Application for a Unicredit research grant on education

Helping teachers give better track advising to students

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March 27, 2024

Abstract

Every year more than one million EU students receive high-school track recommendations from their teachers. There is no clear evidence that teachers are "good" at providing these recommendations. There is not even a consensus on what constitutes a "good" recommendation. The goal of this project is to establish, using a Randomized Control Trial (RCT) and a well-defined metric based on Principal Stratification Analysis, whether teachers can give "better" recommendations with the assistance provided by algorithmic information based on standardized test scores and specifically designed to help them in performing this task.

1 Information on the project, summary, and budget

1.1 Title, summary and central research question of the project

This project, titled *"Helping teachers give better track advising to students"*, is motivated by the observation that every year more than one million EU students receive high-school track recommendations from their teachers, but there is no clear evidence that teachers are "good" at providing these recommendations. There is not even a consensus on what constitutes a "good" recommendation. Our goal is to establish, using a Randomized Control Trial (RCT) and a well-defined metric based on Principal Stratification Analysis, whether teachers can give "better" recommendations with the assistance provided by algorithmic information based on standardized test scores and specifically designed to help them in performing this task.

1.2 Italian institutional setting and design of the RCT

In Italy students begin high school ("Scuola secondaria di secondo grado") in the 9^{th} grade, after five years of elementary school ("Scuola primaria") and three years of junior high school ("Scuola secondaria di primo grado"). During the month of January of the 8^{th} grade, parents must decide the high school that they want their children to attend in the following year. Each high school belongs to one of three main tracks: vocational ("scuole professionali"), technical ("istituti tecnici") and academic ("licei"). Before taking this decision, parents receive a track recommendation ("Consiglio di orientamento finale sul percorso di formazione da intraprendere nel secondo ciclo"). This recommendation is not binding.[1]

The RCT will consist in randomly extracting from the population of schools in the provinces of Firenze, Livorno, Grosseto e Trento. two sets of treated and control schools. In treated schools, teachers at the beginning of the 8^{th} grade will be offered the algorithmic information about students, based on standardized test scores, described below in Section 1.4 and 2.1. Control schools will operate without interference, as they do in the current institutional setting. We will then monitor students' educational decisions and performance after receiving their non-binding track recommendation, starting with their performance in the Invalsi test and in the final exam at the end of the 8^{th} grade. We will later record their high school enrollment decisions in the 9^{th} grade and also every step of their subsequent educational and professional history.

To assess the power of our RCT within the sample of schools available in the provinces that we consider (see Section 3.4), we rely on Dutch registry data for the period 2014-1016.[2] This institutional context is convenient because Dutch elementary school teachers give a first high school track recommendation to students who later take a standardized test (the CITO test). If the students score in this test above a cutoff of a higher track with respect to the one that was initially recommended to them, the elementary school teacher must re-evaluate them for a possible upgrade, although upgrading is not mandatory. Without entering into details to save on space, we exploit this Dutch setting to estimate parameters that are analogous to the ones we will estimate for Italy, and we conduct a power calculation based on these estimates. The result of this calculation is that 70 schools, each one enrolling about 60 students, would be sufficient to detect, with enough statistical precision, an effect of receiving the algorithmic information on the probability that a teacher recommends the"correct" high track to a student of at least 5%. Therefore, the available schools in the provinces that we consider (see Section 3.4) should be sufficient for our RCT.

[1] The Presidential decree of 14 maggio 1966, n. 362 states that schools must provide "un consiglio di orientamento sulle scelte successive dei singoli candidati, motivandolo con un parere non vincolante."

[2] The database of the Dutch National Cohort Study on Education (NCO) can be accessed at this link (for documentation in English see here).

The statistical and theoretical frameworks that guide this experiment are explained in the Research Proposal described in Section 2.

1.3 Duration of the project and its timeline

The estimated duration of the project is 3 years, an its timeline, assuming that the grant will be awarded by May 15, 2024, is as follows.

- July, 2024 – August, 2025:
  - Construction, based on public data files provided by the *Istituto Nazionale per la Valutazione del Sistema Educativo di Istruzione e Formazione (Invalsi)*, of the algorithmic information that, according to the research hypothesis, should help teachers give better recommendations (see Sections 1.4 and 2.1).
  - Schools will be asked to participate in the project, and randomization of treated and control groups will be performed among participating schools.
  - Preparation of treated schools for the experiment and pilot tests.
- September, 2025 – February, 2026
  - In September 2025, after the beginning of the academic year, teachers in treated schools will receive, directly from Invalsi and through their headmasters to protect the privacy of involved subjects, the algorithmic information concerning each one of their students. They will not have any obligation to look at it, but they will have the opportunity to use it in the elaboration of their recommendations.
  - In December 2025, teachers in all schools will give their recommendations to students as prescribed by the law.
  - In January 2026, families and students will take their high school enrollment decisions, which constitutes the first outcome we will consider.
- February, 2026 – June, 2027
  - In May – June 2026, the performance of students in the 8^{th} grade Invalsi test and in the final junior high school exam will be recorded.
  - The 9^{th} grade (first year of high school) performance of all students participating in the experiment will be monitored: for example, the grades, the evaluations of high school teachers, and promotions to the 10^{th} grade.
- Beyond June 2027 (i.e., after the three years of the grant)
  - Although the Unicredit grant lasts for only three years, and therefore until June 2027, our intention is to continue to record the performance and the decisions of students in the following years until the end of high school and possibly also later in their subsequent educational and professional life.

1.4 The algorithmic information offered to treated teachers

The algorithmic information that will be offered to teachers in treated schools will be based on Invalsi data elaborated within the Invalsi premises, with no risk of violating the privacy of involved subjects (see Section 3.4 and attachment 6.1). The project's budget (see Section 1.5) foresees an

expenditure item to cover the cost of this task that will require a research assistant who will take care of it within the Invalsi premises.

Note that the Invalsi information contains items that are known to teachers (e.g., demographics and family background) as well as information of which teachers are instead not aware, but that could be potentially relevant (e.g., the scores obtained by students in the Invalsi standardized tests taken in 2^{nd} and 5^{th} grades). We will use only this second type of information, elaborated by a machine learning algorithm described in Section 2.1, to predict the relevant outcomes of each student. The teachers will receive the raw standardized test scores and the machine learning predictions for their students, as well as the corresponding rankings in the national distribution for both the scores and the predictions. As explained in greater detail in Section 2.2, this information may help teachers give better recommendations for at least two reasons. First, it is standardized, more objective, and less affected by the potential implicit or explicit biases of the teachers. Second, it allows the teachers to position a student not only in relation to the personal and local experience that the teacher has acquired in her career but also in relation to the distribution of skills and competencies in wider populations (e.g., the national distribution). This is possible, given that Invalsi scores are standardized.

Our goal is then to evaluate whether this expectation is correct, that is, to evaluate if and to what extent this Invalsi information, of which teachers are currently not aware, can improve the quality and efficacy of their recommendations. If the outcome of this evaluation is positive, the implications of this finding will be translated into detailed policy suggestions concerning the information that should be offered to all teachers in the future.

In the province of Trento, we will have the possibility to enrich the RCT with a second treatment group in which teachers will receive algorithmic information based also on non-cognitive skills (e.g. the Big 5). This opportunity, still to be defined in detail, originates from the existence of previous data collection efforts on this type of skills for students in this province (see Pisanu and Fraccaroli, 2022), which could serve as the basis for our experiment.

1.5 Expected budget

The requested budget is 200.000 EUR in overall: 159.132 EUR requested by the EUI and 40.868 EUR by FBK-IRVAPP for the foreseen expenses outlined below. As regards personnel, 72.692 EUR are requested by the EUI to cover the cost of the PI Andrea Ichino and co-PI Fabrizia Mealli over the 3 years, while 22.569 EUR are requested by FBK-IRVAPP to cover those of the co-PI Davide Azzolini. Note, however, that the PI and co-PIs will devote to the project more time and effort than the person-months indicated in the table below. A full-time researcher will work on FBK-IRVAPP premises for 3,5 months for a total of 18.299 EUR. Two part-time research assistants will work at the EUI for 23% of their time for the whole duration of the project, for a total of 64.440 EUR. In addition, 22.000 EUR are requested for trips of members of the two teams during fieldwork either to Toscana or to Trento. Trips to Rome will also be needed to work on Invalsi data that cannot be accessed outside the premises of this institution.

Cost Category	EUI	FBK-IRVAPP	Total	Person-months
Personnel				
PI/Co-PI	72,692		**72,692**	4.20
Senior Staff - Co-PI	0	22,569	**22,569**	3.50
Postdocs	0	18,299	**18,299**	3.50
Students	64,440		**64,440**	16.50
Total Personnel:	**137,132**	**40,868**	**178,000**	**27.70**
Other Direct Costs				
Travel	22,000		**22,000**	
Total Other Direct Costs:	**22,000**	**0**	**22,000**	
Total Costs	**159,132**	**40,868**	**200,000**	

2 Research Proposal

Every year, more than one million EU students at the end of primary or lower-secondary education choose a high school track based on a recommendation received from their teachers. In some institutional contexts, like the Netherlands and Bavaria, it is even compulsory for students to start high school in the track that was recommended to them. Despite the potentially dramatic consequences that bad track recommendations may have, there is no clear evidence that assigning to teachers alone the role of providing these recommendations is the best solution and generates an optimal track assignment.[3] Our goal in this project is to establish, using a well-defined metric and a randomized control trial, whether teachers can give better recommendations if they are assisted by algorithmic information specifically designed to help them in performing this task.

To the best of our knowledge, there is no consensus on what should be the goal of high school track advice and what defines a "better" recommendation. The metric we adopt is the one based on Principal Stratification Analysis[4] that Imai et al. (2023) use to study whether algorithms can help judges in deciding which arrested individuals should be released while waiting for their trial: in this case, a decision is better than another if it avoids releasing subjects at risk of repeating a crime. This metric is appealing because it is analogous to the one that Oosterveen et al. (2023) independently proposes to define what constitutes a mistake in a high school track recommendation given by a teacher. They find that these mistakes are quite likely in the Dutch setting.

The nature of this metric in the context of high school recommendations can intuitively be described with reference to a simplified education system with two tracks: low (e.g., vocational) and high (e.g., academically oriented). We make two assumptions that we maintain throughout the analysis: (1) if a student is able to complete a more difficult track, it is better she is allowed to do so for both herself and society; (2) changing between tracks during high school is costly for students and for the education system.[5] Suppose that the population of students can be divided into groups (strata) that differ by how the education outcome depends on track recommendations. There are students who, independently of the track to which they are initially assigned, always finish high school in the low track. Similarly, there are students who always graduate from the high track independently of the initial assignment. Adopting the notation of Oosterveen et al. (2023) we call these students *Always Low* (AL) and *Always High* (AH), respectively. The common characteristic of these two groups is that the final student's outcome is not affected by the recommendation of the teacher. In these cases, the best recommendation is the one that reduces to a minimum the track changes that these two types of students will experience during high school, and, therefore, the one that sends all AL students to the low track and all AH students to the high track.

A third group of students is the one comprising subjects for whom the initial track assignment determines unequivocally the completed track: if the student is assigned to the low track in the first year, she will graduate in the same track at the end of high school, while if assigned to the high track this will be her final graduation outcome. Students in this group are labeled as "Trapped-in-Track" (TT) by Oosterveen et al. (2023) and are those for whom the recommendation of the teacher is a self-fulfilling prophecy and thus becomes crucially important.[6] Some of them are recommended a

[3]There is a wide literature on teachers' biases that may affect the quality of high school track recommendations. These are some recent examples: Driessen et al. (2008), Burgess and Greaves (2013), Gerhenson et al. (2016), Falk et al. (2020), Bach (2021), van Leest et al. (2021), Osikominu et al. (2021), Ferman and Fontes (2020), Carlana et al. (2022b), Carlana and Fort (2022), Carlana et al. (2022a), Alesina, Carlana, La Ferrara, and Pinotti (Alesina et al.), Orellana (1972), Geven et al. (2021) van Huizen (2021) and Batruch et al. (2023).

[4]See Fragakis and Rubin (2002) and Mealli and Mattei (2012).

[5]While the second assumption can hardly be disputed, the first one is possibly more debatable: see the evidence and the discussion in Ichino et al. (2024)

[6]They correspond to the group that, in the context of Imai et al. (2023), is labeled as "Preventable" crimes.

low track and would benefit, instead, from receiving different advice from their teachers (specifically a high first-year recommendation). For this reason, Oosterveen et al. (2023) claim that their fraction in the TT group measures the frequency of mistakes committed by teachers.[7] In the case of these students, we can establish whether algorithmic information based on standardized test scores helps teachers give better recommendations by measuring the fraction of mistakes teachers commit and see if it declines when they can decide based on such information. In light of this consideration, we call these subjects "Helpable" (H) students to signal that they are the ones who can be *helped* by a high first-year track assignment instead of a low one. Therefore, our goal is to estimate the difference between "the fraction of H students that are recommended a high first-year track by teachers receiving algorithmic information based on standardized test scores" and "the analogous fraction for teachers not receiving it". If this difference is positive, algorithmic information helps teachers give students better track advice.

