The effect of an academic dismissal policy on dropout, graduation rates and student satisfaction. Evidence from the Netherlands¹

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Abstract

This paper examines the effect of the introduction of an academic dismissal (AD) policy (i.e. an intervention which can lead to compulsory student withdrawal) on student dropout, student graduation rates and satisfaction with the study program. Using a Difference-in-Differences type of estimator, we compare programs that introduced an AD policy with a control group of programs which did not employ an AD policy. The robustness of the results is tested by a propensity score matching. The outcomes suggest that the implementation of an academic dismissal policy results in a higher first year dropout rate, and a higher student graduation rate. The results also indicate that, on average, student satisfaction decreases due to the introduction of an AD policy, while student satisfaction regarding program feasibility increases when an AD policy is employed.

JEL-Classification: I21; I22

Key words: Higher education; Admission policy; Compulsory student withdrawal; Student satisfaction; School dropout; Student graduation.

1. Introduction

Since the 1990s, governments' interest in performance based funding has increased (Burke & Serban, 1997; Jongbloed & Koelman, 1996). By introducing some form of performance-based funding (PBF), many national authorities aim at pressuring higher education institutions to become more accountable, more efficient and more productive in the use of public resources (Alexander, 2000). To reflect the

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many dimensions of the outputs of higher education institutes in terms of quantity and quality, most PBF mechanisms use a number of different indicators, including the number of credits accumulated by students, the number of degrees awarded, or the number of research publications (Jongbloed & Vossensteyn, 2001). The PBF mechanism provides several related challenges to higher education institutions. We focus on three major ones, while ignoring others (e.g., keeping and improving quality standards; improving research performance).

First, stakeholders of higher education institutes are increasingly focusing on student graduation rates as it is considered as a measure of institutional effectiveness (Fike & Fike, 2008).² Since the introduction of cost-sharing, parents and students benefit from students who graduate ‘on time’ as no extra tuition has to be paid (Johnstone, 2004). Because of the implementation of PBF, higher education institutes also benefit from graduation within the nominal study time, as graduation will lead to higher and sooner funding.

Second, higher education institutions put more emphasis on student satisfaction. Evidence indicates that dissatisfied students often become dropouts (Bryant, 2006). Moreover, it has been argued that students prefer to enroll in institutions with high perceived student satisfaction. Therefore, many institutions are investing in measures that increase student satisfaction (e.g., mentoring and coaching, sports facilities, study choice centrums; Bettinger and Baker, 2011). Other advantages of high student satisfaction, as indicated by Miller (2003), are high retention and graduation rates, low loan default rates and increased alumni giving.

Third, higher education institutes became increasingly selective in accepting students as they are held accountable for the relative efficiency in awarding diplomas. Current practices fall apart in two mechanisms. There is selection ‘at the gate’ which accepts only students with a high possibility of successfully obtaining the degree within the study period (Beller, 2001; Salvatori, 2001). Examples of such selection mechanisms include the use of the Scholastic Assessment Test (SAT) score and/or selection interviews. Next, there is selection ‘after the gate’, which allows all students to enroll in the first year of study. However, it has some strict rules on who can continue in or after the first year (Duijndam & Scheepers, 2009; Lindo et al., 2010). Examples of these screening tools include the use of first-year credits (ECTs) and first-year grade point averages (GPA).

In the Netherlands, 7% of the total higher education budget is reserved for performance agreements between the government higher education institutions (both universities and higher vocational education). The main indicators of these agreements are dropout and completion rates. Due to the performance agreements many institutions decided to introduce an ‘academic dismissal’ (AD) policy. This intervention is based on a law of 1993 which obliged higher education institutions to provide first-year students with an advice regarding the continuation of their studies. Since 1997, some institutions have chosen to make this advice obligatory and to expel students who did not reach a predetermined credit threshold from the study program and the institution. Due to the performance agreements and the increased attention towards graduation and dropout rates, the popularity of the AD policy has increased rapidly the last couple of years.

This paper contributes to the literature in three ways. First, while selection ‘after the gate’ is growing in popularity (e.g., in The Netherlands, Canada, US), little is known about its effects on student dropout, graduation rates and student satisfaction (see Lindo et al., 2010; Van Heerden, 2013). This paper is the first to test the following research hypothesis:

² We use the terms ‘success’ and ‘graduation’ interchangeably throughout the paper.

The introduction of an academic dismissal (AD) policy results in higher first year student dropout, increased graduation rates and a decrease in student satisfaction.

As a second contribution, earlier literature on the influence of student selection mainly uses descriptive and correlational methodologies (e.g., Leverett-Main, 2004; Arnold and van den Brink, 2010; Moore et al., 2009). Unfortunately, if a proper control group is lacking, one cannot obtain causal evidence. This paper exploits the rich panel structure of the data and identifies the effect of an academic dismissal policy by a difference-in-differences (DiD) type of estimator. The estimator examines the effect of a treatment by comparing the treatment group after treatment against the treatment group before treatment and against a control group. To test the robustness of the results, we also use propensity score matching.

As a third contribution, we focus on the Netherlands for which we have a rich data set at program level (also denoted by academic degree). The Netherlands make an interesting case study for two reasons. Performance indicators as student dropout, student graduation rates and student satisfaction are measured in a nation-wide standardized way, which limits measurement errors and results in uniform data across institutions and academic degrees.

The remainder of this paper unfolds as follows. Section 2 presents the Dutch setting. In Section 3, we outline the literature review on student selection mechanisms, student dropout, student graduation, and student satisfaction. A next section discusses the identification strategy, the assumptions behind the methodology and the data. Section 5 presents the results, which are followed by robustness tests. We conclude the paper with policy advice.

2. Setting

2.1 The Dutch higher education system

Dutch higher education is organized as a binary system and consists of governmental funded and private funded institutes. Approximately 88% of the students attend a governmental funded institution (Jongbloed et al., 2004). This paper focusses only on the group of institutions with governmental funding, which consists of 17 universities and 39 institutes for higher vocational education. In addition, the Open University provides higher education through distance learning. While the universities prepare students for independent scientific work in an academic or professional setting, higher vocational institutes prepare students for the practice of a profession. Approximately one-third of the higher education students enroll in universities, while two-thirds enroll in the higher vocation institutes (Huisman, 2008). By following specific tracks in secondary education, Dutch students are sorted for continuing education and prepared for specific disciplines (De Koning et al., 2014). Admission to universities is open to students who have a certificate of pre-university education or a first-year certificate from a vocational higher education institute. Students who hold a certificate of senior general secondary education, secondary vocational education or pre-university education can enter higher vocational institutes (Huisman, 2008).

As of 2002, Dutch higher education institutes offer programs of 60 credit points per year in accordance to the European Credit Transfer System (ECTS). Credit points measure the workload or ‘study time’ that is required to complete a course or program. In the Netherlands, as in most European countries, a norm for a credit point is a workload of 28 hours, meaning that a program year consists of 1680 hours of work a year. The workload of students consists of the hours in classes and the hours needed to prepare for classes, exams and other forms of assessments.

2.2 Academic dismissal policy

In the Netherlands, universities and higher vocational institutes are legally obliged to provide each student with an advice on the continuation of their studies by the end of the first year of enrollment (Law on Higher Education and Scientific Research, art. 7.8b). Based on this law, higher vocational institutions can issue obligatory (binding) advice to students (Onderwijs Evaluatie Rapport, 2007). Issuing obligatory (binding) advice can be seen as an AD policy (in Dutch ‘Bindend Studie Advies’). Whether a binding advice is positive or negative depends on the number of study credit points³ obtained by the student during the first year. Every course that students follow is linked to a number of credits, depending on the workload. When students pass the course, they earn the corresponding credits. Students who do not earn a sufficient number of credits to reach the threshold, and thus make substandard progress after the first year, are dismissed. The credit-threshold students must pass is decided by each institution and can vary by program, and type of higher education (De Koning et al., 2014). On average, the standard is 41 ECs in higher vocational education, whereas the credit-norm is 38 ECs at universities (Inspectie van het onderwijs, 2010). Before an AD policy is issued, students receive an academic warning, hereby giving them a wake-up call and a chance to improve their performance (Rijksoverheid, n.d.). When academic dismissal is issued it leads to the termination of the student’s enrolment for the current program. Further, dismissed students cannot register for the same study program for a certain period, often three years (De Koning et al., 2014). During the academic year 2007/2008, the vocational institutes issued more than 14,000 academic warnings, while in the scientific education over 3,900 academic warnings were given (Inspectie van het onderwijs, 2010).

By using an AD policy, two objectives are pursued. First, it helps students to learn at an early stage whether the program fits them. Second, it allows programs to select and continue with the most talented and motivated students after the first year (De Koning et al., 2014). Because the AD policy is in line with the orienting, selecting and referential function of the propaedeutic phase in higher education, it is used in many universities and vocational institutes (Onderwijsraad, 2008).

