for the mother (Table A-5) qualification. To provide a practical example for the degrees in the scientific group: in the first step we assigned the degrees that contain words such as “science” (as a stand-alone word), “physics”, “informatics”, “mathematics”, “navigation” and their composites to the AlmaLaurea-equivalent group “Scientific”, in the second step we customized the Scientific group by adding to it other STEM degrees that belong to non-STEM AlmaLaurea groups such as “chemistry”, “statistics”, etc. The group “Scientific” does not undergo the third step since it remains a stand-alone also in our final classification and is not merged with another group. In total, we classified 32,803 observations for fathers’ degrees and 30,930 for mothers’ degrees.

A.3 Classification of field of study at high school

For our analysis we also considered the secondary education diplomas obtained by the students, which are a pre-requisite to access tertiary education. We classified their high school qualifications into STEM and non-STEM groups, according to the attended high-school type and the study curricula. We categorized as STEM scientific high schools and selected technical high schools based on high mathematical and technical content of the curriculum of studies.

STEM high schools include: scientific high school (*liceo scientifico*) and technical institutes (*istituti tecnici*) with following specialisations: industrial (*istituto tecnico industriale*), surveying (*istituto tecnico per geometri*), nautical (*istituto tecnico nautico*), aeronautical (*istituto tecnico aeronautico*).

All the remaining high schools were categorized as non-STEM. Non-STEM high schools include: classical high school (*liceo classico*), psycho-socio-pedagogical high school (*liceo psico-socio-pedagogico*) or teacher training school (*istituto magistrale*), linguistic high school

⁶Before the Bologna process, the study cycles lasted 4 years while after they were separated into 3+2 (i.e. 3 years of bachelor’s and 2 years of master’s). We do not have information about the graduation date of the parents, however, given that the Bologna process started in 1999, we assume that the parents graduated under the old system.

(*liceo linguistico*), fine arts high school (*liceo artistico*), artistic school (*istituto d'arte*), technical institutes with specialisation in commerce (*istituto tecnico commerciale*), agriculture (*istituto tecnico agrario*), business administration (*istituto tecnico per periti aziendali*), social service (*istituto tecnico femminile per i servizi sociali*), and vocational schools (*istituti professionali*).

Table A-1: Distribution of students by field of study

Field	Frequency	Percentage
<i>STEM fields</i>		
<i>Scientific</i>	7,704	4.83
<i>Engineering</i>	15,991	10.02
<i>OtherSTEM</i>	12,697	7.96
<i>Non-STEM fields</i>		
<i>Medical</i>	24,299	15.22
<i>Economical</i>	19,585	12.27
<i>Political – sociological</i>	15,123	9.47
<i>Legal</i>	13,173	8.25
<i>Literary</i>	12,132	7.60
<i>Linguistic</i>	11,391	7.14
<i>OtherNon – STEM</i>	27,515	17.24
Observations	159,610	100.00

Notes: Other STEM fields includes Geo-biological and Architecture. Other non-STEM fields includes Pharmaceutical, Agrarian-veterinarian, Teaching, Psychological, Physical education, Defence and security.

Table A-2: List of STEM degrees by fields of study of the students

STEM fields	Almalaurea group
Scientific (Scientifico)	
Scienze e tecnologie chimiche (21)	Chemical-pharmaceutical
Scienze e tecnologie della navigazione marittima e aerea (22)	Scientific
Scienze e tecnologie farmaceutiche (24)	Chemical-pharmaceutical
Scienze e tecnologie fisiche (25)	Scientific
Scienze e tecnologie informatiche (26)	Scientific
Scienze matematiche (32)	Scientific
Scienze statistiche (37)	Economical-statistical
Scienze e tecnologie chimiche (L-27)	Chemical-pharmaceutical
Scienze e tecnologie della navigazione (L-28)	Scientific
Scienze e tecnologie farmaceutiche (L-29)	Chemical-pharmaceutical
Scienze e tecnologie fisiche (L-30)	Scientific
Scienze e tecnologie informatiche (L-31)	Scientific
Scienze matematiche (L-35)	Scientific
Statistica (L-41)	Economical-statistical
Engineering (Ingegneria)	
Ingegneria civile e ambientale (8)	Engineering
Ingegneria dell'informazione (9)	Engineering
Ingegneria industriale (10)	Engineering
Ingegneria civile e ambientale (L-7)	Engineering
Ingegneria dell'informazione (L-8)	Engineering
Ingegneria industriale (L-9)	Engineering
Other STEM fields (Altri corsi STEM)	
<i>Geo-biological (Geo-biologico)</i>	
Biotechnologie (1)	Geo-biological
Scienze biologiche (12)	Geo-biological
Scienze della Terra (16)	Geo-biological
Scienze e tecnologie per l'ambiente e la natura (27)	Geo-biological
Biotechnologie (L-2)	Geo-biological
Scienze biologiche (L-13)	Geo-biological
Scienze e tecnologie per l'ambiente e la natura (L-32)	Geo-biological