Building on Imai and Jiang (2022), a corollary contribution of this analysis is that it makes it possible to also evaluate whether test scores help teachers improve the *fairness* of their recommendations with respect to protected attributes like SES, race, or gender. For example, suppose that gender is a protected attribute with respect to which we want to assess how fair a recommender is. Then, in the stratum of H students, the recommender is fair if the fraction of high first-year track recommendations is the same for female and male students. However, the analogous fraction in other strata could be lower or higher, as long as it is equal for both genders. Therefore, in the overall population, females could receive a different fraction of high first-year track advice from this recommender, but this would not be a violation of fairness because it would only be due to differences in the gender composition of the strata, not to discrimination based on gender within a stratum. In other words, a recommender is fair as long as her recommendations are independent of the protected attribute among students characterized by the same causal effect of first-year advice and who, thus, are in the same stratum.

In the remaining part of this proposal we explain why the RCT described in Section 1.2 can answer these questions. The first step is to show, in the next Section, how we will use machine learning algorithms to elaborate the information collected by Invalsi and unknown to teachers, which we believe may help them give better recommendations.

2.1 The algorithmic information offered to treated teachers

Each student in our sample will receive information constructed as follows starting from the Invalsi database. Let T represent the set of standardized scores obtained by students in grades 2 and 5 of elementary schools. We will use machine learning algorithms to predict a set of relevant outcomes Ω for these students, like their performance in future Invalsi tests (at the end of grades 8, 10, and 13) and in the final exam of junior high school and of high school, the track attended in each year of high school, events of grade repetition, and successful high school completion.

To save on space, here it suffices to say that without entering into the details of the specific machine learning algorithm that we will adopt,[8] we will use the entire Invalsi database to "train" the algorithm and determine the predictive power of scores T on the outcomes Ω. The teachers in

[7] In the educational context that we and Oosterveen et al. (2023) study, it is conceivable the existence of a fourth group of students who always finish high school in the track to which they *have not* been initially assigned. As discussed in Oosterveen et al. (2023), it can be safely assumed that this is an empty set.

[8] As in most cases when applying machine learning, the best algorithm to use is not obvious a priori and will be tested with trial and error among traditional supervised learning algorithms using methods such as train-test splitting and cross-validation for optimal out of sample prediction capacity. Examples of algorithms that will be tested are Generalized Linear Models, random forests, and gradient boosting.

treated schools will then receive the following information for each one of their students: the raw test scores T, the predicted outcomes $\hat{\Omega}$, and the ranking in the national distribution of T and $\hat{\Omega}$.

The next section discusses under what conditions a teacher may give different recommendations to a student with or without such algorithmic information.

2.2 Why algorithmic information may influence teachers' recommendations

The algorithmic information that we will provide to teachers in treated schools may influence their track recommendations for two main reasons: first, it is likely to be a less biased assessment of students' ability while teachers may be biased in their assessment, and second, the algorithmic information can be benchmarked against a wider distribution of students (e.g., the national distribution), while without this information teachers can only use as a benchmark the distribution of students they met in their previous career. In this section, we illustrate why these features matter for our RCT.

Omitting for simplicity subscripts for individuals, let A be a student's true ability. In the absence of algorithmic information, the teacher has a prior P on the student's ability, based on class interactions and previous experience:

$$P = A + \mu \tag{1}$$

where $\mu \sim g(\mu) = N(\bar{\mu}(x), \sigma_\mu)$ is a random bias that prevents the teacher from knowing the exact ability of the student. Assume that the distribution g is normal and that its mean $\bar{\mu}(x)$ depends on characteristics $X = x$ of the student. For example, a teacher may systematically disfavor students with $x =$ "immigrant" (i.e., $\bar{\mu}(x) < 0$) and favor those for whom $x =$ "high SES" (i.e., $\bar{\mu}(x) > 0$).

Suppose that π is the cutoff such that if $P < \pi$ the teacher, not assisted by the algorithmic information, recommends the low track to the student:

$$R = 0 \qquad \Longleftrightarrow \qquad P = A + \mu < \pi.$$

Then, $\Theta = Pr(P < \pi)$ is the probability that the student is sent to the low track when the teacher is not assisted by the algorithmic information.

Consider now the counterfactual case in which the teacher receives the algorithmic information S about the student, which is also determined by true ability plus a random noise component $\nu \sim \phi(\nu) = N(0, \sigma_\nu)$, where note that ν has zero mean:

$$S = A + \nu. \tag{2}$$

Moreover, note that S is assumed to be independent of x and is, therefore, an unbiased signal for A. We will discuss below the validity of this assumption and the consequences of not making it. Based on this information, the teacher updates her belief on the ability of the student as a weighted average of the prior P and the signal represented by S:

$$\tilde{P} = \alpha P + (1 - \alpha)S = A + \alpha\mu + (1 - \alpha)\nu. \tag{3}$$

where $\tilde{P}$ is the posterior belief of the teacher and $0 \leq \alpha \leq 1$ is the weight of the prior. If $\alpha \neq 1$, the posterior $\tilde{P}$ differs from the prior P. For example, the student may have a very high S so that $\tilde{P} > P$ and, as a result, the teacher assisted by the algorithmic information would think more highly about the ability of the student. If now $\tilde{P}$ is also greater than π the teacher recommends the high track to the student, differently than in the counterfactual case of absence of algorithmic

information. This is the first potential effect of providing this information to teachers.

A second effect is that the algorithmic information reduces the bias of the posterior belief with respect to the prior if the two differ. This because if $\alpha < 1$, $E(P|x) = A + \bar{\mu}(x)$ while $E(\tilde{P}|x) = A + \alpha\bar{\mu}(x)$ and $|\alpha\bar{\mu}(x)| < |\bar{\mu}(x)|$. We will come back to this point in Section 2.4, where we discuss how to establish, with the data of our RCT, whether algorithmic information can increase the fairness of teachers' recommendations, by reducing their bias. As long as the algorithmic information is unbiased (or sufficiently less biased) than the prior belief of teachers, the expectation is that this will be the case.

Finally, a third effect, which is important for the statistical analysis of Section 2.3, is generated by the shift to the left or to the right of the distribution $g(\cdot)$ with respect to the distribution $\phi(\cdot)$. Suppose that $\bar{\mu}(x) \neq 0$ so that the distribution $g(\cdot)$ is shifted with respect to $\phi(\cdot)$. Then, it is easy to see that $Pr(\tilde{P} < \pi) \neq \Theta$. This means that if the teachers use the same cutoff π that they would use in the absence of algorithmic information, the probability of recommending the high track to students of any type will, in general, change.

Therefore, for the above reasons, in our RCT, we expect to find that the recommendations of teachers in treated schools will differ from those of teachers in control schools. In the next section, we explain how the framework of Imai and Jiang (2022) and Imai et al. (2023) can be adapted to the case of high-school track recommendations and used to establish whether these differences between recommendations in treated and control schools may allow us to conclude that algorithmic information helps teachers give better recommendations.

2.3 The statistical framework of the proposed experiment

Let $\mathbb{S} = s$ with $s \in \{0, 1\}$ indicate two possible sources of high school track recommendations that we want to compare. To focus ideas, $\mathbb{S} = 0$ if the source is a teacher who does not receive algorithmic information, while $\mathbb{S} = 1$ if the source is a teacher receiving it. Consider our RCT in which the source is randomized in a population of students. Using the potential outcome notation, we denote with $R(s) = r \in \{0, 1\}$, the potential recommendation that a student may receive from the source s, with $r = 1$ for the college track (High) and $r = 0$ for the vocational track (Low). $Y(s, r)$ is the potential outcome if the student receives a recommendation r from the source s, which takes on value 1 if the student successfully completes the college track and 0 otherwise. Finally, X is a set of observable characteristics of students.

This framework requires three assumptions:

1. *Randomization of the source:* $\{R(s), Y(s, r), X\} \perp\!\!\!\perp \mathbb{S}$ for $s, r \in \{0, 1\}$.
   This is satisfied in the context of the RCT that we plan to conduct.

2. *Exclusion restriction:* $Y(s, r) = Y(s', r) = Y(r)$ for $s, s', r \in \{0, 1\}$.
   This requires that the potential outcomes depend only on the recommendation and not on the identity of the source. We are designing the study in such a way that students do not know the source, making this assumption plausible in our RCT. This assumption allows to index the potential outcomes with R only, $Y(r)$, $r \in \{0, 1\}$.

3. *Monotonicity:* $Y(1) \geq Y(0)$.
   This excludes the existence of students who would not complete the college track if recommended this track, but who would complete it if recommended the vocational track.[9]

Under these assumptions, we can divide the population of students into three "Principal Strata":

[9] These students would be characterized by the following set of potential outcomes: $(Y(1), Y(0)) = (0, 1)$.

AH: $(Y(1), Y(0)) = (1, 1)$
These are students who *Always* complete the college track (*High*) independently of the recommendation.

AL: $(Y(1), Y(0)) = (0, 0)$
These are students who *Always* complete the vocational track (*Low*) independently of the recommendation.

H: $(Y(1), Y(0)) = (1, 0)$
These are *Helpable* students who complete the college track (*High*) if suggested to do so and would not otherwise.

Let $J \in \{AL, AH, H\}$ denote the three Principal Strata and consider the *Average Principal Causal Effect* of the source $\mathbb{S} = 1$ (instead of $\mathbb{S} = 0$) on the recommendation R in stratum J:

$$APCE_J = E(R(1) - R(0)| \text{ student is in } J). \tag{4}$$

The sign of this causal effect in the three strata indicates which source is the best for the following reasons. In the case of H students, their future outcome is affected by the recommendation, which is actually self-fulfilling: these, and only these, students complete the college track if recommended to do so, but remain in the vocational track otherwise. We want to establish which source is capable of giving the college recommendation to the largest number of students in stratum H. This source can arguably be considered preferable if the goal is to send to the college track the maximum number of students who can complete it successfully and who would not complete it if not recommended. Therefore, if the $APCE_H > 0$, it is possible to conclude that the algorithmic information helps teachers push toward college a larger number of H students with respect to the case in which teachers are left alone in giving their recommendations.

In the case of AL students, the best source is the one that recommends the college track to the lowest number of them, so as to minimize the cost of future track changes. The teacher assisted by the algorithmic information would then be the best source if $APCE_{AL} < 0$. Finally, in the case of AH students, the best source is the one that recommends the college track to the highest number of these students, again to minimize the cost of future track changes. Therefore, the teacher receiving the algorithmic information would be the best source if $APCE_{AH} > 0$.

Adapting Theorem 1 of Imai et al. (2023) to this context, it is possible to show that

$$\begin{aligned}
APCE_H &= \frac{E(Y|\mathbb{S}=1) - E(Y|\mathbb{S}=0)}{Pr(Y(1)=1) - Pr(Y(0)=1)} \\
APCE_{AL} &= \frac{Pr(R=1, Y=0 \mid \mathbb{S}=1) - Pr(R=1, Y=0 \mid \mathbb{S}=0)}{1 - Pr(Y(1)=1)} \\
ACPE_{AH} &= \frac{Pr(R=0, Y=1 \mid \mathbb{S}=0) - Pr(R=0, Y=1 \mid \mathbb{S}=1)}{Pr(Y(0)=1)}
\end{aligned}$$

where $Y \in \{0, 1\}$ is the observed outcome (1=high track). Without entering into further details to save on space, in all these expressions, the numerator can be point-estimated with data generated by our RCT. Therefore, the sign of each $APCE_J$ can be tested, indicating which is the best source. Estimates of the denominators are also needed to establish how much one source is better than the other. To this end, bounds for the denominators can be estimated without further assumptions. Alternatively, the denominators can be point-estimated assuming unconfoundedness or using Bayesian methods (see e.g., Li et al. (2023)).

2.4 Fairness of the source of a recommendation

Within the same statistical framework described in Section 2.3 of this proposal, Imai and Jiang (2022) and Imai et al. (2023) propose the concept of "Principal Fairness" that can be interestingly used to compare the fairness of two sources of a recommendation.

Definition 1 *Principal Fairness:*
A source s of high-school track recommendations $R(s)$ satisfies Principal Fairness with respect to a protected attribute X (e.g., SES, race, gender), if the recommendations given by this source are conditionally independent of X within each principal stratum $J \in \{AL, AH, H\}$

$$Pr(R(s)|J, X) = Pr(R(s)|J) \tag{5}$$

According to this definition, a recommender is fair as long as her recommendations are independent of the protected attribute among students in the same stratum. The analogous fraction in other strata can be lower or higher if it is equal for both genders within each stratum. A test for Principal Fairness of a source of high school track recommendations can then be designed as follows. Given two values x and x' of a protected attribute X, the Principal Fairness of $\mathbb{S} = s$ in stratum j is given by:

$$\bar{\Delta}_j(s) = \left|Pr\{R(s) = 1|X = x, J = j\} - Pr\{R(s) = 1|X = x', J = j\}\right|$$

Note that the source s is perfectly fair if $\bar{\Delta}_j(s) = 0$. Otherwise, the source s is *unfair* because its probability of recommending the high track to students in stratum j changes with the values of X. In the context of the RCT that we plan to conduct, given Assumption 1 (Randomization of the source), finding that

$$\bar{\Delta}_j(1) < \bar{\Delta}_j(0)$$

would allow us to conclude that giving teachers algorithmic information improves the fairness of their recommendations in comparison to the case in which they do not receive it.

Under the assumptions of the theoretical framework described in Section 2.2, if the algorithmic information is unbiased ($E(S) = A$) while the teacher's prior is biased ($E(P) = A + \bar{\mu}(x)$), it is necessarily the case that $\bar{\Delta}_j(1) < \bar{\Delta}_j(0)$, because the expected posterior is $E(\tilde{P}) = A + \alpha\bar{\mu}(x)$ and $|\alpha\bar{\mu}(x)| < |\bar{\mu}(x)|$ given $\alpha < 0$. Such an outcome, however, may not occur if the algorithmic information retains some biases. This could happen, for example, if "teaching-to-the-test" is more intensively used by high-SES parents for their children or, more generally, if performance in the Invalsi tests differs systematically by traits like gender, immigrants or race.

