SciencesPo
LABORATOIRE INTERDISCIPLINAIRE
D'ÉVALUATION DES POLITIQUES PUBLIQUES

LIEPP Working Paper

January 2017, nº63

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Gender, information barriers and fields of study choice: a field experiment

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Abstract
In this article we propose and test a novel explanation for the segregation of women in less rewarding fields of study in tertiary education that focuses on the lack of knowledge of the profitability of different fields, a mechanism that has arguably received limited attention in previous research. We frame this explanation in the context of research that emphasizes the role of gender-stereotypical curricular preferences and occupational plans for gender differences across fields, and we argue that school counseling can play a crucial role in either reinforcing or countering these mechanisms by providing students with transparent information about returns to educational investments. To test this hypothesis we carried out a field experiment which confronted a random sample of over 9000 Italian high school seniors with detailed information concerning the profitability of fields of study and the vocational alternatives to college. Contrary to the claim that girls are less career-oriented than boys, we found that the former were much more reactive to this information initiative. Indeed, this intervention substantially improved the occupational prospects of the girls by reducing their overrepresentation in weak fields and by enhancing their participation in vocational HE as an alternative to leaving the educational system after high school graduation. These findings support the hypothesis that information barriers fuel gender inequality in educational choices and suggest that light-touch, cost-effective counseling interventions that provide all students with the same information can have significant gender-equalizing effects.

Keywords
Gender segregation; field experiment; information; higher education

1. Introduction

Given the strong relationship between education and labor market outcomes in industrialized countries, education is regarded as the key to reducing social inequalities. It is therefore striking that, despite the reversal of the gender gap in educational attainment (Di Prete, Buchmann 2013), women continue to experience systematic disadvantages in the labor market in terms of earnings and career opportunities, even when they attain college degrees (Bobbitt-Zeher 2007; England 2005). These gender inequalities are created and maintained by a complex configuration of factors that involve both supply- and demand-side processes (Buchmann et al. 2008; Ridgeway, Correll 2004). However, it is widely agreed that part of the explanation lies in gender segregation in education and in the labor market because women major in fields that typically lead to less remunerative jobs (Bobbitt-Zeher 2007; Gerber, Schaefer 2004). There is indeed compelling evidence for Europe and North America that gender segregation in Higher Education (HE) is highly resistant to change and that it contributes to gender inequalities in the labor market (Mann, Di Prete 2013; Barone 2011; Charles, Bradley 2009; England, Li 2006).

Understanding the mechanisms that drive gender segregation in HE is therefore a major theoretical challenge with significant policy implications. Unfortunately, while the detailed patterns across time and space of gendered field of study choices have been extensively described, much less is known about the underlying mechanisms. As discussed below, empirical research has found that certain potential candidates, such as gender differences in math performance and in work-family orientations, do not account for gender segregation across fields; however, less progress has been made in the direction of providing fully fledged explanations.

In this article, we propose and test a novel explanation for gender segregation in HE that focuses on the misperceptions of economic returns to fields of study, a mechanism that has arguably received limited attention in previous research. We frame this explanation in

the context of research that emphasizes the role of gender-stereotypical curricular preferences and occupational plans for gender differences across fields (Morgan et al. 2013; Wiswall and Zafar 2015), and we argue that school counseling can play a crucial role in either reinforcing or countering the influence of these misperceptions. In school contexts, gender differences most often remain in the background (Correll, Shelley 2001). Hence, if counseling activities only emphasize the importance of "genuine" self-expressive career preferences, they reinforce gender-stereotypical preferences, thus perpetuating the overrepresentation of girls in occupationally weak fields (Cech 2013). Conversely, if girls and boys are explicitly invited to consider also the career implications of their field of study preferences, their choices will have a better fit with labor market demands, and the segregation of girls in less rewarding fields will be reduced. Girls are more often undecided as to whether to choose less rewarding fields and are thus more reactive to information concerning the limited profitability of such fields. We rely on dual-process theories to argue that the degree of instrumental rationality of educational decisions is highly responsive to the availability of relevant information.

To support these arguments, we present the results of a field experiment conducted in Italy which confronted high school seniors with detailed information concerning the occupational profitability of fields of study. This intervention targeted both male and female students and provided information not only about earning differentials between fields but also about the related risks of unemployment, overeducation and horizontal skill mismatch. Moreover, this counseling initiative delivered information about vocational alternatives to college. Contrary to the claim that girls are less career-oriented than boys, we found that the former were much more reactive to this information initiative. Indeed, this intervention substantially improved the occupational prospects of the girls by reducing their overrepresentation in weak fields and by enhancing their participation in vocational HE as an alternative to leaving the educational system after high school graduation. These findings support the hypothesis that information barriers fuel gender inequality in educational choices

and suggest that light-touch, cost-effective counseling interventions that provide all students with the same information can have significant gender-equalizing effects.

2. The debate over gender differences in field of study choice

Previous research has extensively documented that the basic contours of gender segregation in HE display some remarkable similarities across western countries (Charles, Bradley 2002, 2009; Barone 2011). Specifically, women are systematically underrepresented in engineering and computing and, to a lesser extent, in physics and math; they are overrepresented in the humanities and the social sciences[1] and, to a lesser extent, in medicine and other health-related fields; life sciences, law, business and economics are generally more gender-balanced.

Gender segregation across fields of study in HE warrants attention for several reasons, for instance because it reduces gender diversity in educational and occupational settings. However, if we focus on its the implications for gender inequalities in the labor market—as we do in this work—it must be noted that not all forms of gender segregation in HE drive gender inequalities in the labor market: much depends on labor market returns to tertiary fields. These can vary to some extent across industrialized countries, but again some systematic patterns can be detected, namely, the humanities and the social sciences perform poorly in terms of unemployment rates, earnings, and risks of overeducation and skill mismatch, while engineering, computing and medicine tend to perform above the average (Reimer et al. 2011; Davies, Guppies 1997). This implies that the relationship between gender segregation in HE and gender inequalities in the labor market is to a significant extent driven by the underrepresentation of women in engineering and computing and by their overrepresentation in the humanities and the social sciences.

[1] In this article, we use a restrictive definition of "social sciences" that includes sociology, communication studies and political science, but not law nor economics.

Moreover, it is broadly agreed that the stubborn resilience of gender segregation in HE reflects the persistence of gender essentialist stereotypes, which are seen as compatible with mandates for formal equality between genders (Charles, Bradley 2009). Gender essentialism thus promotes gender biases in the set of skills, preferences and beliefs that are socialized, internalized, and performatively enacted as cultural scripts (Correll 2004).

With regard to gender differences in skills, a common explanation for women's underrepresentation in more rewarding fields refers to achievement gaps at earlier points in the educational career (Ceci, Williams 2010). This argument is consistent with rational choice theory, which argues that individuals maximize the chances of success of educational investments. However, empirical research reports poor empirical support for this hypothesis (Riegle-Crumb et al. 2012; Morgan et al. 2013; Hedges et al. 1995). This is unsurprising because the gender gap in math has considerably narrowed in recent cohorts, while gender segregation in HE has changed little[2] (Xie, Shauman 2005).

