## DISCUSSION PAPER SERIES

# Intended College Major Choice and the Inheritance of Majors

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# I Z A Institute of Labor Economics

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# ABSTRACT

# Intended College Major Choice and the Inheritance of Majors*

Using Italian data, we study whether their intended choice of college major is affected by the college major selected by family members. We find evidence of strong inter-generational persistence, especially in medicine and health professions, followed by economics and law, and STEM. The effects are strongest for parents and less sizeable for older siblings. No effect is found for grandparents.

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*Introduction.*

The extensive literature on college major choice has focused on the role of expected earnings, perceived ability and non-monetary preferences (see for instance Wiswall and Zafar, 2015, Patnaik et al, 2022). Less explored is the inter-generational transmission of college majors (Patnaik, Wiswall and Zafar, 2020), which can significantly contribute to inter-generational mobility and affect the formation of professional dynasties.

In this paper we use a unique Italian survey of final year high school students to study whether their intended choice of college major is affected by the college major selected by parents, older siblings and grandparents. We find evidence of strong inter-generational persistence. Having a father (mother) with a degree in a major group increases the probability that the respondent enrols in that major group by 44.4 (39.5) percent. Persistence is strongest in medicine and health professions, economics and law and STEM majors. Having an older brother or sister enrolled or with a degree from the same major also affects intended choice, but the effect is much smaller (27.1 and 18.7 percent respectively). In contrast, having any grandparent with a degree in a major group has no impact on the probability of enrolment, suggesting that inter-generational persistence in the choice of college major holds only for contiguous generations.

Previous economic literature on the inheritance of college majors finds controversial results. On the one hand, Altmejd et al., 2021, in their study of data from Chile, Croatia, Sweden and the US find almost no influence of older siblings on the major choices of younger siblings. Aguirre and Matta, 2021, and Dustan, 2018, present evidence of sibling effects in institution choice in Chile and Mexico, but not for major. On the other hand, Dahl et al, 2023, and Almejd, 2023, use admission rules to college, a regression discontinuity approach and data from Scandinavian countries to show that parental choice of high school or college has a sizeable effect on the choice of children.

*1. The Data.*

Our data are drawn from an original national survey of Italian final grade high school students enrolled in the academic track (lyceum), the majority of whom enter tertiary education after high school graduation. The survey was conducted in the spring of 2024 and covers 106 schools and 4,142 students (out of a population of about 270 thousand). For each school, a minimum of one class and a maximum of three entire classes were interviewed.

We elicit from each respondent the probability of enrolling in college major group $k$ (with k=1…6) after graduating from high school, or not enrolling at all (k=7), individual characteristics, parental background and the major chosen by family members (the father, the mother, oldest siblings and grandparents) in the event of college enrolment or graduation. College majors are classified in the following six groups: civil engineering, architecture and design; science, technology, engineering and mathematics (STEM); economics and law; medicine and health professions; psychology, political and social sciences, and humanities. Additional details on the survey are in the Appendix.

The data show, for most major groups, a positive association between having a family member enrolling or graduating in a major and the probability of choosing that major at the end of high school. In the case of the group STEM, for instance, the average probability of selecting this major is 24.8 percent if any family member graduated in STEM and 15.7 if none did (see Table A1 in the Appendix).

This association does not imply, however, a causal relationship. The education and income level of grandparents could influence the major chosen by both parents and their children. For instance, there are cases of families with a tradition of medical studies going back generations. In addition, the genetic factors that we know to strongly influence educational outcomes most likely influence also the choice of major (Altmejd, 2023).

*2. The empirical specification.*

We estimate the following empirical model:

$$P_{ik} = \gamma G_{ik} + \varepsilon_{ik} \qquad\qquad\qquad\qquad (1)$$

where $P_{ik}$ is the probability that respondent $i$ will enrol in major group $k$ after graduation; $G_{ik}$ is a vector of binary variables indicating whether the father and the mother graduated in major group $k$, and whether any older sister, brother or grandparent enrolled or graduated in major group $k$; and $\varepsilon_{ik}$ is a residual error term.