Moreover, let $\Delta_j(s)$ be $\bar{\Delta}_j(s)$ defined without the absolute value. Now the sign of $\Delta_j(s)$ indicates the direction of discrimination. For example, suppose that $X = x$ denotes immigrant students. If $\Delta_j(1) > 0$ while $\Delta_j(0) < 0$, it would mean that when the teacher receives the algorithmic information, immigrant students are positively discriminated into the high track, while when the teacher decides without this information immigrants are negatively discriminated. In light again of the theoretical framework described in Section 2.2 this happens when $\bar{\mu}(x) < 0$ so that the distribution of the posterior is shifted to the left with respect to the distribution of the prior.

2.5 Potential implications for policymakers and families

The implications for policy of the results that this project can obtain are potentially very relevant. Given that in most of Europe, differently from the Anglo-Saxon countries, tracking is the established

way to organize high school studies, it is surprising that no experimental evidence exists to guide educational policymakers in the design of the best system of track advising.

Our project fills in this gap in several ways. First, it contributes to characterizing a reasonable metric to evaluate the quality of the recommendations teachers can give to their students. This metric values two objectives: (i) reducing costly track changes and (ii) sending to more difficult tracks students who are able to complete them but who need to be "pushed" towards these tracks and to be convinced that they can complete them successfully. Differently from the case of a weather forecast, predicting the school track in which a student would have the best performance and recommending this track, may have an effect on the object of the prediction itself, i.e., the choice of the student and her performance in the chosen track as well as later in life. In other words, track recommendations may be self-fulfilling prophecies, and it is crucial to take into account this feature in their optimal design. The metrics we propose take this feature at center stage.

Second, if our results show that algorithmic information based on standardized test scores can assist teachers in giving better recommendations in terms of the above metrics, the obvious policy conclusion is to provide this information to teachers. In the specific Italian context, this type of evidence would suggest anticipating the 8^{th} grade Invalsi test to the beginning of the academic year, so that it can be used by junior high school teachers in the elaboration of their recommendations that are given to students in December. Thanks to this information, teachers would receive a less biased assessment of their students' ability and would be able to position them in the wider population of Italian students instead of in the restricted population they met in their careers.

Third, a large literature (see footnote 3) has demonstrated, in different contexts, that teachers' recommendations do not typically reflect only the previous academic achievement and the future ability potential of a student, being instead highly correlated also with characteristics like SES, gender, race, and behavior in class. The bias affecting recommendations that are determined by the conscious or unconscious use of these variables by teachers is typically deemed not acceptable and has reinforced the opposition to school tracking in general. It is, therefore , crucially important to obtain experimental evidence on whether algorithmic information, like the one we will provide to treated teachers, can improve the fairness of their recommendations.

Finally, but not less importantly, our results can contribute to the recent and growing literature on algorithm-assisted human decisions (see, for example, Ben-Michael et al. (2024) and Rambacan (2024)). It is increasingly frequent that decision-makers in a variety of fields (justice, medicine, finance, politics, education, just to cite few examples) use big data processed by a variety of algorithms to take high stake decisions in highly uncertain contexts. However, it is still not fully clear how to make the best use of these algorithmic and data-driven assistance to human decisions. Our results will improve our understanding in this area, by providing fresh experimental evidence.

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3 Project team description

3.1 Role, responsibility, and knowledge base of the PI Andrea Ichino

In my career I have published scientific articles and policy contributions in many areas of labor economics, as shown in my web page. While most of these topics have attracted my attention for a limited number of years, the economics of education has always been on my radar screen since the beginning of my research activity and more recently has captured the largest part of my attention. My specific interest in high-school track recommendations was initially motivated by observing the effects of such recommendations in the 8^{th} grade classes of my four children. Looking at these effects in relation to the family background of the different classmates and to their apparent cognitive skills, I started to wonder what the objectives of a system of high-school track recommendations should be, whether giving so much power to teachers in influencing the future of their students is a good idea and whether improvements are possible. My children are now all adults, which indicates that it took me a long time to figure out how a research project could be designed to answer these questions: this is definitely not a proposal that was prepared at the last minute. The time and effort I put into developing this project makes me an ideal PI to run it and bring it to a successful conclusion, which will be my main responsibility.

Closely related to this project is a recent line of research that led to the paper "College, cognitive ability, and socioeconomic disadvantage: policy lessons from the UK in 1960-2004" (with Aldo Rustichini and Giulio Zanella), in which we question the idea that any kind of expansion of *tertiary education* can be used to increase equality of opportunities without losses in terms of quality of college graduates, as often claimed in the policy debate. For example, the UK university enlargement led to the selection into college of progressively less talented students from advantaged backgrounds. Only a counterfactual meritocratic selection policy would have avoided these outcomes, but such a policy is typically rejected because it is accused of being unfair. We actually show that this is not necessarily the case. Most importantly, we claim that *tertiary education* policy arrives too late in the life of individuals to address the lack of equality of educational opportunities. Such a problem must be addressed well before, and particularly at the crucial moment of high school choices. Our research proposal, which we hope Unicredit will support, is precisely aimed at improving the orientation of students at this crucial moment of their lives, increasing both equality of opportunities and efficiency.

Policy implications of my research

I always felt the pressure, almost an obligation, to translate my scientific research activity into policy contributions, and this is particularly true for my work on the economics of education. Two of my policy books are devoted to the reform of the school and the university systems in Italy (respectively, "Liberiamo la Scuola", together with Guido Tabellini, and "Facoltà di scelta", together with Daniele Terlizzese). I have also written Op-Eds on various Italian newspapers to influence the public debate on educational policy with evidence-based considerations and theory-driven suggestions. I cannot claim any successes in shaping actual policy decisions, but my contributions originated an intense debate that might slowly have effects. It is my firm desire and intention to reach concrete policy indications also based on the results that this project will reach.

Managerial experience

In the past, I have managed relatively large grants, which I received from the European Commission DG XII, the Italian Ministry of Labour, and the Italian Research Council. More recently I further developed managerial experience within the Department of Economics of the European

University Institute, first as Director of Graduate Studies and then as Head of Department until December 2023. I have also been the director of the Ph.D. Program of the Economics Department of the University of Bologna. The skills I acquired in these tasks make me a better PI for this project.

Scholarly leadership

Having taught for about 30 years in institutions devoted to doctoral and post-doctoral education, I had the opportunity to advise 85 Ph.D. students and 7 post-docs. Some of these became successful scientific researchers, as for example: Francesco Amodio, Sascha Becker, Alice Dominici, Tommaso Nannicini, Daniela Vuri, Zheng Wang and many others. Thanks to this intense supervision activity, I have acquired considerable competence in engaging young researchers and inspiring the first steps of their scientific activity. I believe this competence will be an important asset to guide the activities of the different local teams that will run the RCTof this project. These teams involve young researchers, in addition to more experienced ones, and I hope fruitful co-authorships of scientific papers will emerge from this cooperation, also in the interest of these young researchers.

3.2 Role, responsibility, and knowledge base of the Co-PI Fabrizia Mealli

I am a statistician who develops methodologies that advance the discipline of statistical science and econometrics by addressing broad classes of applied problems. I have a strong background in statistics, econometrics, and applied social and biomedical sciences, and an extended interdisciplinary research experience with an international collaborative network, which has included economists, demographers, epidemiologists, medical doctors, and political scientists.

The area of statistics and econometrics on which I am currently concentrating my research is causal inference. The general problem I have pursued is fundamental to much of modern scientific research – how to infer causal relationships in randomized experiments and observational studies, to address causal questions arising in many areas of application, ranging from medicine to economics, from in sociology to public health.

The specific topics of this research proposal, high-school track recommendations, is therefore of high interest to me from both a scientific and personal perspective, having three (now grown-up) kids who have been facing high-school and higher education choices.

I develop theoretical, methodological and computational tools for investigating a wide range of topics related to this theme, with ideas that advance the field. Most often, but not always, I derive methodology from the Bayesian statistical paradigm. I am arguably a leading expert on principal stratification methodologies, that will be highly relevant for this project.

I have published scientific articles in many areas of applied statistics and econometrics, as shown in my web page. My international reputation has been recognised by several visiting appointments, by invitations to present my work at numerous peer reviewed international scientific conferences and workshops, by serving as member of the scientific program committee of a variety of conferences, including the European Causal Inference Meeting (EuroCIM) and the American Causal Inference Conference (ACIC). I was also invited to teach at international schools on causal inference. I have served as Associate Editor with expertise in causal inference, missing data methods, and Bayesian inference for the Journal of the Royal Statistical Society Series A (Statistics and Society) and Biometrics. I currently serve as AE for Biometrika, the Journal of the American Statistical Association (Theory and Methods), the Annals of Applied Statistics, and Observational Studies.

I am able to operate across a number of academic disciplines and have significant experience of developing research strategies and managing research projects and groups at the interface between statistics and social sciences.

Applied contributions of mine have dealt with the evaluation of pension schemes, of national and regional development policies, such as financial aids to firms, of job-training in Italy, UK, USA, with specific reference to the effects of Temporary Work agencies, and of Italian University students' aid policies. These evaluations did not only lead to academic publications, but also had an impact on the subsequent policy makers' decisions. I have been research consultant for UCW (Understanding Children's Work), an ILO (The International Labour Organisation), UNICEF and the World Bank inter-agency research project, for which I worked on the effects of household vulnerability on child labor in Guatemala, on education and child labor, and on measuring the economic vulnerability of children in developing countries. Along the same lines, I have worked on poverty and fertility dynamics in developing countries for an international research project financed by the European Science Foundation. I have more recently worked in areas of public and environmental health as well as in pharmaceutical statistics. During my visit at the Biostatistics Department of the Harvard School of Public Health, I got involved in research projects of environmental health, studying the effects of air pollution on health and evaluating the impact of air quality regulations on pollution exposure and health.

Managerial experience

I have successfully coordinated other national and international projects, where my interdisciplinary skills were crucial.

I am currently (for the second time) the scientific director of a 5-year strategic development project funded by the Ministry of Education, University and Research (MIUR) for the Department of Statistics, Computer Science, Applications at the University of Florence. As part of the former project, I created the Florence Center for Data Science, an interdepartmental research center, bringing together expertise in data science across the University of Florence, for which I served as Director from 2018 to 2023.

Scholarly leadership

I have been director of graduates studies at the Department of Statistics at the University of Florence, managing the PhD program in Applied Statistics and director of graduate studies at the Department of Statistics, Computer Science, Applications at the University of Florence, managing the Statistics track of the PhD programme in Mathematics, Computer Science and Statistics. I am currently Director of Graduate Studies for the PhD program in Economics at the EUI.

Since 1998, many students successfully completed their PhD studies under my supervision. My effort and ability to inspire young researchers towards high quality statistical and interdisciplinary research is demonstrated by the successful careers of my supervised graduate students and young researchers I mentored, who are currently working at Universities and at relevant public institutions, as for example: Laura Forastiere (Yale), Cheti Nicoletti (York), Andrea Mercatanti (Roma La Sapienza), Alessandra Mattei (University of Florence), Falco Bargagli Stoffi (UCLA).

3.3 Role, responsibility, and knowledge base of the Co-PI Davide Azzolini

My contribution to the project is threefold.

First, I will bring a sociological perspective to the study of students' school choice and its relation with family background and future education and other life dimensions. I have studied the topic of educational choice and school transitions since completing my PhD in Sociology and Social Research in 2012. My focus has been on migrant/native disparities in school performance and its consequences on school trajectories in secondary education, with a particular focus on the Italian case. The study of migrant/native gaps has necessarily implied the analysis of social-background

disparities in school outcomes, a phenomenon closely intertwined with migration background. I have also researched the specific transition between lower secondary education and upper secondary education in Italy to explore the role of prior achievements in accounting for migrant/native disparities and social background gaps in school choice. I am eager to discover through this project if and how such disparities can be mediated by interventions that deliver to teachers new data on students.

Second, I have developed a strong interest in evidence-based policy making in education, especially since working as a researcher at the Fondazione Bruno Kessler Research Institute for the Evaluation of Public Policies and as an affiliated scholar with the Urban Institute, Washington DC. Both institutes conduct empirical research that helps improve policy making in different realms. I have particularly focused on education, participating in over 15 evaluation studies in the past ten years, particularly on programs aimed at sustaining vulnerable students, programs to help low-income families invest in their children's education, and the inclusion of digital technologies in schools. My strong interest in this project is closely linked to the potentially useful lessons that we can learn to help improve how teachers recommend the "best" school to their students.

Third, I have gained extensive practical expertise in designing and conducting field experiments in the area of education. In the past ten years, I have been involved in the design and conduct of ten randomized controlled trials in education. Four of these have been implemented cross-nationally, while the others have been conducted in Italy. This has helped me accumulate expertise in the different phases and critical passages of a randomized controlled trial, from the definition of the evaluation question, the elaboration of the theory of change, the preparation of the experimental protocol, the data collection, randomization, and field operation supervision, to statistical analysis. I am looking forward to the opportunity of engaging in a new RCT such as the one proposed in this project.

3.4 Supporting Institutions and teams

Invalsi

The *Istituto Nazionale per la Valutazione del Sistema Educativo di Istruzione e Formazione (Invalsi)* is the Italian national agency responsible for assessing and evaluating the educational system in Italy. It conducts standardized tests to measure the academic performance of students at various levels of education, providing valuable data for educational policymakers, schools, and the public. The assessments cover subjects such as mathematics, reading, and science, aiming to monitor and improve the quality of education in the country.

