Impact of absenteeism on academic performance under compulsory attendance policies in first to fifth year university students

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Abstract: Since the implementation of the European Higher Education Area, universities have been obliged to implement continuous assessment systems that require a high degree of student attendance. Based on data recorded during a full academic year of 694 students at a European university, where attendance is compulsory, a cross-sectional quantitative study was conducted to analyse the extent to which absenteeism affects academic performance in each of the five years of one of the degrees. The research found a decreasing effect of the impact of absences on academic performance by year, with the greatest impact of non-attendance on performance found for first-year undergraduates. In addition, a cluster analysis was carried out to find out whether the compulsory attendance policy affects all students equally. Three different styles of behaviour were found: those who attend regularly, students who manage their number of absences to meet the attendance standards, which are the real targets of the policy, and a third group with a high number of absences who are not affected by the policy. These results identify the groups of students who benefit the most from adequate attendance.
Keywords: absenteeism; performance; compulsory attendance; academic year; student behaviour.

[es] Impacto del absentismo en el rendimiento académico bajo políticas de asistencia obligatoria en estudiantes universitarios de primer a quinto año

Resumen: Desde la implantación del Espacio Europeo de Educación Superior, las universidades se ven obligadas a implantar sistemas de evaluación continua que exigen un alto grado de asistencia de los estudiantes. A partir de los datos registrados durante un curso académico completo de 694 estudiantes de una universidad europea, donde la asistencia es obligatoria, se realizó un estudio cuantitativo transversal para analizar en qué medida el absentismo afecta al rendimiento académico en cada uno de los cinco años de una de las titulaciones. La investigación encontró un efecto decreciente del impacto de las ausencias en el rendimiento académico según el curso, comprobando que el mayor impacto de la falta de asistencia en el rendimiento se produce en los alumnos universitarios de primer curso. Además, se realizó un análisis de conglomerados para averiguar si la política de asistencia obligatoria afecta a todos los estudiantes por igual. Se encontraron tres estilos de comportamiento diferentes: los que asisten con regularidad, los estudiantes que gestionan su número de ausencias para cumplir con las normas de asistencia, que son los verdaderos objetivos de la política, y un tercer grupo con un elevado número de ausencias al que no afecta la política. Estos resultados identifican los grupos de estudiantes que más se benefician de una asistencia adecuada.
Palabras clave: absentismo; rendimiento; asistencia obligatoria; curso académico; comportamiento de los estudiantes

Sumario. 1. Introduction. 2. Conceptual framework and hypotheses development. 3. Research methodology. 4. Estimation results and findings. 5. Discussion. 6. References.

1. Introduction

In the OECD countries, on average, only 67% of the students who entered a bachelor's programme graduated, implying an average dropout rate of 33% (OECD 2019, 210). Dropouts from Higher Education (HE) affect not only the individual who drops out but also generate reputational prejudices against educational institutions and economic

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costs for our society (Ortiz-Lozano et al, 2018). Tinto's (1993, 1975) classic schema on college dropout conceives dropout behavior as a process associated with the degree of academic and social integration of the student in the institution. In this sense, the student's academic performance becomes one of the most relevant factors, together with the interaction with the teachers, in explaining the degree of integration in the academic system and, therefore, in predicting the student's persistence in the university institution. This theoretical framework was used by Larsen et al. (2013a) to conduct a deep analysis of the causes of dropout, demonstrating that Tinto's model is still valid and that engagement and academic performance are the main variables explaining permanence.

Universities are designing plans to increase student perception of belonging to improve retention rates (Jones et al., 2016; Thomas, 2012; Tovar et al., 2009). Academics, also concerned with the magnitude of the phenomenon, are studying and refining the existing models on the complex construct 'student experience' to help universities in the pursuit of student retention (Bowden et al., 2019; Kahu, 2013). But apart from engagement, academic performance also has a strong positive influence on permanence, that is, the better the grades the lower the risk of dropout (Larsen et al., 2013b). Class attendance has been found to be a consistent predictor of likely student retention (Fike & Fike, 2008). In fact, research has found that absenteeism is one of the most important variables impacting negatively on students' grades (Credé et al., 2010); also poor attendance increases the difficulty of students in engaging fully with their studies (Barlow & Fleischer, 2011). Additionally, in courses designed to collect multiple evaluation evidence from students, including individual and group assignments, the negative effects on absent students spread to students attending class (Landin & Pérez, 2015), to teachers assessing the students' learning process (Westrick et al., 2009) and to institutions in their responsibility for assuring the quality of the learning outcome (Barlow & Fleischer, 2011).