A threat to the identification of the causal effect of $G_{ik}$ on $P_{ik}$ is that the residual $\varepsilon_{ik}$ contains un-observables that are correlated with $G_{ik}$. For instance, unobserved family characteristics such as genes can affect both the past choice of college by parents and the current probability of enrolment by respondents. To address this threat, we exploit the fact that we observe for each respondent seven probabilities (including the probability of not enrolling in college) and control for family characteristics, such as income, traditions and genes, by including in (1) the following vector of fixed effects: i) individual; ii) occupation of the father /mother by major group; iii) whether the mother or father have a college degree by major group (including no college); iv) whether mother or father were born abroad by major group.

We also control for fixed effects generated by the interaction of individual characteristics such as the respondent's immigrant status (a binary equal to 1 for first- and second-generation immigrants and 0 otherwise), the respondent's province of birth and gender with the major group. Finally, we control for teacher and classmates' peer effects by including the respondent's class by major group fixed effects.

Conditional on this extensive set of controls, we treat $G_{ik}$ as conditionally independent of $\varepsilon_{ik}$, implying that parental choice of major group is as good as randomly allocated. This assumption allows us to interpret the estimate of the parameter γ as causal.

3. *The results.*

The original sample has 28,994 student x major observations. The working sample, however, has 22,304 observations, because of the presence of missing values in the elicited probability of enrolling in a major. Table A2 in the Appendix shows the summary statistics of the main variables used in the analysis. The average probability of enrolling in major group $k$ (including no enrolment in college) ranges from 7.7 percent for the option "no college" to 20.3 percent for medicine and health professions. The share of fathers, mothers and grandparents without a college degree is much higher than the share of older siblings. Having a father or mother with a college degree in the same major group is most likely for major group 3 (economics and law).

Table 1 reports the main results both for the full sample and by gender. We find that having a father with a degree in major group $k$ increases the probability that the respondent enrols in that major group by 0.064 percentage points, or 44.4 percent of the mean (0.144). This effect is only slightly larger than the one associated with having a mother with a degree in the major group (0.045 or 39.5 percent). In sharp contrast, having any grandparent with a degree in the major group has no impact on the probability of enrolment.

We also find that having an older brother or sister enrolled or graduated in major group $k$ raises the probability that the respondent enrols in that major group by 27.1 and 18.7 percent respectively. Interestingly, the impact of fathers and older brothers is higher for male than for female respondents. On the other hand, the impact of mothers and older sisters is highest among female respondents, suggesting that inter-generational links may be stronger through same-gender role models.

Table 1 imposes the restriction that family members' choice of major has the same effect on the probability of enrolling in each major group. To remove this assumption and keep results in a manageable format, we define the binary variable "any family member enrolled or graduated in major group $k$" as equal to 1 if at least one among fathers, mothers, older siblings and grandparents

enrolled or graduated in the major and to 0 otherwise. We then interact this variable with the six groups of majors, keeping the option "no college" in the baseline.

Table 2 reports our results. We find that, for the full sample, the effect of having at least a family member who graduated in the same major group is highest for medicine and health professions (+57.6 percent), economics and law (+43.5 percent) and STEM (+25.8 percent), and lowest for psychology, political and social sciences (+14.7 percent). The effect is highest for economics and law (+72.5 percent) for male respondents and for medicine (+53.4 percent), economics and law (55.6 percent) for female respondents.

*Conclusions.*

We have shown that the intended choice of college major by Italian high school students is substantially affected by the college major chosen by parents and older siblings, but not by the choice of grandparents. The inheritance of college majors can be explained with the role model played by parents and siblings, and with the transmission of information. An additional candidate explanation is that in several liberal professions – lawyers, notaries, accountants, pharmacists, architects, engineers and psychologists - the inter-generational transmission of skills and knowledge is important and helps in lowering the entry barrier costs, e.g. shortening the time needed to set a portfolio of customers and increasing potential early profits (Aina and Nicoletti, 2018). This explanation is consistent with our finding that the inheritance of college majors is strongest for most majors that give access to liberal professions, with the notable exception of psychologists.