While non-obligatory study warnings are a tradition in Dutch higher education, the use of AD policies increased considerably in the last few years. In 1997, only one university had implemented an AD policy (Onderwijs Evaluatie Rapport, 2007). In 2000, 67% of all vocational study programs made use of an AD policy against 10% of the study programs at university level. Due to the increased attention towards the increase of graduation rates and the decrease of dropout more institutions started to implement AD policies. Moreover, 98% of the study programs at vocational level and 43% of the study programs at university level had an AD policy against 2007. These study programs were localized at 40 higher vocational institutions and seven universities. At university level, the use of an AD policy is most common in the study fields Economics, Law, Linguistics & Culture, and Behavioral & Social Sciences. The interest concerning the use of an AD policy is still increasing (Inspectie van het onderwijs, 2010). This process is represented in figure 1 which shows the percentage of programs with an AD policy⁴. We observe a steep increase in the use of AD policies between the academic years 2006-07 and 2008-09. During this time period, an extra 10% of the programs decided to implement an AD policy. Figure 2 presents the number of programs per credit

³ Note that the performance requirements of the AD policy also can be qualitative, such as passing essential courses (Mennen, 2013). However we will not focus on this type of AD policy, as it is difficult to measure and interpret this kind of performance requirements.

⁴ Both figures make use of information extracted from our data. Since we only have information as of 2003, we are not able to provide a visual representation of the implementation process and the use of credit thresholds before 2003.

threshold. We observe that the majority of the credit threshold is 36-40 ECTS, followed by 41-45 ECTS. There is also a tendency towards higher thresholds.

Figure 1: Percentage of academic programs with an AD policy per year

Figure 2: The number of programs per credit threshold per year

3. Literature Review

Higher education institutions are increasingly held accountable for their students (Huisman & Currie, 2004). In some countries, financial agreements between the government and higher education institutions even include targets on student dropout, student graduation and student satisfaction (in Australia, the Netherlands, Hong Kong) (OCW, 2011; Benneworth et al., 2011). We review the literature on student performance indicators and student satisfaction.

3.1 Student performance indicators.

3.1.1 Student dropout and student graduation

Different studies show that high freshman attrition rates go hand in hand with a higher percentage of students graduating on time (e.g., Lau, 2003; Levitz et al., 1999). As a result, institutions try to stimulate graduation rates by keeping first-to-second-year dropout under control. The student integration model of Tinto (1975, 1993) and the student attrition model of Bean (1990) conceptualize the dropout phenomenon. These conceptual models acknowledge the important role of organizational factors and the commitment to the institution. Furthermore, there is a wide variation of dropout rates within groups of similar institutions which suggests that institutions can control their dropout rates (first noted by Forrest, 1982). Not surprisingly there exists an extensive body of research that identifies the conditions in which institutions should place their students in order to promote student retention and student graduation⁵.

First, student/staff ratios are positively correlated with dropout rates (e.g., Scott et al., 2008) and negatively with graduation rates (Bound et al., 2010). Indeed, a low student/staff ratio will lead to frequent interaction between student and staff which in turn will lead to student academic integration and persistence (Tinto, 2002). Next, differences in student success and student dropout can be due to differences in institutional size. Most studies (e.g., Calcagno et al, 2008) find a negative relationship between institutional size and individual success. Chickering and Reisser (1993) offer one explanation as to why student outcomes are negatively affected by institutional size. Moreover, if the institution increases in size, the amount of students increases faster than the number of settings such that the ratio of people to settings increases. Consequently, social and academic support suffers. Conversely, Titus (2004) finds that the average chance of dropout can be decreased by four percent by a one standard deviation increase in institutional size.

Besides institutional structures, student characteristics can also influence educational outcomes. Research finds mixed results regarding the influence of gender on dropout and student achievement. Several studies (e.g., Scott et al., 2006; Peltier et al., 1999) find that gender is significantly related to student dropout and graduation. Peltier et al. (1999) conclude that women are less likely to dropout than men. In the same vein, Porter (2000) and Scott et al. (2006) indicate that vocational institutions that are more female are expected to have higher graduation rates. These gender differences in degree performance may be the result of differences (i) in psychological and/or biological factors and (ii) in characteristics that are correlated with attainment (e.g. family background), (McNabb, 2002; Mellanby et al., 2000). Nevertheless, Reason (2003) fails to find a significant relationship between dropout and gender. Bailey et al. (2006), on the other hand, find a negative relationship between the percentage of female students and graduation rates. The class level of students can also influence the dropout process. The class level (graduate or undergraduate) is based on the number of credit hours a student has earned, and hence the study year the student is enrolled at. Bean and Bradley (1986) claim that class level has a positive impact on performance. This finding is in line with a more recent study which finds that cumulative GPA is negatively related to dropout (Okun, 1998). Adelman (2006) also shows that the cumulative credits and GPA are negatively associated with dropout and positively linked to graduation. The above findings can be attributed to the fact that students learn how to get better grades as they progress through their educational careers. Finally, academic effort, measured by study skills, also predict student dropout

⁵ Note that graduation and dropout are complex concepts which are influenced by other factors than discussed above. Because we want to keep the literature section to the point we only discuss the factors we used in our study.

and student graduation. Pantages and Creedon (1978) find that students with poor study habits have a higher likelihood of becoming a dropout. It is also shown that students who participated in a study skills course acquired higher grades than predicted by their previous academic performance (Cone & Owens, 1991). In a similar vein, more recent studies (e.g. Hughes & Pace, 2003; Kuh et al., 2008 ; Chambers, 2009) show that student engagement, as a proxy of student effort, is negatively related to dropout.

3.1.2 AD policy as a form of selection after the gate

Due to the increased accountability towards their students and the financial agreements which are often in place, institutions try to improve the earlier discussed performance indicators. Many institutions focus on interventions aimed at first-year students since Levitz et al. (1999) noted that this is the most crucial period for students. Some institutions try to achieve this by introducing more selective admission standards, which reduce the number of applicants, and make a distinction between the students who are likely to succeed and the students who are likely to dropout (Duncan-Hewitt, 1996; Hagedorn & Nora, 1996; Beecher & Fischer, 1999). Cox et al. (2005) indicate that more selective admission standards have been related to higher retention rates. While in the past admission standards often had a focus ‘at’ the gate, today admission standards “after” the gate are becoming increasingly popular.

Selection ‘after the gate’ denotes performance based mechanisms to remove students making unsatisfactory academic progress from the institution. Performance based selection systems have a general structure. If a student’s performance falls below the minimum standards of the enrolled institution, the student gets a warning which serves as a wake-up call and can lead to escalating penalties. Ideally, selection ‘after the gate’ should happen in the first year as Yorke and Longden (2004) call this a critically important period for the connection between students and their programs. Bénabou and Tirole (2003) argue that the impact of performance standards on students differs by the type of students. Setting performance standards can motivate some students to improve their performance while others can be discouraged from making any attempt at all.

In the Netherlands, many universities and vocational institutes implemented such system in the form of an AD policy (Van Heerden, 2013). This system requires students to make satisfactory study progress during their first year (see section 2.2). Studies find mixed results concerning the influence of AD policies on dropout and graduation. Duijndam and Scheepers (2009) indicate that the introduction of an AD policy in a business management program resulted in earlier students’ withdrawal in the first year, compared to programs where no AD policy is in use. This shows that fewer students linger in the program because of the introduction of a credit threshold. According to Gijbels et al. (2004) an AD policy is an effective tool for the identification of well-performing students. By comparing two cohorts of students (one in which an AD policy was implemented and one in which this was implemented fictitiously) evidence was found that students who would have been dismissed, if their institute applied a credit threshold, obtained lower numbers of credits in their second year. Also a lower first-year completion rate was found. Next, Arnold (2014) compared bachelor programs between the academic years 2002-03 and 2007-08. During these years some programs implemented an AD policy (i.e. intervention group) while others did not (i.e. control group). He proves that the introduction of an AD policy increased the first-year dropout rate and the 4-year completion rate of university students. Another study shows that an increase in credit threshold leads to an increase of student success (Task force studiesucces, 2009). Nevertheless, Stegers-Jager et al. (2011) observe that the presence of an AD policy did not lead to early dropout or higher completion rates during the first two years at medical school. Further, Arnold and Van de Brink (2010) claim that

the number of students languishing in scientific education will not necessarily be reduced by the introduction of a credit-threshold because students who are dismissed often do not get any help in selecting a new program, resulting in a poor performance in their next program. Finally, it is shown that while the introduction of a credit threshold leads to a positive change in study behavior, this introduction does not necessarily translate into a higher level of performance. This may indicate that students rather try to reach the credit requirements than acquiring as much knowledge as possible (De Koning et al., 2014).

