



# Do grants improve the outcomes of university students in a challenging context? Evidence from a matching approach

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Published online: 6 July 2020

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## Abstract

In this work, we investigate whether grants improve the academic outcomes of students from socio-economically disadvantaged families and thereby reduce inequalities of educational opportunities. We focus on Italy, which is characterized by high dropout rates, prolonged duration of higher education studies and considerable social inequalities in educational outcomes. To estimate the effect of grants, we follow a counterfactual approach, relying on a reweighting matching procedure. First, we apply coarsened exact matching to identify the region of common support. Second, we weight the observation using the entropy balancing method. We use a nationally representative survey, which collects data on students who graduated from upper secondary school in 2004 and 2007. We find that grants reduce dropout and increase timely graduation, with larger effects among males and students in Central-Southern Italy, who are more at risk of withdrawal from university.

**Keywords** Financial aid · Dropout · Timely graduation · Matching

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**Electronic supplementary material** The online version of this article (<https://doi.org/10.1007/s10734-020-00586-3>) contains supplementary material, which is available to authorized users.

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## Introduction

Over the last century, enrolment in higher education has grown dramatically in many countries, suggesting increased demand on the part of families and students for advanced instruction and training (Marginson 2016). However, despite the growing enrolments, not all students who enter higher education are able to conclude their studies successfully by obtaining a degree, and many students take longer to complete their degree program than expected (OECD 2010). Furthermore, there is evidence that social background affects not only the chances of enrolling in higher education, but also persistence and the timely completion of a degree, thereby amplifying inequalities in university degree attainment (Triventi and Trivellato 2009).

In many countries, universities and institutions of higher education face the challenge of improving student success by reducing dropout rates and time-to-degree. The Higher Education Dropout and Completion in Europe (HEDOCE) study found that study success is regarded as important in three quarters of the 35 European countries surveyed; in almost half of the countries, it is high or very high on the policy agenda (Vossensteyn et al. 2015). There is great variety in the policy instruments used by governments to increase study success. They include funding and financial incentives (e.g. grants, loans, free services, accommodation and tax reductions), the provision of information and support for students (e.g. counselling, career guidance related to study and future job opportunities and tutoring) and interventions on the characteristics of higher education (e.g. selection at entry, duration of study, types of degrees offered, quality assurance and accreditation).

In this article, we focus on student grants, a specific form of financial aid; we are particularly interested in understanding whether it is an effective tool for improving students' success. Student aid might play a crucial role in reducing dropout rates and improving timely completion of degree, thereby limiting the loss of talent and boosting the effectiveness of the higher education system. In addition, by being targeted primarily to a population of low-income students, this policy instrument has the potential to reduce inequality of educational opportunity in higher education.

While scholars have mainly addressed the effect of financial aid on university enrolment, in the last decade they have expanded their focus on persistence and timely degree completion, in part due to the greater availability of relevant longitudinal data (Page and Scott-Clayton 2016; Castleman and Long 2016).

In our work, we focus on the Italian higher education system. Previous studies have always focused on specific universities and regions (Mealli and Rampichini 2012; Graziosi 2014; Agasisti and Murtinu 2016; Sneyers et al. 2016), limiting the possibility of generalizing the results. Italy is an interesting case study for at least three reasons. First, it has comparatively a very high rate of dropouts from higher education and a long time-to-degree (Triventi and Trivellato 2009; Aina et al. 2011). Dropout rates range between 20% and 50%, depending on the cohort and estimation method. Recent estimates of the time-to-graduation indicate that the cohorts graduating around 2010 took, on average, a year and half more than the formal duration of studies to complete their degree. Second, the system of financial support to students is not well developed and the share of students who have access to public financial support is limited compared to other Western countries (Eurydice 2018). Third, survey data indicate that dropout and long time-to-degree are particularly concentrated among students with more disadvantaged social backgrounds (see Table A.3 in Appendix A).<sup>1</sup> This work can

<sup>1</sup> A similar pattern is found looking at gender (Table A.4) and geographical area (Table A.5), where the disadvantaged groups are respectively male and students from the Centre and South of Italy.

therefore help us to understand whether grants can be an effective tool for improving student success and reducing social inequalities in a challenging context, within the milieu of high-income countries.

Our contribution is threefold. First, we provide the first assessment of the effect of the main public grant awarded in Italy by the “Regional Authority for the Right to Education” (*Ente Regionale per il diritto allo studio*) on a representative sample of recent cohorts of university students who entered the system in the mid-2000s, after the “Bologna process”. Second, we show how it is possible to provide credible estimates of the effect of grants with observational survey data, taking into consideration the challenge posed by potential unobserved factors. Third, we provide estimates of average effects of student grants, and also investigate possible heterogeneity across groups of students defined by gender and geographical area.

The article is structured as follows. In the next section, we provide an overview of selected existing studies in the USA and in Europe. The third section outlines the theoretical framework and research hypotheses; while in the following section, we briefly describe the main features of higher education and the financial aid system in Italy, in order to contextualize our analyses. Data, variables and methods are described in the fourth section, while the fifth section presents the research findings and sensitivity checks. Finally, the last section discusses the results and conclusions drawn.

## **An overview of selected existing studies in the USA and in Europe**

There is a consolidated empirical literature on the effect of grants in the USA. Several studies report that an increase in the amount awarded by needs-based grants diminished dropout rates and increased performance and completion (Bettinger 2015; Castleman and Long 2016). The empirical literature also suggests that financial aid has a positive impact on student success, especially if combined with assistance, tutoring and study groups (Deming and Dynarski 2009; Angrist et al. 2009; Page et al. 2017) and it is particularly effective for students who were less academically successful (Goldrick-Rab et al. 2016). It has also been argued that making the renewal of the scholarship funding a student receives contingent on meeting a minimum academic standard puts a wide section of recipients at risk of ineligibility with potentially negative effects on college persistence (Schudde and Scott-Clayton 2016).

