Nudging or selecting: a quasi-experimental approach to assess the efficiency of different admission policies in public higher education

Abstract

Public colleges and universities are an institutional response to the intuition, first, and then the theory, that higher education services generate social as well as private returns and will be under-produced in a competitive market without government intervention. When that is the case, a net social benefit will result from efficiently allocating public resources to subsidize post-secondary education, up to the point where the collective cost of any additional amount would exceed the benefit. The theory in question also makes a very clear case that the social benefit of public higher education services depends not only on how many students enroll every year, but also on who enrolls and who does not, and on how the students' academic careers progress. Our aim in this paper is to contribute to the recent empirical literature on the efficiency implications of picking students through some selective admission policy. By contrast, our intent is to estimate the effect of policies that variously nudge students towards good enrollment and effort choices, short of selecting them. We adopt a quasi-experimental approach to measure the causal effect, on freshmen at the Department of Economics of the University of Genoa, Italy, of having been treated to a recently activated orientation program when they were high school seniors. Improvements in terms of grade point average (GPA), drop-outs and number of successfully completed exams are compared to improvements from simulated selective admission policies and to actual improvements estimated at other universities, in order to evaluate the relative advantages of selective admission policies.

Keywords

Education policy, public higher education, orientation, nudging, matching techniques.

1 Introduction

Public colleges and universities are an institutional response to the intuition, first, and then the theory, that higher education services generate social as well as private returns and will be under-produced in a competitive market without government intervention. When that is the case, a net social benefit will result from efficiently allocating public resources to subsidize post-secondary education, up to the point where the collective cost of any additional amount would exceed the benefit. The theory in question also makes a very clear case that the social benefit of public higher education services depends not only on how many students enroll every year, but also on who enrolls and who does not, and on how the students' academic careers progress.

Our aim in this paper is to contribute to the recent empirical literature on the efficiency implications of picking students through some selective admission policy. By contrast, our intent is to estimate the effect of policies that variously nudge students towards good enrollment and effort choices, short of selecting them. We adopt a quasi-experimental approach to measure the

causal effect, on freshmen at the Department of Economics of the University of Genoa, Italy, of having been treated to a recently activated orientation program when they were high school seniors. Improvements in terms of grade point average (GPA), drop-outs and number of successfully completed exams are compared to improvements from simulated selective admission policies and to actual improvements estimated at other universities, in order to evaluate the relative advantages of selective admission policies.

When public higher education systems enforce any college admission policy other than open enrollment, they are typically pursuing two objectives. The first is *rationing*, which is meant to control the amount of subsidy per student. Assuming fixed resources in the short run[1], rationing provides the system with control over how thinly spread those resources will be. The second is *allocative efficiency* with respect to the same subsidy and the goal of human capital development maximization. Not unlike any private university, such public higher education system is selecting its customer-inputs so that the overall amount of human capital produced will be higher as a consequence of more academic ability at enrollment and stronger peer effect (Winston 1999).

In this case, higher education is still subsidized under the assumption that appreciable social returns to investment in human capital exist alongside with the corresponding private returns (see, for instance, McMahon 2009) and that market failures hinder a private provision of graduate individuals at the socially optimal levels (Behrman et al. 1997). However, specific universities or courses (or the system as a whole) may have selective admission policies designed out of concerns for the decrease of government funds, for the increase of per-student costs (Johnstone 2009), for the potential effects on inequality of increasing cost-sharing (Jongbloed and Vossensteyn 2016) or, rather, for the preoccupation that mass tertiary instruction (Holmes and Mayhew 2016) may have expanded to a point where, for some students, the expected future contribution to society after enrolling may no longer exceed the social costs of making their enrollment possible. This would not only stem from observing that the graduate wage premium in some occupations is no longer evident (O'Leary and Sloane 2016) but also, and perhaps more importantly, from observing that non-selective education systems are affected by substantially higher drop-out rates and delayed graduations (Hoareau Mc Grath et al. 2014) which bear significant social and private costs.

In a recent strand of empirical literature focused on Italy and fostered by major institutional reforms and by the opportunities for quasi-experimental approaches, Bratti et al. (2008) found strong evidence that a large increase in supply of higher education services in the 1990s in Italy produced more student enrollments but no increase in the likelihood of holding a university degree; Francesconi et al. (2012) found no effects on the performance of students at a leading Italian private university after the interruption of an admission test, but in the context of highly

[1] Depending on national legislations, much of what is said in Winston (1999) about protecting excess demand for private colleges and universities as a way to control the amount of subsidy per student is relevant also for public universities because resources are fixed in that case as well. Even when universities and specific departments receive variable quotas of government appropriations in proportion with enrollments and may thus be inclined to view their resources as somewhat flexible, the overall system typically has planned resources defined over a time horizon of multiple years that don't immediately adjust to changes in enrollments. Notice that admission policies are frequently decided at this level rather than at the level of each university. Furthermore, by rationing, public systems may be pursuing additional goals that don't usually matter much for private higher education institutions, like controlling supply in specific segments of the job market.

selective tuition fees and with a large excess in supply of available slots with respect to applications[2]; at the opposite, Carrieri et al. (2015) found that the introduction of a selective admission test at a public university in southern Italy reduced the drop-out rates of first year students by 14 percentage points and improved their grade point average (GPA) by 0.78 points[3]; Aktas and Cappellari (2017) found comparable effects from an admission procedure based on a test along with high-school scores at a private university, with the test scores being primarily responsible for reducing the drop-out rates at the end of the first academic year. Meanwhile, Grilli et al. (2016) and Masserini et al. (2017) found that non-selective admission tests provided relevant information to predict academic success of college students although, perhaps, not as effective as information from high school grades. The overall message of this literature seems to be that, under conditions that are consistent with the standard models of demand and supply of higher education services, the overall effect of sorting and picking students by their academic ability would be that of improving average student performances and reducing drop-outs, in line with the definition of efficiency that is typically applied to education (Agasisti et al. 2018). Furthermore, one could be tempted to conclude that whatever quality issue may be relevant in the composition of a cohort of students, controlling quantity by selective admission procedures will take care of it.

By contrast, open enrollment systems cannot pick the customers of their educational services. Their admission policy is consistent with the assumption that the positive externalities of higher education are not fully reflected in the current number of enrollments, which is the official stance of many governments and international organizations to this day (Toutkoushian and Paulsen 2016, p. 81). This includes the European Union, which set the target of at least 40% of people aged 30-34 attaining tertiary education by 2020 in its "Europe 2020" strategy (Aina et al. 2018). The pursuit of allocative efficiency under open enrollment consists in enforcing academic standards that take effect in conditional progression schemes barring access to later courses and graduation when initial courses have not been successfully completed. In all evidence, this approach is not designed to limit drop-outs and delayed graduations. Since social costs are considerably different from zero for both delayed graduations and attendance without graduation, openness must then have a social cost which is likely to be a factor in the net social benefit of the corresponding enrollments, even more so because of the *sheepskin effect* which entails a major increase in private and social benefits connected with graduation itself compared to the effect of the number of years of education (Belman and Heywood 1991; Jaeger and Page 1996).