The effects of parental choice of major on the intended choice of high school students raise concerns about equality of opportunity and social mobility in education, especially because these effects are strongest for the majors associated with the highest labour market payoff (medicine, engineering and economics and law).

*Tables and Figures*

Table 1. Estimated effects of family members' choice of major on the intended choice by high school students. Ordinary least squares. Dependent variable: probability of enrolment in college major $k$. Full sample and by gender.

|  | All | Males | Females |
|---|---|---|---|
| Mother graduated in major group $k$ | 0.045*** | 0.031** | 0.059*** |
|  | (0.009) | (0.015) | (0.011) |
| Father graduated in major group $k$ | 0.064*** | 0.077*** | 0.064*** |
|  | (0.009) | (0.016) | (0.012) |
| Old sister graduated in major group $k$ | 0.027** | 0.006 | 0.037** |
|  | (0.012) | (0.021) | (0.017) |
| Old brother graduated in major group $k$ | 0.039*** | 0.055** | 0.033** |
|  | (0.013) | (0.023) | (0.015) |
| Grandparent graduated in major group $k$ | -0.000 | -0.001 | -0.002 |
|  | (0.008) | (0.013) | (0.010) |
|  |  |  |  |
| Observations | 22,304 | 8,904 | 13,400 |
| Mean dependent variable | 0.144 | 0.144 | 0.144 |
| R-squared | 0.213 | 0.346 | 0.260 |
| Student fixed effects | Yes | Yes | Yes |
| Field fixed effects | Yes | Yes | Yes |
| Class-by-major fixed effects | Yes | Yes | Yes |
| Father's occupation-by-major fixed effects | Yes | Yes | Yes |
| Mother's occupation-by-major fixed effects | Yes | Yes | Yes |
| Parents born abroad – by – major fixed effects | Yes | Yes | Yes |
| Parents have college – by – major fixed effects | Yes | Yes | Yes |
| Immigration status – by – major fixed effects | Yes | Yes | Yes |
| Gender – by – major fixed effects | Yes | Yes | Yes |
| Province of birth-by-major fixed effects | Yes | Yes | Yes |

Note: Standard errors clustered by student within parentheses.

Table 2. Estimated effects of family members' choice of major on the intended choice by high school students. Ordinary least squares. Dependent variable: probability of enrolment in college major $k$. Family members' choice interacted with major group.

|  | All | Males | Females |
|---|---|---|---|
| Any family member graduated in major group $k$ | 0.011 | 0.037* | 0.002 |
|  | (0.010) | (0.019) | (0.013) |
| Any family member graduated in major group $k$ * major group 1 | 0.039* | 0.028 | 0.026 |
|  | (0.021) | (0.038) | (0.028) |
|  | [0.006] | [0.040] | [0.263] |
| Any family member graduated in major group $k$ * major group 2 | 0.052*** | 0.050 | 0.047* |
|  | (0.020) | (0.038) | (0.025) |
|  | [0.000] | [0.008] | [0.016] |
| Any family member graduated in major group $k$ * major group 3 | 0.073*** | 0.074** | 0.092*** |
|  | (0.020) | (0.035) | (0.026) |
|  | [0.000] | [0.000] | [0.000] |
| Any family member graduated in major group $k$ * major group 4 | 0.080*** | 0.016 | 0.107*** |
|  | (0.023) | (0.036) | (0.033) |
|  | [0.000] | [0.076] | [0.000] |
| Any family member graduated in major group $k$ * major group 5 | 0.003 | 0.009 | -0.004 |
|  | (0.019) | (0.032) | (0.028) |
|  | [0.388] | [0.063] | [0.915] |
| Any family member graduated in major group $k$ * major group 6 | 0.024 | -0.029 | 0.047* |
|  | (0.017) | (0.028) | (0.025) |
|  | [0.010] | [0.701] | [0.015] |
| Mean major group 1 | 0.116 | 0.123 | 0.12 |
| Mean major group 2 | 0.244 | 0.123 | 0.171 |
| Mean major group 3 | 0.193 | 0.153 | 0.169 |
| Mean major group 4 | 0.158 | 0.236 | 0.204 |
| Mean major group 5 | 0.095 | 0.164 | 0.137 |
| Mean major group 6 | 0.099 | 0.147 | 0.128 |
| Mean no college | 0.104 | 0.06 | 0.077 |
| Observations | 22,304 | 8,904 | 13,400 |
| R-squared | 0.213 | 0.346 | 0.259 |

