Tastes, Ability, or Expected Wages?

The Expected Choice of College Major by Italian Students

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Introduction

Human capital, as captured by individuals' education, is an important determinant of people lifelong earnings distribution (Becker and Chiswick, 1966; Mincer, 1974; Heckman, 2000). Nonetheless, young adults and their households often make choices under uncertainty and with limited information.

This study investigates the factors influencing Italian students' intended choice of college major, focusing on the roles of expected wages, self-perceived ability, and personal preferences. Although prior literature has extensively examined the role of information and information treatments in shaping expectations about earnings and career prospects (Ballarino et al., 2002; Barone et al., 2017, 2018; Wiswall and Zafar, 2015, 2018; McGuigan et al., 2016; Baker et al., 2018; Colon, 2021), the roles of preferences and ability have been less explored (important exceptions include Hilmer and Hilmer, 2012, Zafar, 2013, and Patnaik et al., 2022), or treated as unobservable to be handled for identification purposes rather than directly studied.

Our research has implications on the role of gender on the choice of college major. This is an important issue, as it is a well-documented pattern across OECD countries that female students tend to select college majors that are, on average, less rewarding in terms of occupational outcomes (see for instance Zafar, 2013). This could be due to incorrect expectations of future wages, incorrect beliefs about major-specific ability, and preferences for less rewarding fields, perhaps related to cultural or social stereotypes and norms. Incorrect expectations suggest the need to implement information campaigns. Incorrect beliefs about ability and under-confidence

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by female students may suggest single-sex classes as a policy option (Zafar, 2013, for the US). Policy intervention is less obvious when preferences are the key factor at play.

Methodology

We propose to study these questions with an extensive survey administered to students in their last year of high school, specifically we consider Italian lyceums, where most students enroll in college after graduation. Our sample, nationally representative of schools at the macro-area level (NUTS1), covers 106 schools and 4,142 students. Crucially, on top of basic demographic data, the survey collects a compendium of information by college major. In practice, students are asked to answer the same questions imagining to be enrolled at university in different fields of study, or not to attend university at all.[2]

The most relevant information we collect by college major are about:

- Intended enrolment probability
- Mean expected monetary returns at age of 30
- Perceived ability (relative to other potential students), a measure of confidence
- Individual preferences/tastes

The way we elicit preferences for specific majors (or no college) brings an innovation to the current literature on college choice. While the literature often uses exogenous information treatments, for instance on future wages (e.g., Wiswall and Zafar, 2015), to eliminate the intangible taste component which may drive educational choices, we propose instead to measure field tastes directly by using a Coller and Williams choice-based game where students decide between a benchmark major in field *j* guaranteeing €1,500 per month, and alternative fields *k* offering wages ranging from €500 to €2,500 (at €500 intervals).[3] The wage level at which a student switches to field *k* serves as an indicator of preference strength.[4] Further, those who never switch are categorized as having a strong preference for field *j*.

With this information at hand, we proceed to estimate an intended choice model through a mediation analysis, where the probability of enrolling in a field is a function of expected wage,

[2] The fields of study are: 1) civil engineering, architecture, and design; 2) engineering, ICT, mathematics, physics, and other natural sciences; 3) economics, business, and law; 4) medicine, veterinary medicine, and health professions; 5) psychology, political sciences, and other social sciences; 6) literary studies, philosophy, and humanities.

[3] We take the field of Humanities as the benchmark.

[4] For example, if a student chooses to study field *k* guaranteeing €750 a month instead of choosing field *j* guaranteeing €1,500 per month, the student has a preference for field *k* over field *j*. And the opposite case is also true: if a student chooses to study field *j* guaranteeing €1,500 a month instead of choosing field *k* guaranteeing €2,500 per month, the student prefers field *j* over field *k*.

perceived ability and preferences, and where expected wage (the mediator variable) is on its own shaped by ability and preferences. To estimate the model, we express all major specific variables relative to a numeraire major, "literary studies, philosophy, and humanities" (henceforth humanities). The model is the following:

$$\ln \pi^{E}_{i,k} = \alpha + \beta EW_{i,k} + \gamma A_{i,k} + \delta T_{i,k} + \varphi F_{i,k} + \upsilon_i + \upsilon_k + \epsilon_{i,k} \quad (1)$$

$$EW_{i,k} = \mu_0 + \mu_1 A_{i,k} + \mu_2 T_{i,k} + \mu_3 F_{i,k} + \upsilon_i + \upsilon_k + \rho_{i,k} \quad (2)$$

Where *i* and *k* index student and field of study, π^E is the probability of enrolling (calculated as the log odds ratio between field *k* and humanities), EW is expected earnings at age 30, A is the belief about own ability, T are preferences (measured both as the switching point and an indicator for those who never switch), and F is a vector of environmental factors such as peer-variables and parental information – all varying at *k* level. To estimate equations (1) and (2), we standardize all variables (apart from parental information) and cluster standard errors at student level. Notice the inclusion of student and field fixed effects: importantly, we only exploit within-individual and within-field variation.