The motivation for this paper comes from wondering if the important and increasingly convergent results on the efficiency gains of selective admission policies should be taken as evidence that the higher education services involved in those studies were producing close to or above the socially optimal level and if, in similar circumstances, the introduction of a selective admission policy is unquestionably warranted even for a public institution. The standard interpretation of decision making in the market for higher education and the interpretation of welfare gains associated with the public production of higher education (Paulsen and Smart 2007; Toutkoushian and Paulsen 2016) seem to suggest a nuanced interpretation of those results and

[2] See Aktas and Cappellari (2017), which note that excess supply is likely to reduce the effectiveness of selective tests.

[3] Crucially, 800 out of 1200 applicants (about 65%) were to be admitted and the control group selected in the paper consisted of the 65% top distribution in the scores of non selective tests administered in the previous years.

leave room for further empirical analysis to discriminate between different possible policy approaches. We will expand the discussion on this point in the next section. Essentially, we argue that, under modest assumptions about the informational limitations affecting the decisions of students and institutions about enrollments, the extent of the net efficiency gains from introducing a selective admission policy should be weighed against those of introducing programs that counter inefficient decisions determined by limited information. In fact, admission policies may seek to nudge prospective college-goers into making decisions on their post-secondary careers based on a more informed assessment of their chances of getting a degree, of succeeding in a given field of study, of the amount of effort and the appropriate study habits and methods to achieve it. The efficiency implications of such programs have been subject to limited analysis over the years, particularly in a quasi-experimental setting. While the combination of open enrollment and nudging is unlikely to be as efficient as selective admission policies in terms of GPA results and drop-out rates, major efficiency gains from it would cast doubts on the notion that the supply of higher education services would currently be in excess of the socially optimal level, requiring rationing. Furthermore, it would suggest that large drop-out rates and poor academic performances are not necessarily an indication that there is excess supply.

Such hypothesis is attractive because several, well-documented mechanisms make selective admission methods less likely to achieve goals of distributional equity compared to open enrollment. In fact, academic ability and previous educational attainments are well known to be correlated with family income (Blanden and Gregg 2004), cultural background and socio-economic status, which highlights the unequal distribution of educational opportunities before the postsecondary level. Being generally accepted that allocative efficiency is not the single objective of public interventions and being that various fairness concerns are foundational problems for public finance (Musgrave 1959), there is a clear attractiveness in tools that can accommodate for policy actions aimed at multiple goals rather than just allocative efficiency. One such case is illustrated by the concept of resilient students, that overcome adverse socio-economic contexts to reach good educational outcomes (Masten and Coatsworth 1998). Resilience in education, including postsecondary education (Ayala et al. 2018; Lessard et al. 2014; Young 2016) has received widespread attention in literature because it appears to be at least in part under policy control and its outcomes are seen as worthwhile. While the value judgements implied by literature on resilient students are beyond the scope of this paper, it is interesting that it underscores a class of policy goals related to qualitative features in the composition of a cohort of students that cannot directly be addressed by selective admission policies that control quantity.

1.1 Efficiency gains of selectivity: a sketch of the theoretical framework

The decision of high school graduates to enroll to postsecondary education or, rather, to enter the job market, is generally represented as a function of students' financial and nonfinancial gains associated with attending to college, their ability to pay and a set of observable and non-observable personal characteristics and individual-level factors: if the net present value of attendance referred to at least one institution exceeds the unobservable threshold value set by the student to decide to go to college, the high school graduate will apply (Toutkoushian and Paulsen 2016) and, in an open enrollment regime, will be admitted. Every additional commitment

of time and resources to college education after initial enrollment is, then, a further matter of comparing progressively updated estimates of costs and benefits (Aina et al. 2018). As anticipated, it is generally accepted that the net benefit of any additional year in higher education is significantly smaller than the net benefit of graduation. In this framework, a *drop-out* is a student that, after updating cost and benefit expectations, decided against persisting. It may also be useful to define as *inactive* a student that, regardless of the decision to persist, has made so little progress towards graduation during an academic year that a full academic year of additional costs will be required to recover the time lost[4], thus leading to a delayed graduation.

Most factors affecting costs and benefits of higher education for a student, like tuition fees, academic standards, college wage premium, tax rates, commutation costs, family characteristics and price in loans market may unpredictably tilt the balance of costs and benefits in a given year or predictably vary over time following a trend. In either case, this is consistent with occasional spikes in drop-out rates when there is change or when the trend changes and is, instead, inconsistent with high drop-out rates observed among freshmen for multiple consecutive years. Updated expectations changing systematically every year for a large share of freshmen are likely to depend on a single factor that is common to all them, like the sudden increase in information available after experiencing the first year in college. Information that may reasonably increase after attending for some time includes the evaluation of one's initial endowment of human capital after attending high school, that of academic ability and of the amount of effort required to meet academic standards (Serra and DeMarree 2016; Stinebrickner and Stinebrickner 2014; Twenge et al. 2012). All these factors are likely to influence the expected time to get to graduation and, consequently, the cost. Furthermore they can also justify a revision of the expected benefits, if college wage premium is affected by GPA (Rumberger and Thomas 1993; Thomas 2000) or by age at graduation (Taniguchi 2005). Inactive students may or may not decide to persist depending on their set of costs and benefits, but it is unlikely that their inactivity was planned, and it is plausible that they are revising their expectations as well.

As for the public decision-maker, it operates under the assumption that the private market would not lead to the optimum level of production from society's point of view. Then, the public subsidy intervenes shifting the private demand for higher education or the institutions' supply of college slots for students towards higher quantities, ideally up to the point where the social optimum and the market equilibrium correspond with each other in quantity.

Given these premises, drop-outs and inactive students can be interpreted in two ways. The first, is that the current quantity of equilibrium has been pushed by the subsidy above the socially optimal level, encouraging the enrollment of all the students meeting some minimum skill level and commitment required to provide a net social benefit, plus the enrollment of some that can't meet such level. The latter group will not advance in the performance-based progression schemes or will progress slowly or with poor grades. Notice that this interpretation makes two explicit assumptions: quantity beyond the optimal level and updated estimates of costs and benefits after initial enrollment that reverse or significantly alter the estimates made before enrollment for a

[4] Throughout this paper inactive students are defined as enrolled students that haven't successfully completed any exam at the end of the first year. This is consistent with the National rule (Ministry of University and Research) that indicates inactive students as a negative parameter for the determination of the annual financing (FFO).

large share of students. Furthermore, it makes the implicit assumption that all the determinants of the market equilibrium except for the subsidy and the admission policy are set. In this interpretation, a selective admission policy targeting the minimum required level of skill and commitment is going to unambiguously increase the allocative efficiency of the subsidy and will provide a socially preferable alternative to reducing equilibrium quantity by increasing price.
The second interpretation makes assumptions only on students updating their estimates. The presence of drop-outs and inactive students would simply indicate that the current subsidy is encouraging the enrollment of students with mixed skill levels and commitment which, afterwards, as discussed above, will update their estimates of future outcomes. Contrary to the hypothesis above, drop-outs and delayed graduation don't imply that all the students that can potentially provide a net social benefit have enrolled or that students that drop out, proceed slowly or with lackluster grades are students that lacked the skill level to *ever* provide a net social benefit. Under these premises, the determinants of the market equilibrium other than the subsidy and the admission policy, including the effort and commitment of students, may be under policy control. In this case, a selective admission policy may or may not provide efficiency gains depending on equilibrium quantity, socially optimal quantity and the availability of policy levers other than subsidy and the admission policy.
If a policy is effective in significantly reduce the chances that enrolled students will drop out, delay their graduation or advance with poor grades, the efficiency gains of a selective admission policy become therefore uncertain.