The European literature suggests that needs-based financial aid has a positive effect overall on persistence and timely graduation (Glocker 2011; Fack and Grenet 2015) and also shows the impact of varying grant design. Increasing the amount awarded improved students’ grades in the UK (Murphy and Wyness 2016) and students’ persistence in Denmark, especially among students from more disadvantaged backgrounds (Arendt 2013), but did not seem to lead to major changes in students’ outcomes in Finland (Häkkinen and Uusitalo 2003). Some studies report that a reduction in the maximum duration of grants stimulated higher efficiency in the use of time (Belot et al. 2007; Hakkinen and Uusitalo 2003). Montalbán (2019) found that the strong performance requirement of the Spanish national grant promoted better student performance without affecting dropout rates, seemingly contradicting the US literature. This might be due to the higher affordability of tertiary education in Europe (OECD 2018). Additionally, an experimental study in the Netherlands reports that financial incentives linked to academic performance improve achievement only among highly able first-year students but not among other students (Leuven et al. 2010).

## Theoretical framework

In this section, we review theoretical arguments that aim to explain why student grants may (or may not) be an effective instrument for reducing dropout rates in higher education and improving the timely completion of degrees. A prominent model explaining the heterogeneous chances of making specific educational transitions is rational choice theory. While most studies focus on educational transitions between educational levels, it is also possible to apply this theoretical reasoning to the decision of whether to remain enrolled in higher education or withdraw without obtaining a degree. In Economics, human capital theory (Becker 1962) holds that students invest in education if the labour market returns are higher than the direct (e.g. tuition fees, books, living costs) and indirect costs (i.e. foregone earnings). In the sociological version of rational choice theory, individuals—when making education-related decisions—consider the costs, the benefits and the probability of success associated with the different educational options (Gambetta 1987). Students who perceive university studies as too difficult, costly and bringing fewer benefits in the short and longer term will have greater chances of dropping out. Financial aids and student grants may act specifically to reduce the expected and actual costs of studying at university, by compensating the student for the expenses of tuition fees, study materials, living costs, etc. (Daniel et al. 1999). All else being equal, a reduction of the expected costs should lead to an increase in the utility of staying enrolled and attaining a degree.

Furthermore, since grants are assigned to students from lower income families, receiving regular public financial support should diminish their need to work while studying at university, which has been found to be detrimental for study progression (Triventi 2014a). Without the need to work alongside attending lectures, students receiving a grant are able to regularly attend classes, which may be helpful in preparing for examinations and may improve students' academic performance (Credé et al. 2010; Denning 2019). Regularly participating in classes is also a way by which students receiving public support may experience an improvement in their academic and social integration in the university environment, two key drivers of persistence and student success in higher education in Tinto's classical model (1975). Finally, grants could affect both intrinsic and extrinsic individual motivation. On one side, students receiving public support could feel positively valued by the institution and perceive a stronger sense of responsibility (Goldrick-Rab et al. 2009). On the other side, students have external incentives to put additional effort into making adequate progress in their studies to keep receiving additional funding in the following years, since, in Italy, keeping the grant is conditional on maintaining a given standard of credit accumulation and academic performance (see the next section). All these arguments, then, suggest that financial aid may have a positive effect on student success in higher education. We therefore hypothesize that *grants contribute to reducing the risk of dropping out and increasing the probability of completing the degree on time* (Hypothesis 1a).

Nonetheless, there are also factors that cast doubt on the effectiveness of student grants in reducing dropouts and time-to-degree in the Italian case. First, in Italy, there is no systematic system of orientation guiding students from upper secondary education to university. There is evidence that students have distorted visions about the expected returns, costs and probability of success in the various fields of study, and such misperceptions are also socially stratified (Abbiati and Barone 2017). This means that students and families are left alone in their decision about which university and field of study to attend, which could cause considerable frustration to first-year students who choose a degree program that does not fit their

expectations or needs (Alon and Tienda 2005). In this situation, receiving a grant can do very little to foster persistence or increasing credit accumulation.

A second factor relates to students' previous academic preparation. Heckman (2006) holds that the effect of investment in education follows a dynamic of capital accumulation; therefore, students without adequate initial knowledge will find it remarkably more difficult to gain additional skills within a process of "learning begets learning". In the first year of higher education, grants in Italy are provided mainly on the basis of financial need and only to some extent on the basis of previous academic performance.<sup>2</sup> Moreover, academic readiness varies significantly across geographical areas and high school tracks (Argentin and Triventi 2015). Consequently, eligible students may have very different levels of academic preparation. Thus, the lack of adequate previous basic skills for grant holders could be a counterforce, limiting the effectiveness of financial aid in improving student success. This can be exacerbated by the fact that disadvantaged students with inadequate academic preparation could develop psychological stress related to frustration and fatigue, since understanding the lessons and the material would be harder for them (Goldrick-Rab et al. 2009).

Finally, one could argue that grants in principle may affect students' persistence patterns, but that in the Italian case the level of support is inadequate to activate the virtuous circle described above. If the amount of money is not sufficient to cover the direct costs, for instance, students from low-income families enrolled outside their hometown will have to find a job during their studies, which can make study progression and attachment to the university more difficult, thereby raising the risks of withdrawal or extending time-to-degree. Thus, these rationales suggest that *grants might have little or no effect on students' likelihood of dropping out and time-to-degree*. (Hypothesis 1b).

