"I wish I knew ...". Misperceived ability, school counseling services and the choice of secondary school track[☆]

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Abstract

In tracked educational systems, the choice of school track is a crucial moment of a student's life, as it is strongly associated with her future labor market outcomes. Yet there are few studies esplicitly analyzing the process through which students and their parents decide, and whether they have all the relevant information they need. We use unique data for a large Italian municipality (Turin) which collected information on characteristics and track enrollment intentions for lower secondary school students. The same municipality was also running a school counseling service based on standardized cognitive and non-cognitive tests (the Arianna project). Our analysis shows that students (and their parents) are likely to revise their initial choices after new information on student ability is released by Arianna. This is especially true for children of low educated parents and immigrants, which are at greater risk of school failure and social exclusion. Our analysis suggests that school conseiling services based on standardized tests are likely provided useful information to support students' choices of the school track, and not to simply replicate other 'signals' supplied by teachers during students' past school careers.

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[☆] This paper is work in progress, comments are welcome.

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1. Introduction

In some educational systems students are tracked by ability in schools of different types (e.g., academic vs. vocational schools). There are various reasons why tracking may be an effective way of organizing secondary education. Advocates of tracking maintain that mixing students that have too different levels of abilities may create very heterogenous groups and makes it more difficult to teach. A teacher will have to target instruction on the "average" student in a class, a level which might be too difficult for the low-ability and too easy for the high-ability student. This may lead to levels of student achievement which are lower than those that could be potentially obtained in a tracked stystem. Moreover, the absence of tracking (i.e. a comprehensive high school) may also induce some of the least academically oriented students not to continue in secondary education, in case the latter is not compulsory. Detractors of tracking have opposite thoughts. Their view is that segregating low ability students in "worse" schools in terms of quality of both the peer group and the teacher body may limit their academic potential, and increase social inequality. Cross-sectional evidence shows that both arguments are valid. Brunello and Checchi (2007) find, for instance, that "reducing the extent of student tracking, either by raising the age of first selection or by reducing the number of tracks available, may be appropriate for increasing intergenerational mobility in educational attainment, but may increase social exclusion for people from disadvantaged backgrounds".

As a matter of fact, in tracked educational systems the choice of school track is a powerful predictor of an individual's labor market outcomes. Students who choose academic (or more selective) tracks tend to fare better later on in their lives by having a higher probability of continuing and succeeding in tertiary education (Cappellari and Lucifora 2009, Bratti et al. 2012), better employment opportunities and higher earnings (Dustmann 2004) than those enrolling in vocational tracks. Even if part of these benefits do not reflect a genuine effect of tracks but students' unobserved characteristics, first of all innate ability, a fundamental problem emerges in tracked educational systems: how to implement an efficient system of allocation of students to tracks?[1] To put in other words, the problem is from a social point of view how to minimize

[1]This represents an interesting issue only if individuals' outcomes in the labor market are not fully determined by their level of ability, but school tracks produce a "value added", or put in other words have a true causal effect. In this respect, few studies have made an attempt to address the endogeneity of school track, and the evidence is mixed. Figlio and Page (2002) finds that tracking does not hurt (but benefit) low-ability children using an IVs strategy. However, he explicitly recognizes that his instruments may be weak. Guyon et al. (2012) exploit a natural

the risk of mismatch between an individual's ability and the level of ability required by the track she chooses.

Selecting a secondary school track is for students and their families a choice made under uncertainty: the decision makers have to exploit as good as they can the imperfect information they have on ability and academic potential. The information set available to students (and parents) is made of different elements: students' past performance (in middle school), schools' and teachers' recommendations, their own assessment of children's level of ability, respectively. Moreover, nothing ensures that students' and families' objectives coincide with the social objective of minimizing the ability mismatch between the track chosen and ability. Indeed, some parents may enroll their children in more selective tracks in order to preserve (or gain) "social status". The misallocation of talents is a more severe problem in educational systems in which a large freedom of choice is left to parents, and teachers' recommendations are not binding. Checchi and Flabbi (2007) and Bratti et al. (2012), for instance, observe that although in both Germany and Italy parents do affect their children's choice of school track, the influence is much larger in the second country, where schools' recommendations are less binding. Misallocation of talents may go in two opposite directions. On the one hand, wealthy or better educated parents may choose academic tracks for their children, even if they are of low ability. On the other hand, poor or risk-adverse parents may perceive the choice of the academic track as too risky for their children, pushing them towards vocational or technical tracks even if they have high ability.

We focus in this paper on the upper secondary school track choice in Italy, which individuals have to make at the end of middle school (lower secondary education).[2] This appears to be a very crucial point in a students' academic career, in which the influence of parental background is strongest. De Simone (2013) shows, for instance, that disparities in learning opportunities across socio-economic groups of Italian students are magnified during middle school years and that this translates into a social tracking along the upper secondary's tracks (academic, technical, vocational). Although some previous researchers have already looked into the process

experiment provided by a reform introduced in Northern Ireland in 1989 which involved a rise in quotas applied to grammar school intakes. The authors find that the net effect of the "detracking" reform was a very significant increase in examination results both at the end of compulsory schooling and at the end of "high school".

[2]In what follows, we will sometimes refer to "upper secondary education" using the label "secondary education" for brevity.

of school track choice, they have generally limited themselves to observing a strong infuence of family background, but owing to lack of data have not digged into the potential generating mechanisms. The positive association between parents' education or occupational status and the choice of school track may indeed reflect a spurious correlation between family background and a child's ability, differences in parental knowledge of children's ability, or risk aversion. In this paper, we make an attempt to shed light on these important pathways. We consider the Italian case in which, as we said, parents are free to choose the track they wish for their children and in which school tracking has the potential of increasing social inequality. In particular, we focus on the the city of Turin (Nothern Italy). In Turin the municipality created a service of counseling based on cognitive and noncognitive standardized tests, which is called Arianna. On the basis of test scores, Arianna offers to students (and their families) a piece of advice on the upper secondary school track that best matches their inclinations. The test is taken by the 95% of students in the final stage of lower secondary education and, as we are able to track them over the following step of the educational ladder, we can compare pre-test enrolment intentions and effective track choice. In particular, we are given the unique opportunity to disentangle the effect of family background on (i) pre-test enrolment intentions, mainly driven by self-assessment based on previous school grades and parents' and students' tastes; (ii) the mismatch between pre-test enrolment intentions and the recommendations based on test results related to children's cognitive and non-cognitive skills; (iii) the revision of pre-test enrolment intentions once test results are made available to children and parents. Our analysis allows us to derive some insights into the importance for families and students of having reliable information on children's cognitive and non-cognitive attributes to make an informed choice. In the analysis we put a special emphasis on the choices of immigrants, which are probably the group at major risk of misallocation to school tracks when recommendations are not binding, and of social exclusion.

The structure of the paper is as follows. The next section provides a summary of the relevant literature. Section 3 describes the main features of the counseiling service Arianna, with a particular focus on the cognitive and non-cognitive measures provided by its tests. Section 4 investigates the characteristics associated with the pre-test choice of the school track. Section 5 represents the heart of our analysis, as it studies the determinants of the mismatch between pre-test school enrollment intentions and the Arianna's advice, and whether and what students

make use of the new information provided by this service. The last section briefly summarizes our main findings.

2. Literature review

Educationalists, economists and sociologists have looked into the family's influences on school track choice. Contini and Scagni (2011) have investigated the "unconditional" (or "total") social background effect that is the effect gross of the influence of family origin on ability, because the latter is not observed in their data. The authors use the OECD's Programme of International Students Assessement (PISA) data to compare Germany, the Netherlands and Italy, and find that the total effect of social origins on track choice is weaker in the Netherlands and stronger in Germany, with Italy in between. Moreover, they exploit institutional differences between German Länders showing that access restrictions related to ability tests or binding recommendations appear to weaken the effect of parental background. Bratti et al. (2012) make a comparison between the German and the Italian system. Germany is charaterized by earlier tracking and, as we said, by a more "rigid" system. The authors show that the drivers of track choice are similar in the two countries in terms of the family background's total effect. However, after mediating factors are controlled for (e.g. students' past educational performances), the total effect of family background attenuates more in Germany than in Italy. Moreover, in the latter, unlike in Germany, highly educated parents are more likely to push low ability children towards the academic track. Italy is also characterized by a higher impact of family background on middle school results, and by less inter-track mobility, which is consistent with parents' not updating their choices according to the new evidence acquired on their children's ability that they get along the educational career, but basing their choices on non-academic considerations (e.g., social status). Similar findings are also reported in Checchi and Flabbi (2007), which also features the Germany vs. Italy comparison. The authors draw the conclusion that tracking is very close to tracking by pure ability in Germany and by family background only in Italy, where is a more pronounced vehicle of social inequality.