1.2 Evaluating orientation for prospective college students: a literature overview

Programs of student orientation, and services of academic advising have been typically evaluated on a small selection of recurring indicators. Enrollments are the first-line expected outcomes of orientation efforts (Alcott 2017; Bettinger et al. 2012). With respect to policy frameworks where the socially optimal level of higher education services are assumed as not reached yet, reforms targeting an overall increase in the enrolled population (Foote et al. 2015; Ordovensky 1995) or in enrollment rates of students from disadvantaged backgrounds (Herber 2018; Peter and Zambre 2017; Robinson and Roksa 2016) imbue such indicator with a particularly qualified meaning.
Orientation is also interpreted as a tool to take care of efficiency concerns. A broad overview of the literature on informational and behavioral interventions aimed at encouraging more efficient decision-making from the students, like for instance that in Page and Scott-Clayton (2016), indicates that a variety of interventions have been designed to tackle different information problems, but the prevailing attention has been spent for information on college pricing and financial aid. In the context of countries with a prevailing market approach to higher education and where financial aid in the form of grants and loans plays a major role in enrollment, application assistance and financial advising have been studied in relation with the ability to receive benefits and, consequently, with the ultimate decision on pursuing higher education (Bettinger et al. 2012; Braunstein et al. 1999). A strand of literature is dedicated to studying the relationship between tailored information on students' ability and preparedness and the possibility to obtain better enrollment decisions (Damgaard and Nielsen 2018; Foote et al. 2015; Kerr et al. 2018; Pistolesi 2017). Several authors highlight the role of high school staff in

stimulating correct learning behaviors, along with performance behaviors, in preparation for college (van Herpen et al. 2017; Wolniak and Engberg 2010).

Evaluating improvements in decision making obviously requires other indicators than enrollment figures. One is persistence or, on the other end of the spectrum, drop-out rates. Advising is linked to persistence in the early stages of higher education by a wealth of literature (Bettinger and Baker 2014; Burgette and Magun-Jackson 2009), frequently with a focus on lower-level tertiary education and on institutions with open enrollment policies, that traditionally suffer from lower student retention rates (Hatch and Garcia 2017).

Orientation courses are also linked with outcomes in terms of longer-term persistence or with achievements measured in terms of GPA or other equivalent measures (Burgette and Magun-Jackson 2009; Conrad Glass Jr. and Garrett 1995; Pascarella et al. 2006; Perrine and Spain 2008). As is the case with literature on first-year seminars (Brown et al. 2006; Permzadian and Credé 2015; Porter and Swing 2006; Zeidenberg et al. 2007), much of the works reviewing orientation courses are interested in finding tools to increase persistence of students that have already enrolled, whereas orientation during high school to improve college retention seems a less developed field of study.

For the purpose of this paper, almost every factor thought to influence academic persistence and performance can in principle represent a confounder if it also affects participation in orientation programs. Previous attainments are obviously considered strong predictors of academic success (Foote et al. 2015; van Herpen et al. 2017) . Family income and its related proxies have long been known to be potentially related with academic attainments (Manski 1992; Sewell and Hauser 1972), a finding that seems persistent or increasing over time and consistent across various western countries (Blanden and Gregg 2004; Løken 2010; Roksa 2011). Other known predictors of academic success include commuting distance (Nelson et al. 2016; Woosley 2005) and timing of registration (Hale and Bray 2011; Hatch and Garcia 2017; Shriner 2014). Finally, a vast literature discusses high school context and teacher effort in relation with postsecondary attainment (Alcott 2017; Deming et al. 2011; Wolniak and Engberg 2010), which may involve the actual quality of teaching, the quality of the context in general or the efforts of the school to guide students towards better choices in university enrollments.

2 Institutional context and data

Admission to the public system of higher education in Italy has been shaped in three fundamental steps. In 1969 all high school streams were reformed so that the Leaving Diploma of any 5-years secondary school became a sufficient entry requirement for every university course. Between 1989 and 1999, various reforms introduced standardized national admission tests in a few selected courses and provided more autonomy for each institution, including the possibility to open new courses (Bratti et al. 2008), to introduce more selectivity through locally determined admission tests (Durazzi 2014) and ultimately, with the EU-wide Bologna process (Hoareau Mc Grath et al. 2014), reforms led to the reorganization of post-secondary courses into 3-years bachelor's degrees followed by 2-year master-equivalent degrees. Finally, in 2004, non-selective admission tests were introduced for all bachelor's degrees in order to evaluate students entering

a course (Carrieri et al. 2015). As a consequence of the reforms, admission rules at the time of writing this paper may take three distinct forms: courses with open-enrollment conditional to successfully completing secondary school, courses with access regulated at a national level through a standardized entry test, and courses with access regulated at a local level by specific institutions through selective tests that give each institution the authority to set a number of admissible students for each academic year (Durazzi 2014). Regardless of the different approaches to selectivity, all courses are substantially subsidized with public appropriations and a quick check over publicly available income statements of the main public universities in Italy reveals that most institutions have a ratio of resources from tuition fees to resources from supra-national, national and local public administrations around 20% and rarely exceeding 30%.

In order to test the hypothesis that orientation has a causal effect on first-year outcomes, we analyze the academic performance of six classes of freshmen (2012-2017) enrolled in any of the three bachelor's degree programs offered by the Department of Economics of the University of Genoa (DIEC), Italy. An orientation program (OP) activated by DIEC in 2015, open to high school students in their senior year, effectively divides the six classes in two cohorts of students: one that enrolled in 2015-2017 after the OP was activated (we indicate this as the *treatment period*) and therefore could decide to attend to it, and those who enrolled before the start of the treatment period. Training hours in the OP varied from a minimum of 12 and a maximum of 30 and included workshops illustrating the economic approach to a range of current issues and the possibility to attend to selected university lessons alongside regular students.