Table A-2: List of STEM degrees by fields of study of the students

STEM fields	Almalaurea group
Scienze geologiche (L-34)	Geo-biological
<i>Architecture (Architettura)</i>	
Scienze dell'architettura e dell'ingegneria edile (4)	Architecture
Urbanistica e scienze della pianificazione territoriale e ambientale (7)	Architecture
Tecnologie per la conservazione e il restauro dei beni culturali (41)	Literary
Architettura e ingegneria edile (4/S)	Architecture
Scienze dell'architettura (L-17)	Architecture
Scienze della pianificazione territoriale, urbanistica, paesaggistica e ambientale (L-21)	Architecture
Scienze e tecniche dell'edilizia (L-23)	Architecture
Diagnostica per la conservazione dei beni culturali - EX tecn. per la conservaz. e il restauro dei beni cult. (L-43)	Literary
Architettura e ingegneria edile-architettura (LM-4 C.U.)	Architecture
Conservazione e restauro dei beni culturali - Ciclo Unico (LMR/02)	Literary

Table A-3: List of non-STEM degrees by fields of study
of the students

Non-STEM fields	Almalaurea group
Medical (Medico)	
Professioni sanitarie infermieristiche e professione sanitaria ostetrica (SNT/1)	Medical
Professioni sanitarie della riabilitazione (SNT/2)	Medical
Professioni sanitarie tecniche (SNT/3)	Medical
Professioni sanitarie della prevenzione (SNT/4)	Medical
Professioni sanitarie, infermieristiche e professione sanitaria ostetrica (L/SNT1)	Medical
Professioni sanitarie della riabilitazione (L/SNT2)	Medical
Professioni sanitarie tecniche (L/SNT3)	Medical
Professioni sanitarie della prevenzione (L/SNT4)	Medical
Economical (Economico)	
Scienze dell'economia e della gestione aziendale (17)	Economical-statistical
Scienze economiche (28)	Economical-statistical
Scienze dell'economia e della gestione aziendale (L-18)	Economical-statistical
Scienze economiche (L-33)	Economical-statistical
Legal (Giuridico)	
Scienze dei servizi giuridici (2)	Legal
Scienze giuridiche (31)	Legal
Giurisprudenza (22/S)	Legal
Scienze dei servizi giuridici (L-14)	Legal
Giurisprudenza (LMG/01)	Legal
Other non-STEM fields (Altri corsi non-STEM)	
<i>Pharmaceutical (Farmaceutico)</i>	
Farmacia e farmacia industriale (14/S)	Chemical-pharmaceutical
Farmacia e farmacia industriale (LM-13)	Chemical-pharmaceutical
<i>Agrarian-veterinarian (Agrario-vevtrinario)</i>	
Scienze e tecnologie agrarie, agroalimentari e forestali (20)	Agrarian-Veterinarian
Scienze e tecnologie zootecniche e delle produzioni animali (40)	Agrarian-Veterinarian
Medicina veterinaria (47/S)	Agrarian-Veterinarian
Scienze e tecnologie agrarie e forestali (L-25)	Agrarian-Veterinarian

Table A-3: List of non-STEM degrees by fields of study
of the students

Non-STEM fields	Almalaurea group
Scienze e tecnologie alimentari (L-26)	Agrarian-Veterinarian
Scienze zootecniche e tecnologie delle produzioni animali (L-38)	Agrarian-Veterinarian
Medicina veterinaria (LM-42)	Agrarian-Veterinarian
<i>Teaching (Insegnamento)</i>	
Scienze dell'educazione e della formazione (18)	Teaching
Scienze dell'educazione e della formazione (L-19)	Teaching
Scienze della formazione primaria (LM-85bis)	Teaching
<i>Psychological (Psicologico)</i>	
Scienze e tecniche psicologiche (34)	Psychological
Scienze e tecniche psicologiche (L-24)	Psychological
<i>Physical education (Educazione fisica)</i>	
Scienze delle attivit motorie e sportive (33)	Physical education
Scienze delle attivit motorie e sportive (L-22)	Physical education
<i>Defence and security (Difesa e sicurezza)</i>	
Scienze della difesa e della sicurezza (DS/1)	Defence and security
Literary (Letterario)	
Lettere (5)	Literary
Scienze dei beni culturali (13)	Literary
Scienze e tecnologie delle arti figurative, della musica, dello spettacolo e della moda (23)	Literary
Filosofia (29)	Literary
Scienze geografiche (30)	Literary
Scienze storiche (38)	Literary
Disegno industriale (42)	Architecture
Beni culturali (L-1)	Literary
Discipline delle arti figurative, della musica, dello spettacolo e della moda (L-3)	Literary
Disegno industriale (L-4)	Architecture
Filosofia (L-5)	Literary
Geografia (L-6)	Literary

Table A-3: List of non-STEM degrees by fields of study
of the students

Non-STEM fields	Almalaurea group
Lettere (L-10)	Literary
Storia (L-42)	Literary
Linguistic (Linguistico)	
Scienze della mediazione linguistica (3)	Linguistics
Lingue e culture moderne (11)	Linguistics
Lingue e culture moderne (L-11)	Linguistics
Mediazione linguistica (L-12)	Linguistics
Political-sociological (Politico-sociale)	
Scienze del servizio sociale (6)	Political-sociological
Scienze della comunicazione (14)	Political-sociological
Scienze politiche e delle relazioni internazionali (15)	Political-sociological
Scienze dell'amministrazione (19)	Political-sociological
Scienze sociali per la cooperazione, lo sviluppo e la pace (35)	Political-sociological
Scienze sociologiche (36)	Political-sociological
Scienze del turismo (39)	Political-sociological
Scienze del turismo (L-15)	Political-sociological
Scienze dell'amministrazione e dell'organizzazione (L-16)	Political-sociological
Scienze della comunicazione (L-20)	Political-sociological
Scienze politiche e delle relazioni internazionali (L-36)	Political-sociological
Scienze sociali per la cooperazione, lo sviluppo e la pace (L-37)	Political-sociological
Servizio sociale (L-39)	Political-sociological
Sociologia (L-40)	Political-sociological