## The Italian higher education system

For a long time, Italian higher education has been organized as a unitary system, which offered mostly long-degree programs in universities. For this reason, we will use the expressions "higher education" and "university" interchangeably. In 2001, the "Bologna Process"<sup>3</sup> restructured the degree programs by introducing a two-level structure constituted by 3-year bachelor programs followed by 2-year master programs, in most academic disciplines.

In the transition from upper secondary education to university, three notable features stand out. First, upper secondary graduates can enrol at university regardless of previous performance and high school track (academic, technical or vocational). Second, entry restrictions at the national level are present only for some fields, notably medicine and health professions, veterinary science and architecture. Additionally, universities can restrict the maximum number of available places in specific degree programs, but most of them do not have any *numerus clausus*. Third, Italy lacks a systematic and effective system of orientation for the choice of university and field of study.

While the first-time entry rates are comparable with the other European countries (45%) (OECD 2018), Italy has still a lower rate of graduates than most OECD countries (Viesti

<sup>2</sup> There are a few exceptions to this rule that will be further explained in the next section.

<sup>3</sup> The Bologna process was an attempt to harmonize the European higher education. Its regulations enhance the comparability in various aspects of higher education systems across countries, thereby encouraging the mobility of students, scholars and graduates.

2016). Italy displays very high dropout rates (Triventi and Trivellato 2009), as well as delays in study progression and graduation, especially in the South (Aina et al. 2011). Moreover, access to higher education and the choice of field of study, as well as persistence and timely completion of degree, are subject to a high level of social inequalities (Argentin and Triventi 2011, Triventi et al. 2017).

Public support system for university students is underdeveloped. As with the structure of the Italian welfare regime, there is the implicit expectation that parents will contribute substantially to support students (Daniel et al. 1999, Triventi 2014b). Therefore, the system of public financial aid is not very generous: the proportion of grant beneficiaries and the coverage of educational and living costs for the grant holders are comparatively low.<sup>4</sup> Indeed, Italy has one of the lowest coverage rates in Europe (9%), while 50% or more of students benefit from financial aid in Anglo-Saxon and Nordic European countries (Eurydice 2018, OECD 2018).

The main forms of support are the means-tested fee-waiver and the grant awarded by the “Regional Authority for the Right to Education” (*Ente regionale per il diritto allo studio*), while student loans are very rare in the Italian landscape. In our observational window, for students enrolling in their first year at university, the main criterion of eligibility is financial need; some regions supplement this by requiring a minimum level of performance in upper secondary education. To maintain the eligibility status during the second and the third year, students must obtain a minimum of 25 credits at the end of the first year (out of 60) and 80 at the end of the second year (out of 120).<sup>5</sup> This means that students have to achieve respectively at least 42% and 67% of the expected credit accumulation. Administrative data indicate that, on average, Italian students obtain around 30 credits per year, which corresponds to 50% of the expected credits (MIUR 2011).

The average grant amount is about €3000, which is about twice the average fee (Table B.3 in Appendix B).<sup>6</sup> However, the maximum grant is awarded only to students who transferred to a distant city in order to attend university. In this case, financial aid covers about a third of living costs (€9000) (Finocchietti et al. 2015). Services and subsidies for food and housing are residual and demand for student loans is marginal as well (in 2015, less than 1% of students subscribed to a loan). Importantly, prospective students are unable to plan their studies according to the level of support available, for two reasons: (1) they will know if they are considered eligible (*idonei*) only after having enrolled in university; (2) some regions are not able to offer support to all eligible applicants, due to a lack of financial resources. The students who meet the grant eligibility requirements but do not receive the financial aid are called *idonei non beneficiari* and are mostly concentrated in the South. Finally, families can deduct 19% of tuition and fees from their taxes regardless of their income.

## Research design

### Data and variables

We analyze data from the Survey on Upper Secondary Graduates (USG hereafter) that has been carried out by the Italian Statistical Institute (ISTAT) almost every 3 years since 1998.

<sup>4</sup> The grant amount is around the European average. However, this covers only a small part of the direct costs (for details see further in this paragraph).

<sup>5</sup> See the decree of the President of the Council of Ministers (9 April 2001).

<sup>6</sup> See Appendix B for a detailed discussion about the grant system in Italy.

USG data are a valuable source for our purposes since they provide information on a representative sample of selected cohorts of students who recently gained eligibility to enter university. They represent the vast majority of university enrollees, since in Italy mature students enrolled in higher education represent a tiny proportion of university students.<sup>7</sup> Hence, the USG is commonly considered a reliable source of data on university students.

The survey adopts a two-stage probability sampling design. The first stage units are upper secondary schools stratified according to region of residence, type of school and size in terms of number of graduated students. The second stage units are the upper secondary school students who graduated 3 years before the survey. All the interviews are carried out through a CATI (computer-assisted telephone interviewing) procedure. A detailed description of the sampling procedure of the two waves can be found in the ISTAT's methodological manuals (ISTAT 2007, 2011).