These negative effects of absenteeism opened the debate among HE institutions on the necessity of the deployment of mandatory attendance policies (Barlow & Fleischer, 2011; Teixeira, 2016). On this controversial issue there are two lines of thought. Some authors argue that although attendance policies may be beneficial for some students, it is questionable how beneficial is for all (Tomlinson, 2017). Some authors, such as Clair (1999), argue that enforcing attendance would reduce students' feelings of control over their environment; nevertheless, Clair acknowledges that in some cases it is appropriate to institute an attendance policy, as in courses that require students to complete assignments and demonstrate knowledge in the classroom. By contrast, proponents of mandatory policies argue that implementation of these policies reduces absenteeism and improves performance due to the positive correlation between attendance and performance (Devadoss & Foltz, 1996; Snyder et al., 2014). Sund & Bignoux (2018) recommend attendance policies designed according to student characteristics in teaching‐intensive universities, instead of the one‐size‐fits‐all approach taken by most universities today.

But to deploy efficient customised compulsory attendance policies, universities need to find out the answer to the following two questions: 1) Does absenteeism affect academic performance equally in the different years of a degree?; 2) Do attendance policies affect all students?

To our knowledge, no previous research analyses the impact of absenteeism on performance in all academic years of a university degree, as done in the present study. The result of this study contributes to a better understanding of the effect of absenteeism on academic performance through the years of a university degree; additionally it fills a perceived research gap by providing information about students' behavioural responses to compulsory attendance policies and these findings may be helpful in improving the academic performance of college students. Finally, this study overcomes one of the main limitations of previous literature, where most studies have uses self-reported data to measure attendance (Standish & Umbach 2019).

The rest of the article is organised as follows. This introductory section continues with the explanation of the conceptual framework and the hypotheses development. Then, data, methodology and an analysis of the results are presented. The final section concludes with a discussion of the results.

2. Conceptual Framework and Hypotheses Development

Since the pioneering work of Romer (1993), which revealed a statistically significant relationship between attendance and academic performance, researchers have found that attendance alone explains a yield variance of performance between 15% and 38% (Bijsmans & Schakel, 2018; Cortright et al., 2011; Maloney & Lally, 1998; Marburger, 2001; Teixeira, 2016). Hancock (1994) found that students whose final grades were affected by mandatory attendance averaged higher scores. Devadoss & Foltz (1996) found that required class attendance strongly influences students' behaviour and they found strong empirical evidence of the positive influence of class attendance on student performance. Recently, Ta et al. (2020) showed that for each class session missed, there was a reduction in the overall course grade of 0.18% and 0.14% in the autumn and spring courses in pharmacy students.

Students in junior-level courses had a 5% higher attendance rate than those in sophomore– and senior-level courses, but students in senior-level courses achieved better grades than their junior and sophomore counterparts (Devadoss & Foltz, 1996). In the same vein, Wongtrakul & Dangprapai (2020) found that the lecture attendance rate among second-year students was significantly higher than that among the third-year students. One of the few studies analysing the impact of absenteeism on academic year performance finds that the lack of class attendance has a greater impact on academic performance in second-year students (27% variance explained, term hereinafter used to

represent the R^2 of a linear regression) compared to third-year students (15% variance explained), demonstrating that maturity contributes to the ability to perform well (Maloney & Lally, 1998). These results suggest that absenteeism may have more impact on performance in students of the first courses and that its negative impact diminishes across the different years of the degree; however, we have not found any research that analyses the impact of absenteeism on performance in all academic years of a university degree as with the present study.

But to establish a relationship between attendance and performance, it is necessary to control other effects, such as gender, quality of teaching, and environmental variables (Sund & Bignoux, 2018). Regarding gender, previous research found that females perform better than males (McNabb et al., 2002; Richardson & Woodley, 2003; Voyer & Voyer, 2014; Almutawa & Suwaidan, 2020), although Lumsden & Scott (1987) found that variations occur depending on the type of assessment and that females perform better than males in coursework, whereas males perform better than females in exams. Furthermore, Cortright et al. (2011) found that the influence of regular attendance on examination performance is more important for female students than for male students. Recently, Hakami (2021) found that the mean scores of female medical science students were significantly higher than those of male students for two academic semesters. Contrary to Cortright et al. (2011) Hakami (2021) argues that absenteeism is a negative predictor of academic success for male medical science students, but not for female students.