Less empirical evidence is available concerning an alternative explanation of gender disparities in HE, namely, the competitive advantage hypothesis (Jonnson 1999). If students select the field of study in which they have a comparative advantage in terms of academic performance, then female students on average are more likely to choose fields that reward verbal abilities, such as the humanities and the social sciences. This hypothesis has been formulated in the context of rational choice theory, but it should be noted that it relies on the questionable assumption that girls favor less rewarding fields, even when they possess the mathematical skills to succeed in more economically rewarding, math-intensive fields. It is doubtful that this

[2] A more refined argument states that boys are overrepresented in the upper tail of the distribution of math performance, which is strongly predictive of enrollment in STEM fields (Ellison, Swanson 2010), but again, research reports little in the way of supporting evidence (Xie, Shauman 2005). As noted by Legewie and Di Prete (2014), extreme performance involves too few people to provide an adequate explanation for gender differences in major choice.

assumption can be easily reconciled with a utility-maximization approach (Barone 2011).

A more plausible explanation refers to gender differences in perceived skills. According to Correll (2001, 2004), cultural beliefs about gender can bias student perceptions of personal competence. Accordingly, she reports that, after controlling for objective measures of ability, girls underestimate their mathematical skills relative to boys. These gender-biased self-assessments to some extent mediate gender differences in the selection of a quantitative college major. Correll also provides experimental evidence of a gender-differentiated double standard for attributing performance to ability, which differentially biases the way male and female undergraduate students assess their own competence at career-relevant tasks, controlling for actual ability.

A different set of explanations revolve around gender differences in career preferences. One argument refers to work-family orientations. In particular, women would opt for less rewarding fields because they are more family-centered and thus attach lower value to career prospects or other extrinsic rewards and higher importance to family conciliation (Ridgeway 1998). However, gender differences in career orientations have narrowed in recent cohorts, and the remaining differences fall short of explaining the gender gap in field of study choice and in pay (Konrad et al. 2000; Bobbitt-Zeher 2007). Moreover, these arguments are difficult to reconcile with the substantial gender integration that has occurred in the legal and business professions, which can be demanding in terms of work-time arrangements, as well as with the overrepresentation of women in nursing, social work, and the medical professions, which often entail highly flexible work schedules. A second argument relates to the curricular and occupational preferences of high school seniors. When measured with sufficient detail to allow for “horizontal differences” between school subjects and occupations, these preferences appear to be strong predictors of college major choice and important mediators of gender differences in college choice (Morgan et al. 2013). For instance, girls

more often display a preference for humanistic subjects (e.g., literature, psychology) and for related jobs (e.g., teacher, psychologist) which promotes enrolment in the humanities and the social sciences (Cech 2013; Morgan et al. 2013).

To summarize, empirical evidence does not support the hypothesis that a lack of relevant skills or ambition prevents girls from enrolling in more rewarding fields. At the same time, there are indications that gender essentialism affects both the self-assessments of these skills and the qualitative patterns of educational and occupational preferences, which contribute to the overrepresentation of girls in less remunerative fields.

These gender-biases in self-assessments and career plans should not be merely regarded as psychological mechanisms, but rather as the product of institutionalized practices that promote gender inequality (Correll 2001; Ridgeway, Correll 2004). Throughout educational and career exploration processes, parents, teachers and school counselors tacitly encourage girls and boys to pursue different pathways into the labor market (Jacobs 1995). For instance, it is documented that gender differences in course-taking in high school also reflect social control mechanisms that operate through the gender-biased recognition of the 'talents' and preferences of male and female students on the side of adults, as well as through peer pressure (Gabay-Egozi et al. 2015; Frank et al. 2008). Furthermore, there is evidence that school-level differences in curricular and extra-curricular activities display substantial effects on gendered field of study choices (Legewie, Di Prete 2012, 2014). Hence, there are growing indications that counseling and other school activities may mediate the influence of gender stereotypes on educational choices. In line with this literature, in the next section we rely on dual-process theories to argue that counseling activities can activate different types of decision-making processes that have a different impact on gender biases in college choice.

3. Dual-process theories, information biases and field of study choice

Gender-stereotypical beliefs and choices are typical instances of the fast, automatic and intuitive Type 1 processes of human cognition and decision-making that are identified by dual-process theories (Evans, Stanovich 2013). In contrast, Type 2 processes involve slow, controlled, deliberative thinking and consequentialist models of decision-making. The distinction and the interplay between these two types of processes have become the focus of much interest in contemporary research on decision-making processes, especially in social cognition studies that assess the role of cognitive biases and stereotypes (Chaiken, Trope 1999).

Type 1 processes make minimal demands on working memory resources and are thus routinely activated without controlled attention, while deliberative thinking dispositions place a much higher load on our cognitive resources and are thus activated only under specific circumstances. Using a variety of methods, including qualitative observations, experiments and neural imaging, dual-process researchers have extensively documented that individuals display a relentless tendency to rely on intuitive, heuristic mechanisms instead of engaging in analytical processes (Kahnemann, 2011). Even when individuals are confronted with novel problems for which they lack relevant experience and information, their default strategy is not to engage in systematic processes of information gathering and processing. Instead, they rely on the information that is more readily available in their immediate environment, and they process it by means of simplified heuristic devices. Dual-process research also indicates the specific conditions under which more reflexive Type 2 decision-making processes are activated (Kroneberg 2005; Kroneberg Kalter 2012). A first condition relates to motivation: when the decisions that are involved are high-stakes, deliberative processes are more likely. However, most often, motivation in itself has been found to be insufficient: if individuals do not have easy access to simple and transparent information, they resort to more stereotyped heuristics.

Dual-process theories thus entail a situational perspective on the classical dichotomy between rational and irrational behavior that pervades sociological debates, including the debate between rational choice and culturalist explanations for gender segregation, which was illustrated in the previous section. More specifically, we can expect that, in the absence of accurate information concerning the long-term career consequences of field of study choices, students are more likely to rely on simplified heuristics that mobilize self-expressive curricular preferences and aspired occupations that are highly gender-stereotyped (Cech 2013). However, when they are confronted with clear and pertinent information about these career consequences, they will attach more importance to them. Hence, educational choices are responsive to both self-expressive preferences that concern academic disciplines and their related occupations and assessments that concern prospective economic rewards. The availability of reliable information concerning the latter reinforces their decisional gradient.

Moreover, girls are more likely to be affected by the availability of this type of information. This is because in the case of boys, intrinsic preferences for technical disciplines and related occupations overlap with extrinsic considerations concerning their profitability, while the intrinsic preferences of girls more often involve humanistic and social science disciplines and occupations, which have lower profitability. Moreover, for boys, the informal pressures from significant others (parents, peers, teachers, counselors) are aligned with the objective incentives to invest in STEM fields, whereas for girls there is a mismatch between these pressures and the profitability of gender-stereotypical fields. Therefore, girls are more often undecided as to whether to choose these “weak” fields. Accordingly, receiving simple and accurate information concerning their poor labor market prospects should be more consequential for girls: such information tips the balance in favor of more rewarding fields, and if this information comes from a reliable source it also works as an argumentative resource that girls can mobilize when they discuss their college plans with significant others. These theoretical arguments thus lead to the counterintuitive expectation that providing all students with infor-

mation about occupational returns to tertiary fields will reduce the overrepresentation of girls in less rewarding fields. Then, if information can make the difference, universalistic, light-touch counseling initiatives can nudge gender desegregation in HE.