Table A-4: Distribution of students by field of study of father with university degree

Field	Frequency	Percentage
<i>STEM fields</i>		
<i>Scientific</i>	1,806	5.51
<i>Engineering</i>	5,293	16.14
<i>OtherSTEM</i>	2,882	8.78
<i>Non-STEM fields</i>		
<i>Medical</i>	8,361	25.49
<i>Economical</i>	3,754	11.44
<i>Political – sociological</i>	1,893	5.77
<i>Legal</i>	3,967	12.09
<i>Literary</i>	1,346	4.10
<i>Linguistic</i>	327	1.00
<i>Othernon – STEM</i>	5,067	15.43
Observations	32,803	100.00

Notes: Other STEM fields includes Geo-biological and Architecture. Other non-STEM fields includes Pharmaceutical, Agrarian-veterinarian, Teaching, Psychological, Physical education, Defence and security.

Table A-5: Distribution of students by field of study of mother with university degree

Field	Frequency	Percentage
<i>STEM fields</i>		
<i>Scientific</i>	1,948	6.30
<i>Engineering</i>	333	1.08
<i>OtherSTEM</i>	3,560	11.51
<i>Non-STEM fields</i>		
<i>Medical</i>	5,225	16.89
<i>Economical</i>	2,374	7.68
<i>Political – sociological</i>	1,926	6.23
<i>Legal</i>	3,071	9.93
<i>Literary</i>	4,270	13.81
<i>Linguistic</i>	3,398	10.99
<i>Othernon – STEM</i>	6,751	21.84
Observations	30,930	100.00

Notes: Other STEM fields includes Geo-biological and Architecture. Other non-STEM fields includes Pharmaceutical, Agrarian-veterinarian, Teaching, Psychological, Physical education, Defence and security.

B Appendix - Estimates not included in the main text

This section includes additional tables not included in the main text for brevity. A brief description of the content of each table is reported below.

Table B-1 presents estimates of the intergenerational parameters of parental education, pooled and by gender of the student, controlling for field choice in high school (HS). Dependent variable: completion of a STEM degree at university.

Table B-2 reports estimates of the intergenerational parameters of parental education, pooled and by gender of the student, including an extended set of individual level controls, except high school mark. Dependent variable: completion of a STEM degree at university.

Table B-3 mirrors what is done in Table B-2 allowing for interdependent parents' parameters.

Table B-4 further extends the set of controls added to the regressions in Table B-2 including also high school mark.

Table B-5 further extends the set of controls added to the regressions in Table B-3 including also high school mark.

Table B-6 examines the robustness of the estimated intergenerational parameters of parental education leaving out each field of study of the parents, using data from the pooled sample. Dependent variable: completion of a STEM degree at university.

Table B-7 lists the university courses which are considered as STEM degrees.

Table B-1: Estimates of the intergenerational parameters of parental education, pooled and by gender of the student. Dependent variable: completion of a STEM degree at university. Control for field choice in high school (HS)

	Pooled (1) (mean: 0.228)	Males (2) (mean: 0.341)	Females (3) (mean: 0.155)	Males-Females (4)
<u>STEM choice in HS</u>				
θ_{HS_stem}	0.2455*** (0.0020)	0.2767*** (0.0035)	0.1709*** (0.0025)	0.1058*** (0.0043)
Both parents with with degree in STEM				
θ_{11}	0.2054*** (0.0117)	0.2088*** (0.0178)	0.1990*** (0.0154)	0.0098 (0.0235)
Father with degree in STEM, different mother ed. levels				
θ_{12}	0.1403*** (0.0086)	0.1422*** (0.0139)	0.1251*** (0.0106)	0.0172 (0.0175)
θ_{13}	0.1328*** (0.0080)	0.1358*** (0.0132)	0.1218*** (0.0098)	0.0140 (0.0164)
θ_{14}	0.1222*** (0.0204)	0.1091*** (0.0328)	0.1229*** (0.0254)	-0.0138 (0.0415)
Mother with degree in STEM, different father ed. levels				
θ_{21}	0.0425*** (0.0108)	0.0000 (0.0174)	0.0693*** (0.0136)	-0.0693*** (0.0220)
θ_{31}	0.1143*** (0.0112)	0.0901*** (0.0180)	0.1312*** (0.0141)	-0.0411* (0.0229)
θ_{41}	0.0887*** (0.0247)	0.0708* (0.0422)	0.1038*** (0.0299)	-0.0330 (0.0517)

Notes: Source: Almalaurea XIX Profilo dei Laureati survey (2017 cohort of graduates). Sample: 159,610 students who graduated from high school and from university in Italy, from 3-years and 5-years degree cycles with non-missing value of all covariates included in the analysis. Columns (1)-(3) present different sets of OLS estimates on the pooled sample, on the sample of male students and on the sample of females students, respectively, in the same spirit of equation (2) in the paper. The outcome is $STEM_{i2}$ a dummy taking the value 1 if student i graduates from a STEM field at university and 0 otherwise. All equations include X , the following set of covariates: a dummy for the region of residence in the south, a set of dummies denoting the social class that distinguish between upper class, middle class and lowerclass (the reference category), a set of dummy variables that distinguish between self-employed workers, entrepreneurs, liberal professionals, managers, teachers, white-collar professionals, homemakers and blue-collar (the reference category). Estimates of column (4) correspond to interaction terms of a fully interacted model specification by student gender. θ_{fm} $f, m \in \{1, 2, 3, 4\}$ denote the differential effect of having a father with qualification f and a mother with qualification m on the probability of completing a STEM university degree, respectively, with respect to the case in which both parents hold a qualification equal or lower to a junior high school degree. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%, ***significant at 1% or better.