Some authors have made an attempt to disentangle the specific role of parental *risk aversion*. Wölfel and Heineck (2012) show that in Germany risk adverse mothers are more likely to have their child enrolled in the lower (i.e. more vocational) secondary school track compared to risk-neutral counterparts. The opposite is found for risk-averse fathers. However, they also show

that when risk-aversion of both parents is jointly modeled, risk aversion is associated with preferences for the intermediate track. By way of contrast, Leonardi (2007) does not find any role for risk aversion on the choice of secondary school in the Italian context, but that parents' wealth is positively associated with the choice of the academic track, especially in liquidity constrained households. Although wealth seems to play a role, the same cannot be said for parental income. The evidence for Germany reported in Tamm (2008) suggests, for example, that income has no positive causal effect on school choice and that differences between high and low-income families mainly reflect unobserved heterogeneity, e.g. differences in motivation or parenting quality.[3] Thus like it happens for other educational choices, such as the level of schooling, also the choice of school track appears to be more sensitive to long-term than to short-term parental charateristics (Cameron and Heckman 2001, Bratti 2007).

We already said that in some educational systems track choice is mostly based on teachers' recommendations, which may be very binding like in the case of Germany, and even when they are not —like in Italy— parents are likely to take them into the due account. Researchers have accordingly investigated the potential drivers and the consequences of such recommendations. Teachers' recommendations for the secondary school track are typically based on children's past academic achievement and their own appraisal of pupils' abilities. Ochsen (2011) analyzes the German case and reports that parents' upgrading choices (i.e. choosing more prestigious tracks) with respect to teachers' recommendations is positively associated with higher child education, especially when it is done by highly educated parents. He concludes that the failure of teachers' recommendations of the appropriate school track may have important consequences on students' long-term outcomes. The potential shortcomings with the teachers' recommendation system in Germany are also investigated by Cinnirella et al. (2011). The authors report that taller students are more likely to receive recommendations for the academic track even controlling for past school performance and parental background, and relate this evidence mainly to the positive association between height and noncognitive (social) skills, even if they do not completely discard pure discrimination. Jürges and Schneider (2011) observe relative-age effects in teachers' recommendations: younger children are less likely to receive recommendations for the academic track. Pure age effects are estimated by the authors using assigned relative age as

[3] Tamm (2008) uses a sibling fixed effects estimator for identification.

an instrument for actual age. They conclude that teachers are weighting too much current with respect to (future) expected performance. As the differences in maturity level off over time, the tracking decision at age 10 is simply too early, taking place at an age at which the penalty for younger students is largest. More on a positive side is the article by Caro et al. (2009) which finds that students *growing* more rapidly in their mathematics skills are more likely to obtain a recommendation for the academic track, even after controlling for their achievement levels and that this relation is mainly mediated by teachers' rewarding with higher grades in maths student progress. This effect is stronger for students coming from disadvantaged backgounds and may contribute to reducing social inequality. Yet the *level* of achievement remains the main determinant of teachers' recommendations according to the authors.

A final stream of literature related to our work is concerned with the choices made by immigrant students. Barban and White (2011) use data from Italy and report that immigrant students have a lower performance than natives in the middle school final exam,[4] and that even after controlling for it, immigrants are significantly more likely to enroll in the vocational track. The authors put forward that this may be due either to different preferences for education by immigrants or to poor counseling received during the last year of middle school, but their data does not allow them to distinguish between the two hypotheses. Minello and Barban (2012) investigate the determinants of immigrants' educational aspirations in Italy, and show that long-term aspirations are not affected by immigrant status. They also report evidence of potential social interactions as immigrants' children in schools where natives have higher aspirations also have higher aspirations. Lüdemann and Schwerdt (2013) focus on Germany and find that second-generation immigrants receive worse grades and teachers' recommendations for secondary school tracks than natives, and that the native-immigrant gap cannot be explained by differences in standardized student achievement tests and general intelligence, but is largely mediated by less favorable socioeconomic backgrounds. Overall, the existing research suggests that immigrants may represent a group at particualr risk of social exclusion in tracked educational systems, and that may even suffer from some discrimination in teachers' recommendations.

[4]This is true on average even if Chinese immigrants peform better than natives.

3. Data

3.1. The Arianna Project: measuring cognitive and non-cognitive abilities to support student enrollment choices

Since the early 1990s the Municipality of Turin, one of the largest Italian cities located in the North-West part of the country, offers to all students in the final year of the lower-secondary education (grade 8) the opportunity to access a guidance counseling service external to schools. Within the Arianna project, students are asked to take a set of standardized tests aiming at assessing their cognitive and non-cognitive abilities to highlight their strengths and weaknesses. This piece of information is used to support students in their choices of the upper secondary track and career pathway. Apart from test scores, for each student, the Arianna project gathers information on the family background, on the school and the class attended, on the choice of secondary track they would make at the moment they take the tests. The participation into the program has been increasing over time and since 2005 virtually all lower secondary students in Turin take the tests and receive a suggestion by Arianna's counselors on the track that best matches their abilities. Roughly 32,000 students took the tests between 2005 and 2012 and, starting from year 2008, Arianna's records can be matched with provincial administrative data on actual upper secondary school enrolment decisions and on the regularity of the course of study.

So far, we have been able to match in the provincial administrative data related to upper secondary schools the students that took the Arianna's tests in 2008 and 2009. The attrition rate is small and declining over time: from 7.4% in 2008 to 1.38% in 2009. In the administrative data we are mostly dealing with students who are still falling under the compulsory segment of the education ladder (the age of compulsory schooling is 16), and most unmatched observations have nothing to do with students who dropped out from school during the first year of upper secondary schooling. As a matter of fact, most lower secondary students in the non-matched sample were less than 14 years old (82.89%), although there is a number of students who are 14 or 15 years old (13.85% and 3.26%, respectively). Sample attrition is then likely to be related to older students not continuing in post-compulsory education and to students migrating to other provinces (or abroad, especially for immigrant students) with their families. In order to investigate the possible causes of attrition and potential sample selection bias, we estimated a probit model for sample attrition (see Table 8 in Appendix) which shows that the only signif-

icant predictors of attrition are students' foreign status (+1.7 percentage points, p.p. hereafter), age, since students who are closer to the age of compulsory schooling are more likely not to be matched with schools' administrative data having already complied with the obligation (+17.2 and 33.8 p.p. for students aged 14 and 15, respectively). Interestingly enough, we do not find significant differences by parents' education and Arianna's cognitive test scores, and our matched dataset does not seem to overrepresent abler (as measured by Arianna's tests) or less deprived students. The significant coefficient on the student immigrant status over and above age can be explained by the highest geographic mobility that immigrants might have. For matched students we can assemble a unique dataset where students' expectations and preferences (pre-test enrollment intentions) can be contrasted with both the counselor's suggestions based on test results and the final school enrollment decision.

Arianna's tests aim at capturing the proficiency of students along the full spectrum of cognitive abilities: a) Language; b) Logic; c) Symbolic calculus; d) Spatiality; e) Strategy. Although the test is tailored for lower secondary students (typically aged 13-14 when they take the test), questions are not curriculum based: previous knowledge is not needed to solve the problems given or to find the right answers. This makes test results comparable across schools and waves. As regards non-cognitive abilities, a personality test allows to characterize students' inclinations with respect to three dichotomies: i) Erratic / Intentional; ii) Risk Lover / Risk Adverse; iii) Competitive / Collaborative . See Table 9 in the Appendix for summary statistics on test scores and students' characteristics.