As regards quality of teaching, a recent meta-analysis done by Schneider & Preckel (2017) found that among the first 13 factors predicting academic achievement, six factors were related to the teacher, including preparation of classes, and clarity or ability to communicate. If lecturers are not able to transmit useful learning experiences, students will be less likely to attend their classes and performance may be affected. In this vein, previous research found that students' perception of the quality of teaching was one of the reasons to not attend class (Crespo Tejero et al., 2012; Sloan et al., 2020). Proxies to the variable teaching style have been used in previous studies as a factor affecting performance. Pani & Kishore (2016) created a dummy variable representing the gender of the faculty; Sund & Bignoux (2018) used a dummy variable assigning a value for each tutor, accounting for differences related to each one. To improve the explanatory value of this variable, the recorded SET of each lecturer was used in the present research.

Regarding environmental variables, we considered commuting time. In a study of 159 students at an American university, Dutton & Dutton (2005) found that students with long commutes had significantly lower academic achievement than those without such commutes. Halpern (2007) and Hidayat et al. (2012) concluded that commuting time does not have a significant impact on academic achievement.

This study looks to verify the following hypothesis related to the effect of absenteeism on academic performance:

H1. After controlling for the effects of gender, quality of teaching and commuting distance, the impact of absenteeism on grades diminishes across the years of a university degree.

Once the variables that could control the effect of absenteeism on performance have been analysed, we reviewed the scant literature on the impact of compulsory policies in the behaviour of the recipients of the policy, i.e. the students. Contrary to expectations, students showed predominantly positive attitudes towards attendance policies (Bruen et al., 2020), made them feel that their university cared about their success (Bowen et al., 2005) and that university takes responsibility for their learning by ensuring attendance (Barlow & Fleischer, 2011).

While previous studies have investigated the effect of attendance on academic achievement, few studies have focused on how compulsory attendance affects student behaviour. Brauer (1994) classified students as those with and without attendance problems and found that those without attendance problem obtained better grades than those with attendance problems. O'Sullivan et al. (2015) found three groups of students regarding their tutorial attendance behaviour: a group of students who attended regularly, a second group where the default behaviour was consistent absence and a third group who preferred working on their own and did not attend tutorials. Pani & Kishore (2016) classified students using the quantiles of their performance scores; in their scale, high performers usually go to class and extremely low performers usually do not attend class, with a bigger impact of absenteeism on grades for the low performers. Snyder et al. (2014) classified the students as high, average and low performers and measured their performance and attendance; the results showed that high performers had a better attendance record as well as performance, and that both variables decreased for average and low performers. Teixeira (2016), through exploratory research, created four groups of students depending on their level of class attendance, ranging from the very assiduous, who missed less than 5% of the classes, to the absent students who missed more than 25% of the classes, and found that as the level of absences increased, the performance of these students worsened. More recently, Rendleman (2017) concluded that there are two groups of students. Firstly, there is a 'rational' group, which splits in two groups, those who consider that they need to attend class to master the materials and those who consider that they can perform well with the course materials and tend not to attend. Secondly, there is a 'non-rational' group of students who may be coasting through the school not worried about their performance. Because of the small sample size used, Rendleman recommended to further investigate if such groupings exist and to develop an objective measurement to separate them, as is one of the aims of the present study, especially for the 'rational' group of students.

Based on the previous literature review, the following hypothesis is proposed:

H2. The student behaviour regarding compulsory attendance policy differs between groups of students.

3. Research Methodology

Design and variables

A quantitative methodology with a cross-sectional design was used for this research. This study uses recorded students' data for each one of the four years needed to complete a 240 European credit transfer system degree, plus an additional fifth year specialization degree in marketing management on the Bachelor of Business Administration (BBA) at ESIC Business & Marketing School during the academic year 2016-17. The dataset contains anonymized information of 694 students on all the subjects completed per year, in total 4,043 subjects taken, and includes information on the following variables:

The dependent variable:

The final course grade obtained for each subject taken, on a scale from 0 to 10, with a pass level of 5.