Table B-2: Estimates of the intergenerational parameters of parental education, pooled and by gender of the student. Dependent variable: completion of a STEM degree at university. Extended set of individual level controls, no high school mark.

	Pooled (1) (mean: 0.228)	Males (2) (mean: 0.341)	Females (3) (mean: 0.154)	Males-Females (4)
<u>Father education</u>				
α_1^F	0.1252*** (0.0056)	0.1464*** (0.0092)	0.0974*** (0.0069)	0.0490*** (0.0114)
α_2^F	-0.0156*** (0.0040)	-0.0381*** (0.0070)	-0.0091* (0.0048)	-0.0291*** (0.0085)
α_3^F	0.0225*** (0.0025)	0.0196*** (0.0048)	0.0191*** (0.0028)	0.0005 (0.0055)
<u>Mother education</u>				
α_1^M	0.0867*** (0.0068)	0.0717*** (0.0109)	0.0921*** (0.0085)	-0.0204 (0.0139)
α_2^M	0.0239*** (0.0040)	0.0090 (0.0071)	0.0250*** (0.0047)	-0.0160* (0.0085)
α_3^M	0.0132*** (0.0025)	0.0022 (0.0048)	0.0151*** (0.0028)	-0.0128** (0.0056)
$\alpha_1^F - \alpha_2^F$	0.1408*** (0.0053)	0.1846*** (0.0083)	0.1065*** (0.0067)	0.0781*** (0.0107)
$\alpha_1^M - \alpha_2^M$	0.0628*** (0.0065)	0.0627*** (0.0101)	0.0671*** (0.0083)	-0.0044 (0.0130)
$(\alpha_1^F - \alpha_2^F) - (\alpha_1^M - \alpha_2^M)$	0.0780*** (0.0088)	0.1219*** (0.0139)	0.0394*** (0.0112)	0.0825*** (0.0179)

Notes: Source: Almalaurea XIX Profilo dei Laureati survey (2017 cohort of graduates). Sample: 159,610 students who graduated from high school and from university in Italy, from 3-years and 5-years degree cycles with non-missing value of all covariates included in the analysis. Columns (1)-(3) present different sets of OLS estimates of equation (1) in the paper, reported here for convenience $STEM_{i2} = \alpha_0 + \alpha_1^F FEdu_{i1} + \alpha_2^F FEdu_{i2} + \alpha_3^F FEdu_{i3} + \alpha_1^M MEdu_{i1} + \alpha_2^M MEdu_{i2} + \alpha_3^M MEdu_{i3} + \alpha_X' X_i + \varepsilon_{i2}$, where $STEM_{i2}$ denotes a dummy taking the value 1 if student i graduates from a STEM field at university and 0 otherwise; $FEdu_{ij}$, $MEdu_{ij}$ $j \in \{1, 2, 3, 4\}$ are dummy variables denoting the qualification level of fathers and mothers respectively, where $j = 1$ if the father (mother) has STEM-degree qualification, $j = 2$ if the father (mother) has a non-STEM degree qualification, $j = 3$ if the father (mother) has a high school qualification and $j = 4$ if the father (mother) has a junior high school (JHS) qualification or less. X includes the following covariates: a dummy for the region of residence in the south; a set of dummies denoting the social class that distinguish between upper class, middle class and lowerclass (the reference category); a set of dummy variables that distinguish between self-employed workers, entrepreneurs, liberal professionals, managers, teachers, white-collar professionals, homemakers and blue-collar (the reference category), dummies for years of delay in enrolment at university; dummies for years of delay in graduation from university, a dummy for the region of the university being different than the region of residence; dummies for academic values relevant in the students' degree choice (cultural aspects, professional aspects, both cultural and professional, neither cultural nor professional (reference category); dummies for work values marked as important by students (income opportunities, career opportunities, job stability, professionalism, coherence with previous studies, coherence with cultural interests, free time, social utility); dummies for the high school type that distinguish between classical (reference category), scientific, linguistic, artistic, technical STEM, technical non-STEM and professional. Column (1) uses data for all students. Column (2) and (3) use data on male and female students only, respectively. Estimates of column (4) correspond to interaction terms of a fully interacted model specification by student gender. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%, ***significant at 1% or better.

Table B-3: Estimates of the intergenerational parameters of parental education, pooled and by gender of the student. Dependent variable: completion of a STEM degree at university. Extended set of individual level controls, no high school mark. Interdependent effects.