Table 1. Descriptive statistics for the samples

		Treatment period: NO	Treatment period: YES		
			Untreated	Treated	Total
Number of students		1667	1456	325	1781
AGE		19.52 (1.62)	19.51 (1.34)	19.14 (0.55)	19.43 (1.24)
HIGHSC		76.15 (11.14)	75.49 (11.03)	78.86 (10.96)	76.10 (11.09)
ORIEN		NA	17.08 (23.35)	32.00 (27.87)	19.80 (24.91)
INDIST		49.96 (146.85)	49.47 (132.17)	27.54 (54.00)	45.47 (120.48)
INCOME:	*bracket* 1	0.19 (0.39)	0.18 (0.38)	0.15 (0.36)	0.17 (0.38)
	bracket 2	0.21 (0.41)	0.18 (0.38)	0.20 (0.40)	0.18 (0.38)
	bracket 3	0.21 (0.40)	0.16 (0.37)	0.19 (0.39)	0.17 (0.37)
	bracket 4	0.39 (0.49)	0.48 (0.50)	0.47 (0.50)	0.47 (0.50)
ENROL		0.33 (0.47)	0.39 (0.49)	0.56 (0.50)	0.42 (0.49)
ECON		0.23 (0.42)	0.21 (0.41)	0.41 (0.49)	0.25 (0.43)
RES		0.51 (0.50)	0.54 (0.50)	0.53 (50.00)	0.53 (0.50)
GPA		23.23 (2.76)	23.43 (2.77)	24.20 (2.61)	23.58 (2.76)
Exams		6.17 (2.78)	5.43 (2.68)	5.92 (2.29)	5.52 (2.61)
Inactives		0.094 (0.29)	0.12 (0.33)	0.05 (0.22)	0.11 (0.31)

Note: Average values for each group; SD in brackets.

While undergoing treatment was mostly a matter of self-selection, the availability of vast information on the students nonetheless allows to build a quasi-experimental setting by the

means of statistical matching to test the effect of the OP. Available data cover, for all students: the main socio-demographic attributes (age, gender, address, household income class); those concerning their high school careers (final grade/GPA and curricular focus of the school); those on the university careers (Attendance to the OP, date of enrolment at DIEC, recorded grades of final exams sustained as freshman -up to twelve months after enrolment-).
Figure 1 reports a scheme of the high school streams producing enrollments at DIEC and the logical structure of the OP with respect to the enrollment process. In the *treatment period*, 1781 students enrolled as freshmen and 18.22% of them had attended the OP. The *treatment group* consisted of 325 students that attended the OP during the *treatment period* and, afterwards, decided to enrol at DIEC Bachelor's programs. The cohort that enrolled before the *treatment period* in 2012-2014 consisted in 1667 students. In accordance with its open-enrollment policy and with the overall objective of increasing the population with a college degree by 2020, DIEC recorded an increase of enrollments of 6.8% between the two periods.

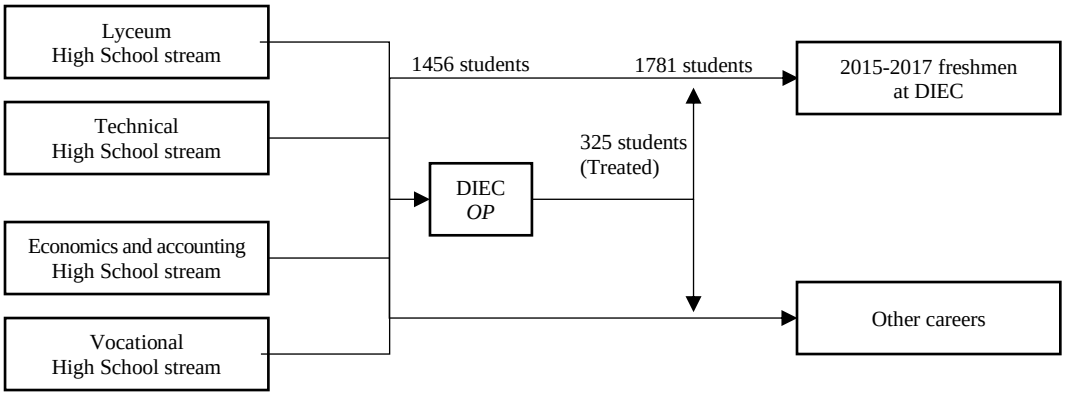

Figure 1: High school streams producing enrollments to the bachelor's degree programs of DIEC. The *OP* was activated in 2015 and was directed to all high school seniors wishing to spend one week of training at DIEC as prospective students.

3 Matching procedure and estimation of the causal effect

To assess the effect of participation to the OP, two potential outcomes must be considered for each student *i* of the population of interest: the first (Y_{i1}) in the presence of the treatment and the second (Y_{i0}) in its absence. The impact of orientation on a specific student can then be evaluated by considering the difference between the above mentioned two potential outcomes $Y_{i1} - Y_{i0}$. In an observational context, however, it is not possible to measure both effects because each student belongs uniquely to one of the two possible groups: those who participated in students' orientation traineeship or those who did not. This means that the treatment effect cannot be identified at individual level and aggregate measures must instead be used (Imbens and Rubin 2015) such as the average treatment effect on the treated (ATET) which is calculated as $E(Y_{i1} | T_i=1) - E(Y_{i0} | T_i=1)$ where T is the treatment indicator ($T_i = 1$ for the treatment and $T_i = 0$ for the absence of treatment). Thus, ATET represents the average effect of treatment on a randomly selected individual among the treated population.

In an experimental context, the estimate of the average effect of treatment is quite straightforward, because randomization makes the treated and the untreated group equivalent in terms of observed and unobserved characteristics. However, in the observational field, treated and untreated units are not generally comparable and a simple comparison of the average of the outcome variable between the two groups provides biased estimates of the causal effect. This is likely to be the case if the *treatment group* consists of students that decided to attend the OP: by doing so they displayed an attitude which is likely to have influence over the effects of the treatment. The same attitude cannot be expected to be present, at the same average level, neither in the untreated students in *treatment period* that selected themselves out, nor in the indistinct population of students in the years when treatment was not available. A more appropriate control group has therefore to be identified by different means.

Among the possible approaches to research issues of this kind, the prevailing method is based on propensity score. The propensity score of an individual in the population of interest represents the probability for that individual of receiving treatment conditional on her or his personal characteristics and is a balancing score: given the propensity score, the distribution of the observed covariates is the same in the treated and untreated groups. Although the true propensity score is not observable, we can estimate it from the observed data and use it, with different techniques, to identify a group of untreated which is by construction comparable with the group of the treated. Among these techniques, we choose the matching technique, which couples each treated unit with one or more untreated units with the most similar propensity score (nearest neighbor matching). In this way, we create a control group of untreated units with the same characteristics of the treated group. Therefore, we can evaluate the average treatment effect on different variables by comparing the two groups constructed in this way. The obtained estimates are certainly unbiased if it is possible to assume the absence of confounding, that is, if it possible to assume that, given the propensity score, the assignment to the treatment is independent from the potential outcomes. Along with propensity score matching, our data allows us to seek an exact match for some specific characteristics of the students (i.e. income bracket, timeliness of enrolment, type of home high school, residence in the municipality of Genoa), which ensures an even closer similarity between the characteristics of the control group to those of the treatment group.