As explained in Sections 1 and 2, Invalsi will play a crucial role in this project by helping in the randomization of schools and providing the information that is necessary to produce the algorithmic information that will be offered to teachers of treated schools with the goal of helping them give their high school track recommendation to students. We are very grateful to Invalsi for the support it will provide to this project (see Attachments Section 6.1).

The project in Toscana and corresponding local team

With the support of the *Istituto per la Programmazione Economica della Toscana (Irpet)* (see Attachments Section 6.2) and the *Dipartimento Educazione e Istruzione della Regione Toscana* (see Attachments Section 6.3), that we gratefully acknowledge, we will conduct the RCT that constitutes the backbone of this project in the provinces of Firenze, Livorno and Grosseto, of which the first one is characterized by a relatively more urbanized setting while the other two are more rural, and do not have local universities. With reference to the 8th grade in which students receive

high-school track recommendations from their teachers, in the province of Firenze there are 75 schools with about 8,600 students while in the case of Livorno and Grosseto that we will consider jointly, given their relative homogeneity, the schools are 71 with about 4600 students. In light of our power calculations described in Section 1.2, these sample sizes are sufficient for our purposes.

The local team that will work on the project in this region will be guided by the PI Andrea Ichino and the Co-PI Fabrizia Mealli, who will be assisted by two PhD students:

- *Gustav Axén* is a third-year PhD Researcher at the EUI specializing in applied econometrics and political economy. He holds a master's degree in Economics from the Stockholm School of Economics and has worked on multiple research projects involving administrative data on educational outcomes from the Netherlands and Sweden.
- Javier Viviens Martín is a PhD student in Economics at the EUI. His research focuses on applied econometrics and causal inference with applications to education and inequality. He has experience bringing cutting-edge research methods on causal inference to data. He has two other projects on education involving administrative data from the Netherlands and Spain.

The project in Trento and Bolzano, and corresponding local team

With the support of the *Research Institute for the Evaluation of Public Policies of Fondazione Bruno Kessler (FBK-IRVAPP)* (see Attachments Section 6.4), that we gratefully acknowledge, the RCT will be conducted in the province of Trento, which is characterized by an alpine setting with some metropolitan areas. The Province has a local university. There are 82 schools with about 5,000 students per grade in the province of Trento. In this case as well, given our power calculations described in Section 1.2, the sample size is sufficient for our purposes.

The local team will be guided by Co-PI Davide Azzolini, who will be assisted by a researcher who will be located at the FBK-IRVAPP premises and whose identity is still to be determined.

4 CV of the PI and the Co-PIs

4.1 Curriculum vitae of the Principal Investigator, Andrea Ichino

Date of Birth: December 10, 1959
Nationality: Italian
Civil Status: married, with four children

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Education

1990 Doctor of Philosophy Degree in Economics — MIT, Cambridge MA, USA.

1985 Laurea in Discipline Economiche e Sociali — Università Bocconi, Milano, Italy.

Positions

2013 – Professor of Economics at the European University Institute, Florence Italy.

2006 – Professor of Economics at the University of Bologna, Italy, currently on leave

1997 – Professor of Economics at the European University Institute, Florence, Italy.

1992–96 Professor of Economics at Bocconi University, Milan, Italy.

Awards and other appointments

1999 Research Fellow of the Center for Economic Studies and ifo Institute (CESifo), Munich.

1999 Research Fellow of the Institute for the Study of Labor (IZA), Bonn.

1997 Research Fellow of the Centre for Economic and Policy Research (CEPR), London.

1997 "Jean Monnet Fellow" at the European University Institute (EUI) in Florence, Italy.

1996 Bocconi Prize for research in economics.

1990 Fellow of the Innnocenzo Gasparini Institute for Economic Research (IGIER), Milan.

1986 Bonaldo Stringher Scholarship offered by the Bank of Italy.

Teaching

2014 – Labor Economics, Microeconometrics; European University Institute, Florence, Italy.

2007-13 Labor Economics, Personnel Economics, Microeconomics and Microeconometrics; undergraduate and graduate courses offered by the University of Bologna, Italy.

2008-10 Director of the PhD program in Economics offered by the University of Bologna.

1997-06 Labor Economics, Personnel Economics, and Microeconometrics (basic and advanced); courses for the Ph.D. program offered by the EUI in Florence, Italy.

1996–97 Labor Economics; course for the "Master in Economics" offered by Bocconi University.

1996–96 Applied Economics; fourth–year course for the "Laurea in Economics" offered by Bocconi University.

1990–96 Economic Principles; first–year course for the "Laurea in Economics" offered by Bocconi University.

1990–96 Macroeconomics; core requirement for the "Master in Business and Administration" offered by the Bocconi Business School (SDA–Bocconi).

Research interests

Labor economics; Economics of education; Economics of the family.; Law and economics; Economics and genetics; Gender studies; Group interactions and network effects; Intergenerational social mobility and income inequality; Rigidity and flexibility in European labour markets; Personnel economics; Causality in econometrics;

Papers in progress

2024 "College education, intelligence and disadvantage: policy lessons from the UK in 1960-2004" (with Aldo Rustichini and Giulio Zanella; submitted).

2024 "Economic incentives, childcare and gender identity norms" (with Barbara Petrongolo, Peter Skogman-Thoursie and Martin Olsson; submitted).

2024 "Gender Policy and Signaling".

2022 "Multi-cutoff RD designs with observations located at each cutoff: problems and solutions" (with Margherita Fort, Enrico Rettore and Giulio Zanella; submitted).

2021 "Restarting the economy while saving lives under Covid 19" (with Carlo Favero and Aldo Rustichini.

Publications in English

2024 "Effects of firing frictions on turnover" (with Omar Bamieh, Decio Coviello and Nicola Persico; forthcoming: *The Journal of Labor Economics*).

2023 "Rule breaking, honesty and migration" (with Tommaso Colussi and Massimo Anelli; *The Journal of Law and Economics*).

2022 "Civicness drain" (with Marco Casari, Moti Michaeli, Ginevra Marandola, Maria De Paola and Vincenzo Scoppa; *The Economic Journal*).

2022 "Wage equalization and regional misallocation: evidence from Italian and German provinces" (with Tito Boeri, Enrico Moretti and Johanna Posch; *The Journal of the European Economic Association*).

2020 "Measuring the gains from labor specialization" (with Decio Coviello and Nicola Persico; *The Journal of Law and Economics.*)

2019 "The cognitive cost of daycare 0–2 for children in advantaged families" (with Margherita Fort and Giulio Zanella; forthcoming, *The Journal of Political Economy.*)

2018 "The Tower of Babel in the classroom. Immigrants and natives in Italian schools" (with Margherita Fort and Rosario Ballatore), *The Journal of Labor Economics.*

2018 " Inelastic buyers in non-competitive markets" (with Giacomo Calzolari, Francesco Manaresi and Viki Nellas), *The Economic Journal.*

2016 "Too Old to Work, Too Young to Retire? " (with Guido Schwerdt, Rudolf Winter-Ebmer and Josef Zweimüller); *The Journal of the Economics of Aging*

2016 "Multi-tasking, multiarmed bandits, and the Italian Judiciary " (with Robert L. Bray, Decio Coviello e Nicola Persico); *Manufacturing and Service Operations Management*

2015 "The Inefficiency of worker time use " (with Decio Coviello e Nicola Persico); *Journal of the European Economic Association*

2014 "Comments on "Gender and experiments: what have we learned from the field and the lab"; *Labour Economics*

2014 "Time allocation and task juggling " (with Decio Coviello e Nicola Persico); *American Economic Review*

2014 "Freeing the Italian school system " (with Guido Tabellini); *Labour Economics*

2014 "Hidden consequences of a first-born boy for mothers" (with Elly-Ann Johansson and Eliana Viviano); *Economic Letters*

2012 "College cost and time to complete a degree: Evidence from tuition discontinuities" (with Pietro Garibaldi, Francesco Giavazzi and Enrico Rettore), *Review of Economics and Statistics.*

2011 "Gender Based Taxation and the Division of Family Chores" (with Alberto Alesina and Loukas Karabarbounis), NBER working paper 13638; *American Economic Journal: Economic Policy.*

2010 "Similarities and Differences when Building Trust: the Role of Cultures" (with Fabian Bornhorst, Oliver Kirchkamp, Karl Schlag and Eyal Winter), *Experimental Economics.*

2010 "The political economy of intergenerational mobility " (with Loukas Karabarbounis and Enrico Moretti), *Economic Inquiry.*

2010 "Does the Color of the collar matters? Firm specific human capital and post displacemente outcomes " (with Oliver Ruf, Guido Schwerdt, Rudolf Winter-Ebmer and Josef Zweimüller), *Economic Letters.*

2010 "Youth Emancipation and Perceived Job Insecurity of Parents and Children" (with Sascha Becker, Samuel Bentolila and Ana Fernandes), *Journal of Population Economics*

2009 "Biological Gender Differences, Absenteeism and the Earning Gap" (with Enrico Moretti), *American Economic Journal: Applied Economics* , 1(1) 183-218.

2008 "How Often Should You Open the Door? Optimal Monitoring to Screen Heterogeneous Agents" (with Gerd Muehlheusser), *Journal of Economic Behaviour and Organizations*, (67) 820-831.

2008 "From temporary help jobs to permanent employment: What can we learn from matching estimators and their sensitivity?" (with Fabrizia Mealli and Tommaso Nannicini), *Journal of Applied Econometrics*, vol. 23, pp. 305 - 327.

2008 "Unemployment and Consumption Near and Far Away From the Mediterranean?" (with Samuel Bentolila), *Journal of Population Economics* , vol. 21, pp. 255 - 280.

2006 "Clean Evidence on Peer Pressure" (with Armin Falk), *Journal of Labor Economics,* January, 24(1), 39-57.

2005 "Temporary Work Agencies in Italy: A Springboard to Permanent Employment?" (with Fabrizia Mealli and Tommaso Nannicini), *Giornale degli Economisti*, September, 64(1), 1-27.

2005 "The Effect of Employment Protection on Worker Effort. A comparison of absenteeism during and after probation" (with Regina T. Riphahn), *Journal of the European Economic Association*, March, 3(1), 120-43.

2005 "Gender Wage Gap in Expectation and Realizations" (with Antonio Filippin), *Labour Economics,* February, 12(1), 125-45.

2005 "Reconciling Motherhood and Work. Evidence from Time Use Data in Three Countries" (with Anna Sanz de Galdeano), in Hamermesh, Dan, and Gerard Pfann, (Eds.), The Economics of Time Use, Amsterdam, Elsevier.

2004 "Absenteeism and Employment Protection: Three Case Studies" (with Regina T. Riphahn), *Swedish Economic Policy Review*, 11(1), 95-114.

2004 "The Long–Run Educational Cost of World War Two" (with Rudolf Winter–Ebmer), *Journal of Labor Economics,* January, 22(1), 57-86.

2004 "How Large is the "Brain Drain" from Italy" (with Giovanni Peri and Sascha Becker), *Giornale degli Economisti,* Anno 117, April, 63(1), 1-32.

2003 "Are Judges Biased by Labor Market Conditions?" (with Michele Polo and Enrico Rettore), *European Economic Review,* October, 47(5), 913-944.

2002 "Estimation of Average Treatment Effects Based on Propensity Scores" (with Sascha Becker), *The Stata Journal,* 2(4), 358-377.

2001 "Productivity, Seniority and Wages" (with Luca Flabbi), *Labour Economics,* June 8(3), 359-387.

2000 "Work Environment and Individual Background: Explaining Regional Shirking Differentials in a large Italian Firm" (with Giovanni Maggi), *Quarterly Journal of Economics*, August, 115(3), 1057-1090.

1999 "More Equal but Less Mobile? Education Financing and Intergenerational Mobility in Italy and in the US" (with Daniele Checchi and Aldo Rustichini), *Journal of Public Economics*, December, 74(3), 351-393.

1999 "Lower and Upper Bounds of Returns to Schooling. An Exercise in IV Estimation with Different Instruments" (with Rudolf Winter–Ebmer), *European Economic Review* April 43(4–6), 889–901.

1999 "Discrimination or Individual Effort? Regional Productivity Differentials in a Large Italian Firm" (with Pietro Ichino). Ch. 3 in: John C. Haltiwanger et al. (eds.), *The Creation and Analysis of Employer–Employee Matched Data*, North–Holland, Elsevier Science B.V., Contributions to Economic Analysis, vol. 241. Amsterdam; New York and Oxford: Elsevier Science, North-Holland, 59–77.

1995 "Wage inequality and Unemployment: US vs. Europe" (with Giuseppe Bertola), in: B. Bernanke and J. Rothemberg (eds.), NBER Macroeconomics Annual 1995, Cambridge, MIT Press.

1995 "Crossing the River: A Comparative Perspective on Italian Employment Dynamics" (with Giuseppe Bertola), *Economic Policy: A European Forum*, October, 0(21), 359-415.

1994 "Wage Differentials in Italy. Market Forces, Institutions and Inflation" (with Chris Erickson), in: Richard Freeman and Larry Katz (eds.), *Differences and Changes in the Wage Structure*, Chicago and London: University of Chicago Press, 265-305.

1994 "Immigration, Human Capital and Growth in the Host Country: Evidence from Pooled Country Data" (with Juan Dolado and Alessandra Goria), *Journal of Population Economics*, Springer, 7(2), 193-215.