The independent variables:

The proportion of unjustified absences collected and recorded via roll call in each session by lecturers.

Gender as a binary variable, 0 for male and 1 for female.

The student evaluation of teaching (SET) of the teacher of the subject. Results of the SET survey for each of the subjects taken and scored on a scale from 0 to 10.

The commuting distance in kilometres of the shortest route to the university calculated with the R library ggmap (Kahle & Wickham, 2013) using the students' zip codes.

The mandatory attendance policy offers two evaluation schemes that the student may choose. Firstly, students may opt for continuous assessment if the student does not miss more than 25% of the classes; in this case, the final grade is the weighted average of two written tests (with a weight of 70% or 80% depending on the subject), and group and individual assignments account for the rest. Alternatively, students may choose one final exam, if the number of unjustified absences is more than 25%; in this case, the student loses 30% or 20% of the final grade, corresponding to the continuous assessment, and the final grade will be 70% or 80% of the final exam mark.

Sample

Recorded data is available for 694 students in years one to five who completed the 2016-17 academic year under a compulsory attendance policy of the BBA at ESIC Business & Marketing School.

Data analysis

To address the first hypothesis, i.e., the effect of absenteeism on the academic performance of students in years one through five, we used ordinary least squares (OLS) multiple linear regression. We ran five different OLS, one for each of the years, using R (R Core Team, 2021). In Equation 1, the hypothesized relation is depicted: for each different year the academic performance of the student i is explained by the percentage of recorded absences; gender, being Female 1 and Male 0; the SET and the distance to University.

$$Performance_i = \alpha + Absences\,\beta_{1,i} + Female\,\beta_{2,i} + SET\,\beta_{3,i} + Distance\,\beta_{4,i} + \varepsilon_i$$

The model uses the information of each subject taken for each student i, which means that if the i-th student took six subjects in a year, the database would contain six different records for that student in that year, one per subject taken. In total, there is information on 649 students, from year 1 to 5, who were taught 4,043 subjects. Table 1 depicts the descriptive statistics of the variables used in the analysis, instead of a sample the analysis uses the total number of students who attended each year of the BBA. The table includes the number of students per year and the number of subjects taken between all of them. The models for each year use all the subjects taken by each student. For example, in Table 1 for the first year there are 171 students who took 1,477 subjects, so the model would use this number of subjects.

Second, to address the second hypothesis and discover whether attendance policies affect all students equally, we calculated a cluster analysis for each of the courses. To create the different clusters, we used the final grade per subject and the variables that were significant in the OLS regression analysis: percentage of absences, gender and SET (Table 3). Following previous literature (Ferguson et al., 2000; Lim et al., 2006; Payne, 2006), first, we visually analysed the different clusters for each year by inspecting the dendrogram of a hierarchical cluster created with Ward's method and found that for all 5 years, 3 clusters seemed to be the best solution; from this information we performed the final k-means cluster, with 3 clusters for each academic year, obtaining 5 different models, one per academic year.

Table 1. Number of students, subjects taken and descriptive statistics.

Year	# Students	# Subjects	Mean age	Mean mark	SD mark	Mean absences	SD absences	Mean age	Proportion females	Mean SET	SD SET	Mean distance	SD distance
1	171	1477	18.96	6.02	2.04	14.71%	11.33%	18.96	31.96%	7.58	0.97	18.18	11.78
2	195	847	19.90	6.06	2.14	15.69%	9.59%	19.90	45.45%	7.68	1.11	19.09	11.34
3	140	727	20.92	6.41	1.77	16.19%	10.92%	20.92	40.30%	7.53	1.00	19.15	11.54
4	129	655	21.85	6.75	1.75	14.06%	10.18%	21.85	46.26%	7.80	1.04	20.14	13.02
5	59	337	22.35	6.98	1.61	15.99%	10.55%	22.35	60.24%	7.55	1.03	16.89	10.55

4. Estimation Results and Findings

Table 1 depicts the descriptive statistics of the variables; it is worth noting that they are aligned with previous literature (Richardson, Abraham, & Bond, 2012) in that the average grade increases across the years of the degree with a value of around 6.0 in the 1st and 2nd year, to around 6.9 in year 5, with a decreasing standard deviation. As opposed to an average of 30% absences found in previous studies in which attendance is not mandatory, the average percentage of absences across the years is around 15%.