The final dataset for the matching procedure included 1992 students: the *treatment group* only from the *treatment period*, and the entire cohort antecedent to the *treatment period* (or *unmatched control group*). The (*matched*) *control group*, identified among the cohort of 2012-2014 by the means of the matching procedure and consisting of 325 students, can therefore be interpreted as a subgroup of students who, due to their characteristics, could have participated in the OP if it had been available. In order to exclude that any effect captured as treatment effect was actually a generalized trend, we checked if the first-year GPA was approximately constant between the cohort of 2012-2014 and the untreated of 2015-2017 (no treatment effect on the untreated). We found an increase in GPA that was not significant although not very far from it (diff=0.2047, t-test 1.95, p-value=0.0513). Excluding two exams that were arguably responsible for much of the difference, the effect essentially disappeared (diff = 0.1212, t-test 1.11, p-value=0.266). We opted to keep the full range of exams as our reference and to make robustness checks to verify that any treatment effect found was still present if the two exams were removed from the first year GPA.

The variables, involved in the propensity score estimate were AGE, HIGHSC (High school GPA over a 100 points scale), ORIEN (Orientation Effort by the Institution of origin, defined as the total number of students in the OP from any given high school), INDIST (the logarithmic distance between the High School attended and the location of DIEC). A perfect matching was sought for the following variables: INCOME (household income bracket), ENROL (timeliness of enrolment; dummy variable which indicates early enrollments as those completed by the second week of September), ECON (dummy variable which indicates if a student comes from a high school in the economics and accounting stream), RES (dummy variable indicating if the residence of the student is the municipality of Genoa).

Table 2. Testing difference in means/proportions between treated and control groups, before and after matching

[Panel A] Balancing check after *propensity score matching*

	Unmatched (U)				Matched (M)				Standard bias %		Bias
	Treated	Control	t-test	p-value	Treated	Control	t-test	p-value	U	M	Reduct %
AGE	19.14	19.52	-4.23	0.000	19.14	19.10	0.34	0.344	-32%	3%	90%
HIGHSC	78.86	76.16	4.02	0.000	78.86	79.92	-1.23	0.219	25%	-10%	61%
ORIEN	32.00	19.50	8.35	0.000	32.00	30.06	0.90	0.369	48%	8%	85%
INDIST	2.59	2.74	-1.67	0.095	2.59	2.56	0.20	0.844	-11%	2%	86%

[Panel B] *Variables used for exact matching* (*unmatched descriptives only reported*)

INCOME	Treated	Control
bracket 1	0.15	0.19
bracket 2	0.20	0.21
bracket 3	0.19	0.21
bracket 4	0.47	0.39
Chi-squared	6.97 (p-value = 0.073)	

	Treated	Control	z-test	p-value
ENROL	0.56	0.33	0.23	0.000
ECON	0.41	0.23	0.18	0.000
RES	0.53	0.51	0.02	0.449

Table 2 presents a comparison between the *treatment group* and the *control group* before the matching and after the matching procedure. Almost all matching variables have statistically significant differences between treated and control students before matching, confirming our expectations. Specifically, panel A of Table 2 shows the observed means and the t-tests performed to check the difference between the treated and the control group for each variable involved in the propensity score matching. On the left side of panel A, the unmatched groups have strongly significant differences in all variables except distance which is only significant at p>0.1 In the central section of panel A, after matching, no difference is statistically significant. The right side of Panel A reports the reduction in bias determined by the nearest neighbor propensity score matching procedure, which is substantial for all variables involved.

In Panel B of Table 1 are reported the descriptive statistics of variables involved in exact matching at their value before the matching. Once more, the case for a matching procedure to balance the treatment and control group is reinforced by mostly statistically different means, with the only exception of variable RES, which is balanced before the matching. Trivially, after an exact matching, there is perfect overlapping of the two subsamples and thus the results are omitted.

The overall effects of the matching procedure can therefore be considered satisfactory as the *treatment group* and the *control group* are now well balanced across all the relevant variables.
Following the above-mentioned matching procedure, treated and untreated students are fully comparable with respect to the variables considered. We then estimate the ATET for each of the outcome variables that we choose to consider. Table 2 shows the results. The ATET is statistically significant (p-value<0.01) for all the outcome variables.

Table 3. ATET estimates for each outcome

Outcome variable	ATET	SE	z		CI 95%	
					LL	UL
GPA	0.598	0.192	3.69	***	0.221	0.974
Exams	-0.541	0.198	-2.73	***	-0.929	-0.153
Inactivity rate	-0.043	0.022	-1.94	*	-0.087	0.00

The results in Table 3 suggest that the OP increases the efficiency of the higher education service supplied to the *treatment group* as an effect of considerable improvements in two out of three of the efficiency criteria being considered (GPA and Inactivity rate). In order to appreciate the size of these efficiency gains, the increase of 0.598 in GPA is somewhat comparable to the increase of 0.78 found in Carrieri et al. (2015) after the introduction of a selective policy that granted admission to only 66% of the applicants in comparable courses. Notably, the improvement is smaller (0.355) if we consider the entire population of students in the *treatment period,* but nonetheless sizeable given the small share of treated students. The results are robust to excluding from the GPA selected exams that have an increasing trend in average grades between 2012 and 2017 in the entire population of students, perhaps due to changes in the teaching staff.
A different approach to compare orientation and selectivity is that of simulating a selective admission policy in our data. Therefore, we set a dynamic selection criterion based on the high school GPA of students and we apply it to the students in the 2012-2014 cohort (in order to avoid the confounding caused by the treatment). Then, we perform a sequence of t-tests on the difference between the first-year university GPA of the 2012-2014 students selected with a progressively more selective policy and the first-year university GPA of our *treatment group* from 2015-1017.