3.2 Student satisfaction

As students nowadays are more “consumer oriented” and as higher education institutions are rewarded through performance-based funding, student satisfaction becomes increasingly important. Students who do not feel satisfied by their institution of choice, due to a mismatch between student expectations and institutional performance, have a high risk of dropping-out or transferring to another institution. Moreover, student satisfaction has a positive influence on student motivation, student retention, recruiting efforts and fundraising (Schertzer & Schertzer, 2004).

Student satisfaction is a highly complex concept, influenced by various observed and unobserved factors. It is influenced by all experiences related to campus life, and not only to what happens to them in the classroom. However, universities and vocational institutes typically focus on the academic dimension of a student’s educational experience (e.g., student-to-faculty ratios and quality programs) (Elliott & Shin, 2002). As a consequence, Kotler and Fox (1995) observe that while students are, on average, highly satisfied with their academic programs, their satisfaction with the support services is low. We identify a number of institutional and student characteristics which literature argued to affect satisfaction.

First, it seems that a substantive relationship with faculty or staff affects students’ satisfaction by deepening institutional connections and commitment (Peterson et al., 2001). Elliott (2002) indicates that faculty accessibility increases student satisfaction and positive feelings about college. Next, Wiers-Jenssen et al. (2002) observe that while students in universities and large state colleges are less satisfied, students at university colleges are more satisfied. They argue that the reason for this result is two-fold. First, the institutional size can have an independent influence on student satisfaction. Second, universities and large state colleges may be more research-oriented than smaller higher education institutes, resulting in research drift of staff (Dill, 2001) and a lower focus on teaching-activities which might result in lower satisfaction (De Witte et al., 2013). Third, male-female differences result into significant differences in satisfaction with college (Adelman, 1991; Rienzi et al., 1993). Most studies find that woman report lower levels of satisfaction with college compared to men. However, Umbach and Porter (2002) report that the proportion of female undergraduates in a department is highly correlated with satisfaction concerning education in the major and with personal skill development. The class level (graduate of undergraduate) can also influence satisfaction. Tan and Kek (2004) find mixed results concerning satisfaction with service quality and class level. While at university A graduates perceived a higher level of service quality in comparison to undergraduates, the opposite was true in university B. Finally, Krohn and O’Conner (2005) suggest that academic effort has a positive association with satisfaction. The effort devoted to a course or program may produce satisfaction directly if students find the activity of studying satisfying on itself. In addition, the results of that effort, e.g. knowledge and grades, may lead to satisfaction.

The combination of increased institutional accountability, performance agreements with student satisfaction as target and the increased use of AD policies, makes it important to know what will happen to student satisfaction. However, this relationship has not yet been empirically investigated. One Dutch descriptive study (Onderwijs Evaluatie Rapport, 2007) mentions that students judge the AD policy as something positive. However, students who obtained almost all first-term credits found it a more positive measure in comparison to students who obtained a limited number of first-term credits. These findings tend towards an increase of student satisfaction since students who obtained a high number of credits are likely to be retained by the AD policy.

4. Identification strategy, data and assumptions

4.1 Identification strategy

To estimate the influence of the introduction of an AD policy on student dropout, graduation and satisfaction, we apply a difference-in-differences (DiD) type of estimator. It is one of the most popular tools to evaluate the effect of interventions on some relevant outcome variables (Abadie, 2005). Although we claim that AD policies are introduced in a rather exogenous way (see section 4.2), we have to account for the time trend as the control and intervention group in this study are not identified at the same time but in a different chronological academic year. A chronological time trend can lead to a biased estimate of the effect of introducing an AD policy. The DiD approach accounts for this time trend by including an extra control group of academic programs which will never implement an AD policy. Moreover, the traditional DiD examines the effect of a treatment by comparing the treatment group after treatment against the treatment group before treatment and against a control group. The outcome Y for study program i is traditionally modeled by the following equation:

$$Y_i = \alpha + \beta D_i + \gamma t_i + \delta (D_i \cdot t_i) + \varepsilon_i \quad (1)$$

where the α denotes a constant term, β the treatment group ($D=1$: treatment) specific effect, γ is the estimated coefficient for the time trend ($t = 0$: pre-treatment, $t=1$: post-treatment) common to control and treatment group, δ stands for the variable of interest as it estimates the effect of the treatment, and ε_i is an error term. As revealed by the interaction effect, the DiD estimator is defined as the difference in average outcome in the treatment group before and after the treatment minus the difference in average outcome in the control group before and after treatment (Albouy, 2004):

$$\hat{\delta}_{DiD} = \bar{Y}_1^T - \bar{Y}_0^T - (\bar{Y}_1^C - \bar{Y}_0^C) \quad (2)$$

In typical DiD estimations the treatment is a one-time change in policy equally applied to all members of the treatment group. Due to the equal application, the treatment and control groups can be identified. Because it is a one-time change, specific pre- and post-treatment points in time can easily be selected. Our study tends to differ from the typical treatment in one important way. AD policies have not been one-time events but have been implemented gradually over multiple years. Taking this issue in consideration, we apply the following model:

$$Y_i = \alpha + \beta(D_i) + \gamma \sum_t t + \delta AD_policy_{it} + \mu X_{it} + \varepsilon_{it} \quad (3)$$

where t_i is a dummy variable for each year (from 2003-04 until 2008-09, where 2003-04 is the reference year) and D_i a dummy variable that assumes 1 for all programs which eventually applied an AD policy and else 0. The model is completed by the AD policy intervention dummy, a categorical interaction variable that is 1 for programs after the start of an AD policy and 0 else (see table 1). We further add additional time (t) and program (i) specific control variables X . This increases the efficiency and consistency of the variables of interest. Note that in the suggested identification

strategy, the control group consists of all study programs which have never implemented an AD policy, whereas the treatment group is created from all study programs which eventually have implemented a study program. We discuss and test the assumptions behind this identification strategy in Section 4.2.

Table 1: Schematic presentation of the identification strategy

	Control group	Treatment group
Before implementation AD policy	$d=0; t=0$	$d=1; t=0$
After implementation AD policy	$d=0; t=1$	$d=1; t=1$

Figure 3 presents the identification strategy graphically. The horizontal axis represents the time and the vertical axis the outcome variable. The upper curve represents the outcome variables of the control group, and the lower curve represents the outcome variables of the treatment group. The dashed line indicates the implementation of the AD policy at a certain moment in time, while the arrow measures the difference in outcome variables caused by the treatment (i.e., the difference between the observed and counterfactual outcome). The figure illustrates that our analyses take three different effects into account: the ‘period/cohort’ specific effects, the ‘treatment group’ specific effects and the effects due to the implementation of an AD policy. Including the ‘treatment group’ specific effects is important as academic degrees which implement an AD policy might have different (un)observed characteristics than academic degrees without an AD policy (see section 4.3 for an extensive discussion).

Figure 3: Visual representation of the identification strategy

4.2 Assumptions behind the identification strategy

The identification strategy relies on some assumptions, which we discuss and test next.

First, the control group should be a well comparable group for the treatment group. We test this assumption by checking whether characteristics of the control and intervention group differ significantly (see section 4.3). Since some of the characteristics are significantly different, we cope with this issue in two ways. First, we include the variables as control variables in the regression analysis such that existing heterogeneity among the control and treatment group is absorbed. Second, as a robustness test, we use a propensity score matching to select a well comparable control group. The matching results (see section 6.1) confirm the robust outcomes.

As a second assumption, the ‘common trend assumption’ argues that, before the implementation of an AD policy, the trend of the observed and unobserved variables between the group of programs that eventually will implement an AD policy and the control group should be similar. We test the assumption by examining whether the difference between the two described groups changes significantly between two subsequent years in the period before the introduction of an AD policy. The results indicate that the common trend assumption is met for all years for the variables *student dropout* and *student graduation* (Appendix A, Table 1-3). The results for the variables concerning satisfaction show that the assumption is not always met. Specifically for the subsequent years 2003-04 and 2004-06, and 2005-06 and 2006-07. Consequently, observations for those years will be included in a second robustness check (see section 6.2). The above results may be explained by the fact that student satisfaction can rapidly change due to changes in the educational environment (Elliott & Shin, 2002). Student dropout and graduation do not respond as quickly.

The ‘Stable Unit Variance Assumption’ (STUVA) requires that the outcomes are not influenced between the control and treatment group. The common perception that an AD-policy is implemented institution-wide is wrong. Often programs in the same institution decide individually whether they implement an AD policy. Students who follow different programs and who are at different faculties or even at different institutions have little possibilities to interact and influence each other. Students who received a negative AD and decided to follow a new program at a different institution are able to influence the opinions of their new peers. However, we do not expect that this situation will reshape the perceptions of the fellow students drastically.

