On the Design of Grant Assignment Rules

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Abstract

The effect of grants on several academic outcomes has been widely studied, finding that they reduce the probability of dropping out of college. In this paper we assess how different rules affect dropout rates in the first year of enrollment, as well as the characteristics of the recipients of the grants and the dropouts. The analysis uses administrative data from all Italian universities in the period 2003-13. We find that awarding the grant to all the eligible students would significantly increase public expenses with only a slightly reduction in the dropout rate. It is therefore important to target the policy, also because we find that the grants have a heterogeneous effect according to students' characteristics. Targeting high-performing students minimizes dropout rates amongst recipients, even if this rule would slightly increase the overall dropout since it excludes students with a higher ex-ante dropout probability. On the other hand, an assignment that targets those who benefit the most achieves the maximum reduction in dropout rates at the cost of increasing the number of grant recipients who drop-out.

Introduction

Grants have typically been assigned on financial grounds, aimed at students with low socio-economic status (Fack and Grenet, 2015), or merit, aimed at high-performing students (Schudde and Scott-Clayton, 2016). Different assignment rules target different students, and funds are usually limited. Consequently, it is crucial to identify the effect that awarding a grant has on students' performance, as each assignment rule will have a different impact on dropout rates for the population as a whole, for grant recipients, and for different demographic groups. A policy maker should take all these aspects into consideration to appropriately design the assignment rule.

Main Objectives

1. Estimate the causal effect of need-based grants on student's drop out rates in Italy.
2. Predict students' performance with and without grants.
3. Define several several assignment rules, based on students' expected performance and/or characteristics.
4. Execute some counterfactual exercises to asses (for a given level of government's expenditure) the impact of the different rules on the performance of the whole population of students and of the different subpopulations of grant recipients.

Institutional Details and Data

After they are enrolled, students are ranked according to two indices that reflect income and assets of their family. Those below a certain threshold can apply for a grant. When funds are not sufficient to cover all eligible students, grants are awarded according to the economic condition of each university. This constitutes the basis for identification, which allows us to compare the outcomes of grant recipients to those of who were eligible but were not awarded a grant.

We use the Anagrafe Nazionale Studenti. It contains administrative records on enrollments, students' school background and their academic careers. It covers the entire population of university students in Italy. We focus on students aged between 18 and 20 who enrolled at an Italian university for the first time during the period 2003-13. First-year grant-recipients conform the treatment group, while eligible students who were not awarded the grant belong to the control group. The sample size equals an average of 31,000 students per year.

Methods

We evaluate the effect of a grant on the probability of dropping out under the potential outcomes framework. The population of students can be split into three types:

- Those who would enroll the following year without a grant.
- Those who would drop out even with a grant.
- Those who would enroll the following year only if they are awarded a grant.

The latter would benefit from the grant, whereas the first two types represent two different kinds of ineffective uses of grants funds, since recipients' outcomes are not affected by the grant. Let D_{it} equal 1 if student i was awarded a grant for the first year at time t and Y_{it} equal 1 if student i successfully completed the first year at time t. We can estimate the following probabilities:

$$\begin{aligned} \mathbb{P}(Y_{it}=1|D_{it}=0) &\text{ Inefficient Grant Type I} \\ 1-\mathbb{P}(Y_{it}=1|D_{it}=1) &\text{ Inefficient Grant Type II} \\ \mathbb{P}(Y_{it}=1|D_{it}=1)-\mathbb{P}(Y_{it}=1|D_{it}=0) &\text{ Efficient Grant} \end{aligned}$$

We use a variety of methods (OLS, logit, probit, blocking with regression), covariates and fixed effects. Covariates (and their interactions) are selected using double lasso with cross validation, and they include gender, native vs foreign, region of residence, mover vs stayer, type of high school degree, high school score split into 5 intervals, and urban vs rural LLS. The selected method and set of fixed effects are the ones that minimize a cross-validated MSE function.

Counterfactuals

In this analysis, we consider the following assignment rules:

- Baseline assignement (BLA): grants are awarded to those students who were grant recipients in the dataset.
- Effectiveness-based assignment (EBA): grants are awarded to students with the highest decrease in the probability of dropping off when they receive a grant.
- Merit-based assignment (MBA): grants are awarded to students with the lowest probability of dropping when they receive a grant.
- Score-based assignment (SBA): grants are awarded to students with the highest high school scores.

Additionally, some of these rules are combined with regional (MBA,R; EBA,R) and gender quotas (MBA,G; EBA,G).