4. The Italian educational system and gender segregation in HE

In this section, we establish the background to present our counseling intervention and the related experimental results. First, we briefly describe the main characteristics of the Italian educational system and the weaknesses of existing counseling activities; then, we illustrate the available evidence for Italy with regard to gender segregation in HE and in the labor market.

In Italy, primary and lower secondary education is comprehensive and lasts between the ages of 6 and 14. Upper secondary education comprises academic tracks (*licei*), technical tracks (*istituti tecnici*), and vocational tracks (*istituti professionali*). All of these tracks require five years to complete and provide access to HE in any field, regardless of previous school performance[3]. However, universities often impose selective entry examinations, which can be more or less demanding across tertiary fields; for instance, medicine and other health-related fields are highly selective (Anvur 2016).

Italian HE comprises a large university sector and a small but growing sector of two-year vocational programs. College education involves three-year bachelor courses and two-year master courses. In Italy, field of study choice mostly occurs at the bachelor level, and mobility between fields in the transition to master courses is relatively uncommon. With regard to postsecondary vocational education, it is highly fragmented, but the main option consists of two-year work-study programs (*istituti tecnici superiori*) that offer a combination of

[3] The governance of the educational system is relatively centralized, and the differences between high schools or universities in terms of socio-economic composition and educational resources are smaller than they are in some Anglo-Saxon countries.

theoretical and practical training. They offer curricula in selected fields that have a high demand for technicians in local labor markets. Graduates from these programs enjoy positive occupational prospects relative to both high school graduates and bachelor's graduates in weak fields (Indire, 2014; Almalaurea 2015). However, these courses were only introduced in 2011, and they currently enroll a small number of students. Therefore, students are often unaware of this option.

In Italy, school-based college advising mainly offers broad overviews of the contents of college curricula. Students have limited access to figures concerning differences between fields in terms of academic selectivity and labor market outcomes, and they have even lower opportunities to assess the data regarding occupational returns to college degrees against comparable information concerning high school diplomas. As in other western countries (Charles, Bradley 2009), the emphasis of counseling activities is instead on self-expression, self-realization and personal development. Similarly, universities propose counseling initiatives that mainly focus on university curricula, while they deliver scant, opaque and often unreliable information with regard to employment perspectives and economic returns to fields of study (Abbiati, Barone 2016).

However, fields of study differences in labor market outcomes are substantial (Almalaurea 2015). Bachelor degrees in the humanities and social sciences, where girls are overrepresented, offer modest occupational returns over high school diplomas; the competitive advantage of these fields is small, even in graduate education and when looking at long-term outcomes. Conversely, engineering and computing, where boys are overrepresented, as well as medicine and other health-related fields, enjoy strong labor market prospects.

Finally, it should be noted that in Italy, the qualitative pattern and the strength of gender segregation in HE display great similarity with the patterns that have been observed in Europe and North America, although the underrepresentation of women in engineering is particularly strong (Charles, Bradley 2009; Barone 2011). Vertical and horizontal gender segregation in the labor market is quite pronounced in

Italy, although it is somewhat less than in other western countries, due to selection effects that are driven by the low rate of female labor market participation (Charles, Grusky 2004). However, in the younger cohorts, the activity rate of female graduates is aligned with those observed in other economically developed countries (Oecd 2016). Overall, the main patterns of the relationship between gender, fields of study and labor market outcomes in Italy have much in common with those observed in other western countries, particularly in younger generations.

5. The main features of the experiment

In this section, we first present the overall experimental design; then, we illustrate the contents of the information initiative, the data collection design and, finally, we discuss the internal and external validity of this experiment.

5.1 Experimental design

We ran a multi-site clustered randomized controlled trial that involved all of the senior students of 62 high schools, from all types of upper-secondary tracks. The schools are located in four provinces (Milan, Vicenza, Bologna, and Salerno) that cover different areas of the country to enhance the external validity of our study. We first drew a random sample of schools proportionally stratified by province and school track. This procedure resulted in 31 pairs of schools that belong to the same province and school track. We invited these schools to participate in the project, and only four of them refused; these were easily replaced with schools of the same province and track. Then, we randomly assigned one school of each pair to the treatment and the other to the control status. No school left the experiment after we communicated the results of the randomization.

5.2 Treatment design

The experimental treatment provided senior students with detailed information concerning the profitability of educational options, that is, their costs, academic selectivity and occupational prospects, with particular attention to differences between fields of study and between college and postsecondary vocational programs.

We met each single class separately on three occasions for a total of six hours. All of the meetings occurred during school hours to maximize student participation. Indeed, treatment compliance was high: 90.4% of the treated students attended at least two meetings. The meetings were held by community workers that routinely work with the schools. The research team extensively trained and briefed them.

In the first hour of the first meeting (October 2013), students filled out a questionnaire concerning their family and school background, as well as their beliefs about college education and college plans. Then, the educators introduced the project and explained that its main goal was to help them carefully consider the pros and cons of different options after high school graduation. It was stressed that the project was not intended to encourage any specific choice, but rather to deliver reliable and detailed information that students could incorporate in their decisions about college. Finally, the educators provided some detailed figures concerning college costs and opportunities for financial aid in order to invite all of the students, regardless of the economic situation of their families, to consider the information about college and vocational programs to be delivered in the next two meetings. The estimates concerning college fees and grants were personalized, that is, they referred to the specific economic situation of each student and to his or her preferences for specific universities.

The second meeting (February 2014) was the core of this counseling intervention. The students were confronted with figures on occupational returns to college degrees in comparison with the prospects of high school diplomas. The differences between fields of study across undergraduate and graduate programs were stressed, with a focus on

four indicators of occupational returns: first job search duration, net monthly salary, risks of over-education and horizontal mismatch.

In the third meeting (March 2014), the educators reiterated the main messages of the previous meetings concerning the financial accessibility of college education and the labor market differences between fields. Then, they delivered information about dropout risks across fields of study for different student profiles, defined by gender, parental education, school track and previous academic performance. Finally, the educators provided information about the vocational sector of HE in terms of available study opportunities and related occupational prospects.

These materials were based on high-quality data collected by the National Statistical Office (*Istat*) that are available for recent cohorts of students. We used statistical modeling to control for selection into different educational programs and to compute the predicted values for different student profiles. These statistical results were then summarized into simple messages using visual formats that were suitable for power-point presentations in the classroom. For instance, the educators first showed the figures displaying detailed comparisons between fields of study for each of the four above-mentioned occupational indicators. Then, they summarized these differences using a three-step scale with occupationally weak fields at the bottom (the humanities and the social sciences), strong fields at the top (engineering, computing, medicine and other health-related fields), and the remaining fields (economics, law, math, physics, and life sciences) in an intermediate position. We focused on this simplified, three-step occupational hierarchy between fields because it is robust across undergraduate and graduate studies as well as across occupational indicators. This basic pattern is well-established in the empirical literature concerning the Italian case (Almalaurea 2015) as well as other western countries (Reimer et al. 2011), thus enhancing the generalizability of our findings.

It should be stressed that this information initiative was not specifically targeted to female students, nor did it specifically aimed to re-

dress gender inequality in HE or in the labor market. In fact, in the pilot study we confronted students with information on labor market returns to fields of study by gender, and we realized that this information input was shifting the focus of the meetings to gender discrimination in the labor market, which was not the purpose of this initiative. Moreover, it should be noted that, while female graduates face poorer labor market prospects than their male counterparts across all tertiary fields, the magnitude of this gender gap is highly similar across fields, and the above-described three-step hierarchy of occupational profitability does not vary by gender. Therefore, we decided not to disaggregate by gender the statistical data on returns to fields of study. The educators mentioned that women experience systematic disadvantages in the labor market, but stressed that returns to fields are similar for men and women.