Fourth, the AD policy should be introduced in a rather exogenous way. Proving that the AD policy is introduced exogenously would require qualitative evidence, which is beyond the scope of this paper. Nevertheless, from the annual reports we know that the introduction and strengthening of an AD policy does not depend on certain institutional or program characteristics. Moreover, we can test the correlation between the introduction of an AD policy and program and/or institutional characteristics such as quality and the number of students. To have an indication on the program quality, we make use of the accreditations of the Dutch-Flemish Accreditation Organization (NVAO). The NVAO is an independent agency, founded by the Dutch and Flemish (i.e., the Dutch speaking region of Belgium) government to assess the quality of higher education. To test for potential correlation between program quality and program admission criteria, we estimate an institution fixed effect model with the introduction of AD policy as dependent variable, and various quality indicators as independent variables. The fixed effect regression mitigates the influence of institution fixed variation. The results, presented in Table 2, indicate that the introduction of an AD policy does not correlate to the quality of an institution. In a second model we include the institutional characteristics *student enrollment* and *student-staff ratio* to account for fast growing institutions (Table 4). The results indicate that the variable *AD policy* is independent of the student-staff ratio. However, the variable *AD policy* depends on the number of students enrolled. This indicates that when an institution knows a sudden growth of students, it often introduces an AD policy. To control for the influence of the student enrollments, we add this variable to the further analyses.

Given that we fulfill the above conditions, we are able to estimate the average treatment effect of the treated (ATT). Specifically, ATT is the average effect on student dropout, student graduation, and student satisfaction caused by to the introduction of an AD policy. In figure 3, this effect is presented by the dashed arrow (see section 4.1).

Table 2: Institution fixed effect model with the variable “AD policy” as outcome variable.

Variable	Model 1		Model 2	
	Coef.	SE	Coef.	SE
Constant	.848***	.019	.520***	.093
Quality indicators (NVAO-data):				
- Program requirements	-.001	.012	.001	.012
- Staff requirements	-.019	.012	-.020	.012
- Improvement measurements	-.003	.012	-.004	.012
- Achieved level	.004	.008	.004	.008
Student enrollment			.000***	.000
Student-staff ratio			-.002	.003
Number of observations	1,978		1,962	
Number of groups (fixed effects at institution level)	50		47	

Where ***, **, and * denote, respectively, significance at 1, 5 and 10%-level.

4.3 Data and descriptive statistics

4.3.1 Data

The data are obtained from the Dutch Ministry of Education (‘Dienst Uitvoering Onderwijs’, DUO). They include information at academic degree level (e.g. biology, applied linguistics) concerning the number of first-year students, the dropout rate, the number of students who re-enroll after the first year, and student graduation rates for all higher education institutes for the years 2010 and 2011. The academic degree is the set of courses that a student follows in order to obtain a degree (e.g., bachelor in economics). The data also include the above indicators on the field of study for all years between 2003 and 2011. The field of study (e.g., technique, law, nature and economics) denotes to which academic field the program belongs.

The data have two limitations, which we need to deal with. First, we lack academic degree-level data from 2003-09. We deal with this by effectively combining the field of study data of 2003-09 with the program level data of 2010-11. The underlying assumption is that the trend of the indicators on program-level is similar to the trend of the indicators on field of study-level.⁶ This assumption holds as the final data are similar to reports by field organizations. As a second limitation, we cannot make a distinction between programs at different locations of the institution. Therefore, we exclude the programs that did not implement an AD policy simultaneously at all locations.

The output variables are defined as follows. Student dropout is defined as the percentage of full-time bachelor students that leave the institution during the first year of enrollment. Student graduation is defined as the share of re-enrolled full-time bachelor students that obtained a degree at

⁶ When the interpolation resulted in values larger than 100 percent or smaller than zero percent for the performance variables, this value is replaced by 100 percent or zero percent respectively. Further, we excluded programs that were terminated in 2010 or 2011, since this event can influence student success and student dropout of previous years.

the institution one year after the nominal study time. Consequently, in order to be included in this latter indicator, students enrolled in universities need to graduate in four years, while students enrolled at higher vocational institutes need to graduate in five years.

We also obtained academic degree level (also called program) data from the annual national questionnaire on student satisfaction ('nationale studentenenquête', NSE). The survey is carried out by the organization Studiekeuze123 and includes information on the opinion of students about the program they are taking. The data also contain institutional information (e.g., the number of students and programs in the institution) and student characteristics (e.g., the percentage of woman or the percentage of first-year students). Although the NSE is an annual survey since 1991 it was not until 1995 that the NSE was carried out on sufficient large scale. In 1995, the NSE became a questionnaire with a fixed division of student issues (Steenkamp et al., 2008b). As of 2003, the organization started to document the student outcomes of the surveys in (publicly available) digital databases (Steenkamp et al., 2008a).

The NSE data have three limitations. First, the student outcomes of the NSE were not (or just limited) registered in digital databases until 2003-04. Consequently, we do not have NSE information before 2003-04. Second, there is a break in the survey questions in 2009-10 which creates data comparability issues. Therefore, we only consider the surveys between 2003-04 and 2008-09. Third, at the time the data was collected, it was not yet possible to survey every program each year. Therefore large programs were surveyed every two years and small programs every three years (Steenkamp et al., 2008a). In order to obtain a balanced panel data set, Studiekeuze123 replaced missing data on student opinions by records from a previous year. The institutional characteristics, on the other hand, are annually adjusted.

Between January and March, students in participating programs are invited to complete the questionnaire and to give their opinion about different aspects of the program. The main purpose of the NSE, the measurement of student opinions, is evaluated by 30 items on a ten point scale ranging from (1) very dissatisfied to (10) very satisfied. These 30 items are grouped into 10 dimensions and one measure of overall satisfaction. The categories are: content of the academic degree, electives, consistency, teaching methods, career preparation, teachers, campus facilities, campus buildings, communication, and feasibility (Steenkamp et al., 2008a).

In the paper at hand, we focus on three central questions in the NSE questionnaire. First, students are asked about their overall satisfaction with the program ("Are you satisfied with your choice for this program at this institution?⁷"). The next outcome variable focuses on a specific subject of student satisfaction, namely feasibility of the program ("Is the program feasible in the available time"). It measures whether students think they are able to complete the degree. In order to exploit the richness of the data, we construct an outcome variable (i.e., average NSE score) consisting of the average of all items surveyed in the NSE data. The latter variable has the advantage of being rather comprehensive and reducing the influence of extremely high or low items, which comes at the cost of having an imprecise interpretation (i.e., the average of all items). Note that the three outcome indicators applied in the paper are well behaved in terms of homogeneous variance and normal underlying distributions, such that parametric analyses can be applied.

Because participation to the NSE is voluntary for each individual student the threat of selection bias exists. Although we are not able to investigate the bias at the individual student level,

⁷ In the NSE of 2007 the central question changed into "give your overall judgment about the program". An analyses of the density functions of both questions, shows that they are comparable.

we do not expect selection to be a serious issue. First, response rates are comparable with the response rates of other college student surveys. From the 588,571 students addressed in 2011, 35.2 percent returned a usable NSE survey. In 2010 a similar response rate of 35.1 percent was found (Broek et al., 2012). For comparison, the National Survey of Student Engagement (NSSE) had an average institutional response rate of 30% in 2013 (NSSE, 2013). Second, by all stakeholders (university management, program directors, civil servants, student bodies) the NSE data are generally considered as a reliable and representative instrument. Third, as illustrative evidence of its importance and reliability, the data are also used in a new performance-based scheme to finance institutions based on performance agreements.

Results of the NSE questionnaires are made public and are used for different purposes. On the one hand, the student assessments are used to maintain or improve internal quality. By analyzing the results it becomes clear which aspects already satisfy students and which aspects should be improved. On the other hand, the results are used to provide comparable information to students about the different academic programs and help them to make a good study choice. The latter is facilitated by a website and publication in influential magazines (studiekeuze123, 2012).

To obtain our final sample, we combine the DUO and NSE data. We take a few restrictions into account. First, although AD policies were first implemented in 1997 we only focus on data between the years 2003-04 and 2008-09. This is the result of the limited data availability before 2003-04 and the break in NSE survey questions in 2009-10. We also focus on state funded institutions since these institutions have to decrease student dropout and increase graduation rates and student satisfaction in order to obtain funds. Consequently, these institutions will be more likely to introduce an AD policy. Next, the sample is restricted to bachelor programs as master programs do not have an AD policy. Thus, the final sample includes all bachelor programs in state funded higher vocational and university institutions between 2003-04 and 2008-09⁸. This dataset contains information about the dropout rate, the graduation rate, student satisfaction opinions, student characteristics and institutional information for each study program. The final sample includes 6,012 higher education degrees (i.e., an average of 1002 study programs per year).