3.2. Students' characteristics and cognitive ability

To shed light on the features of Arianna's tests on cognitive abilities we run a set of plain OLS regressions that aim at explaining score variations on the basis of observable students' characteristics. More specifically, we include as control variables the gender, the immigrant status and the delay in the course of study, the socio-cultural background (as proxied by the parents' educational attainment) and personality traits. In the Italian schooling system the immmigrant status (native / born abroad) and the delay in the course of study are strongly linked owing to the existence of an exception for students of foreign origin to the otherwise strict age-grade rule. Newly arrived foreign students enter schools at lower grades whenever their competence is evaluated to be inadequate to fruitfully join peers in the regular path. On a representative sample of 44,490 Italian students aged 11 and 13, Berchialla et al. (2011) show that,

in the final year of lower secondary education, the probability of a delay in the course of study for a first-generation immigrant student is 19.32 times higher with respect to that of a native peer. As a consequence, a delay of one year in the course of study may not be necessarily intended as a grade repetition for 1st generation immigrant students. For this reason we combine two variables and we tell apart seven different groups: natives with a regular path, native delayers (grade repeaters), 2nd generation immigrant students with a regular path, 2nd generation immigrant students delayers (grade repeaters), 1st generation immigrant students with a regular path, 1st generation immigrant students with a one-year delay (not necessarily grade repeaters), 1st generation immigrant students with 2 or more years of delay (surely grade repeaters). For organizational purposes the Municipality of Turin splits each cohort of students in two groups, one taking the tests at the end of the second year of lower secondary school (March to May) and the other taking the test at the beginning of the third year of lower secondary school (September to November). Thus, in our estimate, we include a dummy identifying the latter group to account for possible systematic unobserved differences between groups. Estimation results are reported in Table 1.

First thing to be noticed is that results remarkably align with those revealed by other national and international assessments of student knowledge, competences and cognitive abilities such as the OECD Programme for International Student Assessment (PISA). Girls lag behind boys in domains related to logic, spatiality and strategy; whereas boys are outperformed by girls in domains such as language and symbolic calculus. Cognitive abilities are unevenly distributed across socioeconomic groups of students: they are lower for children with culturally disadvantaged backgrounds as captured by the low educational attainment of parents. Those who are not able to report the educational attainment of parents ("Don't know") are likely to be a mix of students with poorly educated parents and students with parents with secondary schooling qualifications as they score somewhere in between those two groups. In general, we observe that children with foreign parents lag behind their peers with Italian parents, and there is an additional gap for students born abroad (1st generation immigrants). As expected, for the latter category, we find that cognitive abilities are not much different between 1st generation immigrant students with a regular course of study and their peers with a one-year lag. In fact, the only remarkable difference is found in the domain of language. Thus, we maintain that in the group of 1st generation immigrant students with a one-year delay there are very few actual

Table 1: Test scores and individual characteristics - OLS estimations

Variables	(1) *Overall*	(2) *Logic*	(3) *Language*	(4) *Simbolic Calculus*	(5) *Spatiality*	(6) *Strategy*
Gender (ref. female)	-0.0483***	-0.0583***	0.0662***	0.0444***	-0.0994***	-0.259***
	(0.0147)	(0.0145)	(0.0147)	(0.0154)	(0.0160)	(0.0156)
Origin and regularity (ref. Native, regular)						
Native, deleyer	-0.577***	-0.433***	-0.407***	-0.562***	-0.388***	-0.232***
	(0.0374)	(0.0383)	(0.0344)	(0.0384)	(0.0347)	(0.0306)
1st generation, regular	-0.316***	-0.207***	-0.414***	-0.225***	-0.151***	-0.190***
	(0.0329)	(0.0299)	(0.0337)	(0.0362)	(0.0383)	(0.0300)
1st generation, 1y delayer	-0.365***	-0.244***	-0.544***	-0.247***	-0.155***	-0.205***
	(0.0326)	(0.0336)	(0.0377)	(0.0334)	(0.0362)	(0.0318)
1st generation, 2ys or more delayer	-0.768***	-0.626***	-0.969***	-0.557***	-0.269***	-0.266***
	(0.0745)	(0.0753)	(0.0697)	(0.0753)	(0.0680)	(0.0741)
2nd generation, regular	-0.248***	-0.301***	-0.297***	-0.151***	-0.0509	-0.0945
	(0.0537)	(0.0525)	(0.0546)	(0.0555)	(0.0567)	(0.0574)
2nd generation, delayer	-0.609***	-0.426***	-0.701***	-0.569***	-0.287*	-0.264**
	(0.140)	(0.123)	(0.155)	(0.175)	(0.146)	(0.132)
Parents' education (ref. Post-secondary ed.)						
don't know	-0.394***	-0.250***	-0.306***	-0.323***	-0.288***	-0.198***
	(0.0208)	(0.0200)	(0.0214)	(0.0221)	(0.0207)	(0.0220)
Up to lower-sec. education	-0.518***	-0.355***	-0.344***	-0.428***	-0.423***	-0.238***
	(0.0234)	(0.0258)	(0.0243)	(0.0255)	(0.0245)	(0.0224)
Upper secondary education	-0.223***	-0.151***	-0.150***	-0.164***	-0.202***	-0.120***
	(0.0204)	(0.0195)	(0.0192)	(0.0216)	(0.0210)	(0.0218)
Casual vs Intentional	0.0891***	0.0636***	0.0749***	0.0729***	0.0595***	0.0452***
	(0.00576)	(0.00618)	(0.00528)	(0.00648)	(0.00627)	(0.00596)
Risk Lover vs Risk Averse	0.132***	0.0985***	0.0990***	0.111***	0.0904***	0.0581***
	(0.00525)	(0.00531)	(0.00512)	(0.00560)	(0.00538)	(0.00496)
Competitive vs Collaborative	0.0539***	0.0336***	0.0361***	0.0588***	0.0342***	0.0186***
	(0.00441)	(0.00448)	(0.00435)	(0.00480)	(0.00452)	(0.00510)
Test taken in the final year of lower-sec. school	0.108***	0.0561**	0.126***	0.0933***	0.0865***	-0.00398
	(0.0292)	(0.0232)	(0.0240)	(0.0292)	(0.0247)	(0.0210)
Constant	-1.266***	-0.877***	-1.003***	-1.199***	-0.795***	-0.409***
	(0.0713)	(0.0664)	(0.0629)	(0.0713)	(0.0677)	(0.0547)
Observations	17,594	17,593	17,546	17,455	17,530	16,835
R-squared	0.184	0.095	0.136	0.138	0.083	0.050

***, **, * significant at the 1%, 5% and 10%, respectively.

Note: Robust standard errors in parentheses (clustered by school and year). Wave dummies included but not reported.

grade repeaters. Intentionality in decision making, risk aversion and collaborative attitudes are all positively associated with cognitive abilities, although it is hard to presume the direction of causality between personality traits and test scores. Finally, we observe that those who take the test later in the year, when they are already enrolled in grade 8, tend to perform better than those who take the test in the final part of grade 7.

4. Pre-test student enrollment intentions

As explained in the introductory section, the upper secondary school (5 years, *scuola secondaria di secondo grado*) in Italy consists of three tracks: the academic track (*licei*), the technical track and the vocational track. A residual option to complete compulsory education that spans from 6 up to 16 years of age is to access the vocational and training system falling under the responsibility of the Regions and offered by the recognized formative agencies operating nationwide (vocational training). Thanks to the information collected within the Arianna Project we can investigate how observable characteristics of students, including their cognitive and non-cognitive abilities, relate with their declared intentions as regards the choice of the upper secondary school track. It is worth stressing that intentions will not necessarily translate into actual enrollment choices as school and family pressure and newly available information on ability (test scores, school grades) may induce some revisions. The simple descriptive statistics reported in Table 2 highlights that one student out of two would pick a secondary school falling under the academic track. One in five would opt for a vocational school and very few of them would rather choose a vocational training leaving the schooling system. Amazingly, a few months away from the deadline to make a choice, 29% of students still "don't know" what they will do. Hence, the lack of information about the structure of upper secondary education and on how own ability matches each of the tracks and fields of study appears to be a widespread phenomenon.

4.1. Students' characteristics and pre-test enrollment intentions

The upper secondary track choice incorporates the family willingness to invest in human capital accumulation as well as the risk attitude of individuals (Leonardi 2007). The enrollment in an academic school (*licei*) generally implies a further progression to a university course as the corresponding secondary degree has little value on the job market. This means that a student that opts for the academic track is anticipating a minimum of 8 more years in education (at least

Table 2: Pre-test enrollment intentions

School tracks	*School types*[(a)]	*Freq.*	*%*
Academic track	Classic / Scientific Lyceum (L)	5,917	31.92
Academic track	Human Sciences / Linguistic / Art / Music Lyceum (OL)	1,833	9.89
Academic track	Either L or OL	1,408	7.6
Technical track	Technical Institute (TI)	1,795	9.68
Vocational track	Professional Institute (PI)	1,919	10.35
Vocational training	Vocational Training (VT)	275	1.48
	Don't know	5,361	28.92
	Missing	27	0.15
	Total	18,535	100

[(a)] School types are listed from the most to the least academic oriented.