1994 "Flexible Labour Compensation, Risk Sharing and Company Leverage", *European Economic Review,* Elsevier, vol. 38(7), 1411-1421, August, 38(7), 1411-21.

1994 "Lump Sum Bonuses in Union Contracts" (with Chris Erickson), in: D. Lewin and D. Sockell (eds.), *Advances in Industrial and Labour Relations*, Vol. 6, Greenwich, Conn. and London: JAI Press, 183-218.

1993 "The Economic Impact of Immigration on the Host Country", in: Giacomo Luciani (ed.), *Migration Policies in Europe and the United States*, Dordrecht and Norwell, Mass.: Kluwer Academic, 145-162.

1992 "Is Information More Valuable When Risk Increases? One Answer and an Interesting Analogy" (with Corrado Benassi), Rivista Internazionale di Scienze Economiche e Commerciali, August, 39(8), 673-692.

1988 "Do Marginal Employment Subsidies Increase Re–Employment Probabilities?" (with Leonardo Felli), *Labour*, 2, 63-89.

Publications in Italian

2013 "Liberiamo la scuola" (with Guido Tabellini), Ed. Corriere della Sera.

2013 "Facoltà di scelta" (with Daniele Terlizzese), Rizzoli.

2012 "Giudici in affanno" (with Decio Coviello e Nicola Persico). Forthcoming in Annuario di diritto comparato e studi legislativi.

2009 "L'Italia fatta in casa" (with Alberto Alesina), Mondadori.

2005 "Lo splendido isolamento dell'università italiana" (with Stefano Gagliarducci, Giovanni Peri e Roberto Perotti), in Tito Boeri, Riccardo Faini, Andrea Ichino, Giuseppe Pisauro, Carlo Scarpa (ed.) *Oltre il Declino*, Bologna, Il Mulino, 2005.

2003 "Le perplessita' di un utilizzatore di dati di fronte al Codice di deontologia e buona condotta per il trattamento di dati personali per scopi statistici e scientifici", *Rivista Statistica*, Ottobre-Dicembre, 4, 673-683.

2003 "Il Lavoro Interinale in Italia. Trappola del Precariato o Trampolino verso un Impiego Stabile?", Research report on the project 'Il Lavoro Interinale in Italia' (con Fabrizia Mealli e Tommaso Nannicini), Italian Ministry of Welfare and Regione Toscana / EUI.

2001 "Manuale di Economia del Lavoro". Luchino Brucchi (ed.), Bologna, Il Mulino. Luchino Brucchi (ed.), *Manuale di Economia del Lavoro*, Collana "Strumenti", Bologna, Il Mulino.

2001 "Il Problema della Causalità. Una Introduzione Generale ed un Esempio". Capitolo 20 in: Luchino Brucchi (ed.), *Manuale di Economia del Lavoro*, Collana "Strumenti", Bologna, Il Mulino.

1998 "L'Influenza delle Condizioni del Mercato del Lavoro Regionale sulle Decisioni dei Giudici in Materia di Licenziamento" (with Pietro Ichino and Michele Polo), *Rivista Italiana di Diritto del Lavoro*, XVII(1), 19-46.

1997 "La disciplina limitativa dei licenziamenti. Effetti e giustificazioni nella letteratura economica recente", *Politica Economica*, December, 13(3), 375-408.

1997 "Scuola e mobilità sociale: un'analisi comparata" (with Daniele Checchi and Aldo Rustichini), in: N. Rossi (ed.), *L'istruzione in Italia: solo un pezzo di carta?*, Bologna, Il Mulino.

1996 "Immobili perchè eguali?" (with Daniele Checchi and Aldo Rustichini), in: G.P. Galli (ed.), *La mobilità della società italiana: le persone, le imprese e le istituzioni*, Roma, SIPI.

1996 "Sistemi di incentivazione della forza lavoro. Una rassegna dei principali problemi teorici" (with Leonardo Felli), IGIER, *Politica Economica*, December, 12(3), 331-361.

1994 "A chi serve il diritto del lavoro" (with Pietro Ichino), *Rivista Italiana di Diritto del Lavoro,* 4, 459-505.

1994 "Flussi migratori e convergenza fra regioni italiane" (with Alessandra Goria), *Lavoro e Relazioni Industriali*, 3, July-September, 3-50.

1994 "In mezzo al guado: dalla flessibilità alla rigidità nel problema occupazionale italiano" (with Giuseppe Bertola), in: Guido Tabellini and Alessandro Penati (eds.), *Economia Mercati e Istituzioni: Le Nuove Frontiere della Politica Economica*, Milano, Pirola – Il Sole 24ore.

1993 "Determinanti dei contratti con retribuzione flessibile" (with Alessandra Del Boca), *Rassegna di Statistiche del Lavoro*, 31-37.

1992 "Desiderabilità di un contratto indicizzato e variabilità dell'inflazione" (with Corrado Benassi), *Economia e Lavoro*, Jan.-March, 26(1), 23-35.

1991 "Retribuzione flessibile, suddivisione del rischio e struttura finanziaria dell'azienda", *Economia Marche*, X(1), April, 65-79.

1991 "Premi forfettari e trasformazione del regime salariale negli Stati Uniti" (with Michael Piore and Chris Erickson), in: G. Della Rocca, L. Prosperetti (eds.), *Salari e produttività. Esperienze internazionali ed italiane*, Milano, AISRI Franco Angeli.

1990 "Retribuzione flessibile e partecipazione dei lavoratori al rischio aziendale: effetti sulle relazioni industriali", *Produttività e Competitività*, June, 33-46.

1989 "Incentivazione della produttività o suddivisione del rischio? Ipotesi sui motivi della recente diffusione di contratti con incrementi salariali collegati agli andamenti aziendali", *Politica Economica*. December, 5(3), 463-91.

Grants

2011– *Problemi e soluzioni per la valutazione della performance nella Pubblica Amministrazione.* PRIN 2009 projet financed by the Italian Ministry of education. Andrea Ichino is the National Coordinator of the project which is a joint effort of the universities of Bologna, Padova and Calabria.

2002-2003– *Il lavoro interinale come canale d'accesso al lavoro a tempo indeterminato.* Project financed by the Italian Ministry of Welfare. This grant has originated the report prepared for the Ministry with the title "Il Lavoro Interinale in Italia. Trappola del Precariato o Trampolino verso un Impiego Stabile?" and the article "Temporary Work Agencies in Italy: A Springboard to Permanent Employment?", both written with Fabrizia Mealli and Tommaso Nannicini.

1998-2001– *Targeted Socio-Economic Research Project*, financed by the European Commission DG XII, on the subject: "Labour Demand, Education, and the Dynamics of Social Exclusion". This grant has originated the articles: "Job Insecurity and Children's Emancipation: The Italian Puzzle" (with Sascha Becker, Samuel Bentolila and Ana Fernandes) and "Unemployment and Consumption: Are Job Losses Less Painful Near the Mediterranean?" (with Samuel Bentolila).

Recent invited keynote lectures

2020 COSME workshop, Madrid, Spain.

2020 IZA Research program on Gender and Family, Bonn, Germany.

2019 IZA Junior/Senior symposium, Austin, Texas.

2014 Colloquium on Personnel Economics, Cologne, Germany.

2013 European Association of Labor Economists, Torino, Italy .

2011 International Workshop on the Applied Economics of Education, Soverato, Italy.

Other professional activities

2015– Managing editor of *Economic Policy*.

2012–14 Member of the Bocconi-EIEF *Growth Commission for Italy*.

2012–14 Associate editor of the *Journal of the European Economic Association*.

2010–12 Member of the "Comitato Tecnico Scientifico presso il Dipartimento per la Programmazione e la Gestione delle Risorse Umane, Finanziarie e Strumentali del Ministero della Pubblica Istruzione, con il compito di disegnare il Sistema Nazionale di Valutazione delle Scuole e degli Insegnanti."

2009–11 Member of the panel of *Economic Policy*.

2004–08 Editor-in-chief of *Labour Economics*, the journal of the European Association of Labor Economists.

2002–08 Member of the Scientific Committee of the *European Association of Labor Economists*.

2002–04 Associate editor of the *Journal of the European Economic Association*.

2002–03 Associate editor of *Labor Economics*.

2000-02– Associate editor of the *European Economic Review*.

1990– Referee for: American Economic Review, Canadian Journal of Economics, Economic Development and Cultural Change, Econometrica, Economic Journal, European Economic Review, Industrial and Labour Relations Review, Journal of Business and Economic Statistics, Journal of Applied Econometrics, Journal of Econometrics, Journal of the European Economic Association, Journal of Labour Economics, Journal of Public Economics, Journal of Political Economy, Journal of Population Economics, Giornale degli Economisti, Labour, Labour Economics, Open Economic Review, Politica Economica, Quarterly Journal of Economics, Review of Economic Studies, Scandinavian Journal of Economics.

Other experiences

Regional instructor of ski-randonnee of the Italian Alpine Club.

Italian nautical license "12 miles and beyond".

Italian native speaker, fluent in English, conversational in French.

4.2 Curriculum vitae of the Co-Principal Investigator Fabrizia Mealli

Contact Information

Department of Economics
European University Institute
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Florence, Italy https://sites.google.com/unifi.it/fabriziamealli

Personal Information
Born July 22nd, 1966, Italian Citizen.

Research Interests
Causal Inference for Experimental and Observational Studies, Analysis of Broken Randomized Experiments, Principal Stratification, Bayesian Analysis, Missing Data Methods, Applications to Economic, Social, Biomedical and Environmental Sciences, Program Evaluation.

Google scholar citations 4261, h-index 34, i10-index 65 (as of September 2023).

EDUCATION

2004 – PhD in Statistics, University of Florence, Italy.

1990 – Laurea in Economics (summa cum laude), University of Florence, Italy.

PROFESSIONAL EXPERIENCE

Primary Appointments

2023 – present Professor of Econometrics and Director of Graduate Studies, European University Institute.

2005 – 2023 Professor of Statistics, University of Florence.

2019 – 2023 Director, Florence Center for Data Science, University of Florence.

2021 – 2022 Director, Master in Data Science and Statistical Learning, University of Florence and IMT Lucca

2017 – 2021 Director of Graduate Studies, PhD programme in Mathematics, Computer Science and Statistics, Statistics track, University of Florence.

1998 – 2004 Associate Professor of Statistics, University of Florence.

2002 – 2005 Director of Graduate Studies, PhD programme in Applied Statistics, University of Florence.

1994 – 1998 Assistant Professor of Statistics, University of Florence.

1994 Research Associate, Department of Economics, University of Leicester, UK.

Other Appointments and Affiliations

2021 – 2023 Part-time Professor, European University Institute, Department of Economics

2014 – present Member of the Scientific Committee, Action Research for CO-develpment (ARCO), Research Center, University of Florence.

2017 Visiting Professor of Statistics, Department of Statistics and Department of Biostatistics, Harvard University.

2015 Visiting Professor of Statistics, Department of Statistics, Harvard University.

2012 Visiting Professor, Luxembourg Institute for Socio-Economic Resarch (LISER), Luxembourg.

2011 Visiting Scholar, Department of Statistics, Harvard University.

2006 – present External Research Associate, Institute for Social and Economic Research (ISER), University of Essex, UK.

2001 Visiting Associate Professor of Statistics, Department of Statistics, Harvard University.

2000 Visiting Fellow, Department of Economics, University of California, Los Angeles.

1993 Research Assistant, Department of Applied Economics, University of Cambridge, UK.

EDITORIAL BOARDS

2024 – present Associate Editor, Biometrika.

2023 – present Associate Editor, Journal of the American Statistical Association - T&M.

2020 – present Associate Editor, Observational Studies.

2013 – present Associate Editor, The Annals of Applied Statistics.

2021 Guest Editor, Advances in Statistical Decision Theory and Applications, Mathematics.

2018 Guest Editor, Causal Inference from Non-Experimental Studies: Challenges, Developments and Applications, Journal of the Royal Statistical Society Series A (Statistics and Society).

2014 – 2018 Associate Editor, Biometrics.

2011 – 2021 Associate Editor, Journal of the American Statistical Association - Theory and Methods.

2011 – 2014 Associate Editor, Journal of the Royal Statistical Society - Series A.

2008 – 2012 Associate Editor, Statistical Methods and Applications, Springer Verlag.

Membership in Professional Societies: American Statistical Association, Italian Statistical Society (Società Italiana di Statistica, SIS), Econometric Society, International Society for Bayesian Analysis (ISBA), International Biometric Society (IBS), Institute of Mathematical Statistics (IMS).

FELLOWSHIPS AND HONORS

2013 Elected Fellow of the American Statistical Association

2010 Outstanding Reviewer Award for the Journal of Educational and Behavioral Statistics.

2001 Qualification as Professor of Statistics, University of Pisa, Italy.

1995 – 1999 Honorary Visiting Fellow, Department of Economics, University of Leicester.

1992 Fellowship, Centro Interuniversitario di Econometria (CIDE).

1990 Associazione Villa Favard Award for outstanding student in Economics.

1990 Fondazione Federico del Vecchio Award for the best thesis in Economics.

TEACHING AND SHORT COURSES

Undergraduate Courses

1998 – 2021 Statistics, Statistics for the Social Sciences, School of Political Science, University of Florence.

2015 Statistics 186 – Statistical Methods for Evaluating Causal Effects, Harvard University.

2001 Statistics 100 – Introduction to Quantitative Methods, Harvard University.

1997 – 2000 Statistical Decision Theory (BA programme in Statistics), Faculty of Economics, University of Florence.