At the same time, when we designed this intervention, we made sure that our presentation of returns to tertiary fields accommodated a broad range of (gendered) occupational preferences. Hence, instead of focusing exclusively on earnings, we also stressed differences involving the skill profile of occupational destinations, using indicators of overeducation and skill mismatch.

Overall, this information initiative explicitly encouraged students to compare educational options with respect to their costs, benefits and chances of success, rather than focusing only on self-expressive preferences that, as argued above, can be a powerful driver of gender-stereotypical choices. To be sure, the educators did not promote a purely instrumental model of college choice either, not the least because having a genuine interest in a discipline is a key to college success. Instead, the message was that, if a student was interested in two or more fields, assessing their career prospects could help to resolve his or her indecision[4].

[4] The control students did not receive any placebo for both ethical reasons and feasibility constraints.

5.3 Data collection

Longitudinal data concerning the students' initial college plans and final college decisions were collected among treated and control students before and after the information treatment. The first wave was conducted at the beginning of the school year (October 2013), and it involved self-administered questionnaires in the classrooms; the response rate was 99%. The second wave occurred at the end of the school year (May 2014), after the treatment but before the opening of university registration. This wave was based on telephone interviews, and it assessed whether treated and control students had updated their college plans differently; the cumulative response rate was 82.8%. The third wave was conducted in November 2014 and recorded the students' final college decisions by means of telephone interviews; the cumulative response rate was 79%, which was virtually identical for treated and control students (78.9% and 79.1%, respectively). Overall, the high level of participation of schools and students in the experiment and in the longitudinal survey ensures high external validity for our study.

Moreover, using data from the first wave, we compared the two groups before the treatment across a large number of individual and contextual predictors of college choice, and we could never reject the null hypothesis that the two distributions come from the same population[5]. Overall, we would maintain that equivalence between the two groups, their identical attrition rates, as well as the absence of

[5] We tested the equivalence between the two groups by regressing the characteristic to be tested on the result of the randomization (treated/control). We used OLS regression for the continuous variables (grades in high school) and logistic regression for the categorical variables (gender, province, country of birth, parental education, parental occupation) and we incorporated controls for the two sampling stratification variables (school track and province). The results are reported in table A1 in the appendix.

treatment substitution or contamination; ensure also high internal validity for our study[6].

5.4 Modeling strategy

The primary outcome of interest for our analyses is field of study choice among students who attend college. We will assess the effects of the treatment on enrollment in both occupationally weak fields (the humanities and social sciences) and strong fields (engineering, computing, medicine and other health-related fields). To reiterate, the main focus of this study is not on gender segregation per se, but rather on gender differences across fields that drive gender inequalities in the labor market. However, we will also provide some estimates with regard to the impact of the counseling intervention on the overall level of gender segregation in HE, as measured by the dissimilarity index.

Moreover, we will consider the effects of the treatment on taking undergraduate college entrance exams in different fields. The counseling initiative may have modified the field preferences of treated students but, due to the ability barriers of college tests, these effects may not carry over into actual enrollments. College tests are widespread across fields, but they are less common in the humanities and social sciences, while they are compulsory in some highly rewarding fields, such as medicine and other health-related fields. In wave 3, we collected information about applications to college exams in different fields. We can thus assess the treatment effects on applications to different fields against treatment effects on actual enrollments.

[6] In the second wave of the longitudinal survey, we asked control students whether they had received any specific information about the profitability of college degrees in relation to our project. Only 3.3% of control students answered positively. With regard to the risks of treatment replacement, we conducted interviews with the school counselors of treated and control schools to map the counseling activities that were organized in the school year in which the treatment was implemented and in the year before. No school of the control group reported any activity that overlapped with the treatment.

Furthermore, we will supplement these analyses concerning behavioral outcomes with the results regarding the impact of the treatment on student knowledge of the career prospects of different fields to assess whether the treatment effectively corrected student misperceptions. Finally, we know that, as an alternative to bachelor's courses, upper secondary graduates may opt for postsecondary vocational education. Therefore, we will assess whether the treatment also affected this outcome.

Our main independent variable (T) is a dummy for treatment status that marks the students from the treated schools. To gain statistical power, in all of the models we incorporate the two sampling stratification variables, province (*P*) and high school track (*S*), as well as study intentions in wave 1 (*I*)[7]. Hence, for individual *i* attending school *j* in province *k*, the general equation that underlies all of the models takes the following form:

$$y_{ijk} = \alpha + \beta T_j + \gamma P_k + \delta S_j + \sigma I_i + \varepsilon_{ijk} \quad (1)$$

Standard errors are clustered at the school level.

6. Results

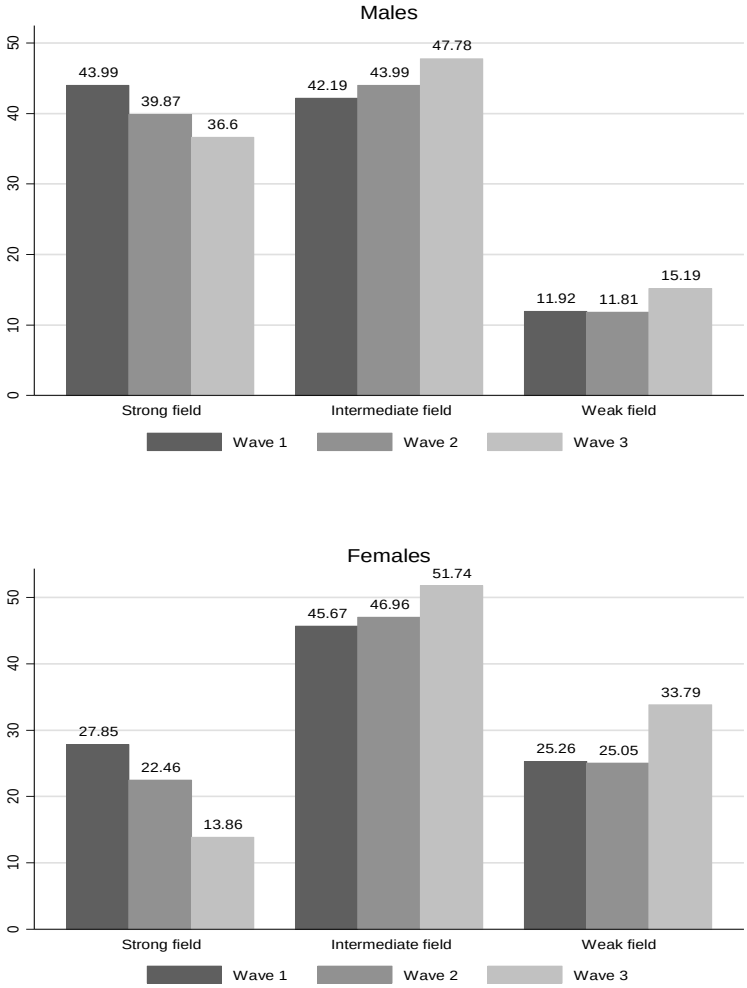
6.1 Descriptive results

In this section, we present some descriptive analyses concerning the pattern of gender differences in field preferences and their evolution over time among the students of the control group, that is, in the absence of the treatment. These analyses provide the background for the experimental results that are presented in the next section. Figure 1 refers to variations across waves in the field preferences of male and female students of the control group who enrolled in college. As is illustrated above, the data for waves 1 and 2 refer to intended field

[7] We measured college plans using two questions. First, we asked students whether they planned to go to college or to pursue vocational training. Second, we asked them in which field of study they would enroll.

choices at the beginning and end of the high school senior year, while wave 3 refers to the actual decisions of the students. For fields of study, we use the threefold classification described in section 5.2; however, we will also comment on some more detailed patterns within these three categories.