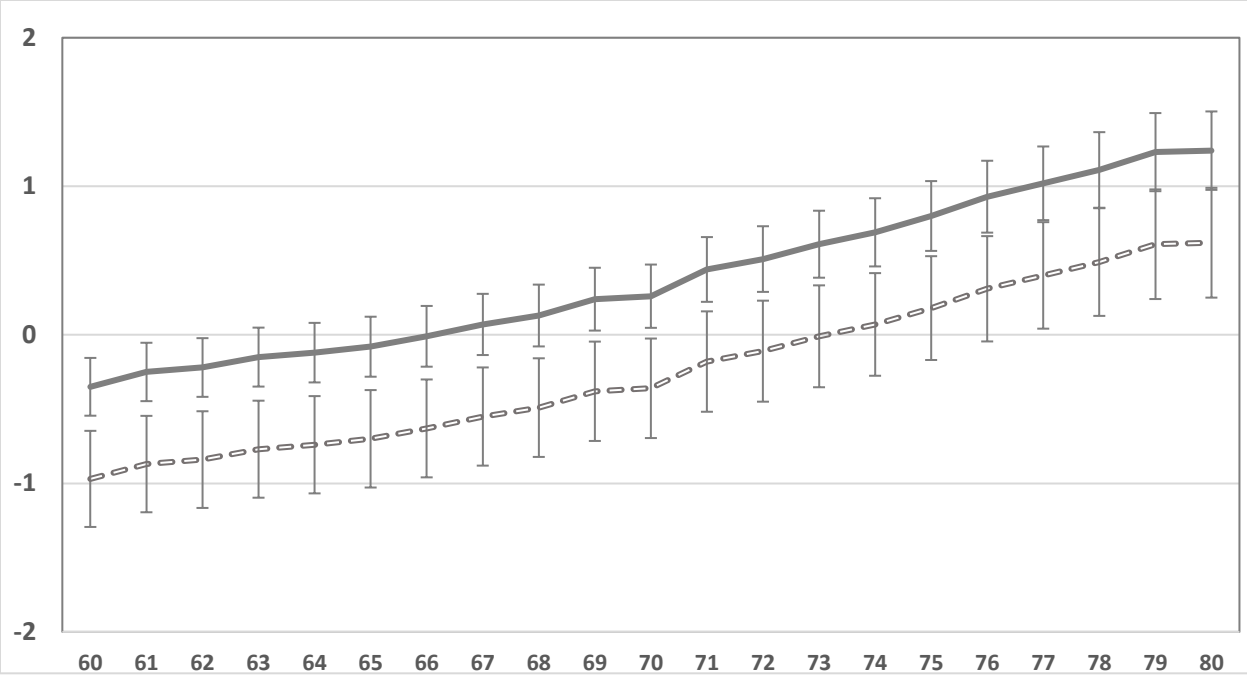

Figure2: (dashed line) difference in average first-year university GPA (vertical axis) between the *control group* and a subset of students in the 20012-2014 cohort selected by high school GPA (horizontal axis); **(black line)** difference in average first-year university GPA (vertical axis) between the 2015-2017 cohort and a subset of students in the 20012-2014 cohort selected by high school GPA (horizontal axis). Difference is significant for the high-school GPA in correspondence of which the 95% confidence interval falls entirely above the line of difference=0

In Figure 2, the dashed line represents such difference as a function of the high school GPA threshold set in the selective admission policy. The line is interpretable as the differential in efficiency gains between selectivity and orientation. Looking at the confidence interval (at 95% confidence level) of the line, statistically significant differences in efficiency gains require the confidence interval to fall entirely above the line of difference equal to 0 and this happens for selective policies that accept high school GPAs of 77/100 or more. In other words, we find that the effect of a selective admission policy on the admitted is larger that the effect of the treatment on the treated only if students with high school GPA lower than 77 are not admitted, amounting to 57% of the applicants. The black line, instead, represents the difference in first-year university GPA between the same students selected from 2012-2014 and the entire 2015-2017 cohort as a function of the high school GPA threshold set in the selective admission policy. Even after diluting the effect of treatment on the entire cohort enrolled in the treatment period, efficiency gains differentials are statistically significant only for admission policies that reject all students with high school GPAs below 69/100, amounting to 29% of the applicants.

4 Discussion

The effect of selectivity on academic performance of first-year college students has long been a relevant field of study, particularly in the case of private institutions that seek to optimize their

production function while having the students as customers as well as inputs (Winston 1999). In recent years, though, selectivity has in some cases become a lingering concern for public universities as well, motivated with alarming drop-out rates, poor average performances, a decrease in resources that has been common to many European countries and, implicitly, with the intuition that a share of students enrolled in their freshmen year are not going to ultimately provide a net social benefit with their attendance. Some recent quasi-experimental works on Italian universities, in particular, have provided substantive evidence that all the relevant indicators of efficiency in higher education improve after introducing selective admission policies, including in the case of public universities. Since improving allocative efficiency in the subsidization of higher education is unquestionably a goal of public universities, this might be interpreted as evidence that the current level of access to post-secondary study has long past the level where the marginal enrolled student provided a marginal social benefit.

We argue that this is not necessarily the case in general, and it is specifically not the case for the bachelor-level courses we investigated. We estimated the causal effects of a week of university orientation for high school students that later enrolled in the bachelor-level courses of the Department of Economics of the University of Genoa, Italy. Such programs aim at nudging prospective students towards better enrollment choices and more appropriate study routines early in their academic career. Underlying such orientation programs is the assumption that some potentially successful students are not enrolling to the courses that are more appropriate for their inclinations, are not enrolling at all, or begin their academic career with a poor understanding of what is asked of them in terms of commitment and effort.

In the light of the recent findings in literature, instead, we expected modest improvements in first-year university performances in treated students compared to a control group of equivalent students enrolled in years when the orientation program was not available. In fact, we expected inactive students and poor GPA after the first year in college to reflect an open-enrollment policy leading to admissions beyond the marginal, socially neutral student, thus including a share of applicants lacking the academic ability or the motivation and commitment required to successfully and timely complete their post-secondary studies. To the contrary, we found that treatment produced an increase in GPA of 0.598 points on average and a rate of inactive students that was nearly halved. These results are comparable, albeit not as high, to those obtained in previous literature by selecting just 66% of the students seeking admission after an admission test. We claim this as inconsistent with the notion that cutting the current enrollment levels is the warranted method to improve allocative efficiency. In fact, this seems to suggest that, if allocative efficiency and equity are both relevant goals of the public subsidy to higher education, the case for selective admission policies is hard to make at all if performances respond to orientation programs, all the more so if the program itself requires modest resources.

There are limitations to this work that should be considered. The average treatment effect on the treated found in our population refers to a relatively small, self-selected group of participants. While the comparison is made with an equivalent control group, one could argue that a larger or mandatory orientation program would produce a lower average treatment effect. Even so, we have showed that the orientation program, as limited as it was, produced an improvement in the average university GPA of the entire cohort of 2015-2017 students that was equivalent to selecting

out 29% of the applicants based on high school GPA. Our findings are also limited by being referred to the first year of college, while the ideal comparison would be made at graduation. The overall message of this work, limitations notwithstanding, is that orientation represents an effective method to increase efficiency (to a degree) and the net social benefits of public higher education services without selection. This is consistent with the leading models of the market of public higher education as orientation corresponds to an anticipated, publicly provided influx of information in the student's decision process that allows an early (pre-enrollment) update of that student's expectations. At least as long as orientation provides a cost-effective but sizeable improvement in academic performance, there seem to be arguments to prefer it to selection from a social welfare standpoint.

References

Agasisti, T., Avvisati, F., Borgonovi, F., & Longobardi, S. (2018). Academic resilience. *OECD Education Working Papers*, (167).

Aina, C., Baici, E., Casalone, G., & Pastore, F. (2018). The economics of university dropouts and delayed graduation: a survey. *GLO Discussion Paper N. 189*.

Aktas, K., & Cappellari, L. (2017). *Selective Admissions and Freshmen ' s Academic Outcomes*.