4.3.2 Descriptive statistics

Table 3 presents descriptive statistics for the study programs with (i.e., the treated group) and without (i.e., the control group) an AD policy. We observe that there are 266 unique programs in the control group, against 1,486 unique programs in the treatment group⁹. The institutional characteristics indicate that programs that implemented an AD policy tend to have more students enrolled and have a higher student-staff ratio. The descriptive statistics show no significant difference concerning the percentage of woman between program with an AD policy and programs without an AD policy. Further, programs with an AD policy have a higher percentage of students for the second and fourth year enrolled compared to programs without an AD policy. However, there is no significant difference concerning the percentage of students enrolled for the third year between both groups of

⁸ Note that since programs which already implemented an AD policy before 2003-04 do not influence the regression specification, we exclude these programs from the analysis (it should be noted that including those observations results in very comparable outcomes; available upon request).

⁹ Note that the total sample consists of 6,012 study programs (see section 4.3.1). For clarity, in the descriptive statistics we present only the number of unique programs. Moreover, when a study program appears every year in the data set it is considered in the descriptive statistics as one unique program while in the total sample it is counted as six observations (i.e. one for every year).

programs. Finally, students in programs without an AD policy tend to study more as is indicated by the variable *study time*.

Table 4 presents some descriptive statistics for the different outcome variables. The descriptive statistics show that all five outcome variables differ significantly between programs with and without an AD policy. The statistics show that more students drop out after the first year of enrollment in programs with an AD policy compared to student in programs without an AD policy. Students in programs that implement an AD policy also have a higher graduation rate compared to students in programs that do not employ an AD policy. Students in an institution without an AD policy have, on average, a higher overall satisfaction with their program than students in institutions with an AD policy. Students in institutions with an AD policy indicate that they find the program more feasible.

Table 3: Descriptive statistics of student characteristics and equality of means between control and treatment group

Variable	Control/treat- ment group ⁶	Number of obs.	First quartile	Mean	Third quartile	Minimum	Maximum	Standard deviation	T-test (dif= mean(0) - mean(1))
Institutional Characteristics									
Number of unique programs	0	266							
	1	1,486							
Number of students	0	812	17,220.00	18,621.33	23,794.00	990.00	29,524.00	6,742.82	-3,551.43***
	1	5,200	15,298.00	22,172.76	32,074.00	281.00	38,551.00	10,686.20	
Student-staff ratio	0	812	5.30	6.08	6.81	1.92	16.56	2.99	-6.57***
	1	5,200	11.87	12.65	14.82	1.98	17.81	3.58	
Student characteristics									
Woman in the program (%)	0	811	27.78	49.95	71.42	.00	100.00	26.30	.91
	1	5,197	25.00	49.04	74.57	.00	100.00	28.87	
First-year students (%)	0	811	24.47	33.23	41.18	.00	86.67	13.44	1.82***
	1	5,197	22.39	31.41	39.13	.00	100.00	13.03	
Second-year students (%)	0	811	18.75	24.41	28.57	.00	61.90	9.25	-.75**
	1	5,197	19.25	25.16	30.56	.00	64.71	9.09	
Third-year students (%)	0	811	13.79	20.23	25.81	.00	61.54	9.39	-.16
	1	5,197	14.29	20.39	26.00	.00	62.22	8.99	
Fourth-year students (%)	0	811	6.25	11.79	16.67	.00	57.14	7.67	-4.96***
	1	5,197	9.76	16.75	23.08	.00	61.54	9.60	
Fifth-year students (%)	0	811	.00	5.40	8.22	.00	30.00	5.89	1.67***
	1	5,197	.00	3.72	5.88	.00	46.15	4.44	
Seniors (%)	0	811	.00	4.11	5.312	.00	61.82	4.11	1.97***
	1	5,197	.00	2.14	3.12	.00	33.33	2.14	
Study time	0	787	25.88	29.36	33.46	11.27	44.60	6.21	3.13***
	1	5,161	20.19	26.23	31.55	10.50	50.14	7.28	

Where *** denotes significant at 0.01%-level. ** p<0.05; * p<0.1

⁶ 0: No AD policy implemented (the control group). 1: AD policy has been eventually implemented (the treatment group)

Table 4: Descriptive statistics of the outcome variables, and equality of means between control and treatment group

Variable	Control/treatment group ⁶	N	First quartile	Mean	Third quartile	Min	Max	SD	T-test (dif= mean(0)-mean(1))
Student dropout	0	607	10.50	17.25	23.20	0	100.00	11.16	-8.83***
	1	2,954	18.50	26.08	32.10	0	100.00	12.27	
Student graduation	0	593	40.90	52.48	64.60	0	100.00	17.79	-10.61***
	1	2,418	52.30	63.09	75.70	0	100.00	18.33	
Overall Satisfaction with the program	0	560	7.30	7.52	7.75	6.37	8.57	.34	.48***
	1	2,909	6.69	7.04	7.37	5.00	9.00	.48	
Average NSE score (own constructed variable from the means of all questionnaire items)	0	812	6.91	7.07	7.24	6.19	7.97	.26	.31***
	1	5,200	6.54	6.76	6.96	5.43	8.11	.32	
Feasibility of the program	0	367	6.23	6.51	6.96	3.87	8.05	.72	-.43***
	1	2,062	6.67	6.94	7.28	3.40	8.67	.53	

Where *** denotes significant at 0.01%-level. ** p<0.5; * p<0.1

⁶ 0: No AD policy implemented (the control group). 1: AD policy has been eventually implemented (the treatment group)

5. Results

5.1 Trend analysis

Before presenting the estimation results, we obtain some intuitive information on the data by a trend analysis. In particular, we plot the relationship between the AD policy and the outcome variables at different points in time before and after the implementation. To do so, we create a variable equal to 0 for the year in which the AD policy is introduced in the academic program. The years after the introduction receive a positive number, while the years before the introduction correspond to a negative number.

We observe that student dropout and student graduation both increased around the introduction of an AD policy (Appendix B, Figure 1-2). The trend is in line with Bénabou and Tirole (2003) who predict that setting a performance standard results in motivating some students to improve their performance while discouraging others to making an attempt at all. Consequently this latter group will drop out.

The trend analysis for overall satisfaction with the program (Appendix B, Figure 3) suggests a decline of overall student satisfaction in the year the AD policy is first employed. This trend is confirmed for the average NSE score, which indicates a steep decline the year the AD policy is introduced (Appendix B, Figure 4). The above trend is in line with labor market studies that report that organizational stress and job satisfaction are inversely related (e.g., Hollon & Chesser, 1976; Miles, 1976). In a similar vein, Cotton et al. (2002) link characteristics of student work environment, such as high work pressure, low control and low support, to psychological stress. The work design influences satisfaction in a similar way, meaning that high demands and low control results in low satisfaction (Cotton et al. 2002). The implementation of an AD policy can have a similar effect on the work design of students, causing more pressure to perform well during their first year of enrolment. In turn this pressure can result in higher levels of stress and lower levels of satisfaction.

Figure 5 (Appendix B) represents the relationship between students' opinions regarding the feasibility of the program before and after the implementation. Concerning feasibility of the program, the trend of the student opinions can go two-way. First, first-year students may find the program less feasible as they have to achieve a minimum number of credits, resulting in lower opinions. Second, students who passed the credit threshold, may find the program more feasible and rate the likelihood of completing the program higher. Looking at the figure, we observe that students find the program more feasible in the year the AD policy is first introduced. Further, we observe a steep decline in satisfaction with program feasibility one year before the introduction of an AD policy. This decrease can be due to an announcement effect.

It should be noted that Figure 1 and 2 provide evidence for the rather 'exogenous' introduction of an AD policy. As we do not observe that academic degrees introduce an AD policy because of increasing dropout rates or declining graduation rates, it makes us more confident on the exogeneity assumption.

While the above analyses describe the trends of the outcome variables in relation to different points before and after the introduction of an AD policy, one drawback of this method is that we do not have a control group. The use of a control group is needed in order to eliminate temporary trends in the outcome variable or effects of events, other than the treatment, that occurred between the measuring periods. To overcome this problem, we will apply the suggested difference-in-differences type of estimator.