5 years of secondary and 3 years of first-level university degree). On the other hand, technical and vocational schools allow for either a progression to the tertiary education or an entrance in the job market right after the high school completion. Hence, a student that chooses either the technical or the vocational tracks knows he could stop after the attainment of the secondary school degree (5 years). Finally, a student that opts for the vocational training concludes her course of study in 3 years, but she is not entitled to access tertiary education. Individual observable characteristics may capture a lot of variation in intentions, preferences and uncertainty about upper secondary school choice (see Tables 10-15 in the Appendix). Hence, in order to disentangle the independent effect of single variables, we take to the data a multinomial logit (MNL, hereafter) model that allows us to single out the prevailing features for each group of students stating a specific intention.[5] Marginal effects are reported in Table 3.

Estimates in column 1 reveal that male students, grade repeaters, students of foreign origin and those with disadvantaged socio-cultural background tend to be more uncertain about their future. This may reflect both doubts on their own abilities and information constraints that limit the familiarity of foreign parents and children of poorly educated parents with secondary education tracks. The well known social stratification of upper secondary tracks in Italy (Checchi and Flabbi 2007, Bratti et al. 2012, Checchi et al. 2013) is mirrored by the intentions of students. Students with university-educated parents cluster in the traditional academic schools (L), those with parents that attained secondary education spread over the other academic schools (OL)

[5]We also estimated Multinomial Probit Models and obtained very close marginal effects.

Table 3: Pre-test intentions and individual characteristics - MNL (marginal effects)

Variables	(1) *Don't know*	(2) *L*	(3) *OL*	(4) *Either L or OL*	(5) *TI*	(6) *PI*	(7) *VT*
Gender (female)	-0.017**	-0.032***	0.109***	0.055***	-0.088***	-0.026***	-0.000
	(0.007)	(0.007)	(0.006)	(0.004)	(0.008)	(0.005)	(0.002)
Origin and regularity (ref. Native, regular)							
Native, deleyer	0.109***	-0.222***	-0.039***	-0.006	0.004	0.119***	0.034***
	(0.013)	(0.013)	(0.009)	(0.008)	(0.008)	(0.011)	(0.006)
1st generation, regular	0.107***	-0.074***	-0.041***	-0.015**	0.031**	-0.005	-0.004
	(0.015)	(0.018)	(0.008)	(0.007)	(0.0109)	(0.009)	(0.003)
1st generation, 1y delayer	0.108***	-0.130***	-0.036***	0.009	0.031**	0.007	0.010**
	(0.016)	(0.015)	(0.008)	(0.010)	(0.0109)	(0.009)	(0.005)
1st generation, 2ys or more delayer	0.268***	-0.254***	-0.084***	0.008	-0.016	0.046**	0.032***
	(0.033)	(0.018)	(0.011)	(0.024)	(0.015)	(0.020)	(0.012)
2nd generation, regular	0.070***	-0.052**	-0.022	-0.007	0.035**	-0.025*	0.001
	(0.022)	(0.025)	(0.014)	(0.012)	(0.018)	(0.014)	(0.006)
2nd generation, delayer	0.150**	-0.268***	0.021	-0.031	0.059	0.014	0.055*
	(0.068)	(0.039)	(0.049)	(0.032)	(0.042)	(0.034)	(0.033)
Parents' education (ref. Post-secondary ed.)							
don't know	0.184***	-.285***	0.015**	-0.045***	0.045***	0.074***	0.011***
	(0.009)	(0.010)	(0.007)	(0.006)	(0.005)	(0.006)	(0.002)
Up to lower-sec. education	0.159***	-0.359***	0.005	-0.039***	0.073***	0.139***	0.022***
	(0.012)	(0.012)	(0.007)	(0.006)	(0.007)	(0.008)	(0.003)
Upper secondary education	0.067***	-0.222***	0.029***	-0.019	0.072***	0.067***	0.006***
	(0.009)	(0.011)	(0.007)	(0.006)	(0.007)	(0.006)	(0.002)
Test taken in the final year of lower-sec. school	-0.069***	-0.035**	0.004	-0.006	0.059***	0.042***	0.006**
	(0.015)	(0.014)	(0.008)	(0.006)	(0.007)	(0.007)	(0.002)
Observations				17,896			
Pseudo R-squared				0.085			

***, **, * significant at the 1%, 5% and 10%, respectively.

Note: Robust standard errors in parentheses (clustered by school and year). Wave dummies included but not reported.

and the technical and vocational tracks (TI, PI), those with poorly educated parents tend to be overrepresented in the technical and vocational track (TI, PI) and training (VT). On a general basis, those who experienced an irregular course of study tend to state a preference for non-academic schools and training. Apparently, the same happens for students of foreign origin (1st and 2nd generations). Girls are more uncertain than boys on the kind of academic school they want to enroll in (column 4). However, they show a strong preference for academic schools with courses related to humanities, pedagogy, foreign languages and arts (column 3).

4.2. Does the lower-secondary school provide students with proper information on their true ability?

All the considerations drawn so far on pre-test enrollment intentions could be taken at their face value if we assumed that students have no clue on their cognitive and non-cognitive abilities. Although we can rule out that students are aware of Arianna's test results when they state their intentions, we can expect that they have been receiving relevant signals during their school career (grades, teacher feedbacks, etc.) before taking the test. In such a case, results in Table 3 could be significantly biased by the omission of a control on student ability. To investigate this issue we replicated the estimation of the MNL model described in the previous section by introducing the scores on both cognitive and non-cognitive tests as controls. Marginal effects of variables are reported in Table 4.

We observe that students with stronger cognitive and non-cognitive abilities are overrepresented among those who intend to enroll in the academic track. When abilities are taken into account, the preferences of 2nd generation immigrant students seem to be more aligned with those of their Italian peers. But the rest of the picture remains largely unaffected, and both immigrant and socio-economic status continue to significantly correlate with students' choices. Two possible explanations can be put forward: either (a) some students ignore their true ability as they receive misleading signals from schools, or (b) some students receive useful feedbacks from schools but they neglect that part of information in the decision making process. In the following section we will explore in depth this issue and we will try to understand which one among the two explanations finds support in the data.

Table 4: Pre-test intentions and cognitive/non-cognitive abilities - MNL (marginal effects)