We use the 2007 and 2011 waves carried out on upper secondary graduates respectively in 2004 and 2007, the only ones with the necessary information for our purpose. To answer the research questions, we rely on two analytical samples, one for each outcome of interest: university dropout and timely graduation. The first sample is used to examine the effect of financial aid on dropout rates and it includes only the students who enrolled immediately after upper secondary school graduation or 1 year later. In this way, we can observe whether they dropout in the first 2 years after enrolment, which is the critical period with the highest risk of dropout (ANVUR 2018). One has to consider that this sample restriction only partially reduces the target population, since in Italy the vast majority of students enter university immediately after the end of upper secondary school (around 85%). The initial sample includes 28,742 cases. After case selection due to the matching procedure we adopted (see below), the analytical sample is constituted by 19,263 individuals.

For the second sample, we select only the students that could graduate in the observation window of the USG survey. First, we retain exclusively the students who enrolled immediately after their diploma, since they are the only group observable for 3 years, which is the legal duration of the bachelor program. Second, we were forced to retain only the students in the 2011 wave due to a partially different design in the 2007 edition. We consider students as having graduated on time if they completed their studies in 4 years.<sup>8</sup> The initial sample includes 10,795 bachelor students. After matching, we selected a group of 6,131 individuals.

The independent variable of interest (“treatment” in the impact evaluation literature) is a dummy variable that takes value one (“treated”) for students who receive the grant awarded by the *Ente Regionale per il Diritto allo Studio* at least once during university studies and otherwise takes the value zero (“controls”). All the students, both treated and controls, are enrolled at university.

In the USG data, there is a rich set of variables that are useful to adjust for the differences in composition between the group of students who received the grant and the other students. These covariates include socio-demographic characteristics (gender, parental education, parental social class,<sup>9</sup> geographic area of residence), secondary education (final marks in lower and upper secondary education, high school track, grade retention) and university studies (type

<sup>7</sup> See Appendix C for a comparison of the main variables in the ISTAT data with those from the national student registers.

<sup>8</sup> Due to limitations in the data, we cannot also analyze graduation in 3 years. However, this is not a major issue in Italy, since only a tiny proportion of students are able to obtain their bachelor degree in just 3 years.

<sup>9</sup> Social class, based on the occupations in which the student's parents are employed, is used as a proxy for the economic resources available at the family level, since parental income is not available in our data.



of degree, field of study), as well as contextual labour market indicators (unemployment rate and youth unemployment rate). These characteristics might be related to the chances of applying for and receiving a grant, and can also independently affect the chances of degree completion. Tables A.1 and A.2 in Appendix A provide a detailed explanation of the coding of these variables and descriptive statistics.

## Identification strategy

To estimate the effect of the grant, we followed a counterfactual approach that relies on a three-step reweighting matching procedure. Instead of using the classical propensity score matching estimator, the limits of which have recently been stressed by King and Nielsen (2018), we integrated two recently developed matching procedures: *coarsened exact matching* (CEM) (Blackwell et al. 2009) and the *entropy balancing method* (EBM) (Hainmueller 2012).

First, CEM is applied to restrict the data to the region of common support. Using the control variables specified above, appropriately recoded,<sup>10</sup> we implemented an exact matching: the algorithm selects the counterfactual for each treated subject (students who received a grant) using the control cases (students who did not receive a grant) that have identical values on the coarsened variables. In particular, the algorithm creates one stratum for each combination of the new variables; it then classifies every observation in a stratum and discards the stratum (and the observations inside it) if it does not contain at least one treated case and one control case. In the second step, the EBM algorithm weighs the observations in order to balance mean, variance and skewness of the covariates in the treatment and control groups. The weights obtained from this procedure can be used with standard estimators to identify the average treatment effect for the treated (ATT).<sup>11</sup>

Figure 1 shows that our matching approach was successful in balancing the composition of the two groups in terms of socio-demographic characteristics and previous educational career, since almost all the standardized differences in the means of treated and control group are approximately zero after matching.

In the third and last step, to estimate the effect of the grant on dropout and timely graduation, we applied *binomial logistic regression* on the analytical sample selected in step 1 and weighted the observations using the weights created in step 2.

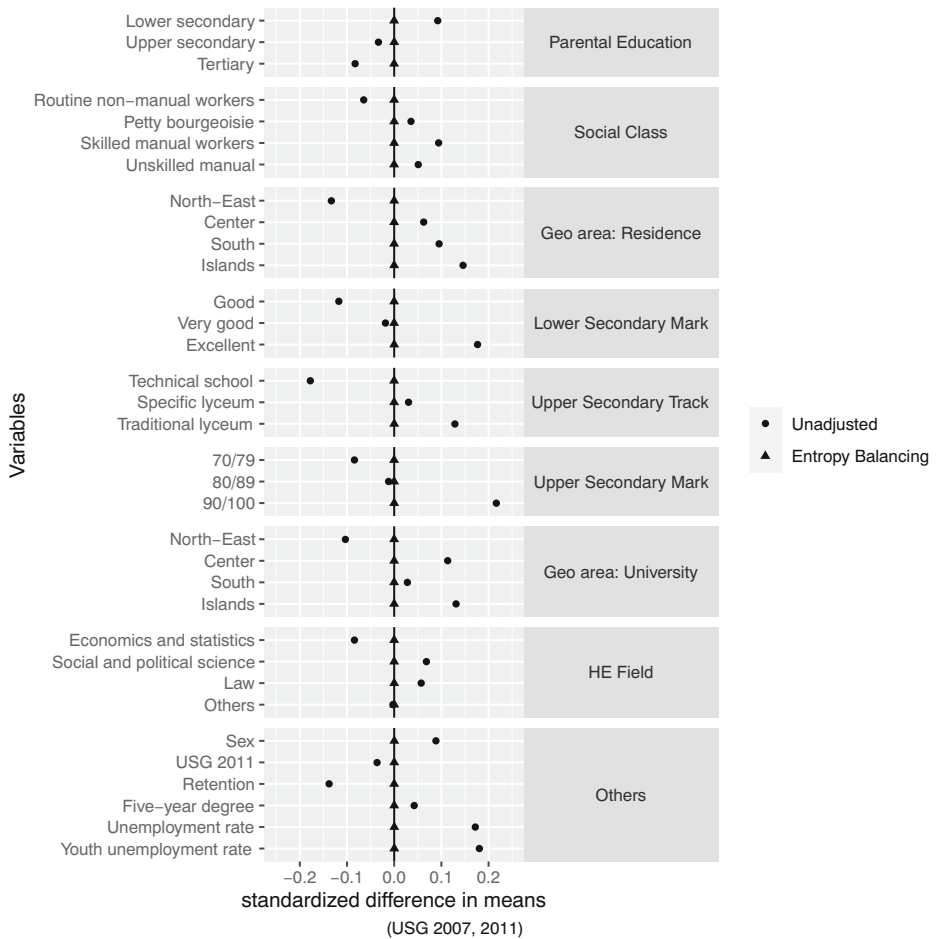
To ease the interpretation, we present the results in terms of average partial effects (APE), which can be interpreted as the average effect on the outcome of interest (e.g. probability of dropping out) of having received a grant. Given the setting employed in this paper, the APE represents the ATT. With this approach, it is also possible to analyze the heterogeneity of the effects confronting sub-groups of students. We did this by comparing firstly female and male students and, secondly, students enrolled in northern and southern universities.