1994 – 1998 Statistics I, Statistics II, Econometrics I (BA programme in Statistics), Faculty of Economics, University of Florence.

Graduate Courses and International Schools

2024 EuroCIM 2024 - Pre-conference short course in Bayesian Causal Inference.

2023 IRVAPP Advanced School 2023 - Advanced Methods for Impact Evaluation.

The Econometrics of Causality, EUI, Department of Economics.

2022 The Econometrics of Causality, EUI, Department of Economics.

2021 The Econometrics of Causality, EUI, Department of Economics.

2020 IRVAPP Advanced School 2020 - Advanced Methods for Impact Evaluation.

1996 – present Statistical Inference, Causal Inference and Program Evaluation, University of Florence, Master and PhD programmes in Statistics.

2019 Atlantic Causal Inference Conference, Montreal, Canada. Pre-conference course: Bayesian Causal Inference.

2018 4th Annual Advanced Workshop on Research Design for Causal Inference, Northwestern Pritzker School of Law, Chicago, IL.

2nd "Giovanni Anania" Summer School on Evidence-Based Policy Making, University of Calabria, Arcavacata di Rende.

European Causal Inference Meeting, Florence, Italy. Pre-conference course: Theory and Practice of Principal Stratification Analysis.

2017 Statistics 286 − Causal Inference and Program Evaluation, Harvard University.

3rd ARCO Summer School, Methods for Program Evaluation, LISER, Luxembourg

2016 Atlantic Causal Inference Conference, New York, NY. Pre-conference course: Principal stratification.

2nd ARCO Summer School, Methods for Program Evaluation, Florence.

2015 Statistics 286 − Theory and Practice of Principal Stratification Analysis, Harvard University.

Causal Inference in Epidemiology and applications to Environmental Health, Summer School, University La Sapienza, Rome.

ARCO Summer School, Methods for Program Evaluation, Florence.

2012 Theory and practice of program evaluation, Short Course, CEPS/INSTEAD, Luxembourg.

Issues and Methods for the Evaluation of Public Policies, Summer School, University of Naples "Federico II", Naples.

2011 Statistical Methods for Causal Effects, Short Course, University of Helsinki.

2009 Causal Inference, Bocconi University, Milan.

2007 Missing data in Statistical Practice, Applied Statistics Week, University Pompeu Fabra, Barcelona.

Duration Models in Population Studies, School of the Italian Statistical Society, Florence.

2002 Statistical Models for the Analysis of Educational Processes, School of the Italian Statistical Society, Florence.

2001 Statistics 214-Causal Inference, Harvard University.

1994 Quantitative Methods (MA programme in Economics), University of Leicester.

OTHER PROFESSIONAL ACTIVITIES

2023−2027 Scientific Director - DiSIA, Fondo del Ministero dell'Istruzione, dell'Universita' e della Ricerca destinato a strutture di ricerca di eccellenza.

2022 Chair of the Organizing Committee, IMS International Conference in Statistics and Data Science for Health Policy Statistics(ICSDS), Florence, Italy.

2021−2022 Consultant - Daiichi Sankyo.

2020−2022 Consultant - Novartis.

2020−present Member of the Organizing Committee of the Online Causal Inference Seminar.
https://sites.google.com/view/ocis/home?authuser=0

2019 Consultant - Novartis.

2018−2019 Member of the Scientific International Program Committee, 30th International Biometric Conference 2020, Seoul, Korea.

2018−2019 Member of the Scientific Program Committee, International Conference for Health Policy Statistics 2020, San Diego, CA.

2018−2022 Scientific Director - DiSIA, Fondo del Ministero dell'Istruzione, dell'Universita' e della Ricerca destinato a strutture di ricerca di eccellenza.

2018 Head of the Organizing and Scientific Committee, European Causal Inference Meeting EuroCIM, Florence, Italy.

2013 − 2014 Member of the National Committee for "Abilitazione Scientifica Nazionale - ASN" for Statistics.

2003 − 2010 Member of the Ethical Committee for Pharmaceutical Experimentation (Comitato Etico Sperimentazione Farmaci) of the Arezzo Health Agency, Italy.

2013 Member of the Programme Committee, Fifth Italian Congress of Econometrics and Empirical Economics, CIDE, Genova, Italy.

2012 Member of the Programme Committee, Meeting of the Italian Statistical Society 2012, Member of the Programme Committee, Rome, Italy.

2011 Consultant for Istituto Regionale Programmazione Economica della Toscana (IRPET) for the analysis and evaluation of industrial and social policies in Tuscany, Italy.

2010 Member of the Programme Committee, Fourth Italian Congress of Econometrics and Empirical Economics, CIDE, Pisa, Italy.

2009 Member of the Programme Committee, CLADAG 2009 − Seventh Scientific Meeting of the CLAssification and Data Analysis Group of the Italian Statistical Society, Catania, Italy.

2009 Member of the Programme Committee, Statistical Methods for the analysis of large datasets, Italian Statistical Society, Pescara, Italy.

2008 Member of the Programme Committee, International Conference on Health Policy Statistics, Philadelphia, USA.

2007 Short Term Consultant, The World Bank, April-June.

2005 Member of the Programme Committee, First Italian Congress of Econometrics and Empirical Economics, CIDE, Venezia, Italy.

2000 Member of the Organizing Committee, Scientific Meeting of the Italian Statistical Society, Florence, Italy.

2003-2004 Research consultant, UCW (Understanding Children's Work), an ILO, UNICEF, and the World Bank inter-agency research project.

2003 − 2008 Research consultant, *Multiple Imputation of AVA Clinical Trials*, Centers for Disease Control and Prevention (CDC).

PUBLICATIONS

2024

Mattei A., Ding P., Ballerini V., **F. Mealli** (2024), Assessing causal effects in the presence of treatment switching through principal stratification, forthcoming in *Bayesian Analysis*.

Mealli F., Mattei A., Mariottini A., Massacesi L., Non-inferiority analysis of subcutaneous versus intravenous 300 mg monthly natalizumab administration: A post hoc analysis of the REFINE study, *Multiple Sclerosis Journal*.

2023

Mealli F., Mortimer J.H. (2023), A conversation with Guido W. Imbens, *Statistical Science*

Wang, C, Zhang, Y, **Mealli, F.**, Bornkamp, B. Sensitivity analyses for the principal ignorability assumption using multiple imputation. *Pharmaceutical Statistics.* 2023; 22(1): 64- 78. https://doi.org/10.1002/pst.2260.

Li F., Ding P., **Mealli F.** (2023), Bayesian Causal Inference: A Critical Review, *Philosophical Transactions A* (https://arxiv.org/abs/2206.15460)

Tortù C., Crimaldi I., **Mealli F.**, Forastiere L. (2023). Estimating Causal Effects of Multi-Valued Treatments Accounting for Network Interference: Immigration Policies and Crime Rates. *Sociological Methods and Research*, https://doi.org/10.1177/00491241221147503

Papadogeorgou G., Menchetti F., Choirat C., Wasfy J.H., Zigler C. M., **Mealli F.** (2023) Evaluating federal policies using Bayesian time series models: estimating the causal impact of the hospital readmissions reduction program, *Health Services and Outcomes Research Methodology*, https://doi.org/10.1007/s10742-022-00294-8

Menchetti F., Cipollini F. **Mealli F.**, Combining counterfactual outcomes and ARIMA models for policy evaluation, *The Econometrics Journal*, 26, 1, 1–24
https://doi.org/10.1093/ectj/utac024

2022

Wu X., **Mealli F.**, Kioumourtzoglou M.A., Dominici F., Braun D. (2022) Matching on Generalized Propensity Scores with Continuous Exposures, *Journal of the American Statistical Association*, https://doi.org/10.1080/01621459.2022.2144737.

Mattei A., Forastiere L., **Mealli F.** (2022) Assessing Principal Causal Effects Using Principal Score Methods. In J. R. Zubizarreta, E. A. Stuart, D. S. Small, P. R. Rosenbaum (Eds.). *Handbook of Matching and Weighting Adjustments for Causal Inference.* Chapter 17. Chapman and Hall/CRC/Taylor and Francis.

Paganini I., Sani C., Chilleri C., Baccini M., Antonelli A., Bisanzi S., Burroni E., Cellai F., Coppi M., **Mealli, F.**, Pompeo G., Viti J., Rossolini G. M., Carozzi F. M., (2022). Assessment of the feasibility of pool testing for SARS-CoV-2 infection screening. *Infectious Diseases*, 54, 478-487, ISSN:2374-4235
https://doi.org/10.1080/23744235.2022.2044512

Mariottini A., Bulgarini G., Forci B., Innocenti C., **Mealli F.**, Mattei A., Ceccarelli C., Repice A. M., Barilaro A., Mechi C., Saccardi R., Massacesi L. (2022) Autologous haematopoietic stem cell transplantation versus low-dose immunosuppression in secondary–progressive multiple sclerosis. *European Journal of Neurology* 29, 1708– 1718, https://doi.org/10.1111/ene.15280

Forastiere L., **Mealli F.** , Wu A., Airoldi E. M. (2022), Estimating Causal Effects Under Interference Using Bayesian Generalized Propensity Scores, in *Journal of Machine Learning Research*, https://www.jmlr.org/papers/v23/18-711.html.

Mealli, F. Causal Inference Perspectives. *Observational Studies*, 8, 2, 2022, 105-108. *Project MUSE*, http://doi.org/10.1353/obs.2022.0011

2021

Mattei, A., **Mealli, F.**, Nodehi, A. (2021). Design and Analysis of Experiments. In: Zimmermann, K.F. (eds) *Handbook of Labor, Human Resources and Population Economics.* Springer, https://doi.org/10.1007/978-3-319-57365-6_40-1.

Dominici F., Bargagli-Stoffi F.J., **Mealli F.** (2021), From controlled to undisciplined data: estimating causal effects in the era of data science using a potential outcome framework, *Harvard Data Science Review*, (https://arxiv.org/abs/2012.06865).

Nethery R.C., **Mealli F.**, Sacks J.D., Dominici F. (2021) Evaluation of the health impacts of the 1990 Clean Air Act Amendments using causal inference and machine learning, *Journal of the American Statistical Association*, 116:535, 1128-1139, https://doi.org/10.1080/01621459.2020.1803883

Baccini M., Mattei A., Irene Paganini I., Rocco E., Sani C., Vannucci G., Bisanzi S., Burroni E., Peluso M., Munnia A., Cellai F., Pompeo G., Micio L., Viti J., **Mealli F.**, Carozzi F. (2021) Pool testing on random and natural clusters of individuals: optimisation of SARS-CoV-2 surveillance in the presence of low viral load samples, PLoS ONE, 16(5): e0251589. https://doi.org/10.1371/journal.pone.0251589.

Yitshak Sade M., Nethery R., Schwartz J., **Mealli F.**, Dominici F., Di Q., AAbu Awad Y., Ifergane G., Zanobetti A. (2021) PM2.5 and hospital admissions among Medicare enrollees with chronic debilitating brain disorders, Science of The Total Environment, 755, 2.

https://doi.org/10.1016/j.scitotenv.2020.142524

Mealli, F. (2021), Answering causal questions: Angrist, Imbens and the Nobel prize. Significance, 18: 4-5, https://doi.org/10.1111/1740-9713.01581.

2020

Forastiere L., Airoldi E.M., **Mealli F.** (2020), Identification and estimation of treatment and interference effects in observational studies on networks, Journal of the American Statistical Association, T&M, 1-18, https://doi.org/10.1080/01621459.2020.1768100.

Cereda G., Viscardi C., Gottard A., **Mealli F.** (2020) Baccini M., Analisi e previsioni dell'epidemia da SARS-CoV-2 in Toscana / Analysis and future scenarios of the SARS-CoV-2 epidemic in Tuscany Region (Central Italy), *Epidemiologia&Prevenzione*, 120-127, Sept-Dec 2020. https://doi.org/10.19191/EP20.5-6.S2.110

Baccini M., Mattei A., Rocco E., Vannucci G., **Mealli F.**, Evaluating a SARS-CoV-2 screening strategy based on serological tests / Valutazione di una strategia di screening per l'infezione da SARS-CoV-2 basata su test sierologici, *Epidemiologia&Prevenzione*, 193-199, Sept-Dec 2020. https://doi.org/10.19191/EP20.5-6.S2.118

Yitshak Sade M., Nethery R.C., Abu Awad Y., **Mealli F.**, Dominici F., Zanobetti A. (2020) How Many Hospital Admissions in Massachusetts Would Have Been Prevented by Lowering Levels of Particulate Air Pollution?, Journal of the American College of Cardiology, 2020 May 26;75(20):2642-2644. http://doi.org/10.1016/j.jacc.2020.03.056

Baccini M., **Mealli F.**, Cereda G., Gottard A., Pedone M., Rocco E., Viscardi C.; ARS; ISPRO Strategie di sorveglianza e biomonitoraggio del contagio da SARS-CoV-2 tramite tamponi individuali, pool testing e test sierologici: il protocollo per affrontare il dopo lockdown in Regione Toscana. E&P Repository 2020. E&P Code: repo.epiprev.it/1235.

Caloffi A., Mariani M., Mattei A., **Mealli F.** What kinds of R&D consortia enhance SMEs productivity? A hierarchical Bayesian approach for the analysis of a regional innovation policy, forthcoming, Papers in Regional Science. 2020; 99: 25– 53. https://doi.org/10.1111/pirs.12476

2019

Mattei A., **Mealli F.** Ricciardi F.(2019) Bayesian Inference for Sequential Treatments under Latent Sequential Ignorability, Journal of the American Statistical Association, 1-20,

https://doi.org/10.1080/01621459.2019.1623039.