5.2 Difference-in-Differences type of estimator

The estimation results for Equation (3) are presented in Table 5. The results indicate that the introduction of an AD policy (captured by the variable of interest *AD policy*) is significantly correlated to all outcome variables. The results suggest that the introduction of an AD policy leads to a significant increase of student dropout and student graduation¹⁰. Moreover, due to the introduction of an AD policy, student dropout will increase by 7.5% while student graduation will increase by 3.3%. The results further show that the introduction of an AD policy leads to a significant decrease of overall satisfaction (i.e. .48 point on a ten point scale) and average NSE score (i.e. .36 point on a ten point scale). Perceived program feasibility increases significantly due to the implementation of an AD policy (i.e. .43 point on a ten point scale).

The group specific effects explain also a part of the variation in student performance and student satisfaction. The results show that programs that eventually will implement an AD policy have a higher level of student dropout and student graduation in comparison with programs that will never employ an AD policy. Next, programs that will apply an AD policy (i.e., $D = 1$) receive a higher average NSE score compared to programs that will never apply an AD policy at some point in time.

Looking at the time-specific effects, we observe mixed results. First, the results for student dropout show no time-specific results. For student graduation we only detect a decline in the academic year 2007-08 in comparison to the reference year. Furthermore, it seems that overall student satisfaction and satisfaction with program feasibility decreases in time. However, while the average NSE score in the years 2005-06 and 2008-09 is higher than in 2003-04, it is lower in the years 2006-07 and 2007-08 compared to 2003-04.

We additionally run a second model specification which includes various covariates (see table 6). We also cluster the standard errors at the level of the academic field of the program (i.e. *field of study*), such as economics, medicine or law. Finally, we add the variable *student enrollment*, which was indicated in section 4.2 to correlate with the introduction of an AD policy. The results are in line with our previous outcomes. In particular, we observe that an AD policy has a significant positive influence on student dropout, student graduation and satisfaction with program feasibility. Specifically, student dropout, student graduation and satisfaction with program feasibility rise by 5.8%, 7% and .33 point (on a ten point scale) respectively. The implementation of an AD policy has again a significant negative influence on overall student satisfaction (i.e. .35 point on a ten point scale) and average NSE score (i.e. .26 point on a ten point scale).

Significantly more students in programs that eventually will implement an AD policy drop out and graduate on time in comparison to students in programs that will never introduce an AD policy. Students in programs that eventually will introduce an AD policy have a significantly higher overall satisfaction and NSE scores compared to students in programs that will never employ an AD policy.

It is observed that student graduation is declining in later years. The results indicate that programs receive significantly lower scores for overall satisfaction and satisfaction with program feasibility in later years. The average NSE scores decline in the academic years 2005-06 and 2008-09 in comparison to the academic year 2003-04. These results are consistent with a study of Steenkamp et al. (2008b) that satisfaction of students, measured by the NSE, decreased slightly from 1996 until 2005.

¹⁰ A factor analysis points out that student dropout and student graduation are no substitutes (uniqueness of the estimates is .9455) and thus should be included separately in the analyses.

We find with respect to the covariates that programs with a high percentage of female students have a lower dropout rate and receive higher satisfaction compared to programs with a low percentage of female students. This is in line with findings by Bruinsma (2004), Andrews et al. (2012), and Umbach and Porter (2002). Further, we observe that programs with a higher percentage of students who are enrolled for two, three or four years have a significantly higher graduation rate than programs with a higher percentage of first-year students. Programs with a high percentage of students enrolled for the fifth year have a significant lower graduation rate than programs with a high percentage of first-year students. This finding is not surprising since students enrolled for the fifth time (in the same program) will not graduate within the nominal study time, while students enrolled for the second, third or fourth time can still graduate on time. The results also show that programs with a high percentage of students who are enrolled for four years have significantly lower scores on overall satisfaction than programs with a high percentage of first-year students. We find similar results for the average NSE score. More specifically, students enrolled for two or four years have a significantly lower average NSE score compared to first-year students. Interestingly, we find that students enrolled for more than five years have a significantly higher NSE score. Concerning the feasibility of the program, programs with a high percentage of students who are three or four years enrolled score significantly higher on the feasibility of the program compared to programs with a high percentage of first-year students. This result was expected as most students enrolled for the third or fourth year passed the credit-threshold, resulting in a higher likelihood of graduating compared to first-year student. However, programs with a high percentage of students who are five years or longer enrolled show significantly lower satisfaction with program feasibility compared to programs with a high percentage of first-year students. These students may fear that they will not pass, resulting in a lower satisfaction with the feasibility of the program compared to students enrolled for the first time. Next, as expected, we find a significant negative relationship between study time and student dropout and a significant positive relationship between study time and student graduation. We also observe that programs receive higher overall satisfaction and average NSE score when students study more. Surprisingly, satisfaction regarding feasibility of the program is negatively correlated with study time. As we do not know the direction of the correlation, reverse causality might be an issue here. Finally, we observe that the variable *student enrollment* has a small significant influence on all outcome variables.

Various alternative specifications deliver similar outcomes, but are not reported here to save some space (available upon request). Additional control variables include the average number of credits achieved by the students in the program and the type of admission criteria to enter the program. Similar results are found when the variables *number of years enrolled* and *study time* are excluded from the analysis. By clustering at the institutional level, at location level and at program level, we find robust outcomes concerning the direction of the relationships. The significance of the results sometimes decreases, but this is not surprising since the analyses are done in smaller groups of observations.

Table 5: Regression outcomes of Equation (3)

	Student dropout		Student graduation		Overall satisfaction		Average NSE score		Satisfaction with program feasibility	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Intercept	17.028***	1.636	54.346***	2.527	7.804***	.031	7.072***	0.183	6.647***	.045
D (0= never an AD policy)	1.934**	.908	6.856***	1.399	0.050	.033	.046**	.021	.059	.058
Year (2003-04= ref. year)										
2004-05	-2.169	1.730	0.977	2.672	-0.061	.038	-.016	.012	-0.038	.054
2005-06	-0.083	1.688	-3.420	2.608	-.183***	.034	.051***	.012	-.280***	.056
2006-07	1.567	1.687	-3.381	2.605	-.412***	.036	-.090***	.021	-.212***	.055
2007-08	1.061	1.700	-4.604*	2.626	-.351***	.037	-.104***	.021	-.216***	.053
2008-09	-0.240	1.708	2.878	2.774			.118***	0.025	-.158***	.057
AD policy (0= before the implementation of an AD policy)	7.469***	.820	3.271***	1.196	-.481***	.030	-.357***	.019	.425***	.056
N	3,561		3,011		3,092		5,600		2,429	
R ²	.102		.071		.291		.206		.108	
Adjusted R ²	.100		.069		.289		.205		.105	

Where ***, **, and * denote, respectively, significance at 1, 5 and 10%-level. The sample size varies due to missing values in the covariates.

Table 6: Regression outcomes for the DiD type of estimation with covariates for the outcome variables

	Student dropout		Student graduation		Overall satisfaction		Average NSE score		Satisfaction with program feasibility	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Intercept	20.851***	2.610	34.799***	3.985	7.487***	.074	7.069***	.040	7.547***	.111
D (0= never an AD policy)	1.772**	.823	6.426***	1.279	.065**	.030	.056***	.019	-.057	.052
Year (2003-04= reference year)										
2004-05	-.621	1.695	-1.417	2.461	-.153***	.039	-.013	.020	-.129***	.052
2005-06	.807	1.658	-3.917	2.408	-.209***	.035	.045**	.020	-.307***	.056
2006-07	2.362	1.673	-4.708*	2.430	-.399***	.035	-.068***	.021	-.296***	.051
2007-08	2.037	1.679	-6.465***	2.440	-.250***	.038	-.021	.021	-.352***	.051
2008-09	.575	1.678	.160	2.558			.093***	.024	-.387***	.053
AD policy (0= before the implementation of an AD policy)	5.793***	.823	6.980***	1.193	-.345***	.029	-.264***	.018	.329***	.050
Gender (0= men)	-.022**	.010	.162	.017	.001***	.000	.001***	.000	.002***	.001
Number of years in the program (reference category= 1 year)										
2 years	-.032	.205	.127***	.042	-.001	.001	-.002***	.000	0.001	.001
3 years	-.001	.024	.232***	.038	-.001	.001	-.001	.000	.003***	.001
4 years	-.028	.025	.127***	.041	-.004***	.000	-.004***	.000	.006***	.001
5 years	-.053	0.049	-.316***	.077	.001	.001	-.001	.001	-.028***	.003
>5 years	-.035	.058	-.014	.089	.001	.002	.003**	.001	-.028***	.003
Study time	-.318***	.049	.197**	.077	.012***	.001	.006***	.001	-.027***	.002
Number of students	.0001***	.000	-.0001***	.000	-.00001	.000	-.000	.000	.000***	.000
Field of study	YES		YES		YES		YES		YES	
N	3,539		2,997		3,032		5,489		2,409	
R ²	.096		.159		.316		.267		.237	

Where ***, **, and * denote, respectively, significance at 1, 5 and 10%-level. The sample size varies due to missing values in the covariates.