Variables	(1) *Don't know*	(2) *L*	(3) *OL*	(4) *Either L or OL*	(5) *TI*	(6) *PI*	(7) *VT*
Gender (ref. female)	-0.017**	-0.035**	0.109***	0.056***	-0.089***	-0.025***	0.000
	(0.007)	(0.007)	(0.006)	(0.004)	(0.005)	(0.005)	(0.002)
Origin and regularity (ref. Native, regular)							
Native, delayer	0.087***	-0.162***	-0.039***	0.004	0.009	0.078***	0.022***
	(0.013)	(0.014)	(0.009)	(0.009)	(0.009)	(0.009)	(0.005)
1st generation, regular	0.068***	-0.015	-0.044***	-0.013*	0.031***	-0.022**	-0.005**
	(0.015)	(0.017)	(0.008)	(0.008)	(0.011)	(0.009)	(0.002)
1st generation, 1y delayer	0.065***	-0.069***	-0.037***	0.011	0.032***	-0.006	0.004
	(0.017)	(0.016)	(0.008)	(0.010)	(0.011)	(0.009)	(0.004)
1st generation, 2ys or more delayer	0.212***	-0.182***	-0.089***	0.022	-0.004	0.022	0.019**
	(0.036)	(0.027)	(0.011)	(0.029)	(0.017)	(0.019)	(0.009)
2nd generation, regular	0.048**	-0.007	-0.027*	-0.007	0.029*	-0.036***	-0.000
	(0.021)	(0.024)	(0.014)	(0.012)	(0.019)	(0.013)	(0.006)
2nd generation, delayer	0.096	-0.202***	0.041	-0.046	0.083*	-0.002	0.031
	(0.069)	(0.053)	(0.055)	(0.029)	(0.046)	(0.032)	(0.025)
Parents' education (ref. Post-secondary ed.)							
don't know	0.152***	-0.224***	0.008	-0.045***	0.042***	0.059***	0.009***
	(0.009)	(0.010)	(0.007)	(0.006)	(0.005)	(0.007)	(0.002)
Up to lower-sec. education	0.120***	-0.282***	-0.004	-0.039***	0.075***	0.113***	0.017***
	(0.012)	(0.012)	(0.007)	(0.007)	(0.008)	(0.008)	(0.003)
Upper secondary education	0.045***	-0.182***	0.021***	-0.022***	0.069***	0.062***	0.005**
	(0.009)	(0.009)	(0.007)	(0.001)	(0.007)	(0.007)	(0.002)
Test taken in the final year of lower-sec. school	-0.062***	-0.045***	0.004	-0.006	0.058***	0.046***	0.006***
	(0.014)	(0.012)	(0.006)	(0.005)	(0.007)	(0.006)	(0.002)
Std. Test score - Overall	-0.053***	0.118***	-0.013***	-0.000	-0.001	-0.043***	-0.007***
	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
Casual vs Intentional	-0.008***	0.011***	0.004**	0.002	-0.004**	-0.003	-0.002***
	(0.002)	(0.003)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)
Risk Lover vs Risk Adverse	-0.007***	0.009***	-0.001	0.002	-0.002	-0.000	-0.001
	(0.003)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)
Competitive vs Collaborative	0.003	0.002	-0.003*	-0.003**	0.001	-0.001	0.000
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)
Observations				17,567			
Pseudo R-squared				0.111			

***, **, * significant at the 1%, 5% and 10%, respectively.

Note: Robust standard errors in parentheses (clustered by school and year). Wave dummies included but not reported.

Table 5: Discordance of students' pre-test enrollment intentions with Arianna's suggestions

Concordance/Discordance	*Freq.*	*%*
Intentions match test results (0)	7,262	56.00
Intentions do not match test results (1)	5,705	44.00
Conservative intentions	*1,264*	*9.75*
Risky intentions	*4,441*	*34.25*
Total	12,967	100.00

5. Does Arianna provide useful information?

In this section we investigate factors associated with a student's likelihood of being matched with Arianna's advice, whether this information is used by students (and their parents) to update the initial school choice, and who is more likely to make use of Arianna's conseil.

5.1. The mismatch between students' intentions and Arianna's suggestions

In the previous section we have examined the characteristics associated with the intentions of enrolling in different types of schools as declared during lower secondary schooling. In this section we examine the determinants of the mismatch between a student's declared intention and what is suggested by Arianna. Data reveal that slightly more than a half of students in our sample make a proper self-assessment and are willing to choose an upper secondary track that matches their true inclinations and talents (Table 5). In fact, in 56% of cases pre-test declared intentions match with Arianna's suggestion based on cognitive and non-cognitive test results while 44% of individuals have "mismatched" intentions. Among those whose intentions did not match with Arianna's suggestion, individuals with more optimistic views of their academic ability tend to prevail on those who underestimate their true potential. In particular, 34.25% of individuals show "risky intentions" as, contrary to Arianna's suggestion, they would choose a highly academic oriented upper secondary track, possibly implying a further progression to tertiary education. A much lower percentage of individuals (9.75%) declares more "conservative intentions": they are willing to chose less academic oriented upper secondary courses, wasting part of their potential.

However, these aggregate figures do not allow us to appreciate the specific contribution of different factors on the probability of being mismatched with Arianna's conseil. The table reporting our definition of "conservative" and "risky" choice (i.e. $CONSERVATIVE_i$ and

Table 6: Determinants of discordance between declared intentions and Arianna's advice - Probit model (marginal effects)

Variables	Matched (0) / Mismatched (1)
Gender (Female)	0.0272***
	(0.0100)
Origin and regularity (ref. Native, regular)	
Native, delayer	0.100***
	(0.0215)
1st generation, regular	0.0984***
	(0.0215)
1st generation, 1y delayer	0.136***
	(0.0244)
1st generation, 2ys or more delayer	0.170***
	(0.0466)
2nd generation, regular	0.118***
	(0.0317)
2nd generation, delayer	0.120
	(0.0923)
Parents' education (ref. Post-secondary ed.)	
don't know	0.129***
	(0.0133)
Up to lower-sec. education	0.164***
	(0.0140)
Upper secondary education	0.0987***
	(0.0108)
Test taken in the final year of lower-sec. school	-0.0438***
	(0.0109)
Year dummies	Yes
Observations	12,603
Pseudo R-squared	0.022

***, **, * significant at the 1%, 5% and 10%, respectively.
Note: Robust standard errors in parentheses (clustered by school and year).

$RISKY_i$) is reported in the Appendix (16). Table 6 reports the marginal effects of a probit model for the outcomes of having declared pre-enrollment intentions which are discordant with the Arianna's suggestions. The dependent variable takes on value one in case of a discordant choice and zero otherwise.

Girls have a 2.7 p. p. higher probability of being mismatched than boys. School delayers have a higher probability of having discordant choices. In particular, native individuals who accumulated a school delay tend to have a 10 p.p. lower probability of being matched than regular students. As for the 1st generation immigrants, regular students tend to be more mismatched than natives with an about 10 p.p. higher probability of mismatch while students with one-year

and two-year delays have 13.6 and 17 p.p. higher probabilities. As for 2nd generation of immigrants, we still observe a penalty in the probability of being matched with respect to natives, which is however precisely estimated only for regular foreign students (-11.8 p. p.). Thus, it seems likely that the penalty of immigrants does not stem from an insufficient knowledge of the Italian school systems of newly arrived foreigners, since it extends to the 2nd generation who was exposed to the host country's institutions for a sufficient number of years.

As for parents' education, we find a monotonically increasing effect on the likelihood of being mismatched. In particular, children of parents with up to lower secondary education are 16.4 p.p. more likely to be mismatched than those whose parents have a tertiary degree. The gap with respect to the reference group is smaller for the offspring of parents with upper secondary schooling, for whom the probability of being unmatched is 9.9 p.p. higher.

Taking the test in the final year of lower secondary education reduces the probability of a mismatch by 4.4 p.p.

Table 6 suggests overall that native regular students and students with highly educated parents are more likely to be matched with Arianna's advice. As we anticipated, this could be interpreted in two ways: (i) they have better information than the remaining groups (immigrants or individuals with low parental education); (ii) information is equally available to all groups, but some of them make better use of it or are constrained in their choices by other factors (e.g. liquidity or credit constraints).

5.2. Does information on true ability matter for a student's final track choice?

In this section, we investigate whether Arianna's advice is taken into account by students and their parents when making their final school choice. In case it is, we could put forward that the Arianna project provides a useful piece of information which was unknown before taking the test. The table reporting our definition of "upgrading" and "downgrading" choices is reported in the Appendix (17).

Column (1) of Table 7 shows the marginal effects of a probit model for the probability of updating the pre-test school enrollment intentions. The estimated equation is

$$y_i = \alpha_0 + \alpha_1 DISCORDANCE_i + \alpha_2 x_i + \varepsilon_i \tag{1}$$

where y_i is a dichotomous variable taking value one in case the individual mantained her choice and zero otherwise, $DISCORDANCE_i$ is our main independent variable of interest, indicating

whether the individual's initial choice was in contrast with Arianna's advice (in this case it takes value one and zero otherwise), x_i are control variables and ε_i an idiosyncratic error term, which is assumed to be standard normally distributed. The αs are parameters to be estimates using Maximum Likelihood estimation, and α_1 gives us some insights into whether individuals "react" to new information provided by Arianna or not.

Column (1) shows that individuals who are mismatched with Arianna's advice have a 18.8 p.p. lower probability of maintaining their initial choice. This is certainly a non-negligible effect, yet our results suggest the presence of strong persistence in individuals' choices even in the presence of new information. Ideally, if individuals were constrained only by the availability of information we would have expected a much larger effect. From column (1) of Table 7 we also observe that the choice of track is in "flux". Indeed, some student characteristics predict choice updating over and above the information provided by Arianna. Interestingly enough almost all categories of immigrant students are more likely than natives to revise their pre-test choices. This is very interesting and should be object of further study. A similar pattern is also observed by parents' education: students with low educated parents are more likely to change their initial choice.