Preliminary results

Table 1 shows the estimated coefficients from equation (1) adding one by one our main regressors: expected earning in column (1), perceived ability in column (2), and preferences in column (3). Two findings are particularly striking. First, in a horserace between our suggested predictors of intended college major enrollment, the direct effects of ability and taste are bigger than the effect of expected earnings. To quantify those effects, column (3) suggests that:

- a one standard deviation increase in perceived ability in field *k* increases the relative probability of enrolment in the field by 112.9%,
- a one standard deviation increase in taste for field *k* increases the relative probability of enrolment in the field by 91.1%,
- a one standard deviation increase in expected wage in field *k* increases the relative probability of enrolment in the field by 30.3%.

Second, a model which excludes perceived ability and taste can result in over-estimating the causal effects of earnings on intended choice: adding those two predictors almost halves the impact of expected future income. Moreover, adding them crucially increases the R-squared from 0.61 to 0.72, suggesting a significant improvement in the model's explanatory power.

Column (4) of Table 1 further sheds light on the indirect effects of ability and tastes, mediated by expected earnings. Although small, these effects are positive and statistically significant. Summed with the direct effects discussed before, they indicate that the total effect of a one standard deviation increase in, respectively, ability and taste in field *k*, is to increase the relative probability of enrolment in the field by 116.7% and 94%.

Do results differ by gender? We answer this question in Table 2 by re-estimating column (3) of Table 1 splitting the sample between males and females. The coefficients on our main predictors are virtually the same as in the previous table, and not statistically different from each other, suggesting that expected earnings, ability and taste play similar causal roles for females and males when deciding college majors.

Nonetheless, our data show heterogeneous intentions to enroll in different majors: the intention to enroll in STEM disciplines relative to humanities, for instance, is much higher for males than for females. We reveal this pattern using a Blinder-Oaxaca-type decomposition, which separate the effects of differences in endowments from the effects of differences in the prices of endowments. Using hats for predicted or estimated coefficients, we have that

$$\ln \hat{\pi}_{mk} - \ln \hat{\pi}_{fk} = \hat{\beta}_f\left(X_m - X_f\right) + X_m\left(\hat{\beta}_m - \hat{\beta}_f\right) + \hat{\delta}_m - \hat{\delta}_f \qquad (4)$$

Where $\hat{\beta}_f\left(X_m - X_f\right)$ represents the difference in endowments (the explained component), $X_m\left(\hat{\beta}_m - \hat{\beta}_f\right)$ the difference in parameters (the unexplained component), and $\hat{\delta}_m - \hat{\delta}_f$ the difference in fixed effects (that cannot be decomposed in an explained and unexplained components). The results are shown in Table 3, where we drop the *no college* scenario due to the lack of data about self-perceived ability.

Columns 2 and 3 show, for instance, that males indicate higher intentions to enroll in STEM and Economics&Law disciplines relative to Humanities with respect to females (a pattern we don't see, for instance, for Medicine and Psychology in columns 4 and 5). To drive these findings is the explained component and particularly the differences in perceived ability and taste. For instance, focusing on STEM, we find that differences in beliefs about ability account

for 36 percent of the total difference in intended enrolment, while differences in tastes account for 26 percent. In comparison, the contribution of expected earnings is minor (4.6 percent).

It is interesting to contrast our results with those of Zafar, 2013. He uses a much smaller sample of college students in an elite US college (Northwestern) and finds that differences both in beliefs about ability and in expected earnings do not explain the gender enrolment gap. Most of this gap is due to preferences (enjoying coursework and parental approval).

Since perceived ability captures also the degree of confidence that a student has in his/her skills, our findings point to the fact that Italian high school female students lack the confidence required to enroll in the hard sciences. This is probably associated to the fact that, on average, the performance of females in standardized tests is lower than the performance of males in mathematics.[5]

Concluding remarks

This study highlights that expected wages, ability, and preferences all influence college major selection, but preferences and self-perceived ability often outweigh financial considerations. Thus, interventions aimed solely at correcting wage expectations of young adults in the process of making a crucial decision for their future may have limited effects. Moreover, we show that any policy aiming at providing better career guidance should take into account that certain students may underestimate their academic abilities, a pattern we observe for our female students.