Alcott, B. (2017). Does Teacher Encouragement Influence Students' Educational Progress? A Propensity-Score Matching Analysis. *Research in Higher Education*, *58*(7), 773–804. doi:10.1007/s11162-017-9446-2

Ayala, J. C., Manzano, G., & Ayala, J. C. (2018). Academic performance of first-year university students : the influence of resilience and engagement. *Higher Education Research & Development*, *37*(7), 1321–1335. doi:10.1080/07294360.2018.1502258

Behrman, J., Crawford, D., & Stacey, N. (1997). Conclusion. In J. Behrman & N. Stacey (Eds.), *The Social Benefits of Higher Education*. Ann Arbor, Michigan: University of Michigan Press.

Belman, D., & Heywood, J. S. (1991). Sheepskin Effects in the Returns to Education : An Examination of Women and Minorities. *The Review of Economics and Statistics*, *73*(4), 720–724.

Bettinger, E. P., & Baker, R. B. (2014). The Effects of Student Coaching. *Educational Evaluation and Policy Analysis*, *36*(1), 3–19. doi:10.3102/0162373713500523

Bettinger, E. P., Long, B. T., Oreopoulos, P., & Sanbonmatsu, L. (2012). The role of application assistance and information in college decisions: results from the H&R block FAFSA experiment. *The Quarterly Journal of Economics*, 1205–1242. doi:10.1093/qje/qjs017.Advance

Blanden, J., & Gregg, P. (2004). Family income and educational attainment: A review of approaches and evidence for Britain. *Oxford Review of Economic Policy*, *20*(2), 245–263.

doi:10.1093/oxrep/grh014
Bratti, M., Checchi, D., & Blasio, G. De. (2008). Does the expansion of higher education increase the equality of educational opportunities? Evidence from Italy. *Labour*, *22*(SI), 53–88. doi:10.1111/j.1467-9914.2008.00411.x
Braunstein, A., McGrath, M., & Pescatrice, D. (1999). Measuring the impact of income and financial aid offers on college enrollment decisions. *Research in Higher Education*, *40*(3), 247–259. doi:10.1023/A:1018742931941
Brown, R. D., Pascarella, E. T., & Terenzini, P. T. (2006). How College Affects Students. *The Journal of Higher Education*, *63*(3), 355. doi:10.2307/1982025
Burgette, J. E., & Magun-Jackson, S. (2009). Freshman Orientation, Persistence, and Achievement: A Longitudinal Analysis. *Journal of College Student Retention: Research, Theory & Practice*, *10*(3), 235–263. doi:10.2190/cs.10.3.a
Carrieri, V., D'Amato, M., & Zotti, R. (2015). On the causal effects of selective admission policies on students ' performances : evidence from a quasi-experiment in a large Italian university. *Oxford Economic Papers*, *67*(4), 1034–1056. doi:10.1093/oep/gpv038
Conrad Glass Jr., J., & Garrett, M. (1995). Student participation in a college orientation course, retention, and grade point average. *Community College Journal of Research and Practice*, *19*(2), 117–132.
Damgaard, M. T., & Nielsen, H. S. (2018). Nudging in education. *Economics of Education Review*, *64*(March), 313–342. doi:10.1016/j.econedurev.2018.03.008
Deming, D. J., Hastings, J. S., Kane, T. J., Staiger, D. O., Kovak, B., Long, B., et al. (2011). School Choice, School Quality and Postsecondary Attainment. *NBER Working Paper No. 17438*.
Durazzi, N. (2014). the Italian Admission System To Higher Education: Quality, Equity and Mobility Issues. *CRUI: Conferenza dei Rettori delle Universita'Italiane*.
Foote, A., Schulkind, L., & Shapiro, T. M. (2015). Missed signals: The effect of ACT college-readiness measures on post-secondary decisions. *Economics of Education Review*, *46*, 39–51. doi:10.1016/j.econedurev.2015.02.002
Francesconi, M., Aina, C., & Cappellari, L. (2012). Student performance may not improve when universities are choosier. *Evaluation and Research in Education*, *24*(4), 231–242. doi:10.1080/09500790.2011.623772
Grilli, L., Rampichini, C., & Varriale, R. (2016). Statistical modelling of gained university credits to evaluate the role of pre-enrolment assessment tests: An approach based on quantile regression for counts. *Statistical Modelling*, *16*(1), 47–66. doi:10.1177/1471082X15596087
Hale, J. M., & Bray, N. J. (2011). The Impact of Registration Timing on Student Performance AU - Hale, Jacqueline M. *Community College Journal of Research and Practice*, *35*(7), 556–573. doi:10.1080/10668920802289984
Hatch, D. K., & Garcia, C. E. (2017). *Academic Advising and the Persistence Intentions of Community College Students in their First Weeks in College*. *The Review of Higher Education* (Vol. 40). doi:10.1353/rhe.2017.0012
Herber, S. P. (2018). The role of information in the application for highly selective scholarships: Evidence from a randomized field experiment. *Economics of Education Review*, *62*(March 2017), 287–301. doi:10.1016/j.econedurev.2017.12.001
Hoareau Mc Grath, C., Henham, M., Corbett, A., Durazzi, N., Frearson, M., Janta, B., et al.

(2014). *Higher education entrance qualifications and exams in Europe: a comparison*.
Holmes, C., & Mayhew, K. (2016). The economics of higher education. *Oxford Review of Economic Policy*, *32*(4), 475–496. doi:10.1093/oxrep/grw031
Imbens, G., & Rubin, D. (2015). *Causal inference in statistics, social, and biomedical sciences*. Cambridge: Cambridge University Press.
Jaeger, D. A., & Page, M. E. (1996). Degrees Matter : New Evidence on Sheepskin Effects in the Returns to Education. *The Review of Economics and Statistics*, *78*(4), 733–740.
Johnstone, D. (2009). Worldwide Trends in Financing Higher Education: A Conceptual Framework. In J. Knight (Ed.), *Financing Access and Equity in Higher Education*. Rotterdam: Sense Publishers.
Jongbloed, B., & Vossensteyn, H. (2016). University funding and student funding: international comparisons. *Oxford Review of Economic Policy*, *32*(4), 576–595. doi:10.1093/oxrep/grw029
Kerr, S. P., Pekkarinen, T., & Sarvim, M. (2018). Educational Choice and Information on Labor Market Prospects : A Randomized Field Experiment. *Working Paper*.
Lessard, A., Butler-kisber, L., Fortin, L., Marcotte, D., Lessard, A., Butler-kisber, L., et al. (2014). Analyzing the Discourse of Dropouts. *he Journal of Educational Research*, *107*(2), 103–110. doi:10.1080/00220671.2012.753857
Løken, K. V. (2010). Family income and children's education: Using the Norwegian oil boom as a natural experiment. *Labour Economics*, *17*(1), 118–129. doi:10.1016/j.labeco.2009.06.002
Manski, C. F. (1992). Income and higher education. *Focus*, *14*(3), 14–19.
Masserini, L., Bini, M., & Pratesi, M. (2017). Effectiveness of non-selective evaluation test scores for predicting first-year performance in university career : a zero-inflated beta regression approach. *Quality & Quantity*, *51*(2), 693–708. doi:10.1007/s11135-016-0433-z
Masten, A. S., & Coatsworth, J. D. (1998). The Development of Competence in Favorable and Unfavorable Environments: Lessons from Research on Successful Children. *American Psychologist*, *53*(2), 205–220. doi:10.1037/0003-066X.53.2.205
McMahon, W. (2009). *Higher Learning, Greater Good: The Private and Social Benefits of Higher Education*. Baltimore, Maryland: The John Hopkins University Press.
Musgrave, R. A. (1959). *The theory of public finance: a study in public economy*. New York: McGraw-Hill.
Nelson, D., Misra, K., Sype, G. E., & Mackie, W. (2016). An Analysis Of The Relationship Between Distance From Campus And GPA Of Commuter Students. *Journal of International Education Research*, *12*(1), 37. doi:10.19030/jier.v12i1.9565
O'Leary, N., & Sloane, P. (2016). Too many graduates? An application of the Gottschalk-Hansen model to young British graduates between 2001-2010. *Oxford Economic Papers*, *68*(4), 945–967. doi:10.1093/oep/gpw027
Ordovensky, J. F. (1995). Effects of institutional attributes on enrollment choice: Implications for postsecondary vocational education. *Economics of Education Review*, *14*(4), 335–350. doi:http://dx.doi.org/10.1016/0272-7757(95)00013-A
Page, L. C., & Scott-Clayton, J. (2016). Improving college access in the United States: Barriers and policy responses. *Economics of Education Review*, *51*, 4–22. doi:10.1016/j.econedurev.2016.02.009
Pascarella, E. T., Terenzini, P. T., & Wolfle, L. M. (2006). Orientation to College and Freshman