Column (1) of 7 gives us some useful insights into the factors which are associated with individuals' updating their choices conditional on the new information they acquired from Arianna. Yet from the model in equation (2) it is not possibile to know in what direction individuals do revise their pre-enrollment intentions, that is whether they "upgrade" or "dowgrade" their initial choices. Thus, we considered two pairwise comparisons: (i) upgrading the initial choice, that is moving towards a more academic track, vs. maintaining the initial choice; (ii) dowgrading the initial choice, that is moving towards a less academic track, vs. maintaining the initial choice. We estimated accordingly the following model

$$y_i = \beta_0 + \beta_1 CONSERVATIVE_i + \beta_2 RISKY_i + \beta_3 x_i + \varepsilon_i \tag{2}$$

where now y_i is in column (2) of table 7 a dichotomous variable taking value one in case of upgrading and zero in case individuals persisted in their initional intentions, and in column (3) a dichotomous variable taking on value one in case individuals downgraded their initial choice and zero if they mantained it. On the right-hand-side of the equation, the discordance varible ($DISCORDANCE_i$) is now split into two distinct dummy variables: $CONSERVATIVE_i$ which

is equal to one in case the individual made a "conservative choice" (see the previous section) and zero otherwise, and *RISKY* which is equal to one in case the individual made a "risky choice" and zero otherwise. The reference group are individuals who according to Arianna are well matched with their initial choice. It is worth stressing that column (2) uses only the sample of individuals who are "at risk" of downgrading their choices, that is it excludes individuals whose initial intentions was to enroll in vocational training. Column (3), by contrast, includes only the individuals who are "at risk" of upgrading their choices, that is it excludes students who initially planned to enroll in *licei* (L) or are in the mixed category either L or OL, for which choice upgrading cannot be defined.

Column (2) of table 7 shows that individuals who received an advice of "risky intentions" are 19.8 p.p. more likely to downgrade their choice. Column (3) shows instead that receiving an advice of "risky intentions" is associated to a -11.2 p.p. lower probability of upgrading the initial choice and receiving an advice of "conservative intentions" is associated to a 20.1 p.p. higher probability of upgrading. Thus, this result seems to confirm that individuals are sensitive to the information provided by Arianna in both directions, that is both when they made too optimistic and when they made too pessimistic choices.

Since there might be some substantial heterogeneity in the responste to Arianna's advice according to individuals' observable characteristics, in the next section we will estimate a model with interaction terms between the "discordance" variables and students' origins and socio-economic backgrounds in order to assess who is more likely to revise his/her choice in response to the newly available information.

5.3. Who does make use of the new information?

The marginal effects commented in this section are obtained using probit models similar to those reported in table 7 but including interaction terms between discordance variables and individuals' parental education in Figure 1 and immigrant background in Figure 2. The top of Figure 1 clearly shows a monotonic decreasing effect of scaling down the initial choices with parents' education after receiving a signal of "risky intentions". Children of parents with post-secondary education whose intentions were assessed as risky have a 11 p.p. higher probability of scaling down their choice than matched students with equally educated parents. Marginal effects are 20 p.p. and 28 p.p. for children of parents with upper secondary education and up to lower secondary education, respectively. This suggests that students coming from advantaged

Table 7: Determinants of the revision of enrollment intentions after the test - Probit model (marginal effects)

Variables	(1) *Maintaining* pre-test intention	(2) *Downward* revision	(3) *Upward* revision
Intentions unmatched with test results	-0.188***		
	(0.0158)		
Discordance (ref. Intention matched with test results)			
Conservative intentions		-0.0192	0.201***
		(0.0235)	(0.0286)
Risky intentions		0.198***	-0.112***
		(0.0169)	(0.0268)
Gender (female)	0.0221*	-0.0278**	0.0336
	(0.0125)	(0.0125)	(0.0246)
Origin and regularity (ref. Native, regular)			
Native, deleyer	-0.187***	0.246***	-0.0512
	(0.0354)	(0.0384)	(0.0486)
1st generation, regular	-0.128***	0.117***	0.0340
	(0.0384)	(0.0398)	(0.0556)
1st generation, 1y delayer	-0.171***	0.176***	0.00988
	(0.0358)	(0.0404)	(0.0511)
1st generation, 2ys or more delayer	-0.331***	0.388***	0.0946
	(0.0893)	(0.0852)	(0.170)
2nd generation, regular	-0.166***	0.158**	0.0142
	(0.0617)	(0.0635)	(0.0902)
2nd generation, delayer	-0.172	0.208	-0.108
	(0.168)	(0.174)	(0.148)
Parents' education (ref. Post-secondary ed.)			
don't know	-0.187***	0.184***	-0.121***
	(0.0176)	(0.0143)	(0.0401)
Up to lower-sec. education	-0.241***	0.239***	-0.147***
	(0.0255)	(0.0252)	(0.0331)
Secondary education	-0.159***	0.131***	-0.0732**
	(0.0206)	(0.0177)	(0.0331)
Test taken in the final year of lower-sec. school	0.0410*	-0.0364*	-0.133***
Pre-test intentions	(0.0215)	(0.0207)	(0.0221)
Year dummies	Yes	Yes	Yes
Observations	4,487	4,035	1,421
Pseudo R-squared	0.1044	0.1432	0.0836

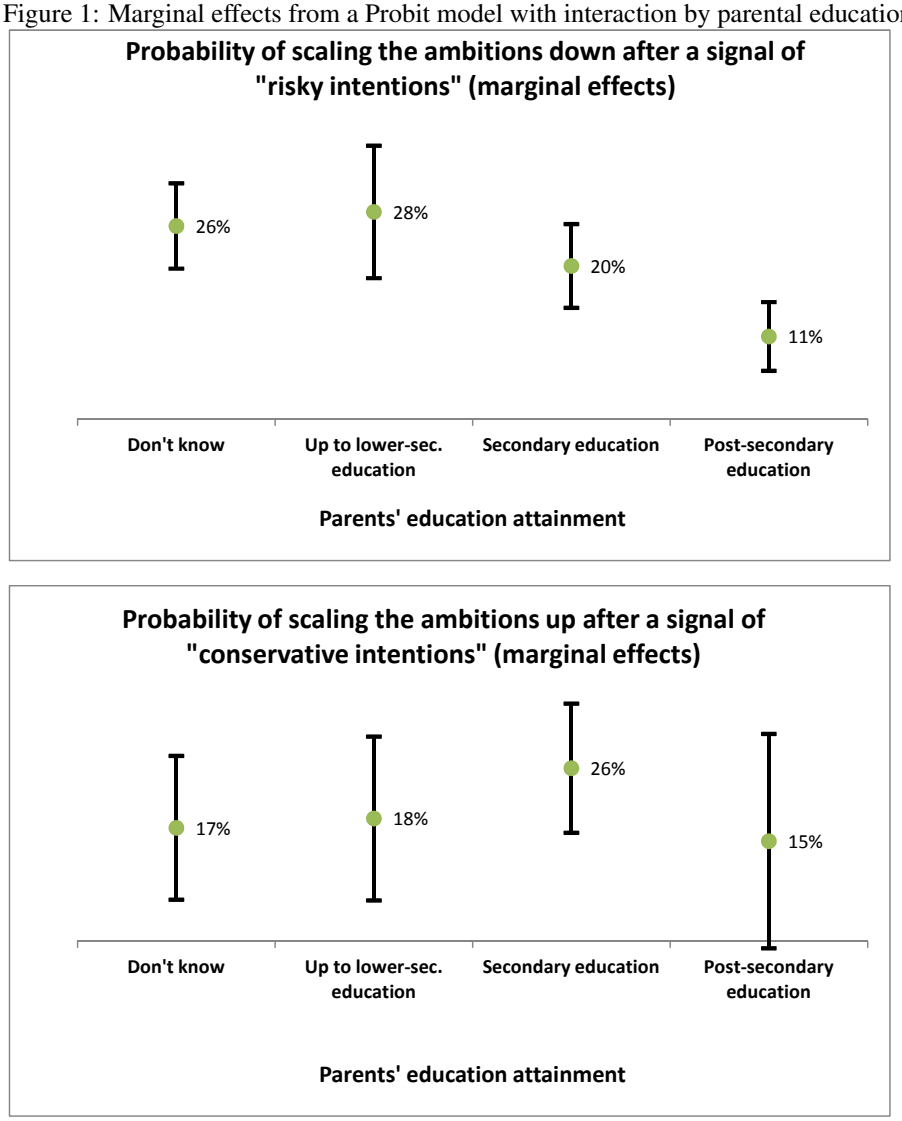
***, **, * significant at the 1%, 5% and 10%, respectively.