Fig.1 Variation over time of preferences by gender (control group)



As seen, we observe a marked decline over time of strong fields and a corresponding increase of intermediate and weak fields for both male and female students. Hence, the field preferences at the beginning of the senior year (wave 1) are more ambitious than the actual decisions (wave 3). This trend is definitively more pronounced for girls: 27.9% of girls initially planned to choose a strong field, but only 13.9% finally chose one. This decline is twice as large as the corresponding decline observed among the boys (from 44% to 36.6%). Conversely, the share of girls who enroll in a weak field (33.8%) is considerably higher than the share of girls who initially planned to do so (25.3%); among the boys, we detect a much smaller increase (+3.3%). Hence, the gender gap in access to rewarding fields of study widens substantially over the senior year.

If we inspect the variations in the detailed field of study preferences between waves 1 and 3 (Fig. A1 in the appendix), we find that both the humanities and the social sciences attract an increasing share of students, particularly among girls (+3.2% and +5.3%, respectively, for girls). With regard to the contraction of strong fields, engineering and computing actually increase for both genders. For both men and women, the decrease of strong fields is driven by medicine (-10.8% for girls and -8.3% for boys) and other health-related fields (-4.9% and -1.2%). These are the fields that entail the most selective entrance exams. Because the girls initially more often planned to choose them, they are more often forced to redirect their preferences towards other fields. Hence, these selective entrance exams are a first mechanism that drives the widening of the gender gap.

However, this is only part of the story. The figures upon which we have thus far commented only refer to the aggregate distributions of field preferences. Hence, they say nothing about the flows between fields. A cross-tabulation of final field choices (wave 3) by initial field preferences in wave 1 (tab. A2 in the Appendix) reveals that only 39% of the girls who intended to enter a strong field succeeded, as opposed to 66.4% of the boys. This reflects the greater initial preference of girls for medicine and health-related fields and their lower

preference for engineering. However, there is a second important gender difference in the flows between fields: among the girls who were initially interested in intermediate fields, 20.5% finally opted for a weak field (10% for boys) and only 5.8% opted for a strong field (13.3% for boys). Hence, a significant share of the girls who had expressed interest for more rewarding fields ultimately chose the more gender-stereotypical and less rewarding fields.

At the same time, if we take a closer look at initial preferences, we detect a considerable degree of fluidity. When expressing their field preferences in wave 1, the students could indicate up to three fields, and the pattern of their multiple initial preferences is revealing. Table 1 classifies field preferences at the beginning of the school year according to the number and type of field options that are mentioned by the students.

Tab. 1 – Number and type of field preferences expressed in wave 1 by gender (only students who enrolled in wave 3)

	Male	Female	Total
No preference	**1.5**	**1.1**	**1.3**
Certainly strong	**19.7**	**8.2**	**13.0**
1 preference	*8.7*	*3.0*	*5.4*
2 preferences	*6.6*	*3.1*	*4.5*
3 preferences	*4.4*	*2.1*	*3.1*
Certainly intermediate	**22.2**	**22.3**	**22.3**
1 preference	*10.2*	*9.0*	*9.5*
2 preferences	*6.8*	*8.7*	*7.9*
3 preferences	*5.2*	*4.6*	*4.9*
Certainly weak	**4.9**	**11.8**	**8.8**
1 preference	*1.9*	*4.6*	*3.4*
2 preferences	*1.6*	*3.7*	*2.8*
3 preferences	*1.4*	*3.5*	*2.6*
Undecided between weak and other fields	**17.2**	**30.2**	**24.7**
1 weak + 1 strong	*1.3*	*1.6*	*1.5*
1 weak + 1 intermediate	*3.0*	*7.8*	*5.8*
1 weak + 1 intermediate + 1 strong	*4.1*	*5.5*	*4.9*
1 weak + 2 intermediate	*4.2*	*6.7*	*5.6*
1 weak + 2 strong	*0.9*	*1.4*	*1.2*
1 intermediate + 2 weak	*3.1*	*6.2*	*4.9*
1 strong + 2 weak	*0.6*	*1.0*	*0.8*
Undecided between intermediate and strong fields	**34.5**	**26.3**	**29.8**
1 intermediate + 1 strong	*10.9*	*8.2*	*9.3*
1 intermediate + 2 strong	*10.1*	*7.8*	*8.8*
1 strong + 2 intermediate	*13.5*	*10.3*	*11.7*
N	1,878	2,578	4,456

As expected, the boys more often indicated only strong fields ("certainly strong") and the girls more often indicated only weak fields ("certainly weak"). Most importantly, the table reveals a high degree of uncertainty in student preferences: more than half of both the male and the female students were undecided between fields that differ substantially in their economic prospects. Crucially, more often than boys, the girls considered the alternative between a weak field and a more rewarding field (30.2% vs. 17.2%). In particular, this gender difference almost entirely reflects indecision between a weak field and an intermediate field. Conversely, the boys were more often undecided between the intermediate and the strong fields; however, this gender gap was much smaller (34.5% vs. 26.3%).

This pattern of initial gender differences sheds light on the flows between fields commented above. On the one hand, large numbers of male and female students were forced by the entrance exams to change their initial preferences medicine and other health-related fields; however, the boys more often had a second preference for engineering or for an intermediate field, and we know that they moved more often into these fields. On the other hand, the girls were more often undecided between an intermediate and a weak field, and indeed the comparison between initial intentions and final decisions revealed marked flows between them. Overall, these descriptive analyses reveal a high degree of indecision and interchangeability about college choices in student preferences among fields that differ in their profitability. The question is whether students are aware of these differences and whether providing relevant information affects their final decisions. The next section provides some answers to these questions.

6.2 Experimental results

The first two lines of Table 2 refer to the effects of the treatment on field of study choices. As seen, the treatment reduced enrollments in weak fields by 3.1%. If we consider that the share of control students

who enrolled in these fields is 14.5%, we can conclude that this effect size is far from negligible. Most importantly, if we estimate the treatment effects separately for male and female students, we find that they are even stronger for girls (-5.2%), while for boys they are negligible (-0.3%) and not statistically significant. Moreover, if we formally test the null hypothesis that the difference between treatment effects for the girls and the boys is zero, we obtain a p-value of 0.06. Hence, there is evidence that the treatment reduced the gender gap in access to weak fields.