Forastiere L., Lattarulo P., Mariani M., **Mealli F.**, Razzolini L. (2019) Exploring Encouragement, experience and spillover effects using principal stratification in a field experiment on teens' museum attendance, Journal of Business and Economic Statistics 1-15,

https://doi.org/10.1080/07350015.2019.1647843.

Papadogeorgou G., **Mealli F.**, Zigler C.M. (2019) Causal inference for interfering units with cluster and population level treatment allocation programs, Biometrics ,75,3, 778-787,

https://doi.org/10.1111/biom.13049.

Nethery R.C., **Mealli F.**, Dominici F. (2019), Estimating Population Average Causal Effects in the Presence of Non-Overlap: A Bayesian Approach The Annals of Applied Statistics, 13, 2, 1242-1267

https://doi.org/10.1214/18-AOAS1231

2018

Forastiere L., **Mealli F.**, Miratrix L. (2018) Posterior Predictive P-values with Fisher Randomization Tests in Noncompliance Settings: Test Statistics vs Discrepancy Variables, Bayesian Analysis, 13, 681-701. https://doi.org/10.1214/17-BA1062

Mariani M., **Mealli F.** (2018) The Effects of R&D Subsidies to Small and Medium-Sized Enterprises. Evidence from a Regional Program, Italian Economic Journal, 4, 249-281.

https://doi.org/10.1007/s40797-017-0062-2

2017

Baccini M., Mattei A., **Mealli F.** (2017) Bayesian inference for causal mechanisms with application to a randomized study for postoperative pain control, Biostatistics, 18, 605-617. https://doi.org/10.1093/biostatistics/kxx010

Feller A., **Mealli F.**, Miratrix L. (2017) Principal Score Methods: Assumptions and Extensions, Journal of Educational and Behavioral Statistics, 42, 726-758. https://psycnet.apa.org/doi/10.3102/1076998617719726

Baccini, M., Mattei, A., **Mealli, F.**, Bertazzi, P.A. and Carugno, M. (2017) Potential outcome approach to causal inference in assessing the short term impact of air pollution on mortality, Environmental Health, 16, 7. https://doi.org/10.1186/s12940-017-0215-7

2016 Mattei A., **Mealli F.** (2016) Regression Discontinuity Designs as Local Randomized Experiments, Observational Studies, 2, 156-173. https://doi.org/10.1353/obs.2017.0004

Mealli F., Pacini B., Stanghellini E. (2016) Identification of Principal Causal Effects Using Additional Outcomes in Concentration Graphs, Journal of Educational and Behavioral Statistics, 41, 463-480. https://doi.org/10.3102/1076998616646199

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Submitted Manuscripts and Work in progress

Forastiere L., **Mealli F.**, Pescarini J.M., Fiaccone R.L., Barreto M.L., Mattei A., Selecting Subpopulations for Causal Inference in Regression Discontinuity Designs, (https://arxiv.org/abs/2211.09099), under review.

Menchetti F., Cipollini F., **Mealli F.**, Uncovering the impact of regulated Bitcoin futures on volatility and volume, http://doi.org/10.2139/ssrn.4017262.

Forastiere L., **Mealli F.**, Zigler C.M., Bipartite Interference and Air Pollution Transport: Estimating Health Effects of Power Plant Interventions, (https://arxiv.org/abs/2012.04831), under review.

Branson Z., **F. Mealli**, Local Randomization and Beyond for Regression Discontinuity Designs, (https://arxiv.org/abs/1810.02761).

Comment L., **Mealli F.**, Haneuse S., Zigler C.M., Survivor average causal effects for continuous time: a principal stratification approach to causal inference with semicompeting risks, (https://arxiv.org/abs/1902.09304), under review.

4.3 Curriculum vitae of the Co-Principal Investigator Davide Azzolini

Date of Birth: May 23, 1980
Nationality: Italian

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Research Institute for the Evaluation of Public Policies
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Research interest

Inequality in education opportunity; educational technology; student aid; immigrant integration; policy analysis; program evaluation; randomized controlled trials.

Positions

11/2019– Affiliated Scholar **Urban Institute** – Washington DC, US

08/2018– Research fellow (tenured) **Research Institute for the Evaluation of Public Policies - Bruno Kessler Foundation (FBK-IRVAPP)** – Trento, Italy

2013-2018 Research fellow (fixed term) **Research Institute for the Evaluation of Public Policies - Bruno Kessler Foundation (FBK-IRVAPP)** – Trento, Italy

2019 Visiting scholar **Urban Institute** – Washington DC, US

2012–05 Research collaborator **Department of Sociology and Social Research - University of Trento** – Trento, Italy

2010 Visiting Research Collaborator **Office of Population Research - Princeton University** – Princeton NJ, US

2007–2010 Research Collaborator **Laboratorio di Politiche - COREP** – Turin, Italy

2005 Research Collaborator **Berlin Institute for Comparative Social Research** – Berlin, Germany

Research

2023-2026 Evaluation of WILL-Torino
Funding: Fondazione Ufficio Pio - Compagnia di San Paolo
Role: Coordinator of the research team in charge of the randomized controlled trial to evaluate the effects of an education matched savings program.

2023-2027 Evaluation of PUOI
Funding: Impresa Sociale Con i Bambini - Fondo di Contrasto alle Poverta' Educative
Role: Coordinator of the research team in charge of the mixed-methods evaluation of an education matched savings program.

2022 Evaluation of Arcipelago Educativo
Funding: Fondazione Agnelli
Role: Member of the research team of the randomized controlled trial evaluation of a summer learning program.

2022-2025 The future of schooling: harnessing the potential of digital education technology
Funding: European Investment Bank - University Research Sponsorship Programme.
Role: Member of the research team in charge of analyzing educational technology investments and deployment across the European Union.

2020-2022 SENSES - Evaluation of an Experiential School Intervention to Counter Stereotypes Towards Persons with Visual Disabilities
Funding: Fondazione Caritro
Role: Member of the research team in charge of the randomized controlled trial evaluation.

2019-2023 WILL - Educare al Futuro
Funding: Impresa Sociale Con i Bambini - Fondo di Contrasto alle Poverta' Educative
Role: Researcher in charge of the design and implementation of the experimental evaluation of a new savings program for education in Italy

2019-2021 200SME Challenge
Funding: European Commission - Program: H2020-Innosup6
Role: Researcher in charge of the design and implementation of the experimental evaluation of a UX-Challenge for SMEs.

2019-2022 Assess[at]learning
Funding European Commission - DG Education, Audiovisual & Culture Executive Agency; Program: Erasmus+ Key Action 3
Role: Researcher in charge of the design and implementation of the experimental evaluation of a new online tool to increase schools' adoption of digital formative assessment in five EU Member States.

2018-2019 Evaluation of Entrepreneurship Education Programmes in Higher Education Institutions and Centres
Funding: European Commission - DG Education, Audiovisual & Culture Executive Agency
Role: Independent consultant.

2017-2019 Study on engagement and achievement of 15 year olds in PISA 2015 across EU Member States
Funding: European Commission - DG Education, Audiovisual & Culture - Policy Strategy and Evaluation Unit
Role: Researcher in charge of the analysis of students' engagement and achievement indicators using PISA2015 data for EU countries.

2017-2020 TeachUP - Teacher UPskilling Policy experimentation
Funding: European Commission - DG Education, Audiovisual & Culture Executive Agency - Erasmus+ Key Action 3
Role: Researcher in charge of the design and implementation of the experimental evaluation of a new online support to increase teacher retention in online corses ten European Countries.

2016-2017 Study on Youth Work and Youth Entrepreneurship
Funding: European Commission - DG Education, Audiovisual & Culture Executive Agency
Role: Member of the research team in charge of analyzing entrepreneurship education programs in Italy.

2015-2016 Investigating the second digital divide across European countries: social disparities on digital reading and navigation skills
Funding:EUN Schoolnet
Role: Researcher in charge of analyzing digital gaps using PISA 2012 micro data for EU Member States.

2015-2018 MENTEP - Mentoring Technology-Enhanced Pedagogy
Funding: European Commission - DG Education, Audiovisual & Culture Executive Agency - Erasmus+ Key Action 3 (EACEA/10/14)
Role: Researcher in charge of the design and implementation of the experimental evaluation of an online self-assessment tool to raise teachers' digital skills for teaching in eleven European Countries.

2015-2017 Scuolinsieme
Funding: Fondazione per la Scuola, Compagnia di San Paolo
Role: Member of the research team in charge of the experimental evaluation of a school intervention aimed at promoting students' achievement and study motivation

2015 An Integrated System for the Evaluation of the Education System in Trentino
Funding: IPRASE
Role: Member of the research team in charge of statistical analyses on student achievement microdata.

2014-2017 ACHAB - Affording College with the Help of Asset Building
Funding: European Commission - DG Employment, Social Affairs and Inclusion; Programme: Progress (VP/2013/012)
Role: Member of the research team in charge of the implementation of the experimental evaluation of the Percorsi matched savings program for education.

2013-2014 SPHERA- Spatial Planning and Health Systems: enhancing territorial governance in Alpine Space
Funding: Managing Authority of the Alpine Space Programme -European Territorial Cooperation 2007-2013, Alpine Space Programme
Role: Member of the research team.

2013-2014 Family background, beliefs about education and participation in Higher Education: an experiment integrated with a longitudinal survey
Funding: Italian Ministry of Education; Programme:Progetti di Rilevante Interesse Nazionale (PRIN)
Role: Research assistant.

2005-2006 INTGEN - Indicators For Integration and Generational Change
Funding: European Commission - DG Justice, Freedom and Security - Programme: Integration of Third Country Nationals (INTI)
Role: Research assistant.

Education

2012 Ph.D. in Sociology and Social Research *Doctoral School in Social Sciences*, University of Trento, Italy

2007 Post-graduate Master Degree in Public Policy Analysis

Corep, University of Turin, Politecnico of Turin and University of Piemonte Orientale, Turin, Italy

2005 University Degree in Political Science

University of Padova, Faculty of Political Sciences, Italy

2004 Erasmus Visiting Student

Freie Universität Berlin, Otto-Suhr-Institut für Politikwissenschaft, Berlin, Germany

Publications

2024 Azzolini, D., & Schnell, P. *Children of immigrants and the second generation.* In Research Handbook on the Sociology of Migration, pp. 192-204, Edward Elgar Publishing.

2024 Azzolini, D., Doppio, N., Mion, L., Russo, I. Q., & Tomelleri, A. Enhancing SMEs' Digital Innovation Capabilities: Experimental Evidence from a User Experience Design Challenge, *Research Institute for the Evaluation of Public Policies* No. 2024-01.

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2019 Azzolini, D., Sisti, M. (2019) Evidence-Based Policy e Attivita' Legislativa. Cosa c'e' di nuovo? Federalismi.it. Rivista di diritto pubblico italiano, comparato, europeo, Numero speciale 3 (2019), pp. 159-174

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2010 Barone, C., and Azzolini, D., Gender, social class and ethnicity: towards a growing meritocracy in education? Facts and fantasies about educational policies in Italy, *Ricercazione*, 4: 167-177

2006 Berlin Institute for Comparative Social Research, *Integration Indicators and Generational Change-Country Report Germany*, Berlin, Germany (contribution as research collaborator)

Other experience

Since 2021 Member of the promoting committee of *Studi Randomizzati*, Italian blog on the use of randomized controlled trials to support evidence-based policy making.

2021 Expert Reviewer for the *United States-Israel Binational Science Foundation.*

Since 2020 Italian National Scientifc Qualification as University Professor - Abilitazione Scientifica Nazionale 2018-2020 alle funzioni di professore universitario di Seconda Fascia, nel settore concorsuale 14/D1 SOCIOLOGIA DEI PROCESSI ECONOMICI, DEL LAVORO, DELL'AMBIENTE E DEL TERRITORIO

Since 2020 Italian National Scientifc Qualification as University Professor - Abilitazione Scientifica Nazionale 2018-2020 alle funzioni di professore universitario di Seconda Fascia, nel settore concorsuale 14/C1 SOCIOLOGIA GENERALE

Since 2018 Member of the Association for Public Policy Analysis & Management (APPAM)

Since 2018 Coordinator and chair of Session on Impact Evaluation of Public Policies at the yearly *ESPANET Italia* Conference.

2018 Member of COST Action 16111 (ETHMIGSURVEYDATA) chaired by Prof Laura Morales (Sciences Po, CEE)

2017 Coordinator and chair of the worskhop *It's too late: They are already in our homes! The nexus between mixed unions and immigrants' integration in Europe*, Bologna, October 6

2013 Member of the scientific commitee of the Spring 2013 ISA RC28 meeting "Economic crises, social inequalities and social policies" , Trento, May 16-18

Since 2013 Member of ISA RC28 (International Sociological Association - Research Committee on Social Stratification)

2013 Member of *Italian Association of Population Studies - Italian Association of Statistics*

01/2012–05/2013 Employee at the Municipality of Trento, Italy. Main tasks: Open Government Data, Smart City, Fund Raising and EU-project management.

05/2007–12/2009 Consultancy on public planning, management and evaluation for the Office of Public Policy Analysis, Province of Trento, Trento, Italy.