6. Robustness tests

6.1 Propensity score matching

As a first robustness test we use propensity score matching (PSM). PSM is a statistical analysis that allows us to match treated units to non-treated units who have similar characteristics, hereby reducing the bias arising from working with an inappropriate control group (Dehejia & Wahba, 2002; Peikes et al., 2008; Rosenbaum & Rubin, 1983). In particular, the possibility of bias arises when we estimate a treatment effect on groups with different characteristics. This increases the risk that the difference in outcome depends on the difference in characteristics, rather than it is caused by the treatment. Observational studies often have a problem of biasedness, because the assignment of treatment to research subjects is not randomized, resulting in a control and treatment group that are not balanced regarding covariates. Matching attempts to mimic randomization by creating a treatment group that is comparable on all observable characteristics to the control group.

We match on the covariates at the institutional-level and student-level described in table 1. The former group of covariates consists of the student-staff ratio, and the number of students enrolled, while the latter group consists of gender, number of years enrolled, study time (as a proxy for the requirements of the program), and year of the questionnaire (given that students are more critical in later years than earlier years). Further, we include the variable *vocational-university* that indicates if the program is at university level or at vocational higher institute level and the variable *field of study*. To assess the validity of the comparison groups, we compare treatment-control group differences in outcomes (based on the quasi-experimental design) with treatment-comparison differences (based on the non-experimental PSM design).

Table 7 shows that, for the treated units, student dropout and satisfaction regarding feasibility of the program decreases when based on the matched sample. However, student graduation, overall satisfaction and average NSE score are underestimated when based on the unmatched sample. Subsequently, with the exception of student graduation, the estimated effects by the PSM method are smaller than under the earlier estimations.

More precisely, for student dropout, we find by the PSM a significant positive influence (t-stat = 19.00), but compared to the regression specifications the effect loses some of its strength (t-stat = 8.79). Based on the unmatched sample, we find a significant positive impact (t-stat = 12.44) for student graduation. Regarding the average student satisfaction and the overall NSE score, we find a negative significant influence based on the unmatched sample (respectively, t-stat = -28.40 and t-stat = -32.66), compared to a smaller significant negative influence based on the matched sample (respectively, t-stat = -12.90 and t-stat = -11.74). For satisfaction with program feasibility both methods estimated impacts to be positive and significant (respectively, t-stat = 14.89 and t-stat = 7.94). Note, that adding extra covariates, such as the average number of ECTS achieved by the students in the program and the type of admission criteria, deliver similar results.

Table 7: Robustness check of the five outcome variables using propensity score matching

Variable	Sample	Treated	Controls	Difference	SE	t-stat
Student dropout	Unmatched	26.731	17.788	8.943	.471	19.00
	Matched	22.343	17.788	4.555	.518	8.79
Student graduation	Unmatched	63.642	54.394	9.248	.743	12.44
	Matched	67.450	54.394	13.056	.879	14.85
Overall satisfaction	Unmatched	7.007	7.530	-.523	.018	-28.40
	Matched	7.284	7.530	-.246	.019	-12.90
Average NSE score	Unmatched	6.733	7.080	-.347	.009	-32.66
	Matched	6.935	7.080	-.145	.011	-11.74
Satisfaction with program feasibility	Unmatched	6.960	6.541	.419	.028	14.89
	Matched	6.886	6.541	.435	.043	7.94

6.2 Different subsamples

As a second robustness test we estimate Equation (3) for different subsamples. The first subsample consists of observations from the years 2003-04 and 2004-05. Between those years, the common trend assumption was not met (see appendix A, Table 1-3). The results, presented in Table 8, are identical to those obtained by the full sample, which yields confidence in the earlier results.

Second, as the common trend assumption was not met for the years 2005-06 and 2006-07 (see appendix A; Table 1-3), we only include observations from those years in the second subsample. The results, presented in Table 9, indicate the robustness of the outcomes.

Third, we include only observations from higher education institutes in urban areas. This distinction is made as students from urban and rural areas can differ in background, ethnicity, grade point average, socio-economic situation (SES), enrollment curriculum and educational level of parents (McCracken and Barcinas, 1991), which in turn may influence the findings. Again, we confirm our previous findings (see Table 10).

We conclude that the estimation outcomes are robust for the different subsamples.

Table 8: Regression outcomes for Equation (3) using observations from the years 2003-04 and 2004-05

	Student dropout	Student graduation	Overall satisfaction	Average NSE score	Satisfaction with program feasibility
Model 1 (without covariates)					
	Coef.	Coef.	Coef.	Coef.	Coef.
treatment effect	5.968*** [1.443]	8.945*** [2.259]	-.362*** [.068]	-.295*** [.024]	.297*** [.074]
N	471	460	640	1,921	670
R ²	.091	.178	.192	.195	.151
adjusted R ²	.086	.173	.188	.193	.148
Model2 (with covariates)					
	Coef.	Coef.	Coef.	Coef.	Coef.
treatment effect	6.288*** [1.599]	10.717*** [2.420]	-.344*** [.068]	-.275*** [.024]	.274*** [.068]
N	468	458	610	1,853	666
R ²	.115	.225	.207	.267	.259

Where ***, **, and * denote, respectively, significance at 1, 5 and 10%-level, standard errors between brackets. The sample size varies due to missing values in the covariates.

Table 9: Regression outcomes for Equation (3) using observations from the years 2005-06 and 2006-07

	Student dropout	Student graduation	Overall satisfaction	Average NSE score	Satisfaction with program feasibility
Model 1 (without covariates)					
	Coef.	Coef.	Coef.	Coef.	Coef.
treatment effect	7.711*** [1.157]	3.217* [1.750]	-.513*** [.041]	-.397*** [.028]	.886*** [.104]
N	1,594	1,577	1,920	2,345	801
R ²	.088	.044	.258	.209	.136
adjusted R ²	.086	.043	.257	.208	.133
Model2 (with covariates)					
	Coef.	Coef.	Coef.	Coef.	Coef.
treatment effect	5.833*** [1.188]	6.794*** [1.712]	-.307*** [.035]	-.239 *** [.027]	.644*** [.099]
N	1,586	1,569	1,892	2,311	789
R ²	.080	.124	.252	.232	.270

Where ***, **, and * denote, respectively, significance at 1, 5 and 10%-level, standard errors between brackets. The sample size varies due to missing values in the covariates.

Table 10: Regression outcomes for Equation (3) using observations from higher educational institutes in urban areas

	Student dropout	Student graduation	Overall satisfaction	Average NSE score	Satisfaction with program feasibility
Model 1 (without covariates)					
	Coef.	Coef.	Coef.	Coef.	Coef.
treatment effect	7.354*** [.946]	3.234** [1.452]	-.484*** [.033]	-.352*** [.020]	.338*** [.061]
N	2,113	1,814	1,910	3,406	1,417
R ²	.010	.059	.355	.242	.102
adjusted R ²	.097	.055	.352	.240	.098
Model2 (with covariates)					
	Coef.	Coef.	Coef.	Coef.	Coef.
treatment effect	4.754*** [.946]	6.170*** [1.384]	-.329*** [.031]	-.243*** [.019]	.290*** [.056]
N	2,109	1,810	1,881	3,357	1,415
R ²	.101	.143	.341	.236	.244

Where ***, **, and * denote, respectively, significance at 1, 5 and 10%-level, standard errors between brackets. The sample size varies due to missing values in the covariates.

7. Conclusions, further research and policy implications

The growing accountability of higher education institutes makes them increasingly selective in accepting students. Students in programs with academic dismissal (AD) policies can be removed from the institution when they do not make satisfactory study progress. It is thus a form of selection after the gate. The credit-threshold students must pass differs by institution and by academic degree. Although the effect of such an AD policy on performance is measured by a few studies (e.g. De Koning et al., 2014; Gijbels et al., 2004), little is known about the effect of this type of selection tool on student satisfaction. This paper is the first to examine empirically the effect of the introduction of an AD policy on both student performance and student satisfaction. Using Dutch nationwide data, the effect of the introduction of a student selection tool on student graduation, student dropout and student satisfaction is investigated.