	Pooled (1) (mean: 0.228)	Males (2) (mean: 0.341)	Females (3) (mean: 0.154)	Males-Females (4)
Both parents with degree in STEM				
β_{11}	0.2151*** (0.0116)	0.2213*** (0.0175)	0.1935*** (0.0152)	0.0278 (0.0232)
Father with degree in STEM different mother education levels				
β_{12}	0.1484*** (0.0085)	0.1564*** (0.0137)	0.1177*** (0.0105)	0.0388** (0.0172)
β_{13}	0.1363*** (0.0079)	0.1445*** (0.0129)	0.1139*** (0.0097)	0.0306* (0.0161)
β_{14}	0.1207*** (0.0196)	0.1136*** (0.0312)	0.1128*** (0.0247)	0.0008 (0.0398)
Mother with degree in STEM different father education levels				
β_{21}	0.0535*** (0.0106)	0.0160 (0.0171)	0.0639*** (0.0134)	-0.0479** (0.0217)
β_{31}	0.1206*** (0.0110)	0.0977*** (0.0178)	0.1264*** (0.0138)	-0.0288 (0.0225)
β_{41}	0.0865*** (0.0243)	0.0784* (0.0412)	0.0882*** (0.0295)	-0.0098 (0.0507)

Notes: Source: Almalaurea XIX Profilo dei Laureati survey (2017 cohort of graduates). Sample: 159,610 students who graduated from high school and from university in Italy, from 3-years and 5-years degree cycles with non-missing value of all covariates included in the analysis. Columns (1)-(3) present different sets of OLS estimates of equation (2) in the paper on the pooled sample, on the sample of male students and on the sample of females students, respectively. The outcome is $STEM_{i2}$ a dummy taking the value 1 if student i graduates from a STEM field at university and 0 otherwise. All equations include X , the following set of covariates: a dummy for the region of residence in the south; a set of dummies denoting the social class that distinguish between upper class, middle class and lowerclass (the reference category); a set of dummies denoting fathers' and mothers' professions that distinguish between self-employed workers, entrepreneurs, liberal professionals, managers, teachers, white-collar professionals, homemakers and blue-collar (the reference category); dummies for years of delay in enrolment at university; dummies for years of delay in graduation from university, a dummy for the region of the university being different than the region of residence; dummies for academic values relevant in the students' degree choice (cultural aspects, professional aspects, both cultural and professional, neither cultural nor professional (reference category); dummies for work values marked as important by students (income opportunities, career opportunities, job stability, professionalism, coherence with previous studies, coherence with cultural interests, free time, social utility); dummies for the high school type that distinguish between classical (reference category), scientific, linguistic, artistic, technical STEM, technical non-STEM and professional. Estimates of column (4) correspond to interaction terms of a fully interacted model specification by student gender. β_{fm} $f, \min\{1, 2, 3, 4\}$ denote the differential effect of having a father with qualification f and a mother with qualification m on the probability of completing a STEM university degree, respectively, with respect to the case in which both parents hold a qualification equal or lower to a junior high school degree. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%, ***significant at 1% or better.

Table B-4: Estimates of the intergenerational parameters of parental education, pooled and by gender of the student. Dependent variable: completion of a STEM degree at university. Extended set of individual level controls, including high school mark.

	Pooled (1) (mean: 0.228)	Males (2) (mean: 0.341)	Females (3) (mean: 0.154)	Males-Females (4)
<u>Father education</u>				
α_1^F	0.1154*** (0.0055)	0.1299*** (0.0090)	0.0902*** (0.0068)	0.0397*** (0.0112)
α_2^F	-0.0211*** (0.0040)	-0.0465*** (0.0069)	-0.0141*** (0.0047)	-0.0324*** (0.0084)
α_3^F	0.0205*** (0.0025)	0.0173*** (0.0046)	0.0171*** (0.0027)	0.0002 (0.0054)
<u>Mother education</u>				
α_1^M	0.0753*** (0.0067)	0.0587*** (0.0107)	0.0822*** (0.0084)	-0.0234* (0.0136)
α_2^M	0.0175*** (0.0040)	0.0035 (0.0069)	0.0185*** (0.0047)	-0.0150* (0.0084)
α_3^M	0.0116*** (0.0025)	0.0025 (0.0047)	0.0129*** (0.0028)	-0.0104* (0.0055)
$\alpha_1^F - \alpha_2^F$	0.1365*** (0.0052)	0.1764*** (0.0081)	0.1043*** (0.0066)	0.0721*** (0.0105)
$\alpha_1^M - \alpha_2^M$	0.0578*** (0.0064)	0.0552*** (0.0099)	0.0637*** (0.0082)	-0.0084 (0.0128)
$(\alpha_1^F - \alpha_2^F) - (\alpha_1^M - \alpha_2^M)$	0.0787*** (0.0087)	0.1212*** (0.0137)	0.0406*** (0.0111)	0.0805*** (0.0176)

Notes: Source: Almalaurea XIX Profilo dei Laureati survey (2017 cohort of graduates). Sample: 159,610 students who graduated from high school and from university in Italy, from 3-years and 5-years degree cycles with non-missing value of all covariates included in the analysis. Columns (1)-(3) present different sets of OLS estimates of equation (1) in the paper. The outcome is $STEM_{i2}$ denotes a dummy taking the value 1 if student i graduates from a STEM field at university and 0 otherwise; $FEdu_{ij}$, $MEdu_{ij}$ $j \in \{1, 2, 3, 4\}$ are dummy variables denoting the qualification level of father and mother of student i respectively, where $j = 1$ if the father (mother) has STEM-degree qualification, $j = 2$ if the father (mother) has a non-STEM degree qualification, $j = 3$ if the father (mother) has a high school qualification and $j = 4$ if the father (mother) has a junior high school (JHS) qualification or less. X includes the following covariates: a dummy for the region of residence in the south; a set of dummies denoting the social class that distinguish between upper class, middle class and lowerclass (the reference category); a set of dummies denoting fathers' and mothers' professions that distinguish between self-employed workers, entrepreneurs, liberal professionals, managers, teachers, white-collar professionals, homemakers and blue-collars (the reference category); dummies for years of delay in enrolment at university; dummies for years of delay in graduation from university, a dummy for the region of the university being different than the region of residence; dummies for academic values relevant in the students' degree choice (cultural aspects, professional aspects, both cultural and professional, neither cultural nor professional (reference category); dummies for work values marked as important by students (income opportunities, career opportunities, job stability, professionalism, coherence with previous studies, coherence with cultural interests, free time, social utility); dummies for the high school type that distinguish between classical (reference category), scientific, linguistic, artistic, technical STEM, technical non-STEM and professional; standardised high school graduation mark. Column (1) uses data for all students. Column (2) and (3) use data on male and female students only, respectively. Estimates of column (4) correspond to interaction terms of a fully interacted model specification by student gender. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%, ***significant at 1% or better.