Note: The dependent variables take value one in case individuals mantained their choices (column 1), downgraded their choices (column 2) and upgraded their choices (column 3). Column 2 excludes individuals who declared vocational traininig as their pre-enrollment choice and column 3 excludes individuals who specified *licei* (L) as their initial choice. Robust standard errors in parentheses (clustered by school and year).

socio-economic backgrounds are more persistent in their choices, even after new evidence on the fact that they may be mismatched becomes available. As long as students' families play a crucial role in the choice of the upper secondary track, we can infer that highly educated parents tend to be over-confident; i.e. they still think that their children are endowed with a better potential than what is assessed through the Arianna's test. An alternative explanation would suggest that highly educated parents are particularly sensible to considerations related to the "social status" associated with each of the upper secondary tracks. In any case, highly educated parents are likely to think they will be able to provide additional inputs into the educational production function of to their children (e.g. remedial education) which may help them to succeed. The bottom part of Figure 1 reveals that students with less advantaged backgrounds are relatively more likely to revise upward their choice when they receive a signal pointing to a possible waste of academic potential ("conservative intentions"). Marginal effects are 18 p.p., 26 p.p. and 15 p.p. for parents with up to lower secondary schooling, upper secondary schooling, and tertiary education, respectively. This may reflect a comparatively lower risk aversion or a comparatively less binding credit constraints for secondary educated parents. Interestingly, as children with highly educated parents have a little probability to show "conservative intentions", we cannot estimate an upward response that is significantly different from zero for this small group of students.

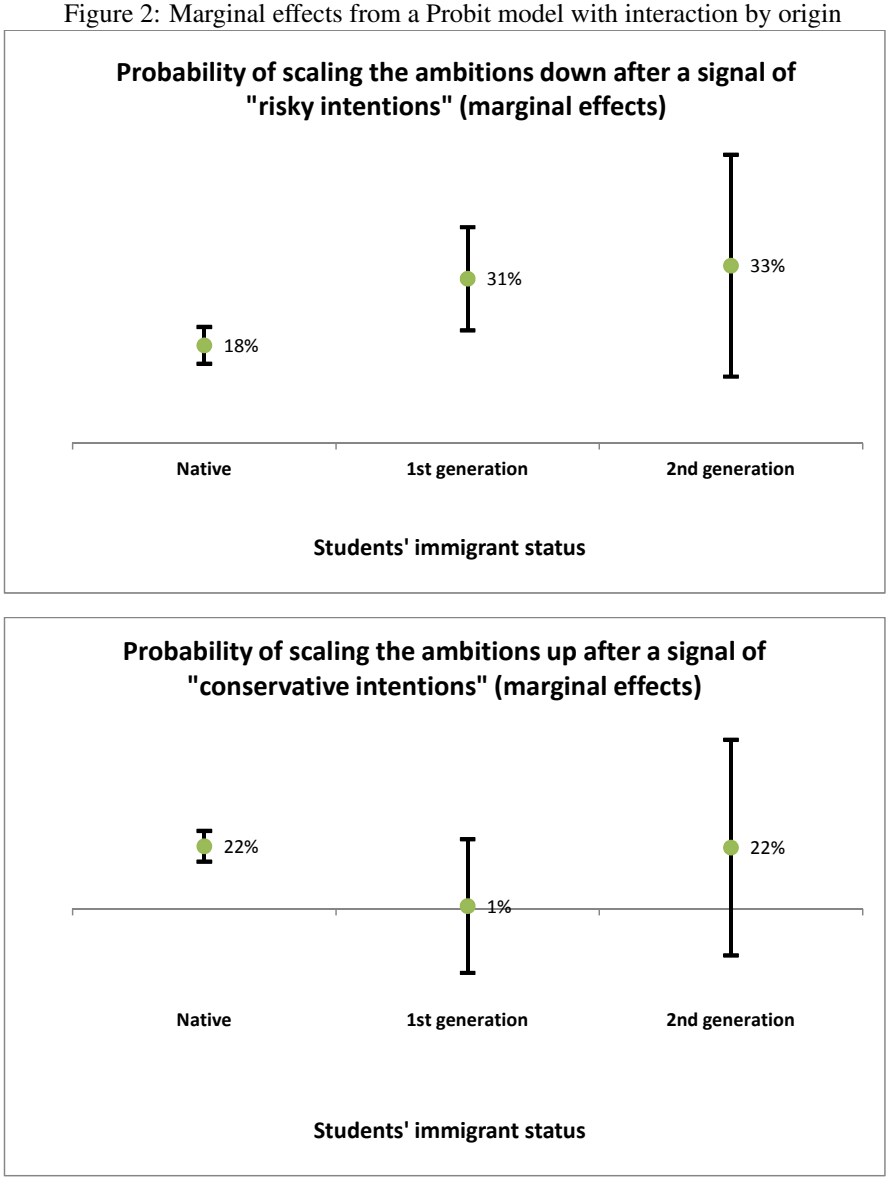
The marginal effects from the probit model with interaction terms by origin are reported in Figure 2. In this case, to avoid too small cell sizes, we had to consider only three groups (native, 1st generation immigrants and 2nd generation immigrants), but we controlled separately for the regularity in the course of study as captured by the student age. As regards the probability of scaling the intentions down in case of "risky intentions", we observe a higher responsiveness of immigrant students with respect to native students. Native students who received an advice of "risky intentions" have a 18 p.p. higher probability to downgrade their choice compared to matched students. Marginal effects are 31 p.p. and 33 p.p. for 1st and 2nd generation immigrants, respectively. However, the large within-group heterogeneity and the small group size makes point estimates for immigrant students less precise than that for native students. Similarly, as regards the probability of scaling the intentions up in response to a signal of "conservative intentions", we find a significant probability only for natives (22 p.p.), with imprecise estimates for immigrants.

Figure 1: Marginal effects from a Probit model with interaction by parental education



Note. The reference group are students matched with Arianna's advice.

Figure 2: Marginal effects from a Probit model with interaction by origin



Note. The reference group are students matched with Arianna's advice.

6. Concluding remarks

In tracked educational systems, the choice of school track is a crucial moment of a student's career, as it is strongly associated with her future labor market outcomes. Yet there are few studies esplicitly analyzing the process through which students and their parents make this choice, and whether they have all the relevant information they need.

We exploit unique data for an Italian municipality (Turin), which collected a wealth of information on students' and parents' characteristics and their enrollment intentions during lower

secondary schooling, and on a standardized test assessing both cognitive and non-congnitive skills (Arianna project), aimed at providing further support for students' and parents' choices. First, we investigate the factors which are associated with the students' pre-test intentions, and of these intentions to be mismatched with respect to Arianna's conseil. Second, after observing the students' actual choices of school track, we investigate whether students (and their families) update them in response to the newly available information.

Our analysis shows that the Arianna project is indeed a valuable resource for students and their parents. Students who were judged to have made too conservative or too risky choices with respect to what was adviced by the Arianna conseiling services are more likely to change their initial choice. We also show that students with high socio-economic status tend to be more persistent in their choices than students with a less priviledged background. We find similar evidence as for immigrant status. Indeed immigrants tend to be more sensitive to information provided by Arianna than native students.

Our findings suggest overall that conseiling services based on standardized tests may provide new useful information on students' ability, and not to simply replicate the signals that students and parents receive by teachers. These services may be particularly valuable to increase the efficiency of the school track choice of individuals who are potentially at a higher risk of poverty and social exclusion, such as children with low educated parents or immigrants, especially in systems where teacher recommendations are not binding.