Our results suggest that, on average, student dropout and student graduation increased due to the introduction of an AD policy. Next, we found that the introduction of an AD policy leads to a decrease of student satisfaction. The outcomes also indicate that student satisfaction regarding program feasibility increases because of the implementation of an AD policy. Looking at the period specific effects, we observe that student graduation rates are lower in more recent years. This is an alarming finding since higher educational institutes are increasingly aware of the benefits of graduation ‘on time’. The results also indicate that student satisfaction used to be higher in the past. This result can be explained by the relationship between satisfaction and expectations. As students increasingly perceive themselves to be customers, due to the tuition fees and growth of consumerism in public services, their expectations rise (Tricker, 2005). In this context, expectations of students are high and include, for example, flexibility and choice in the delivery of education, and a two way communication process between themselves and the university (Davies, 2002). Due to this increase in expectations it is possible that the actual performance of the higher educational institutes is below the expectations of the students, resulting in dissatisfaction (Appleton-Knapp & Krentler, 2006; Bitner & Hubbert, 1994). Important to note is that the observed results are very robust.

This paper yields some insightful policy advice. An AD policy enables effective selection of students after the first year. While, for equity arguments, selection at the gate is often undesired, this paper indicates that selection after the gate might be effective. Nevertheless, the negative influence on student satisfaction suggests that the introduction of an admission policy should be complemented by measures to improve, or at least stabilize, student satisfaction.

We observed that the AD policy is an effective selection tool. However, the level of the AD policy norm is also important. A very high AD policy threshold will probably not only result into a steep increase of graduation rates but also in a considerable increase in dropout rate. This can lead to the dismissal of many students who would have graduated on time. A too low AD policy norm, on the other hand, can result in too few dismissed students. Moreover, the optimal AD threshold is not easy to determine and depends on the type of academic program and the current dropout rate. A study program in the medical field, for example, will require more from students than a program in the social field, and will thus need a higher AD policy threshold to be an effective selection tool. Study programs with a current high dropout rate may not want to introduce an even higher norm because this can result in few students who are able to enroll in the second year. Programs with a low dropout rate can opt to start with a low credit norm during the first years after introduction and increase it if the selection does not seem sufficient. Important to note is that there is no ‘one-size-fits-all’ AD policy norm.

This paper provides several lines for future research. First, the current study does not focus on the underlying mechanisms between an AD policy, student performance and student satisfaction, as we do not measure intervening process variables. Additional research is necessary to exploit the mechanisms between an AD policy and its outcome variables. Second, we investigated the effect of the introduction of an AD policy on performance and satisfaction using program-level data. As such we could not distinguish students in their first year and students in later years. Those two groups of students will respond different on an AD policy. Indeed, first-year students still need to face the AD policy while students in later years do not. We expect that the former group will be more affected by an AD policy in terms of performance. By using data on student-level, the effect of the introduction of an AD policy on performance and satisfaction of first-year students can be exploited. Third, because we could not distinguish students that received a negative obligatory advice, the treat of a selection problem exist. Future research can focus solely on this type of students and investigate the effect of receiving a negative advice on student satisfaction and on the academic career. Future research could also focus on whether students that received a negative obligatory advice and started a new study are more or less satisfied than students who never received a negative obligatory advice. This can have a large impact on the policy decisions of institutions. Fourth, it is also possible that students choose a study program based on the presence of an AD policy. If this is the case, more motivated and talented students will attend study programs with an AD policy. Future research can focus on investigating this matter. Finally, the study used a sample of Dutch higher education programs, and the extent to which the results are generalized to other countries is not known. Further research can generalize our results to other countries.

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Appendix A – Parallel time trend assumption

Table 1: Common trend assumption when AD policy is introduced in 2005-06 for the different outcome variables

Year	control group	programs that eventually will implement an AD policy	t-statistic ¹¹	p-value
Student drop-out				
2003-04	17.67813	17.21000	-0.50980	0.303090
2004-05	16.22152	18.28000		
Student graduation				
2003-04	52.17097	68.85000	0.52022	0.60380
2004-05	51.01867	64.28000		
Overall satisfaction				
2003-04	7.70232	7.61847	0.61855	0.53700
2004-05	7.64664	7.67334		
Average NSE score				
2003-04	7.04701	6.923773	5.62012	.00000
2004-05	7.05591	6.725286		
Satisfaction concerning program feasibility				
2003-04	6.60035	7.04879	-0.5499	0.58300
2004-05	6.56483	7.08615		

Table 2: Common trend assumption when AD policy is introduced in 2007-08 for the different outcome variables

Year	control group	programs that eventually will implement an AD policy	t-statistic	p-value
Student dropout				
2003-04	17.67813	16.32500	-0.19796	0.8434
2004-05	16.22152	15.85455		
2005-06	18.58819	18.39565	-0.04308	0.9657
2006-07	17.87905	18.74783	-0.24204	0.8089
Student graduation				
2003-04	52.10970	69.46250	0.15009	0.8794
2004-05	51.01867	66.12727		
2005-06	50.84823	67.92174	-0.19605	0.8447
2006-07	52.93219	69.41739	0.06964	0.9445

¹¹ This t-statistic between four groups is estimated by applying the next formulas:

- 1) T-test= difference/s.e. $[(\bar{Y}_2 - \bar{Y}_4) - (\bar{Y}_1 - \bar{Y}_3)]$
- 2) Difference= $(\bar{Y}_2 - \bar{Y}_4) - (\bar{Y}_1 - \bar{Y}_3)$
- 3) s.e. $[(\bar{Y}_2 - \bar{Y}_4) - (\bar{Y}_1 - \bar{Y}_3)] = \sqrt{\left(\left[\frac{s_2^2}{n_2}\right] + \left[\frac{s_4^2}{n_4}\right]\right) + \left(\left[\frac{s_1^2}{n_1}\right] + \left[\frac{s_3^2}{n_3}\right]\right)}$

Overall satisfaction				
2003-04	7.70232	7.67035		
			-1.2842	0.2008
2004-05	7.64664	7.85334		
			0.53296	0.5944
2005-06	7.47936	7.58980		
			2.26184	0.0422
2006-07	7.32302	7.19212		
Average NSE score				
2003-04	7.04589	7.01980		
			-1.21106	0.2267
2004-05	7.05591	7.08703		
			-0.80549	0.4209
2005-06	7.09764	7.17026		
			1.74649	0.0814
2006-07	6.97333	6.92591		
Satisfaction concerning program feasibility				
2003-04	6.60035	6.84051		
			-3.16656	0.0018
2004-05	6.56483	7.44475		
			2.21044	0.0290
2005-06	6.41611	6.87112		
			-1.01641	0.3112
2006-07	6.522684	7.17342		

Table 3: Common trend assumption when AD policy is introduced in 2008-09 for the different outcome variables

Year	control group	programs that eventually will implement an AD policy	t-statistic	p-value
Student drop-out				
2003-04	17.67813	20.450000		
			0.03220	0.9744
2004-05	16.22152	18.850000		
			0.26298	0.7928
2005-06	18.58819	20.44146		
			0.18084	0.8566
2006-07	17.87905	19.26667		
			-0.88230	0.3783
2007-08	16.09327	19.79394		
Student graduation				
2003-04	52.17097	43.85000		
			-1.35663	0.1773
2004-05	51.01867	52.40000		
			-0.07172	0.9429
2005-06	50.84823	52.61220		
			-0.16194	0.8714
2006-07	52.93219	55.49524		
			-0.10224	-0.9186
2007-08	49.88750	53.00303		

Overall satisfaction				
2003-04	7.70232	7.83066		
			1.01004	0.3138
2004-05	7.64664	7.61804		
			-0.84056	0.4012
2005-06	7.47936	7.52537		
			-2.69522	0.0073
2006-07	7.32302	7.56727		
			0.8829	0.3785
2007-08	7.50859	7.64113		
Average NSE score				
2003-04	7.04589	7.11589		
			-0.09305	0.9260
2004-05	7.05591	7.13176		
			1.06529	0.2876
2005-06	7.09763	7.10654		
			-1.91691	0.05587
2006-07	6.97333	7.11824		
			2.78928	0.0057
2007-08	7.11595	7.01874		
Satisfaction concerning program feasibility				
2003-04	6.60035	6.46962		
			-0.32416	0.7462
2004-05	6.56483	6.52854		
			0.98012	0.3290
2005-06	6.41611	6.13018		
			-0.43661	0.6631
2006-07	6.52268	6.36784		
			-0.34304	0.7320
2007-08	6.45324	6.40105		

Appendix B – Trend analysis

Figure 1 (left): Trend of student dropout before (negative numbers) and after (positive numbers) the introduction of an AD policy

Figure 2 (right): Trend of student graduation before (negative numbers) and after (positive numbers) the introduction of an AD policy

Figure 3 (left): Trend of overall student satisfaction of bachelor's students before (negative numbers) and after (positive numbers) the introduction of an AD policy

Figure 4 (right): Trend of average NSE score of bachelor's students before (negative numbers) and after (positive numbers) the introduction of an AD policy

Figure 5: Trend of feasibility of the program perceived by bachelor's students before (negative numbers) and after (positive numbers) the introduction of an AD policy