However, treatment effects on access to strong fields are smaller and non-significant. The main treatment effect is in the expected direction (+1.8%) and there are some indications also in this case that the girls were more reactive to the treatment (+2.5%) than the boys (1.3%). If we consider that the share of girls of the control group who enrolled in strong fields is 13.9%, the effect for girls is sizeable, but the gender differential in treatment impact does not reach statistical significance (p-value: 0.22). We do not report the treatment effects for enrollment in intermediate fields because they are redundant, but the clear implication is that the main impact of the treatment was to redirect the girls from weak to intermediate fields (+3%), while it was less effective in channeling them into strong fields. We cannot formally test for treatment effects for specific fields due to constraints of statistical power, but if we inspect these field-specific shifts by means of dichotomous contrasts, we find that the treatment redirected the girls out of both the humanities (-2.8%) and social sciences (-2.7%), and that the most attractive fields were economics (+2.6%), education and psychology (+2.8%), engineering and computing (+1,4%) and health-related fields (+1,4%). Because these fields are less feminized than the humanities and social sciences, the treatment reduced the overall level of gender segregation across fields. In particular, the dissimilarity index for a detailed twelve-fold classification of fields of study is lower among treated students (0.26) than among the controls (0.31).

Moreover, we estimated treatment effects for the subpopulation of the students who were initially undecided between a weak field and an intermediate or strong field. As reported in table 2, the departure from weak fields (-5.7%) was twice as strong as the main treatment effect for the whole population of college students (-3.1%). This is consistent with our expectation that the counseling intervention would have a greater effect on the choices of students who were open to considering multiple field options. Interestingly, if we look at the point estimates, this conclusion applies more to the girls (-6%) than to the boys (-3%), but the test for the difference in treatment effects is not statistically significant (p-value: 0.53). However, our main point is not that undecided girls are more reactive than undecided boys, but rather that indecision about weak fields is more widespread among girls. Even if among these undecided students the treatment was equally effective for girls and boys, we know from the previous section that the girls were much more often undecided between a weak and an intermediate field. Hence, due to a compositional effect, the treatment necessarily more often channeled the girls from weak to intermediate fields.

Table 2 also reports treatment effects on college entrance exams. One potential explanation for the limited treatment effects on enrollment in strong fields relates to the descriptive results presented in the previous section. We know that access to medicine and other health-related fields is highly selective, and even if engineering and computing less often have a *numerus clausus*, their math-intensive entrance exams are highly challenging. Therefore, one could suspect that there was no effect on access to strong fields because the treatment persuaded some students to enroll in these fields, but these students did not pass the entrance exams. However, our analyses do not indicate that girls were screened out of strong fields by entrance exams. We can see that the treatment did not cause girls to apply more to admittance tests in strong fields (+0.6%). At the same time, Table 2 indicates that the treatment had a negative effect on applications to admittance tests in weak fields (-1.6%) and that this effect was particularly strong for girls (-4.4%). The pattern for applications to admit-

tance tests thus closely reproduces the results concerning actual enrollments, which suggests that access barriers did not weaken treatment effects to any significant extent.

Table 2 - Effect of the treatment on field of study choices

	Overall	Males	Females
Enrollment in weak fields	-3,1**	-0,3	-5,2***
Enrollment in strong fields	1,8	1,3	2,5
Enrollment in weak fields: students undecided between a weak field and another field	-5,7%*	-3%	-6%**
At least one test in a strong field	0,6	0	1,4
At least one test in a weak field	-1,6**	0,5	-4,4***
Enrollment in postsecondary vocational education	+1,5**	+0,7	+2,2*

Note: * p<0.1; ** p<0.05; *** p<0.01

Finally, the last row of Table 2 indicates that the counseling intervention had an additional effect: it raised participation in postsecondary vocational education. The main effect of +1.5% is statistically significant and, given the low share of control students who enrolled in these programs (4%), it is a substantial effect. Moreover, the girls were more reactive to the treatment (+2.2%) than the boys (+0.7%) also in this respect. Hence, among students with a low academic orientation, the girls were more inclined to exploit information about educational alternatives to labor market entry, possibly because girls tend to rely more on educational credentials for labor market success (Jonsson 1999).

Overall, we conclude that the treatment had two important beneficial effects. First, it improved the occupational prospects of the students both by reducing their presence in weak fields and by increasing their participation in vocational HE. Second, it improved the relative prospects of the girls over the boys in both respects.

Let us comment on the results of two robustness analyses that are reported in the appendix (Table A3). First, the models for field of study choice reported in Table 2 only refer to the students who con-

tinued to college because, by definition, gender segregation across field involves only students who attend college. Accordingly, previous research has focused on college students. However, it is important to control that the pattern of results is the same for unconditional models that refer to the whole sample of students, regardless of college attendance. In these models the reference outcome is leaving the educational system, and the four alternative outcomes are continuing to college in i) weak fields; ii) intermediate fields; iii) strong fields; or, alternatively, iv) pursuing vocational HE. Of course, these models conflate continuation to college with field of study choice, but they are more rigorous than conditional models in terms of causal inference, because they do not entail any selection of the initial samples of treated and control students. However, it turns out that the specification of conditional or unconditional models does not affect our conclusions: we find with both specifications that the students were redirected from weak to intermediate fields, and that this effect was much stronger for the girls[8]. Second, using Average Treatment estimates on the Treated (ATT), instead of Intention-To-Treat (ITT) estimates, does not affect our results. This was expected because we know that treatment compliance was high.

Finally, in Table 3 we assess some competing explanations for the above treatment effects on fields of study choices. A first possibility is that girls and boys had different initial levels of information about the profitability of different fields and thus benefitted differently from the counseling intervention. This hypothesis is not supported by our analyses. At the end of the senior school year (wave 2), we assessed student expectations of career opportunities across different fields using this format: “It is easier to find a job with good career opportunities for a graduate in technical fields (engineering, computing) than for a graduate in the natural sciences (e.g., biology, chem-

[8] The similarity of the results between conditional and unconditional models reflects the fact that the treatment did not have an impact on the overall college enrollment rate nor on the related gender differentials (results available upon request).

istry).” The students had to express their agreement on a 10-point scale, and we submitted to them four dichotomous contrasts between field clusters that reflect our threefold classification in strong, intermediate and weak fields. Table 3 reports the mean agreement scores and the percentages of ratings that were below 6 for male and female students. As seen from the first two columns, a substantial minority of control students disagreed that the pure sciences offer better career prospects than the humanities (23.4 and 24.1%, respectively, for male and female students) or social sciences (36.3% and 36.4%). There was also limited awareness technical fields are more rewarding than the pure sciences (19.2% and 19% of disagreement). Hence, in the absence of the treatment, the students reveal limited awareness of field differentials in career prospects. This applies equally well to girls and boys: the initial information biases were not gender-differentiated.

A second hypothesis is that the girls more strongly internalized the contents of the information initiative because they paid more attention during the meetings; we know from the literature that they are more disciplined and active at school (Di Prete, Buchnan 2013). The third and fourth columns of Table 4 show that treated students agree more often that technical fields offer better prospects than the natural sciences and that in turn the latter are in a better position than the humanities and social sciences. Hence, they internalized the threefold hierarchy of profitability between the fields more than control students. However, we can see in table 3 that treated male and female students were equally receptive. This undermines the interpretation of treatment effects that refers to a gender-differentiated internalization of the messages of the counseling initiative.