Year Persistence/Withdrawal Decisions. *The Journal of Higher Education*, *57*(2), 155. doi:10.2307/1981479

Paulsen, M., & Smart, J. (2007). *The Finance of Higher Education: Theory, Research, Policy, and Practice*. New York: Agathon Press.

Permzadian, V., & Credé, M. (2015). Do First-Year Seminars Improve College Grades and Retention? A Quantitative Review of Their Overall Effectiveness and an Examination of Moderators of Effectiveness. *Review of Educational Research*, *86*(1), 277–316. doi:10.3102/0034654315584955

Perrine, R. M., & Spain, J. W. (2008). Impact of a Pre-Semester College Orientation Program: Hidden Benefits? *Journal of College Student Retention: Research, Theory & Practice*, *10*(2), 155–169. doi:10.2190/cs.10.2.c

Peter, F. H., & Zambre, V. (2017). Intended college enrollment and educational inequality: Do students lack information? *Economics of Education Review*, *60*, 125–141. doi:10.1016/j.econedurev.2017.08.002

Pistolesi, N. (2017). Advising students on their field of study : Evidence from a French University. *Labour Economics*, *44*(December 2016), 106–121.

Porter, S. R., & Swing, R. L. (2006). Understanding how first-year seminars affect persistence. *Research in Higher Education*, *47*(1), 89–109. doi:10.1007/s11162-005-8153-6

Robinson, K. J., & Roksa, J. (2016). Counselors, Information, and High School College-Going Culture: Inequalities in the College Application Process. *Research in Higher Education*, *57*(7), 845–868. doi:10.1007/s11162-016-9406-2

Roksa, J. (2011). Differentiation and work: Inequality in degree attainment in U.S. higher education. *Higher Education*, *61*(3), 293–308. doi:10.1007/s10734-010-9378-7

Rumberger, R., & Thomas, S. (1993). The economic returns to college major, quality and performance: A multilevel analysis of recent graduates. *Economics of Education Review*, *12*(1), 1–19.

Serra, M. J., & DeMarree, K. G. (2016). Unskilled and unaware in the classroom: College students' desired grades predict their biased grade predictions. *Memory and Cognition*, *44*(7), 1127–1137. doi:10.3758/s13421-016-0624-9

Sewell, W. H., & Hauser, R. M. (1972). Agricultural & Applied Economics Association Causes and Consequences of Higher Education : Models of the Status Attainment Process Published by : Oxford University Press on behalf of the Agricultural & Applied Economics Association Stable URL : http://www. *American Journal of Agricultural Economics*, *54*(5), 851–861.

Shriner, K. N. (2014). Late Registration: Continued Impact on Student Success. *Community College Journal of Research and Practice*, *38*(6), 588–591. doi:10.1080/10668926.2013.790857

Stinebrickner, R., & Stinebrickner, T. R. (2014). A major in science? Initial beliefs and final outcomes for college major and dropout. *Review of Economic Studies*, *81*(1), 426–472. doi:10.1093/restud/rdt025

Taniguchi, H. (2005). The influence of age at degree completion on college wage premiums. *Research in Higher Education*, *46*(8), 861–881. doi:10.1007/s11162-005-6932-8

Thomas, S. (2000). Deferred costs and economic returns to college major, qua and performance. *Research in Higher Education*, *41*(3), 281–313. doi:10.1023/A:1007003510102

Toutkoushian, R., & Paulsen, M. (2016). *Economics of Higher Education* (eBook.). Springer Science & Business Media.

Twenge, J. M., Campbell, W. K., & Gentile, B. (2012). Generational Increases in Agentic Self-evaluations among American College Students, 1966-2009. *Self and Identity*, *11*(4), 409–427. doi:10.1080/15298868.2011.576820

van Herpen, S. G. A., Meeuwisse, M., Hofman, W. H. A., Severiens, S. E., & Arends, L. R. (2017). Early predictors of first-year academic success at university: pre-university effort, pre-university self-efficacy, and pre-university reasons for attending university. *Educational Research and Evaluation*, *23*(1–2), 52–72. doi:10.1080/13803611.2017.1301261

Winston, G. C. (1999). Subsidies, Hierarchy and Peers: The Awkward Economics of Higher Education. *Journal of Economic Perspectives*, *13*(1), 13–36.

Wolniak, G. C., & Engberg, M. E. (2010). Academic achievement in the first year of college: Evidence of the pervasive effects of the high school context. *Research in Higher Education*, *51*(5), 451–467. doi:10.1007/s11162-010-9165-4

Woosley, S. (2005). Stop-Out or Drop-Out? An Examination of College Withdrawals and Re-Enrollments. *Journal of College Student Retention: Research, Theory & Practice*, *5*(3), 293–303. doi:10.2190/6nw2-fuj4-4atu-ekhc

Young, J. L. (2016). Access , Achievement , and Academic Resilience : The Relationship between AVID and Black Student Participation in Advanced Placement Courses. *Journal of Multicultural Affairs*, *1*(2).

Zeidenberg, M., Jenkins, D., Calcagno, J. C., & Columbia Univ NY Community Coll, Research Center, N. Y. (2007). Do Student Success Courses Actually Help Community College Students Succeed? CCRC Brief. Number 36. *Community College Research Center, Columbia University*, *36*, 1–6. http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=ED499357&site=ehost-live