To verify H1, we ran a first regression including as dependent variable the grade obtained for all the students for each year and the respective absences as independent variable, i.e., for year 1 there is information on the results of 1,477 subjects (Table 2). The regressions clearly show the negative, although, decreasing impact of absences for all the years. The value of the constant is very high, meaning that there is there is a substantial amount of unexplained information. Additionally, the highest R^2 is 17.7% corresponding to the first year.

Table 2. OLS regression with grade as dependent variable

Year	Variable	Beta	Std. Error	t	p value	R^2	Adj. R^2	F	p value	n
All	Constant	7.26***	0.05	143.84	0.00	11.88%	11.86%	545.23***	0.00	4,043
	Absences	-0.06***	0.00	-23.35	0.00					
1	Constant	7.14***	0.08	90.35	0.00	17.79%	17.73%	319.15***	0.00	1,477
	Absences	-0.08***	0.00	-17.86	0.00					
2	Constant	7.37***	0.13	56.25	0.00	13.95%	13.85%	136.98***	0.00	847
	Absences	-0.08***	0.01	-11.70	0.00					
3	Constant	7.14***	0.11	63.11	0.00	7.66%	7.53%	60.14***	0.00	727
	Absences	-0.04***	0.01	-7.76	0.00					
4	Constant	7.5***	0.11	67.83	0.00	9.80%	9.66%	70.96***	0.00	655
	Absences	-0.05***	0.01	-8.42	0.00					
5	Constant	7.37***	0.16	46.66	0.00	2.48%	2.18%	8.50***	0.00	337
	Absences	-0.02***	0.01	-2.92	0.00					

***Significant at 1%; **Significant at 5%; *Significant at 10%. Non-standard Betas.

To improve the explanatory power of the regression we include the control variables gender, SET and Distance (Table 3) finding a general improvement in the results. Although the impact of absences is similar, i.e., when including all the years a value of 0.06, the constant decreases, and the R^2 also increases giving a better explanation of the academic performance.

For every year (Table 3), there is a negative and statistically significant relationship between percentage of absences and subject grades. The effect of absences on subject grades across the five years may be divided into three stages: i) a first stage, including first and second-year students with a similar impact of absences on grade (around –0.09), and variance explained (R^2) around 21%. ii) a second stage, including third– and fourth-year students, with less impact of absences on the grade (around –0.05) and a lower level of variance explained between 12% and 15%, and iii) a third stage, the fifth year students, on whom the impact of absences is very low, although significant; absence itself explains only 2% of the variance of the subject grade.

Table 3. OLS regression with grade as dependent variable

Year	Variable	Beta	Std. Error	t	p value	R²	Adj. R²	F	p value	n
All	Constant	4.72***	0.24	19.46	0.00	15.63%	15.53%	163.35***	0.00	4,043
	Absences	-0.06***	0.00	-20.97	0.00					
	Gender Female	0.53	0.06	8.49	0.00					
	SET	0.28***	0.03	9.36	0.00					
	Distance	0.01***	0.00	2.64	0.01					
1	Constant	4.41***	0.42	10.63	0.00	21.48%	21.23%	87.53***	0.00	1,477
	Absences	-0.08***	0.00	-16.51	0.00					
	Gender Female	0.06	0.11	0.53	0.60					
	SET	0.32***	0.05	6.21	0.00					
	Distance	0.01***	0.00	2.47	0.01					
2	Constant	4.43***	0.53	8.37	0.00	21.13%	20.70%	50.15***	0.00	847
	Absences	-0.09***	0.01	-11.98	0.00					
	Gender Female	0.64***	0.14	4.56	0.00					
	SET	0.35***	0.06	5.58	0.00					
	Distance	-0.002	0.01	0.39	0.70					
3	Constant	5.16***	0.53	9.76	0.00	12.75%	12.20%	23.06***	0.00	727
	Absences	-0.04***	0.01	-6.89	0.00					
	Gender Female	0.72***	0.13	5.39	0.00					
	SET	0.2***	0.07	3.10	0.00					
	Distance	0.002	0.01	0.73	0.46					
4	Constant	5.11***	0.56	9.10	0.00	15.48%	14.88%	25.60***	0.00	655
	Absences	-0.05***	0.01	-6.80	0.00					
	Gender Female	0.83***	0.14	6.09	0.00					
	SET	0.22***	0.07	3.34	0.00					
	Distance	0.003	0.01	0.99	0.32					
5	Constant	6.59***	0.77	8.61	0.00	2.74%	1.36%	1.98*	0.10	337
	Absences	-0.02**	0.01	-2.35	0.02					
	Gender Female	-0.003	0.21	-0.02	0.99					
	SET	0.105	0.09	1.11	0.27					
	Distance	-0.002	0.01	-0.27	0.79					