Table B-5: Estimates of the intergenerational parameters of parental education, pooled and by gender of the student. Dependent variable: completion of a STEM degree at university. Extended set of individual level controls, including high school mark. Interdependent effects.

	Pooled (1) (mean: 0.228)	Males (2) (mean: 0.341)	Females (3) (mean: 0.154)	Males-Females (4)
Both parents with with degree in STEM				
β_{11}	0.1950*** (0.0114)	0.1948*** (0.0171)	0.1767*** (0.0151)	0.0181 (0.0228)
Father with degree in STEM different mother education levels				
β_{12}	0.1327*** (0.0084)	0.1351*** (0.0135)	0.1043*** (0.0104)	0.0309* (0.0170)
β_{13}	0.1249*** (0.0078)	0.1277*** (0.0126)	0.1048*** (0.0096)	0.0229 (0.0158)
β_{14}	0.1107*** (0.0194)	0.1002*** (0.0307)	0.1045*** (0.0245)	-0.0043 (0.0393)
Mother with degree in STEM different father education levels				
β_{21}	0.0357*** (0.0106)	-0.0087 (0.0168)	0.0490*** (0.0134)	-0.0578*** (0.0215)
β_{31}	0.1072*** (0.0108)	0.0839*** (0.0174)	0.1141*** (0.0135)	-0.0303 (0.0221)
β_{41}	0.0798*** (0.0238)	0.0724* (0.0405)	0.0820*** (0.0289)	-0.0096 (0.0497)

Notes: Source: Almalaurea XIX Profilo dei Laureati survey (2017 cohort of graduates). Sample: 159,610 students who graduated from high school and from university in Italy, from 3-years and 5-years degree cycles with non-missing value of all covariates included in the analysis. Columns (1)-(3) present different sets of OLS estimates of equation (2) in the paper on the pooled sample, on the sample of male students and on the sample of females students, respectively. The outcome is $STEM_{i2}$ a dummy taking the value 1 if student i graduates from a STEM field at university and 0 otherwise. All equations include X , the following set of covariates: a dummy for the region of residence in the south; a set of dummies denoting the social class that distinguish between upper class, middle class and lowerclass (the reference category); a set of dummies denoting fathers' and mothers' professions that distinguish between self-employed workers, entrepreneurs, liberal professionals, managers, teachers, white-collar professionals, homemakers and blue-collars (the reference category); dummies for years of delay in enrolment at university; dummies for years of delay in graduation from university, a dummy for the region of the university being different than the region of residence; dummies for academic values relevant in the students' degree choice (cultural aspects, professional aspects, both cultural and professional, neither cultural nor professional (reference category); dummies for work values marked as important by students (income opportunities, career opportunities, job stability, professionalism, coherence with previous studies, coherence with cultural interests, free time, social utility); dummies for the high school type that distinguish between classical (reference category), scientific, linguistic, artistic, technical STEM, technical non-STEM and professional; standardised high school graduation mark. Estimates of column (4) correspond to interaction terms of a fully interacted model specification by student gender. β_{fm} $f, m \in \{1, 2, 3, 4\}$ denote the differential effect of having a father with qualification f and a mother with qualification m on the probability of completing a STEM university degree, respectively, with respect to the case in which both parents hold a qualification equal or lower to a junior high school degree. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%, ***significant at 1% or better.

Table B-6: Estimates of the intergenerational parameters of parental education leaving out each field of study of the parents, pooled and by gender of the student. Dependent variable: completion of a STEM degree at university.

	Baseline (1)	Scientific (2)	Biological (3)	Medicine (4)	Engineering (5)	Legal (6)
<u>Father education</u>						
α_1^F	0.1534*** (0.0059)				0.1325*** (0.0078)	
α_2^F	-0.0134*** (0.0043)			-0.0091* (0.0047)		-0.0072 (0.0045)
α_3^F	0.0353*** (0.0027)					
<u>Mother education</u>						
α_1^M	0.1100*** (0.0071)	0.0891*** (0.0083)	0.1347*** (0.0092)			
α_2^M	0.0241*** (0.0043)					
α_3^M	0.0192*** (0.0027)					