Table 3 – Beliefs and choice criteria. Descriptive evidence and effect of the treatment

	Control students Mean values (and % of ratings below 6)		Effect of the treatment		
	Male	Female	Male	Female	P-value of the difference
In Italy it is easier to find a job with good career opportunities for…					
… a graduate in technical fields than for a graduate in natural sciences	6.8 (19.2)	6.9 (19.0)	0,35***	0,29***	0,510
…a graduate in natural sciences than for a graduate in the humanities	6.7 (23.4)	6.7 (24.1)	0,4'***	0,51***	0,212
…a graduate in natural sciences than for a graduate in social sciences	6.0 (36.3)	6.0 (36.4)	0,51***	0,56***	0,43
…a graduate in natural sciences than for a graduate in economics and law	5.0 (58.3)	5.1 (55.0)	0,11	0,20***	0,257
When deciding what to do after leaving school, how important to you are the following considerations…?					
The difficulty of studying at university	6.4 (27.6)	6.3 (29.1)	0.02	-0,06	0,444
The possibility of having a good career	7.4 (10.9)	7.6 (9.1)	-0.07	-0.07	0.060
The cost of studying at university	6.4 (26.9)	6.7 (24.6)	-0.23***	-0.33***	0.214

Finally, a third possibility is that the treatment encouraged students, and particularly female students, to be more instrumental in their educational decisions. To assess this possibility, in wave 2 we asked treated and control students to indicate the importance that they attached to the three decision-making criteria: the costs, career prospects and chances of success of educational investments. First, our findings show that, in the absence of the treatment (columns 1 and 2), the girls and the boys attached similar importance to these criteria. If anything, the girls regarded career opportunities as a slightly more relevant criterion, a finding that contradicts explanations for gender segregation that stress a lack of ambition of girls. Second, the treatment reduced student concerns about college costs, but it did not impact on the career orientations of either the girls or the boys. Hence, the girls of the treatment group did not become more career-

oriented. Overall, gender differences in the initial beliefs and decision-making criteria, as well as in the related treatment effects, are small to negligible. What made a difference between male and female students was instead the propensity to make use of our information inputs, which was higher among the girls. Because girls were more often undecided about weak fields, this information was far more relevant to their choices. This explains why our "universalistic" counseling initiative produced gender-differentiated impacts.

7. Concluding remarks

This study has proposed and tested a novel explanation for the overrepresentation of girls in less rewarding fields of study, namely the lack of information concerning their occupational prospects. We argued that girls and boys are often undecided between two or more fields that offer different career prospects. If college advising fails to provide students with reliable information about these career prospects, students are likely to rely on oversimplified choice heuristics that solely focus on their preferences for subject matter or "dream occupations." Because the gender-bias of these self-expressive preferences is seldom questioned in school contexts, students are thus led to reproduce gender-stereotypical patterns of college choice.

However, we have seen that girls and boys also attach importance to the economic profitability of different fields. However, this does not imply that they will look for relevant and reliable information. Following dual-process theories, we argued that in the absence of pertinent information, their default strategy is instead to mobilize gender-stereotyped decision-making mechanisms. Conversely, if students receive detailed and reliable information concerning field of study differentials in the labor market, they will make use of it. Crucially, girls are more often undecided than boys between a weak field and a more rewarding field. Therefore, they are more reactive to information about career prospects, which will tip the balance in favor of more rewarding fields.

To test this explanation, we designed a field experiment that provided students with reliable information about the profitability of different educational options both in college education and in postsecondary vocational programs. We confronted the students with personalized, ready-to-use information inputs concerning the costs and occupational returns of different options, as well as the chances to succeed in different fields. To accommodate the heterogeneity of occupational preferences, we presented figures on earnings prospects, as well as on the risks of unemployment, overeducation and skill mismatch.

The level of participation in our study of the schools and the students was high and the students interiorized the main messages of the treatment. Moreover, this experiment has high internal validity (equivalence between the two groups, identical attrition rates, absence of treatment substitution or contamination). Hence, the comparison between treated and control students allows for genuine causal inferences concerning the impact of information barriers on college choices.

The results of our analyses indicate that information barriers fuel the overrepresentation of girls in less rewarding fields. Among treated students, enrollments in less rewarding fields declined to the advantage of more rewarding fields. Crucially, this treatment effect was entirely driven by the girls; therefore, their overrepresentation in weak fields was reduced. Because these fields are highly feminized, the overall level of gender segregation was also reduced. Moreover, the students who did not continue to college enhanced their participation rates to vocational programs. Again, this treatment effect was entirely driven by the girls. Overall, we may thus conclude that a lack of information about HE programs prevents girls from undertaking more ambitious and rewarding educational investments.

Contrary to the widespread claim that girls are less career-oriented than boys, we found that they are more responsive to information about career prospects. To put it bluntly, give girls more reliable information, and they will make more ambitious choices. Our results

indicate that male and female students have similar career orientations, similar beliefs about HE and a similar propensity to interiorize the messages of the counseling initiative; the key difference is that girls more often consider the alternative between a weak field and a more rewarding field, and they are thus more penalized by information barriers. The weaknesses of college advising thus fuel the segregation of girls in less rewarding fields.

The main policy implication of our study is that improving the quality of college advising can promote a more efficient and equitable allocation of students between tertiary programs. This conclusion is in line with some previous information experiments that focused on the causal effect of information on overall enrollment rates and the related social origins differentials (Bettinger et al., 2009; Loyalka et al., 2013; Oreopoulos and Dunn, 2013). Our study suggests that information barriers can also drive gender inequalities in education and in the labor market and that removing these barriers can thus promote a more efficient distribution of students across fields to the advantage of girls. On the one hand, this type of information initiative has the potential to reduce the overcrowding of weak fields and thus arguably improve the labor market prospects of their graduates, who are more often girls. On the other hand, it can persuade girls to opt for more rewarding fields.

We would argue that this type of information-based college advising has four additional strengths from a policy perspective. First, it is an inexpensive and light-touch intervention that could be easily organized by school teachers or counselors. Second, student behavior is altered without forcing or forbidding any educational option, in line with the definition of nudge proposed by Thaler and Sunstein (2008): the choice frame is simply modified by removing information barriers. Third, this information initiative does not involve any differential treatment: girls and boys receive the same information inputs. Finally, this type of intervention does not attempt to manipulate student preferences. This marks a significant difference from mentoring initiatives promoted by schools and universities that attempt to enhance

girls' interest in math and science or to encourage them to explore STEM fields and related occupations. These initiatives have proliferated in recent years in Europe and North America, but the evidence base supporting their effectiveness is remarkably poor[9]. Their potential is to raise the salience of career options for which girls may fail to give due consideration because the informal pressures of significant others encourage them to pursue more gender-typical options. However, if students' career preferences are shaped by a lifelong immersion in the gender-essentialist stereotypes that are endorsed by parents, teachers and peers, we suspect that they will be barely affected by these extemporaneous initiatives. Instead raising awareness of the likely consequences of college choices for career developments may be a more feasible approach. Of course, information initiatives are not a panacea, and our own results indicate that they can only partially redress gender differences in college choice. Therefore, they should be integrated by more comprehensive actions to raise the awareness of parents, teachers and counselors of gender biases in educational decisions. In turn, educational interventions should be integrated by welfare and labor market policies aimed at promoting equal opportunities of access to different occupations, given that research shows that significant gender differences in occupational outcomes persist when controlling for field of study (Bobbitt-Zeher 2007; Gerber, Schaefer 2004; Smyth, Steinmetz 2008).