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Appendix. Supplementary tables

Table 8: Determinants of sample attrition, Probit model (marginal effects)

Variables	*Missing (1) / Not missing (0)*
Gender (female)	0.00478
	(0.00409)
Origin (Non-Italian parents)	0.0170**
	(0.00684)
Age (ref. 13)	
12	-0.00171
	(0.00631)
14	0.172***
	(0.0169)
15	0.338***
	(0.0341)
Parents' education (ref. Post-secondary ed.)	
don't know	0.00543
	(0.00591)
Up to lower-sec. education	0
	(0.00603)
Upper secondary education	-0.00200
	(0.00612)
Cognitive test score	0.000956
	(0.00213)
Casual vs Intentional	0.00137
	(0.00150)
Risk Lover vs Risk Averse	0.000175
	(0.00122)
Competitive vs Collaborative	-0.000779
	(0.00165)
Test taken in the final year of lower-sec. school	-0.0119***
	(0.00392)
Observations	7,187
Pseudo R-squared	0.398

***, **, * significant at the 1%, 5% and 10%, respectively.

Note: The dependent variable takes value one in case an individual does not appear in the matched dataset (attrition) and zero otherwise.

Table 9: Sample summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Test score - overall	12967	2.677132	0.535045	0.404762	3.808791
Test score - logic	12967	3.198096	0.739514	0.166667	4
Test score - language	12931	2.653989	0.777495	0.1	4
Test score - symbolic calculus	12890	3.138571	0.798553	0.133333	4
Test score - spatiality	12927	2.65485	0.800308	0.1	4
Test score - strategy	12447	1.509426	0.730618	-0.04798	3.8
Casual vs Intentional	12951	6.097753	1.386316	0	9
Risk Lover vs Risk Averse	12951	5.766813	1.443927	0	9
Competitive vs Collaborative	12951	6.937534	1.665235	0	9
Gender - female	12967	0.50775	0.499959	0	1
Origin and regularity					
Native, regular	12603	0.812108	0.390641	0	1
Native, delayer	12603	0.061493	0.240243	0	1
1st generation, regular	12603	0.050544	0.219072	0	1
1st generation, 1y delayer	12603	0.045624	0.208677	0	1
1st generation, 2ys or more delayer	12603	0.008728	0.093019	0	1
2nd generation, regular	12603	0.018805	0.135841	0	1
2nd generation, delayer	12603	0.002698	0.051872	0	1
Parents' education					
don't know	12967	0.246549	0.431018	0	1
Up to lower-sec. education	12967	0.173672	0.378842	0	1
d_educ_par 3	12967	0.288656	0.453155	0	1
Secondary education	12967	0.291124	0.454298	0	1
Wave					
2008	12967	0.200586	0.400454	0	1
2009	12967	0.202129	0.401603	0	1
2010	12967	0.276471	0.44727	0	1
2011	12967	0.320814	0.466808	0	1
Test taken in the final year of lower-sec. school	12967	0.522789	0.4995	0	1

Table 10: Gender differences in pre-test enrollment intentions

School type	*Male*	*Female*
Classic / Scientific Lyceum (L)	52.05	47.95
Human Sciences / Language / Art / Music Lyceum (OL)	22.2	77.8
Either L or OL	31.89	68.11
Technical Institute (TI)	72.48	27.52
Professional Institute (PI)	57.17	42.83
Vocational Training (VT)	55.27	44.73
Don't know	51.84	48.16
Total	50.06	49.94

Table 11: Pre-test enrollment intentions by origin

School type	*Native*	*1st generation immigrant*	*2nd generation immigrant*
Classic / Scientific Lyceum (L)	90.04	8.13	1.83
Human Sciences / Language / Art / Music Lyceum (OL)	88.76	9	2.24
Either L or OL	86.03	11.9	2.07
Technical Institute (TI)	79.97	16.72	3.31
Professional Institute (PI)	84.13	13.98	1.9
Vocational Training (VT)	79.62	16.54	3.85
Don't know	77.25	19.48	3.27
Total	84.21	13.31	2.48

Table 12: Pre-test enrollment intentions by parents' educational attainment

School type	*Post secondary education*	*Upper secondary* education	*Up to lower-sec. education*	*Don't know*
Classic / Scientific Lycecum (L)	43.42	26.25	9.06	21.28
Human Sciences / Languate / Art / Music Lyceum (OL)	22.09	32.73	17.35	27.82
Either L or OL	33.17	30.26	15.41	21.16
Technical Institute (TI)	11.59	34.99	24.57	28.86
Professional Institute (PI)	7.5	27.36	34.6	30.54
Vocational Training (VT)	6.55	18.91	41.45	33.09
Don't know	14.9	23.41	22.51	39.17
Total	24.91	27.23	18.89	28.97

Table 13: Pre-test enrollment intentions by regularity in the course of study

School type	*1 year ahead*	*Regular*	*1 year delayer*	*2 year (or more) delayer*
Classic / Scientific Lyceum (L)	5.8	87.92	5.66	0.63
Human Sciences / Languate / Art / Music Lyceum (OL)	3.44	87.23	8.67	0.65
Either L or OL	5.11	83.03	10.16	1.7
Technical Institute (TI)	2.79	78.5	16.1	2.62
Professional Institute (PI)	2.29	70.19	21.94	5.58
Vocational Training (VT)	2.92	54.74	33.21	9.12
Don't know	2.71	74.96	17.87	4.46
Total	3.92	80.48	12.95	2.65

Table 14: Pre-test enrollment intentions by regularity in the course of study

School type	*1 year ahead*	*Regular*	*1 year delayer*	*2 year (or more) delayer*
Classic / Scientific Lyceum (L)	5.8	87.92	5.66	0.63
Human Sciences / Language / Art / Music Lyceum (OL)	3.44	87.23	8.67	0.65
Either L or OL	5.11	83.03	10.16	1.7
Technical Institute (TI)	2.79	78.5	16.1	2.62
Professional Institute (PI)	2.29	70.19	21.94	5.58
Vocational Training (VT)	2.92	54.74	33.21	9.12
Don't know	2.71	74.96	17.87	4.46
Total	3.92	80.48	12.95	2.65

Table 15: Pre-test enrollment intentions and cognitive/non-cognitive abilities

	Cognitive abilities *Average Std. test score*						*Non-cognitive abilities*		
School type	*Overall*	*Logic*	*Language*	*Simbolic*	*Spatiality*	*Strategy*	*Casual vs. Intentional*	*Risk Lover vs. Risk adverse*	*Competitive vs. Collaborative*
L	0.46	0.32	0.33	0.40	0.34	0.24	6.26	5.93	7.06
OL	-0.03	0.02	0.05	-0.03	-0.07	-0.13	6.10	5.74	6.97
Either L or OL	0.12	0.09	0.11	0.11	0.07	0.00	6.12	5.86	6.94
TI	-0.04	-0.02	-0.08	-0.05	0.00	-0.02	5.92	5.58	6.81
PI	-0.57	-0.41	-0.39	-0.52	-0.42	-0.26	5.81	5.45	6.69
VT	-0.84	-0.66	-0.57	-0.69	-0.70	-0.30	5.60	5.22	6.58
Don't know	-0.27	-0.20	-0.22	-0.23	-0.19	-0.12	5.91	5.55	6.85
Total	0.00	0.00	0.00	0.00	0.00	0.00	6.04	5.70	6.91

Table 16: Definition of discordance between pre-test intentions and Arianna's advice

Discordance	**test suggestions**	**pre-test intentions**
Conservative intentions	L (lyceum)	OL, TI, PI, VT
	SL / OL / TI	PI, VT
	OL / TI	PI, VT
	TI / PI	VT
	PI	VT
	IP / VT	VT
Matched intentions	L (lyceum)	L, either L or OL
	SL / OL / TI	L, either L or OL, OL, TI
	OL / TI	either L or OL, OL, TI
	TI / PI	TI, PI
	PI	PI
	IP / VT	PI, VT
	VT	VT
Risky intentions	OL / TI	L
	TI / PI	L, either L or OL, OL
	PI	L, either L or OL, OL, TI
	IP / VT	L, either L or OL, OL, TI
	VT	L, either L or OL, OL, TI, PI

Table 17: Defintion of choice revision after observing Arianna's advice

Revision	**pre-test intentions**	**enrollment choice**
Downgrade choice	L	OL, TI, PI, VT
	either L or OL	TI, PI, VT
	OL	TI, PI, VT
	TI	PI, VT
	PI	VT
Maintain choice	L	L
	either L or OL	L, OL
	OL	OL
	TI	TI
	PI	PI
	VT	VT
Upgrade choice	OL	L
	TI	L, OL
	PI	L, OL, TI
	VT	L, OL, TI, PI