Notes: Source: Almalaurea XIX Profilo dei Laureati survey (2017 cohort of graduates). Sample: 159,610 students who graduated from high school and from university in Italy, from 3-years and 5-years degree cycles with non-missing value of all covariates included in the analysis. Columns (1) presents the sets of OLS estimates of equation (1) in the paper on the pooled sample, reported here for convenience $STEM_{i2} = \alpha_0 + \alpha_1^F FEdu_{i1} + \alpha_2^F FEdu_{i2} + \alpha_3^F FEdu_{i3} + \alpha_1^M MEdu_{i1} + \alpha_2^M MEdu_{i2} + \alpha_3^M MEdu_{i3} + \alpha'_X X_i + \varepsilon_{i2}$, where $STEM_{i2}$ denotes a dummy taking the value 1 if student i graduates from a STEM field at university and 0 otherwise; $FEdu_{ij}$, $MEdu_{ij}$ $j \in \{1, 2, 3, 4\}$ are dummy variables denoting the qualification level of father and mother of student i respectively, where $j = 1$ if the father (mother) has STEM-degree qualification, $j = 2$ if the father (mother) has a non-STEM degree qualification, $j = 3$ if the father (mother) has a high school qualification and $j = 4$ if the father (mother) has a junior high school (JHS) qualification or less. X includes the following covariates: a dummy for the region of residence in the south, a set of dummies denoting the social class that distinguish between upper class, middle class and lowerclass (the reference category), a set of dummies denoting fathers' and mothers' professions that distinguish between self-employed workers, entrepreneurs, liberal professionals, managers, teachers, white-collar professionals, homemakers and blue-collars (the reference category). Columns (2)-(6) presents the sets of OLS estimates of the same equation (1), leaving out the fields of study of the parent denoted in these columns, one at the time. The leave out was performed on the sixteen fields of study listed in Appendix A.1, however only the estimates for those fields that, when left out, resulted in a change of at least 2 p.p from the estimates in the baseline model are presented. Robust standard errors in parentheses. * significant at 10%; ** significant at 5%, ***significant at 1% or better.

Table B-7: List of Italian STEM degrees at university

Numero	Denominazione	Ordinamento	ISCED_F_3
1	Biotecnologie	D.M. 509/99	512
4	Scienze dell'architettura e dell'ingegneria edile	D.M. 509/99	731
7	Urbanistica e scienze della pianificazione territoriale e ambientale	D.M. 509/99	731
8	Ingegneria civile e ambientale	D.M. 509/99	732
9	Ingegneria dell'informazione	D.M. 509/99	688
10	Ingegneria industriale	D.M. 509/99	719
12	Scienze biologiche	D.M. 509/99	511
16	Scienze della Terra	D.M. 509/99	532
21	Scienze e tecnologie chimiche	D.M. 509/99	531
22	Scienze e tecnologie della navigazione marittima e aerea	D.M. 509/99	539
24	Scienze e tecnologie farmaceutiche	D.M. 509/99	531
25	Scienze e tecnologie fisiche	D.M. 509/99	533
26	Scienze e tecnologie informatiche	D.M. 509/99	688
27	Scienze e tecnologie per l'ambiente e la natura	D.M. 509/99	521
32	Scienze matematiche	D.M. 509/99	541
37	Scienze statistiche	D.M. 509/99	542
41	Tecnologie per la conservazione e il restauro dei beni culturali	D.M. 509/99	531
03/S	Architettura del paesaggio	D.M. 509/99	731
04/S	Architettura e ingegneria edile	D.M. 509/99	788
06/S	Biologia	D.M. 509/99	511
08/S	Biotecnologie industriali	D.M. 509/99	512
09/S	Biotecnologie mediche, veterinarie e farmaceutiche	D.M. 509/99	512
10/S	Conservazione dei beni architettonici e ambientali	D.M. 509/99	731
100/S	Tecniche e metodi per la società dell'informazione	D.M. 509/99	688
11/S	Conservazione dei beni scientifici e della civiltà industriale	D.M. 509/99	588
12/S	Conservazione e restauro del patrimonio storico-artistico	D.M. 509/99	588
20/S	Fisica	D.M. 509/99	533
23/S	Informatica	D.M. 509/99	688
25/S	Ingegneria aerospaziale e astronautica	D.M. 509/99	716
26/S	Ingegneria biomedica	D.M. 509/99	719
27/S	Ingegneria chimica	D.M. 509/99	711
28/S	Ingegneria civile	D.M. 509/99	732
29/S	Ingegneria dell'automazione	D.M. 509/99	714

Table B-7: List of Italian STEM degrees at university

Numero	Denominazione	Ordinamento	ISCED_F_3
30/S	Ingegneria delle telecomunicazioni	D.M. 509/99	714
31/S	Ingegneria elettrica	D.M. 509/99	713
32/S	Ingegneria elettronica	D.M. 509/99	714
33/S	Ingegneria energetica e nucleare	D.M. 509/99	713
34/S	Ingegneria gestionale	D.M. 509/99	719
35/S	Ingegneria informatica	D.M. 509/99	688
36/S	Ingegneria meccanica	D.M. 509/99	715
37/S	Ingegneria navale	D.M. 509/99	716
38/S	Ingegneria per l'ambiente e il territorio	D.M. 509/99	712
45/S	Matematica	D.M. 509/99	541
48/S	Metodi per l'analisi valutativa dei sistemi complessi	D.M. 509/99	542
50/S	Modellistica matematico-fisica per l'ingegneria	D.M. 509/99	788
54/S	Pianificazione territoriale urbanistica e ambientale	D.M. 509/99	731
61/S	Scienza e ingegneria dei materiali	D.M. 509/99	788
62/S	Scienze chimiche	D.M. 509/99	531
66/S	Scienze dell'universo	D.M. 509/99	533
68/S	Scienze della natura	D.M. 509/99	521
69/S	Scienze della nutrizione umana	D.M. 509/99	519
80/S	Scienze e tecnologie dei sistemi di navigazione	D.M. 509/99	539
81/S	Scienze e tecnologie della chimica industriale	D.M. 509/99	531
82/S	Scienze e tecnologie per l'ambiente e il territorio	D.M. 509/99	521
85/S	Scienze geofisiche	D.M. 509/99	532
86/S	Scienze geologiche	D.M. 509/99	532
90/S	Statistica demografica e sociale	D.M. 509/99	542
91/S	Statistica economica, finanziaria ed attuariale	D.M. 509/99	542
92/S	Statistica per la ricerca sperimentale	D.M. 509/99	542
L-02	Biotecnologie	D.M. 270/04	512
L-07	Ingegneria civile e ambientale	D.M. 270/04	732
L-08	Ingegneria dell'informazione	D.M. 270/04	688
L-09	Ingegneria industriale	D.M. 270/04	719
L-13	Scienze biologiche	D.M. 270/04	511
L-17	Scienze dell'architettura	D.M. 270/04	731
L-21	Scienze della pianificazione territoriale, urbanistica, paesaggistica e ambientale	D.M. 270/04	731
L-23	Scienze e tecniche dell'edilizia	D.M. 270/04	732
L-27	Scienze e tecnologie chimiche	D.M. 270/04	531
L-28	Scienze e tecnologie della navigazione	D.M. 270/04	539
L-29	Scienze e tecnologie farmaceutiche	D.M. 270/04	531
L-30	Scienze e tecnologie fisiche	D.M. 270/04	533