It would be interesting to replicate this experiment outside of Italy to assess the generalizability of our findings. We cannot take for granted that this type of intervention would produce similar results in different countries. However, as argued above, the basic patterns of the relationship between gender, fields of study and labor market outcomes in Italy display great similarity with the patterns documented for other western nations. In addition, the gendered patterns of subject matter preferences and career aspirations of Italian high school

[9] For instance, the database of the What Works Clearinghouse does not contain any study that assesses the effectiveness of interventions designed to reduce gender segregation in HE.

students have much in common with those observed in other OECD countries (OECD 2015). However, we would expect more cross-national variation with regard to the contents of counseling activities. For instance, our finding that college decisions are responsive to information about fields of study returns confirms the results reported by Wiswall and Zafar (2015) for American students, but it diverges from the conclusions of the field experiment conducted by Kerr et al. (2014) on Finnish high school students. This is unsurprising when we consider that all high school students in Finland receive systematic information on the career consequences of college choices as part of their school curricula. However, in several western countries, the quality of information about college that is delivered to students is remarkably poor and, perhaps even more importantly, much less uniform across schools (Perna 2008; Aastrup 2007). Therefore, we may expect that in several countries information barriers affect college choice and its gendered patterns.

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Appendix

A. Internal validity analyses

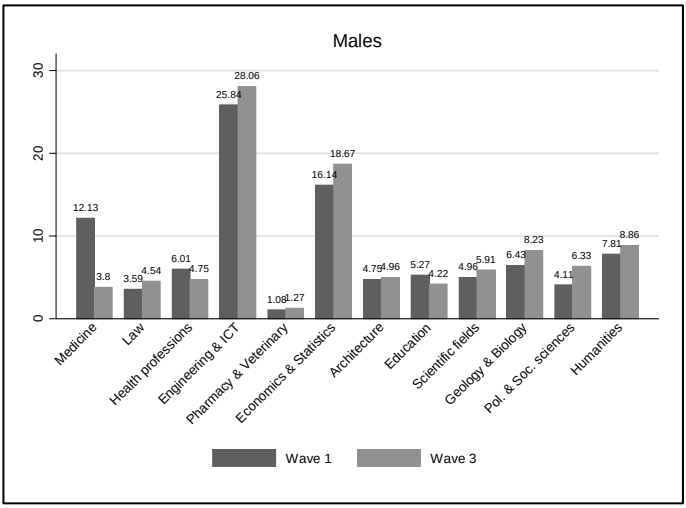
Table A1 shows the distribution of contextual and individual characteristics across the two groups generated by the randomization. We tested their equivalence using statistical models in which Y is the characteristic to be tested and X is the result of the randomization (treated/control). We used OLS regression for continuous variables and logistic regression for dummies, controlling for the two sampling stratification variables (school stream and province).
As seen, the two groups are equivalent: we detect only minor differences in the point estimates, and we never reject the null hypothesis that the two distributions come from the same population.

Table A1 – Baseline equivalence of treated and control students on individual and contextual characteristics

	Controls	Treated	*p value*
Province (%)			
Bologna	12.3	14.2	0.85
Milan	45.3	42.0	0.81
Salerno	24.9	27.7	0.80
Vicenza	17.5	16.1	0.89
Stream (%)			
General, scientific curriculum	26.2	27.2	0.92
General, humanistic curriculum	26.4	20.4	0.53
Technical, business curriculum	20.7	20.2	0.96
Technical, industrial curriculum	9.0	13.0	0.53
Vocational, business curriculum	9.6	10.2	0.92
Vocational, industrial curriculum	8.1	9.1	0.88
Individual characteristics			
Female *(%)*	55.4	47.6	0.31
At least one parent has a tertiary degree *(%)*	22.7	25.7	0.48
At least one parent is in a high-status job (ISCO 1 or 2) *(%)*	31.9	32.8	0.84
Born abroad *(%)*	5.9	7.3	0.27
Average mark in language	6.8	6.7	0.36
Average mark in mathematics	6.9	6.9	0.98
At least one-year repetition *(%)*	21.3	19.9	0.43
N	4,805	4,534	

B. Additional analyses

Fig. A1 - Variation over time of preferences by gender (control group), detailed classification of fields of study



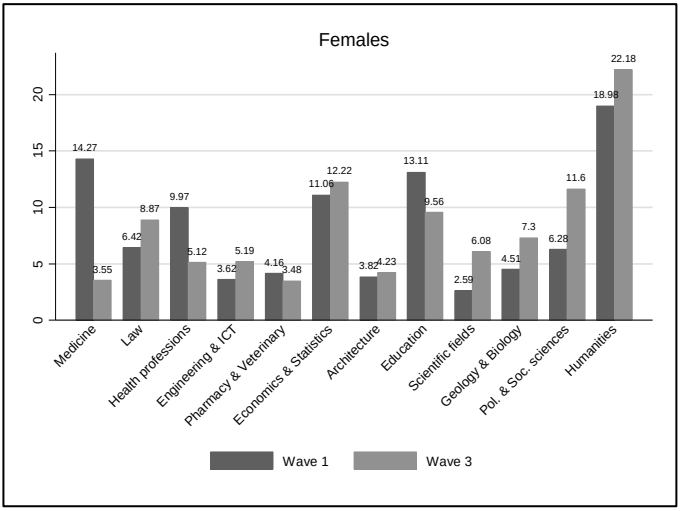


Table A2 – Field choice in wave 3 by field preferences in wave 1 (control group)

	MALES				FEMALES			
	Strong	Intermediate	Weak	N	Strong	Intermediate	Weak	N
Strong field	66.4	27.8	5.8	414	39.0	46.2	14.8	405
Intermediate field	13.3	76.7	10.0	399	5.8	73.6	20.5	668
Weak field	10.7	20.3	69.0	113	1.7	18.9	79.4	365
Total	36.7	48.0	15.3	926	14.1	52.0	33.9	1,438

Table A3 – Treatment effects: ITT and ATT estimates for conditional and unconditional models

	ITT MODELS								ATT MODELS					
	UNCONDITIONAL				CONDITIONAL				UNCONDITIONAL			CONDITIONAL		
	Overall	M	F	P-value differ-ence	Overall	M	F	P-value differ-ence	Overall	M	F	Overall	M	F
Enrollment to weak fields	-2,5**	-1,1	-3,7***	0,149	-2,8**	-0,3	-4,5***	0,061	-2,8**	-1,2	-4,2**	-3,1**	-0,3	-5,2***
Enrollment to strong fields	-0,05	-1,2	1,4	0,113	1,6	1,2	2,1	0,707	0,05	-1,3	1,6	1,8	1,3	2,5
Enrollment to non-tertiary education	1,5**	0,7	2,2**	0,082					1,6***	0,7	2,5***			
At least one test for strong fields	0,9	0,8	1,1	0,876	0,7	0,7	1	0,869	0,7	0,1	1,6	0,6	0	1,4
At least one test for weak fields	-1,5*	0,3	-3,4**	0,003	-1,6*	0,4	-3,6**	0,002	-1,9*	0,4	-4,1***	-1,9**	0,5	-4,4***

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Le LIEPP (Laboratoire interdisciplinaire d'évaluation des politiques publiques) est un laboratoire d'excellence (Labex).
Ce projet est distingué par le jury scientifique international désigné par l'Agence nationale de la recherche (ANR).
Il est financé dans le cadre des investissements d'avenir.

(ANR-11-LABX-0091, ANR-11-IDEX-0005-02)

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