Since 12/2010 Affiliated to *Princeton University Global Network on Child Migration*

Since 2010 Referee for: *Acta Sociologica*, *Comparative Education Review*, *Demographic Research*, *Economics of Education Review*, *Education Sciences*, *European Journal of Population*, *European Journal of Psychology of Education*, *European Societies*, *European Sociological Review* (7), *Innovation: The European Journal of Social Science Research*, *International Migration* (3), *International Migration Review* (2), *Italian Journal of Sociology of Education*, *Journal of Applied Statistics*, *Journal of Ethnic and Migration Studies* (3), *Genus*, *Polis*, *Rassegna Italiana di Sociologia*, *Research in Social Stratification and Mobility* (3), *Scuola Democratica*, *Social Problems*, *Social Psychology of Education*, *Sociological Quarterly.*

5 Declaration of consent to handling the candidates' data

5.1 Declaration of the PI Andrea Ichino

I, Andrea Ichino, hereby declare my consent to the handling of my personal data by Unicredit in accordance with Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation, GDPR).

I understand and agree that Unicredit may collect, process, and store the personal data provided by me to evaluate my application for a Research Grant on Education. This data may include but is not limited to my resume, cover letter, contact information, educational background, work experience, and any other information relevant to the evaluation of my candidacy.

I acknowledge that this information will be used solely for the purpose of evaluating my application. I consent to the sharing of my personal data within Unicredit for these purposes.

I further understand that my personal data will be retained for the duration necessary to fulfill the aforementioned purposes or as required by applicable laws and regulations. I have the right to request access to, rectification, erasure, or restriction of my personal data, as well as the right to object to the processing of my personal data, in accordance with the provisions of the GDPR.

By signing below, I confirm that I have read and understood the terms of this Declaration of Consent and voluntarily provide my consent to the processing of my personal data as described herein.

Sincerely,
Andrea Ichino

5.2 Declaration of the Co-PI Fabrizia Mealli

I, Fabrizia Mealli, hereby declare my consent to the handling of my personal data by Unicredit in accordance with Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation, GDPR).

I understand and agree that Unicredit may collect, process, and store the personal data provided by me to evaluate my application for a Research Grant on Education. This data may include but is not limited to my resume, cover letter, contact information, educational background, work experience, and any other information relevant to the evaluation of my candidacy.

I acknowledge that this information will be used solely for the purpose of evaluating my application. I consent to the sharing of my personal data within Unicredit for these purposes.

I further understand that my personal data will be retained for the duration necessary to fulfill the aforementioned purposes or as required by applicable laws and regulations. I have the right to request access to, rectification, erasure, or restriction of my personal data, as well as the right to object to the processing of my personal data, in accordance with the provisions of the GDPR.

By signing below, I confirm that I have read and understood the terms of this Declaration of Consent and voluntarily provide my consent to the processing of my personal data as described herein.

Sincerely,
Fabrizia Mealli

5.3 Declaration of the Co-PI Davide Azzolini

I, Davide Azzolini, hereby declare my consent to the handling of my personal data by Unicredit in accordance with Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation, GDPR).

I understand and agree that Unicredit may collect, process, and store the personal data provided by me to evaluate my application for a Research Grant on Education. This data may include but is not limited to my resume, cover letter, contact information, educational background, work experience, and any other information relevant to the evaluation of my candidacy.

I acknowledge that this information will be used solely for the purpose of evaluating my application. I consent to the sharing of my personal data within Unicredit for these purposes.

I further understand that my personal data will be retained for the duration necessary to fulfill the aforementioned purposes or as required by applicable laws and regulations. I have the right to request access to, rectification, erasure, or restriction of my personal data, as well as the right to object to the processing of my personal data, in accordance with the provisions of the GDPR.

By signing below, I confirm that I have read and understood the terms of this Declaration of Consent and voluntarily provide my consent to the processing of my personal data as described herein.

Sincerely,
Davide Azzolini

6 Attachments

6.1 Support letter of the Istituto Nazionale per la Valutazione del Sistema Educativo di Istruzione (INVALSI)

INVALSI Istituto nazionale per la valutazione del sistema educativo di istruzione e di formazione

Ente di Diritto Pubblico Decreto Legislativo 286/2004

Lettera d'intenti

Il sottoscritto Roberto Ricci, in qualità di Presidente dell'Istituto nazionale per la valutazione del sistema educativo di istruzione e di formazione – INVALSI,

visto il programma PRIN (Progetti di ricerca di Rilevante Interesse Nazionale) *destinato al finanziamento di progetti di ricerca pubblica, al fine di promuovere il sistema nazionale della ricerca, di rafforzare le interazioni tra università ed enti di ricerca in linea con gli obiettivi tracciati dal Piano Nazionale di Ripresa e Resilienza (PNRR) e favorire la partecipazione italiana alle iniziative relative al Programma Quadro di ricerca e innovazione dell'Unione Europea* (art. 1, Bando Prin 2022)

dichiara

l'interesse dell'INVALSI a supportare le attività di ricerca previste dal progetto di ricerca "Helping teachers give better track advising to students" con il quale i Professori Andrea Ichino, Fabrizia Mealli e Davide Azzolini intendono competere per uno dei "Research Grants on Education – second edition, year 2024" banditi da Unicredit con scadenza 1° aprile 2024.

L'INVALSI fornirà supporto e consulenza nella fase di campionamento delle scuole italiane di ogni ordine e grado che saranno coinvolte e nelle successive indagini previste dal progetto sulle attività di orientamento praticate dalle scuole.

Roma, 22 marzo 2024

Il presidente INVALSI
Roberto Ricci

Roberto Ricci
INVALSI
Il Presidente
INVALSI
22.03.2024
12:06:42
GMT+00:00

6.2 Support letter of the Istituto Regionale per la Programmazione Economica della Toscana (IRPET)

IRPET

"Helping teachers give better track advising to students" –

Application for a Unicredit research grant on education by Andrea Ichino (PI), Fabrizia Mealli, and Davide Azzolini (Co-PIs)"

Dear Unicredit Foundation,

I am writing to express the commitment and support of IRPET (Istituto Regionale Programmazione Economica della Toscana) for the research project proposed by Andrea Ichino, Fabrizia Mealli, and Davide Azzolini. Our involvement in this initiative includes:

1. Facilitating institutional contacts with the educational authorities of the Tuscany region and with the Tuscany regional administration;
2. Participating in the interpretation of the project's results and their policy implications.

IRPET's support for this project is fully in line with the research carried out by the institute and with the Memorandum of Understanding (Protocollo di Intesa) between IRPET and EUI (Economics Department) signed on January 24 2024, which place a strong focus on the application of counterfactual analysis designs for the evaluation of education policies.

We look forward to contributing to the success of this research endeavor and furthering the objectives outlined in the grant application.

Sincerely,

Nicola Sciclone

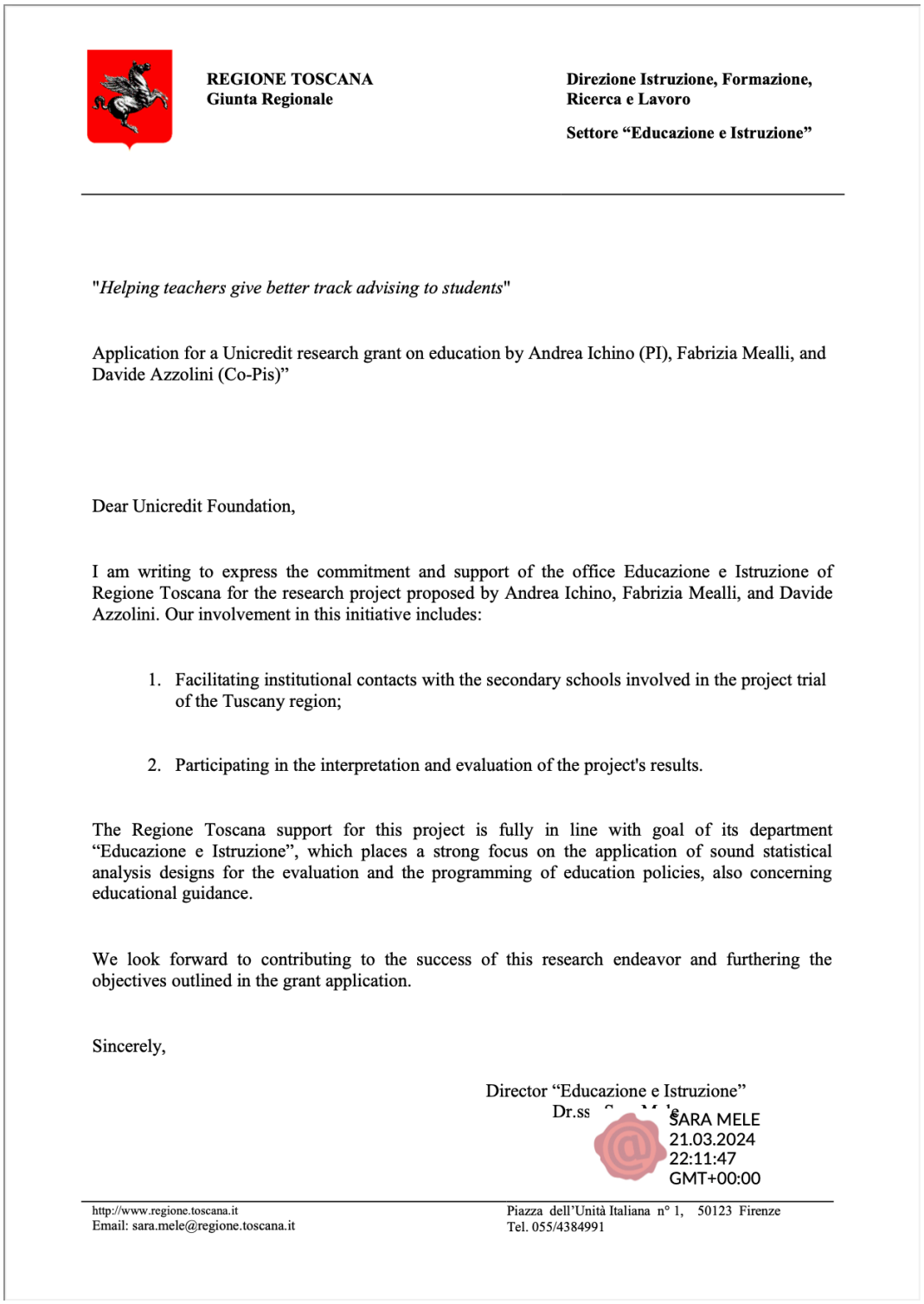
Director of IRPET

SCICLONE
NICOLA
18.03.2024
12:22:51
GMT+01:00

nicola.sciclone@irpet.it

IRPET - Istituto regionale per la programmazione economica della Toscana
Villa La Quiete alle Montalve - Via Pietro Dazzi, 1 – 50141Firenze (ITALIA)
Tel + 39 055 459111- www.irpet.it

6.3 Support letter of the Dipartimento Educazione e Istruzione della Regione Toscana



REGIONE TOSCANA
Giunta Regionale

Direzione Istruzione, Formazione, Ricerca e Lavoro

Settore "Educazione e Istruzione"

"*Helping teachers give better track advising to students*"

Application for a Unicredit research grant on education by Andrea Ichino (PI), Fabrizia Mealli, and Davide Azzolini (Co-Pis)"

Dear Unicredit Foundation,

I am writing to express the commitment and support of the office Educazione e Istruzione of Regione Toscana for the research project proposed by Andrea Ichino, Fabrizia Mealli, and Davide Azzolini. Our involvement in this initiative includes:

1. Facilitating institutional contacts with the secondary schools involved in the project trial of the Tuscany region;

2. Participating in the interpretation and evaluation of the project's results.

The Regione Toscana support for this project is fully in line with goal of its department "Educazione e Istruzione", which places a strong focus on the application of sound statistical analysis designs for the evaluation and the programming of education policies, also concerning educational guidance.

We look forward to contributing to the success of this research endeavor and furthering the objectives outlined in the grant application.

Sincerely,

Director "Educazione e Istruzione"
Dr.ss [illegible]

SARA MELE
21.03.2024
22:11:47
GMT+00:00

http://www.regione.toscana.it
Email: sara.mele@regione.toscana.it

Piazza dell'Unità Italiana n° 1, 50123 Firenze
Tel. 055/4384991

6.4 Support letter of the Institute for the Evaluation of Public Policies of Fondazione Bruno Kessler (FBK-IRVAPP)

FONDAZIONE BRUNO KESSLER
INSTITUTE FOR THE EVALUATION OF PUBLIC POLICIES

"Helping teachers give better track advising to students" - Application for a Unicredit research grant on education by Andrea Ichino (PI), Fabrizia Mealli, and Davide Azzolini (Co-PIs)"

Dear Unicredit Foundation,

I am writing to express the commitment and support of FBK-IRVAPP (Istituto di Ricerca sulla Valutazione delle Politiche Pubbliche della Fondazione Bruno Kessler) for the research project proposed by Andrea Ichino, Fabrizia Mealli, and Davide Azzolini. Our involvement in this initiative includes:

1. Facilitating institutional contacts with the educational authorities of the province of Trento;
2. Assisting in the realization of the Randomized Control Trial concerning schools in the province of Trento;
3. Participating in the interpretation and evaluation of the project's results.

FBK-IRVAPP's support for this project is fully in line with the research carried out by the institute, which places a strong focus on the application of counterfactual analysis designs for the evaluation of education policies.

We look forward to contributing to the success of this research endeavour and furthering the objectives outlined in the grant application.

Sincerely,

Trento, 20 March 2024

Director of FBK-IRVAPP

Mirco Tonin

Mirco Tonin
20.03.2024
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