Note: each regression includes the fixed effects listed in Table 1. Standard errors clustered by student within parentheses. P-values of the test that the sum of the coefficient associated with "any family member graduated in major $k$" and the coefficient of the interaction term is different from zero within brackets. Major 1: Civil engineering and architecture; major 2: STEM; major 3: economics and law; major 4: medicine and health professions; major 5: psychology and social sciences; major 6: arts and the humanities.

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*Online Appendix*

*The data*

According to a report by Alma Diploma, 2021, 73.3% of Italian lyceum students graduating from high school in 2017 are in college one year after graduation, compared to 41.5% of technical high school students and to 21.7% of vocational high school students.

Our sample of respondents tracks reasonably well the distribution of lyceum students in the five Italian macro-areas. The shares of respondents in the Northwest, South and Islands are 21.7, 24.9 and 11.3 percent of total respondents, close to the population shares of students in the three areas (23.9, 26.3 and 11.7 percent respectively). The shares of respondents in the Northeast and Centre are instead 23.5 and 18.6 percent, respectively higher and lower than the population share of students (15.1 and 22.6 percent).

We elicit the intended choice of college majors with the following question: "What is the probability (from 0 to 100) that you choose to enrol in a college major belonging to major group k (k=1…6) or that you do not enrol in college? Assigned probability should add up to 100". The order of college major groups is randomized across respondents.

For fathers and mothers, we ask respondents to indicate the college major group. No college is coded as 0. For older siblings, we ask: "Consider your older sisters (brothers). Is any of them enrolled or has he/she completed one of the following majors?" (Multiple answers are possible. Answers include the six college major groups and no college). For grandparents, the question was "Consider your grandparents. Has any of them completed one of the following majors"? (Multiple answers are possible. Answers include the six college major groups and no college).

Reference:

Alma Diploma, 2021, *XV Indagine. Esiti a distanza dei diplomati*, Bologna.

*Tables*

Table A1. The association between students' intended choice of major and family members' majors.

|  | Major 1 | Major 2 | Major 3 | Major 4 | Major 5 | Major 6 | No college |
|---|---|---|---|---|---|---|---|
| Any family member with same major | 17.35 | 24.82 | 23.89 | 28.89 | 13.98 | 14.98 | 8.23 |
| No family member with same major | 11.63 | 15.68 | 15.18 | 19.07 | 13.82 | 12.35 | 5.80 |

Notes: average probabilities of enrolling in the major. Major 1: Civil engineering and architecture; major 2: STEM; major 3: economics and law; major 4: medicine and health professions; major 5: psychology and social sciences; major 6: arts and the humanities.

Table A2. Summary statistics. By field.

| | Major 1 | Major 2 | Major 3 | Major 4 | Major 5 | Major 6 | No college |
|---|---|---|---|---|---|---|---|
| Probability of enrolling in major | 0.120 | 0.171 | 0.170 | 0.203 | 0.137 | 0.128 | 0.077 |
| Share of fathers graduated in major | 0.040 | 0.071 | 0.099 | 0.046 | 0.018 | 0.020 | 0.704 |
| Share of mother graduated in major | 0.024 | 0.045 | 0.102 | 0.060 | 0.040 | 0.097 | 0.631 |
| Share of older sisters enrolled or graduated in major | 0.050 | 0.132 | 0.161 | 0.173 | 0.129 | 0.193 | 0.162 |
| Share of older brothers enrolled or graduated in major | 0.044 | 0.235 | 0.165 | 0.098 | 0.044 | 0.065 | 0.348 |
| Share of grandparents graduated in major | 0.020 | 0.037 | 0.043 | 0.041 | 0.011 | 0.062 | 0.784 |

Notes: Major 1: Civil engineering and architecture; major 2: STEM; major 3: economics and law; major 4: medicine and health professions; major 5: psychology and social sciences; major 6: arts and the humanities.