Results

	%	$P_{it}(1)$	$P_{it}(0)$	ΔP_{it}
Total	100.0	93.2	92.1	1.1
Female	64.2	94.0	93.1	0.8
Male	35.8	92.0	90.3	1.7
Foreign	2.4	94.0	91.5	2.4
Native	97.6	93.2	92.1	1.1
North	25.6	93.0	93.8	-0.7
Center	12.6	92.0	90.9	1.1
South	61.8	93.6	91.7	1.9
Dif reg	14.1	96.3	95.8	0.5
Same reg	85.9	92.7	91.5	1.2
HS deg	58.6	95.9	95.3	0.5
TS deg	28.4	90.0	87.6	2.4
Ot deg	13.1	88.6	87.5	1.1
Score 1	13.4	86.5	84.7	1.8
Score 2	21.3	90.9	89.7	1.2
Score 3	23.3	93.9	92.8	1.1
Score 4	20.2	95.4	94.3	1.1
Score 5	21.8	96.9	96.2	0.7
Urban	42.6	93.0	91.8	1.2
Rural	57.4	93.4	92.3	1.1

Table 1: Base Results

- 92.1% ineffective grants of type I.
- 6.8% ineffective grants of type II.
- 1.1% effective grants.
- Heterogeneous effects across demographic groups (higher for male, foreign, students in the South, with lower grades).

	BLA	EBA	MBA	EBA,R	MBA,R	EBA,G	MBA,G	SBA
Female	64.6	59.9	69.0	56.5	68.0	50.0	50.0	67.9
Male	35.4	40.1	31.0	43.5	32.0	50.0	50.0	32.1
Foreign	3.3	2.1	2.6	3.3	3.1	2.3	2.5	1.7
Native	96.7	97.9	97.4	96.7	96.9	97.7	97.5	98.3
North	33.6	4.3	25.9	33.6	33.6	6.6	26.0	22.5
Center	15.3	11.5	10.8	15.3	15.3	11.7	11.2	12.9
South	51.0	84.1	63.3	51.0	51.0	81.6	62.7	64.6
Different region	18.9	9.7	20.9	6.7	19.5	11.4	21.0	14.5
Same region	81.1	90.3	79.1	93.3	80.5	88.6	79.0	85.5
HS degree	56.2	47.1	80.6	40.1	77.8	45.1	74.3	58.9
TS degree	29.6	41.7	14.0	47.2	15.8	43.5	19.3	28.1
Other degree	14.2	11.2	5.5	12.8	6.4	11.4	6.4	13.0
Score 1	15.0	16.4	3.2	17.4	4.6	17.6	5.3	0.0
Score 2	23.3	25.0	11.8	24.4	12.2	25.1	14.0	0.0
Score 3	24.7	23.7	23.9	22.1	22.8	21.6	21.6	17.4
Score 4	19.6	18.8	26.9	19.6	25.9	18.6	24.8	39.7
Score 5	17.4	16.0	34.2	16.6	34.4	17.0	34.4	42.9
Urban	39.6	42.4	42.6	47.4	43.9	43.8	43.0	43.3
Rural	60.4	57.6	57.4	52.6	56.1	56.2	57.0	56.7

Table 2: Characteristics of grant recipients under different counterfactuals

- Each rule targets different students
- EBA assignment targets students with largest gains (males, from the South, stayers, with lower grades).
- MBA assignment targets students with high probability of success (females, from the South, with high school degree, with high grades).

	BLA	EBA	MBA	EBA,R	MBA,R	EBA,G	MBA,G	SBA
Dropout rate	7.4	6.5	7.7	6.7	7.8	6.6	7.6	7.4
Efficient grants	0.9	2.7	0.4	2.3	0.3	2.6	0.6	0.9
Type I inefficient grants	92.1	88.8	97.2	89.3	97.1	88.8	96.3	94.9
Type II inefficient grants	7.0	8.6	2.4	8.4	2.7	8.6	3.0	4.2

Table 3: Counterfactual probabilities of continuing into second year

- EBA asignment maximizes gains and reduces type I inefficient grants, but increases type II inefficient grants.
- MBA reduces type II inefficient grants, but increases type I inefficient grants and reduces efficient grants.
- SBA similar to MBA, but less stark.
- Quotas contain the effects of each grant assignment, but change grant recipients along the characteristic that determines the quota.

Conclusions

- Heterogeneous effects of grants (1.1% dropout decrease on average).
- Awarding the grant to all eligible students would only slightly reduce the dropout rate, but it would double the expenditure.
- Different assignment rules substantially affect dropout rates.
- Trade-off between efficiency and merit: rules based on effectiveness reduce the total number of dropouts but increases the number of grant recipient-dropouts; the opposite for rules based on merit.