Although our matching strategy combines the strengths of CEM and EBM and it provides a very good balance between the treated and the control group, this approach is still based on the assumption of selection on observables i.e. we are assuming that, conditioning on the relevant covariates, treated and controls are equivalent. Being aware of the limitations of methods based on this assumption, we tested its plausibility following the approach proposed by Nannicini (2007). Specifically, we analyzed the sensitivity of the estimated treatment effects simulating the presence of a potential confounder. The main idea is that the result of the analysis can be

<sup>10</sup> See Table A.6 in Appendix A for the comparison between original and coarsened variables.

<sup>11</sup> See Table A.7 for a list of the covariates used to compute such weights.





**Fig. 1** Standardized differences in the means of covariates: before and after the matching by entropy balance Source: authors’ elaboration of ISTAT-USG data. Note: for the categorical variables, the difference has been computed with respect to the reference category. Starting from the top of the figure, the reference categories are as follows: Primary; Professional, managers and large proprietors; North-West; Sufficient; Vocational school; 60–69; North-West; Engineering. The variables listed in the “Others” category are dummy or continuous variables. In the upper secondary track variable, the academic track is split between traditional lyceums (classical and scientific studies) and specific lyceums (foreign languages, arts, pedagogical studies)

considered robust if introducing a simulated unobserved variable in the models does not alter considerably the estimated effect of having received the grant. Examples of potentially relevant unobserved variables are a student’s motivation or his/her educational aspirations. This unobservable variable ( $U$ ) is chosen to mimic the behaviour of some important factors for the phenomenon under scrutiny such as sex, geographical area, social origins and school career. We calibrated the distribution of  $U$  according to these covariates and, since the routine requires a binary confounder, we dichotomized the covariates that have more than two categories. The routine includes  $U$  in the set of control variables and estimates the grant’s effect using a kernel matching estimator. The final value of the ATT is the average of the ATTs estimated by repeating the simulation 500 times.

Although we cannot exclude the existence of some unobservable variables that do not follow the distributions assumed in this simulation, this exercise gives us important insights on whether our results would be modified if the potential unobserved variable plays a role which is comparable with observed variables that are particularly important for the phenomenon under scrutiny. Therefore, even if we are not in the position to rely on experimental or quasi-experimental (i.e. regression discontinuity) designs, our method allows us to get closer to a credible estimate of the causal effects of grants on students' outcomes and makes the assumptions under which the effects are identified transparent.

## Empirical findings

### The effect of grants on student outcomes

In this section, we assess the impact of grants on tertiary degree attainment using matching techniques. Figure 2 reports the average effects of grants on university dropout (on the left) and timely graduation (on the right).<sup>12</sup> The figure displays the overall effects and heterogeneous effects by gender and geographical area.

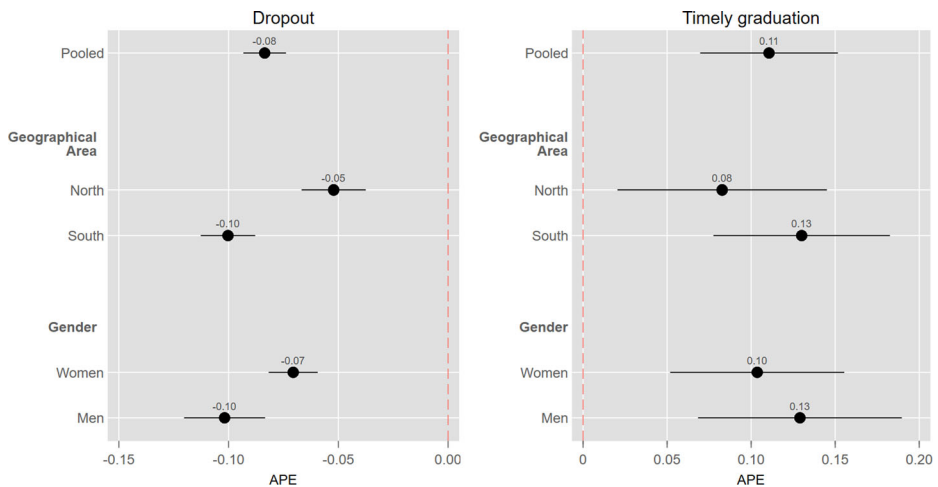
First, we observe that financial support significantly diminishes the risk of leaving university without a degree. On average, having received the grant decreases a student's probability of dropping out from 0.116 to 0.032, an effect of about 8 percentage points (see Table A.8 in Appendix A). Second, receiving aid raises the likelihood of graduating on time: a student's probability of timely attaining the tertiary degree increases by 11.1 percentage points, up to 0.408 (see Table A.9 in Appendix A). These results corroborate the expectation formulated in hypothesis 1a and go against the contrasting hypothesis 1b. Even if we are not in the position to identify the exact mechanisms through which these effects are achieved, they have notable policy implications. Indeed, our results point out that—despite the selection processes occurring in secondary education—interventions implemented in higher education can still have positive and remarkable effects on educational outcomes.