Table B-7: List of Italian STEM degrees at university

Numero	Denominazione	Ordinamento	ISCED_F_3
L-31	Scienze e tecnologie informatiche	D.M. 270/04	688
L-32	Scienze e tecnologie per l'ambiente e la natura	D.M. 270/04	521
L-34	Scienze geologiche	D.M. 270/04	532
L-35	Scienze matematiche	D.M. 270/04	541
L-41	Statistica	D.M. 270/04	542
L-43	Diagnostica per la conservazione dei beni culturali	D.M. 270/04	588
LM-03	Architettura del paesaggio	D.M. 270/04	731
LM-04	Architettura e ingegneria edile-architettura	D.M. 270/04	788
LM-04cu	Architettura e ingegneria edile-architettura (quinquennale)	D.M. 270/04	788
LM-06	Biologia	D.M. 270/04	511
LM-08	Biotecnologie industriali	D.M. 270/04	512
LM-09	Biotecnologie mediche, veterinarie e farmaceutiche	D.M. 270/04	512
LM-10	Conservazione dei beni architettonici e ambientali	D.M. 270/04	731
LM-11	Scienze per la conservazione dei beni culturali	D.M. 270/04	588
LM-17	Fisica	D.M. 270/04	533
LM-18	Informatica	D.M. 270/04	688
LM-20	Ingegneria aerospaziale e astronautica	D.M. 270/04	716
LM-21	Ingegneria biomedica	D.M. 270/04	719
LM-22	Ingegneria chimica	D.M. 270/04	711
LM-23	Ingegneria civile	D.M. 270/04	732
LM-24	Ingegneria dei sistemi edilizi	D.M. 270/04	732
LM-25	Ingegneria dell'automazione	D.M. 270/04	714
LM-26	Ingegneria della sicurezza	D.M. 270/04	719
LM-27	Ingegneria delle telecomunicazioni	D.M. 270/04	714
LM-28	Ingegneria elettrica	D.M. 270/04	713
LM-29	Ingegneria elettronica	D.M. 270/04	714
LM-30	Ingegneria energetica e nucleare	D.M. 270/04	713
LM-31	Ingegneria gestionale	D.M. 270/04	719
LM-32	Ingegneria informatica	D.M. 270/04	688
LM-33	Ingegneria meccanica	D.M. 270/04	715
LM-34	Ingegneria navale	D.M. 270/04	716
LM-35	Ingegneria per l'ambiente e il territorio	D.M. 270/04	712
LM-40	Matematica	D.M. 270/04	541
LM-44	Modellistica matematico-fisica per l'ingegneria	D.M. 270/04	788
LM-48	Pianificazione territoriale urbanistica e ambientale	D.M. 270/04	731
LM-53	Scienza e ingegneria dei materiali	D.M. 270/04	788

Table B-7: List of Italian STEM degrees at university

Numero	Denominazione	Ordinamento	ISCED_F_3
LM-54	Scienze chimiche	D.M. 270/04	531
LM-58	Scienze dell'universo	D.M. 270/04	533
LM-60	Scienze della natura	D.M. 270/04	521
LM-61	Scienze della nutrizione umana	D.M. 270/04	519
LM-66	Sicurezza informatica	D.M. 270/04	612
LM-71	Scienze e tecnologie della chimica industriale	D.M. 270/04	531
LM-72	Scienze e tecnologie della navigazione	D.M. 270/04	539
LM-74	Scienze e tecnologie geologiche	D.M. 270/04	532
LM-75	Scienze e tecnologie per l'ambiente e il territorio	D.M. 270/04	521
LM-79	Scienze geofisiche	D.M. 270/04	532
LM-82	Scienze statistiche	D.M. 270/04	542
LM-83	Scienze statistiche attuariali e finanziarie	D.M. 270/04	542
LM-91	Tecniche e metodi per la societa dell'informazione	D.M. 270/04	688
LMR/02	Conservazione e restauro dei beni culturali	D.M. 270/04	588

Notes: Source: http://www.processodibologna.it/wp-content/uploads/2014/03/Corrispondenza-ClassidiLaurea-e-ISCED-FOET-2013_MIUR-2016.pdf