***Significant at 1%; **Significant at 5%; *Significant at 10%. Non-standard Betas.

In years one and five, gender has no impact on performance, but from years 2 to 4 females perform better, with improvements of 0.3 to 0.8 grade points. Quality of teaching, measured by SET, is more relevant for students in the first and second years, but its effect diminishes in the third and fourth years and it has no impact on performance in the fifth year. Commuting distance has a significant, although minimum positive effect, only for first-year students.

The dendrograms of a hierarchical cluster analysis, using Ward's method, showed that three clusters seemed to be the best solution, and after calculating the k-means cluster, we found three clearly defined clusters with a similar behaviour across years: a group of students who 'attend' regularly and with generally good academic performance; a second group of absence 'managers' who, in response to the compulsory attendance policy, manage their number of missed classes to be below the 25% threshold of missed classes to enter the continuous evaluation system, with lower performance than the previous case; and a third group of 'absent' students with a high percentage of missed classes and the worst academic performance. The graphical representation of the cluster analysis, comparing final grades and percentage of absences, is shown in Figure 1, where each one of the points represents a subject finished by a student.
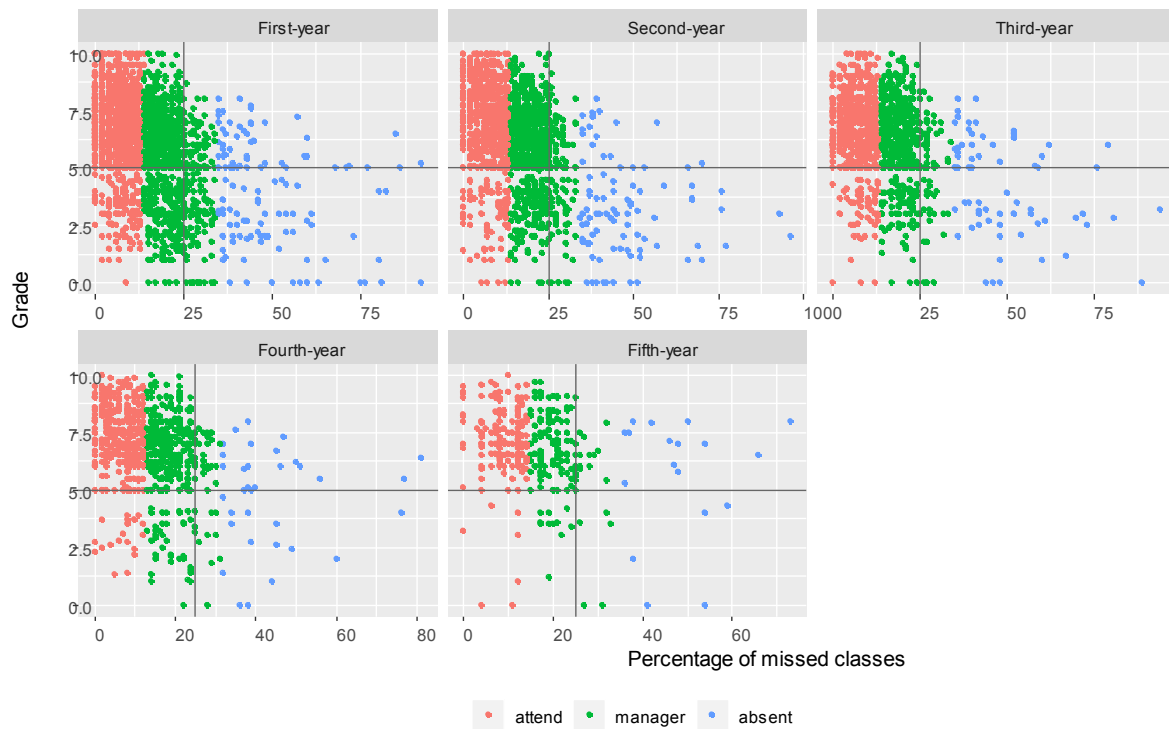
Figure 1. Scatter plot of the three clusters for each academic year. Each dot represents a subject finished by a student. The horizontal line represents the minimum grade of 5 to pass the subject; the vertical line the threshold of 25% unjustified absences needed for continuous assessment.