### Heterogeneity of the impact of grants

Higher education is very diverse in Italy and in order to understand if grants work it is important to investigate their relative efficacy across different types of students (Dynarski and Scott-Clayton 2013). In this section, we explore the heterogeneity of the effect according to the geographical area of the university (northern Italy vs central and southern Italy) and the gender of the recipients. We compare the treated and control groups of each subsample.

We hypothesize that the effect of financial aid could be different for the students who attended university in Southern Italy compared with the North. The South, indeed, is characterized by a more challenging environment than the North, including higher dropout rates, greater incidence of low-income families and greater numbers of eligible students who do not receive the grant due to a lack of economic resources on the part of the Regional Authority for the Right to Education (see Table A.10 in Appendix A). The combination of the last two phenomena leads to the fact that students who receive the grant in Southern regions are, on

<sup>12</sup> See Figure A.2 in Appendix A for a comparison between estimates before and those after the matching procedure.



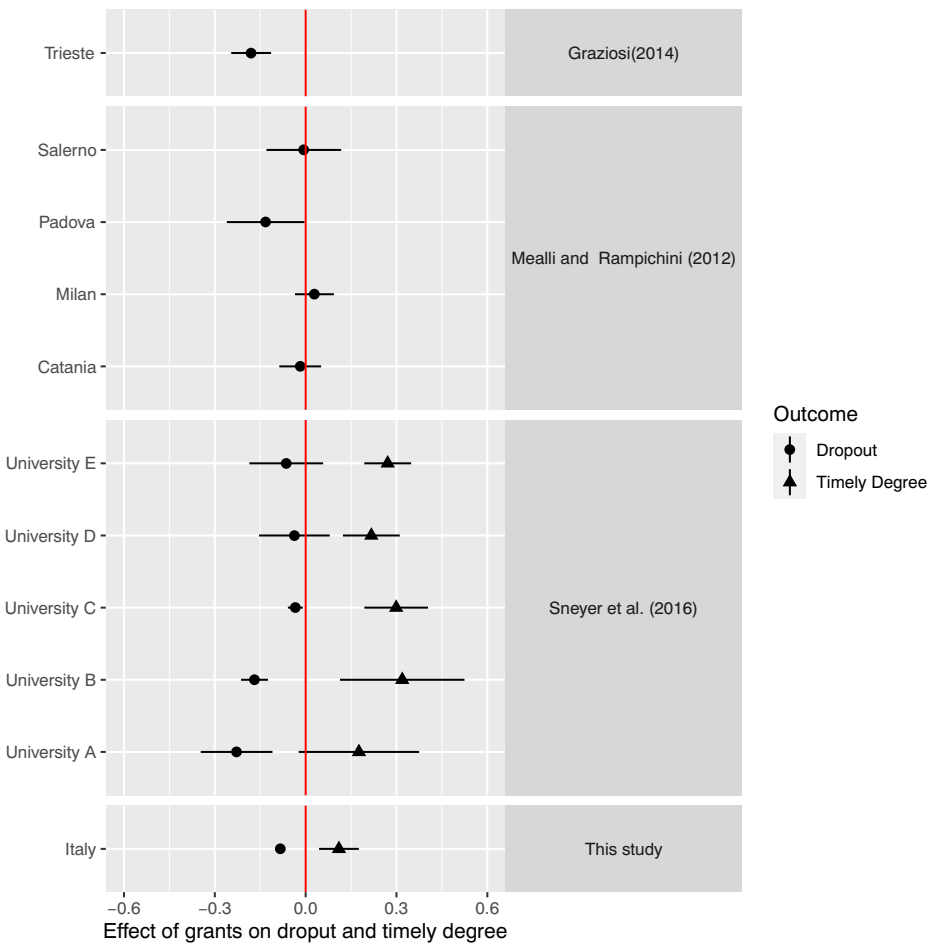
**Fig. 2** Average treatment effect on the treated (ATT) (and 95% confidence intervals) of student grants on dropout (left graph) and timely graduation (right graph): overall effect and heterogeneous effects by geographical area and gender from matching analysis. Source: authors' elaboration of ISTAT-USG data

average, in a worse financial situation than those in the North, since financial aid is awarded to students who are in the lowest portion of the income distribution in their region. We can expect the effect of financial aid to be stronger in the South, since the students who receive the grant have stronger liquidity constraints. This idea builds on existing research in other countries which has found that financial support systems are more beneficial to more disadvantaged categories of students (e.g. Goldrick-Rab et al. 2016).