[5] (https://www.invalsiopen.it/risultati-ocse-pisa-2018/)

Table 1: Baseline mediation analysis

	(1) Pr. enrolment	(2) Pr. enrolment	(3) Pr. enrolment	(4) Exp. earnings
Expected earnings at 30	0.584***	0.400***	0.303***	
	(0.046)	(0.034)	(0.030)	
Self-perceived ability		1.564***	1.129***	0.126***
		(0.040)	(0.039)	(0.015)
Preferences (switchers)			0.911***	0.096***
			(0.032)	(0.012)
Preferences (never switchers)			-1.798***	-0.165***
			(0.086)	(0.027)
Classmates' self-perceived ability		0.436***	0.240***	0.011
		(0.050)	(0.055)	(0.022)
Classmates' preferences (switchers)			0.087**	-0.000
			(0.035)	(0.014)
Classmates' preferences (never switchers)			-0.129***	-0.020
			(0.040)	(0.015)
Mother graduated in field	0.345***	0.238***	0.170**	-0.001
	(0.081)	(0.079)	(0.074)	(0.034)
Father graduated in field	0.398***	0.296***	0.243***	0.145***
	(0.082)	(0.077)	(0.072)	(0.039)
Older sister/s graduated in field	0.393***	0.268**	0.226*	0.021
	(0.147)	(0.136)	(0.127)	(0.052)
Older brother/s graduated in field	0.338**	0.353***	0.294**	0.154***
	(0.138)	(0.129)	(0.120)	(0.047)
Classmates' mother graduated in field	0.187***	0.084	0.057	-0.011
	(0.062)	(0.062)	(0.058)	(0.019)
Classmates' father graduated in field	0.003	-0.007	-0.003	0.021
	(0.065)	(0.064)	(0.060)	(0.025)
Classmates' older sister graduated in field	0.088***	0.039*	0.020	-0.002
	(0.025)	(0.023)	(0.021)	(0.008)
Classmates' older brother graduated in field	0.042	0.051*	0.022	0.001
	(0.028)	(0.027)	(0.025)	(0.008)
Observations	13,159	13,159	13,159	13,159
R-squared	0.610	0.682	0.722	0.489
Student FE	Yes	Yes	Yes	Yes
Field FE	Yes	Yes	Yes	Yes

Table 2: Mediation analysis by gender

	(1) Pr. enrolment	(2) Pr. enrolment
Expected earnings at 30	0.374***	0.248***
	(0.0533)	(0.0363)
Self-perceived ability	1.055***	1.301***
	(0.0499)	(0.0650)
Preferences (switchers)	0.882***	0.881***
	(0.0412)	(0.0530)
Classmates' self-perceived ability	0.303***	0.173*
	(0.0724)	(0.0890)
Classmates' preferences (switchers)	0.0448	0.131**
	(0.0444)	(0.0578)
Mother graduated in field	0.208**	0.154
	(0.0919)	(0.120)
Father graduated in field	0.211**	0.298***
	(0.0946)	(0.111)
Older sister/s graduated in field	0.176	0.287
	(0.162)	(0.208)
Older brother/s graduated in field	0.174	0.550***
	(0.151)	(0.191)
Classmates' mother graduated in field	-0.0492	0.190**
	(0.0723)	(0.0935)
Classmates' father graduated in field	0.00680	-0.00741
	(0.0762)	(0.0971)
Classmates' older sister graduated in field	0.0586**	-0.0186
	(0.0285)	(0.0321)
Classmates' older brother graduated in field	0.0350	0.0202
	(0.0323)	(0.0379)
Sample	Women	Men
Observations	7,585	5,407
R-squared	0.745	0.682
Student FE	Yes	Yes
Field FE	Yes	Yes

Table 3: Blinder-Oaxaca decomposition by field of study (with respect to Humanities)

	Architecture and Civil Eng.	STEM and Natural Sciences	Economics, Business and Law	Medicine and Health Professions	Psychology and Social Sciences
total difference	0.759	1.779	1.105	0.028	-0.033
difference endowments	0.799	1.361	0.835	0.413	-0.012
preferences	0.250	0.469	0.207	0.001	-0.068
ability	0.406	0.637	0.452	0.244	0.065
parental education	0.004	0.001	0.011	-0.002	0.001
peers	0.100	0.175	0.055	0.094	-0.015
expected earnings at 30	0.046	0.083	0.113	0.074	0.009
missing values	-0.007	-0.005	-0.003	0.001	-0.003
difference prices	-0.096	-0.098	-0.096	-0.160	-0.101
preferences	0.046	0.058	0.044	0.059	0.040
ability	0.052	0.063	0.073	0.028	0.056
parental education	0.007	0.027	0.026	0.017	0.006
peers	-0.115	-0.152	-0.105	-0.118	-0.143
expected earnings at 30	-0.006	-0.009	-0.055	-0.061	0.021
missing values	0.027	0.022	0.028	0.023	0.027
difference fixed effects	0.056	0.517	0.366	-0.225	0.079

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