First, we observe that financial support diminishes the probability of dropping out in both geographical areas. However, the intensity of the effect is substantially different. As Fig. 2 shows, having obtained the grant decreases a student's probability of dropping out in Northern Italy from 0.098 to 0.046, a change of about 5 percentage points, and in Southern Italy from 0.126 to 0.026 (10 percentage points). Thus, the estimated impact of grants is almost twice as large in the South as it is in the North. Second, we examined the effect on timely graduation. Figure 2 reports that a student's chances of completing their degree on time improves by 8.3 percentage points in Northern Italy, starting from 0.482, and by 13 percentage points in Southern Italy, up to 0.330. However, the estimates of the grant effects in the North and South of Italy partially overlap, due to large sample uncertainty.

We can therefore conclude that the effect of aid on dropping out is distinctly higher in Central and Southern Italy than it is in the North. A possible explanation is that, in southern regions, the students who receive the grants need more support to cover the direct and indirect costs of university because of their more disadvantaged economic situation. Notably, while a student has a greater probability of dropping out in the South and their chances of attaining a tertiary degree in a timely way are halved, this context does not hinder the compensating role of financial aid.

Looking at the second dimension, we are interested in understanding whether the effect of aid varies on the basis of gender. Female students are considered, on average, to be more motivated (Buchmann and DiPrete 2006); they tend to have better academic achievement in high school as well as more developed soft-skills (Fortin et al. 2015), which would reduce the difficulty and thus the costs of learning in higher education (Becker 1962). Moreover, men



**Fig. 3** Benchmarking of the estimated effect of student grant on dropout and on timely graduation with previous studies on single Italian universities

tend to be less risk averse and more overconfident (Croson and Gneezy 2009), which could lead to over-ambitious field of study choices that make academic progress more difficult. Additionally, the literature suggests that men are on average more responsive than women to financial incentives (Croson and Gneezy 2009). Therefore, we would expect that, for women, financial aid would be less crucial for avoiding dropping out, than it is for male students, who are often at greater risk of withdrawing from their studies.

The results indicate that financial support in the form of student grants decreases the probability of dropout for both genders. Figure 2 shows that having obtained the grant reduces a student's probability of dropping out from 0.097 to 0.026 for women, a change of 7 percentage points, and from 0.147 to 0.045 (10 percentage points) for men. Thus, looking at the point estimates, we found some support for our expectation of larger effects among men; despite the fact that the confidence intervals partially overlap, we tested whether the difference between the two coefficients is statistically significant and we found it is at the 95% confidence level.

Second, we examined the effect of financial aid on timely graduation. On average, having obtained the grant increases a student's probability of graduating on time from 0.332 to 0.436 for women (+0.104), and from 0.230 to 0.359 (+0.129) for men. In this case, even if the pattern goes in the expected direction, the uncertainty around the point estimates does not allow us to reject the null hypothesis of similar impact for both genders.

As a final step in our main analysis, we compared our estimated effects with those found previously by local studies in the Italian context. Figure 3 displays the benchmarking of our estimates, comparing the ATT in our study with those found by previous research. The value of the estimated effect of aid on dropout rates holds a central position within the range of previous estimates. Instead, the estimated effect of grant on timely degree is located at the lower bound of the distribution of previous estimates. Our relatively low estimate could be due to the inclusion of more universities in the sample and to the collecting method of USG 2011. Indeed, the questionnaires were administered until October 2011, 6 months before the end of the fourth academic year, possibly leading to a downward bias.

### Sensitivity checks

We carried out several checks to assess the robustness of our findings. First, we tried different specifications of the statistical models, changing the number of control variables, the categories in which they are measured and their reciprocal interactions. Second, we also used a classical matching procedure to pre-process the data before the estimation of the grant effects. The results are robust to these alternative methodological choices (see Tables A.11 and A.12 in Appendix A).

Finally, following Nannicini (2007), we tested the sensitivity of our estimates to the existence of a relevant unobserved variable, which is simulated to “behave” similarly to each

**Table 1** Sensitivity analysis of the effect of grants on dropout and timely graduation: effect of “calibrated” confounders

	Dropout			Timely graduation		
	Outcome effect	Selection effect	ATT	Outcome effect	Selection effect	ATT
No confounder			-0.104			0.150
Confounderlike						
Sex	0.560	1.453	-0.101	1.501	1.352	0.148
Top final mark in high school	0.346	1.747	-0.097	2.681	1.775	0.140
Good final mark in high school	0.407	1.713	-0.097	2.610	1.682	0.141
Top final mark in middle school	0.256	1.454	-0.100	2.514	1.571	0.143
Good final mark in middle school	0.319	1.389	-0.099	2.432	1.484	0.144
High parental educational attainment	0.406	0.583	-0.106	1.678	0.596	0.152
Low parental educational attainment	1.790	1.433	-0.105	0.686	1.439	0.151
Academic track	0.280	1.121	-0.102	2.068	1.139	0.148
Central or Northern University	1.423	1.239	-0.104	0.349	1.266	0.152
Central or Southern University	1.318	1.185	-0.104	0.422	1.228	0.152
Grade retention	2.711	0.715	-0.102	0.309	0.847	0.149

Source: authors' elaboration of ISTAT-USG data

of the following variables<sup>13</sup>: final mark in high school and middle school, parental education, track, geographical area of university, sex and grade retention. The outcome effect ( $I$ ) corresponds to the average odds ratio of the unknown variable  $U$  on ( $Y = 1|D = 0, U, S$ ), where  $S$  is the set of covariates. The selection effect ( $\Lambda$ ) is the average odds ratio of  $U$  for the logit model ( $D = 1|U, S$ ). The first row of Table 1 shows the effect of grants on dropouts (first three columns) and timely degree completion (last three columns) in the absence of confounders. In the second row, the confounder mimics the distribution of sex and so forth.

If, for instance, the unobserved variable “behaved” as sex, it would have a positive effect on the relative probability of receiving the grant ( $1.453 > 1$ ) and a negative effect on dropping out ( $0.560 < 1$ ). The impact of the grant would be slightly higher than the value estimated using entropy balancing ( $-0.09$ ) and very near to the ATT computed without confounders. The results further indicate that none of the confounders would substantially change the estimated effect of financial aid on dropout. The same holds concerning timely graduation. In conclusion, the results of the simulations seem to support the findings reported in the previous section.

## Conclusions

The aim of this article was to assess whether financial aid, specifically grants, could be an effective way to reduce social inequalities in students’ academic outcomes in higher education in Italy, a context with high levels of dropout, delayed graduations and social inequalities in students’ educational careers. The contribution of the paper was, first, to provide a theoretical discussion on the potential effects of grants to students. We highlighted that, while several arguments suggest that providing financial aid to students could improve their outcomes, the positive impact of support should not be taken for granted. Indeed, grants could fail to improve students’ outcomes if the money transferred is not sufficient, if the students lack the academic preparation necessary to satisfy the academic requirements of need-based aid and to succeed in university or if the degree course matches poorly with their abilities and aspirations.

The second contribution was to provide an empirical answer to the question of whether grants can be an effective tool for improving students’ outcomes in a higher education system characterized by high withdrawal rates and delayed graduations. Our main finding is that grants positively affect students’ outcomes, both in terms of reducing dropouts and improving timely graduation. The effects are not only statistically significant, but also substantially relevant. This result has implications for both academic and policy-relevant debates.

First, it suggests that—despite the fact that returns on investment in childhood education might be larger than those on investment at later educational stages—awarding grants to students in higher education can work effectively and play a role in improving students’ performance, thereby reducing the waste of “human capital” due to students’ withdrawal. Second, from a policy perspective, given that grants are directed towards relatively high-performing students from lower socio-economic backgrounds, our results suggest that well-designed financial aid instruments have the potential not only to improve the effectiveness of students’ educational careers in university, but also to contribute to reducing social inequalities in higher education by boosting the outcomes of low-income students.

<sup>13</sup> By using the term “behave”, we mean the extent by which such an unobserved variable affects the probability of receiving a grant and its independent effect on the outcome of interest.

Moreover, we found that the effect of grants might differ according to students' characteristics and contexts. In line with the previous literature, we found that grants are more effective in reducing the dropout rate among males, who are usually considered to be at greater risk of university withdrawal. Moreover, grants appear to be more effective in the Southern regions than in the North, a more challenging context in terms of the financial resources available to institutions and families. Therefore, our findings suggest that expanding the resources for financial aid would improve the effectiveness of higher education, reducing the waste of talent and mitigating inequalities in students' outcomes related to social background, gender and geographical area of residence. Our findings are consistent with those of a recent review of quasi-experimental studies across the globe, which reports that, while needs-based grants do not systematically raise enrolment rates, they significantly improve completion rates among disadvantaged students (Geven and Herbaut 2020).

Another contribution of our work refers to the research strategy adopted. We have argued that it is useful to combine evidence from administrative data on single institutions with survey data providing rich information on representative samples of students from a wider spectrum of universities, in order to improve the external validity of findings. In our article, we have developed a protocol of analysis that can be useful for those who want to provide credible estimates of the effect of individual-level interventions in higher education on student outcomes by relying on observational data. This procedure includes the following: (1) the integration of two novel, flexible and effective *matching techniques* (coarsened exact matching, entropy balancing); (2) a *sensitivity analysis* assessing the robustness of the estimated effects to the potential presence of unobserved heterogeneity; (3) an *estimate benchmarking* to assess the plausibility of the effect sizes and their substantive relevance (Gelman and Carlin 2014; Bernardi et al. 2017).

As with any research, this article comes with some limitations. A potential drawback comes from not considering students' selection into higher education. If well-informed students decided to enrol and are aware of their chances of receiving the grant, this could make our estimates upwardly biased. Nonetheless, we believe that the design characteristics of the grant system in Italy—e.g. scholarships are awarded after enrolment; there is a non-negligible incidence of eligible students who cannot access the grant—make this unlikely to have had any impact on enrolment decisions. A second limitation was the impossibility of restricting the control group to those who applied for a grant but were excluded. This would have made the control group more comparable with the treated group by design. While our results appear to be reasonably in line with those found by quasi-experimental studies in specific Italian universities and not overly sensitive to potential unobserved heterogeneity, we cannot completely discard the presence of some bias in our estimates. Notwithstanding this, given the considerable size of the estimated effects, it is unlikely that such bias could reverse their sign. Finally, we were not in a position to further identify the channels by which grants affect students' outcomes, as outlined in our theoretical section. We believe future research in this area should attempt to provide rigorous empirical evidence from various contexts, not only on the effectiveness of policies designed to improve student outcomes and reduce social inequalities in educational attainment, but also more detailed insights on the mechanisms by which they affect such outcomes.

**Acknowledgments** A previous version of the paper was presented at the XI Italian Espanet Conference (Florence, 13–15 September 2018). We thank the participants for useful comments. We also thank Nadir Zanini for additional feedback and Federica Laudisa for her help in finding contextual data about the Right to Education in Italy. All errors remain ours.



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