Because the clusters were created using information on performance, absences, gender and SET, and for each one year, we can conclude that although the impact of absences, gender and SET is decreasing the composition of the different groups of students is similar across all years.

The proportion of 'attend' students (Table 4) ranges between 40% and 52%, in line with previous literature (Triado-Ivern et al., 2018). This group misses on average only between 5% and 8% of the classes and in all the cases, the mean mark for the group is greater than the others. The group of 'managers' ranges from 42% to 52%, depending on the course, and in all the cases the average missed classes is around 20% with a standard deviation of 4%, making clear that their behaviour is affected by the continuous evaluation policy rule of no more than 25% unjustified absences. In all the cases, the students of this group have an average lower grade than that of the 'attend' group, but their average grade is still more than 5. The 'absent' group is composed of around 5% of the students, missing between 37% and 48% of the classes, and with an average grade below 5 in the first and second years and above in the rest of the years.

Table 4. Descriptives of the different clusters per course

Year	Cluster	Proportion	Mean mark	SD mark	Mean absences	SD absences
1	Attend	52.88%	6.70	1.74	7.01%	4.00%
1	Manager	42.52%	5.40	2.01	20.60%	4.67%
1	Absent	4.60%	3.97	2.34	48.69%	15.87%
2	Attend	40.85%	6.80	2.02	7.01%	3.83%
2	Manager	52.30%	5.76	1.96	19.56%	3.73%
2	Absent	6.85%	3.98	2.25	37.90%	9.56%
3	Attend	41.54%	6.67	1.72	7.64%	3.64%
3	Manager	52.82%	6.36	1.73	19.54%	3.86%
3	Absent	5.64%	5.01	1.93	47.80%	15.37%
4	Attend	43.36%	7.19	1.52	5.78%	3.37%
4	Manager	49.16%	6.56	1.74	17.79%	4.12%
4	Absent	7.48%	5.36	2.09	37.53%	13.02%
5	Attend	51.93%	7.21	1.57	8.93%	4.01%
5	Manager	42.73%	6.75	1.62	20.53%	4.12%
5	Absent	5.34%	6.61	1.76	48.17%	10.52%

This analysis suggests that the attendance policy only affects the group of absence 'managers', it does not affect everyone, because the 'attend' students attend class independently of the maximum number of allowed absences, and the 'absent' students miss class independently of the policy.

5. Discussion

Our study aims to deepen the knowledge of the impact of absenteeism on university students to help Universities to improve student performance and, consequently, retention in the Tinto (Tinto, 1993) schema. To this purpose, our research focuses on two questions. Firstly, we ask whether and to what extent the effect of absenteeism on performance is equal for different years of the degree. According to the analyses conducted, our research findings support hypothesis H1, formulated at the beginning of the research, that absences affect academic performance across all five years of the degree, but the effect diminishes in terms of coefficients and percentage of variance explained. Specifically, first– and second-year students are the most affected in their academic performance if they do not attend class, with 21% of variance explained. These findings highlight the relevance of providing special attention to attendance of students in the first and second year and to put more energy into setting up dropout-reducing measures during the early phases of the degree (Larsen et al., 2013b) where the impact of absenteeism on performance is more significant than in other academic years, and because of the importance of the first year to increase chances of completing studies in HE (Bijsmans & Schakel, 2018). In the third and fourth years, the effect is smaller, but it still explains between 12% and 15% of the variance of the final grade, so the policy may have an effect. For fifth-year students, the effect of attendance is negligible, which would suggest scope for more relaxed attendance policies. These results confirm previous research (Maloney & Lally, 1998) and demonstrate that the impact of absenteeism on academic performance decreases as students' progress through the university degree programme. Furthermore, provide evidence of the unequal effect of non-attendance across academic years.

In addition to the effect of attendance on performance, and in line with other authors, this study found that the final grades of females from second to fourth years are slightly higher than males' grades (Cortright et al., 2011; Richardson & Woodley, 2003; Voyer & Voyer, 2014), and that teaching quality (Devadoss & Foltz, 1996; Romer, 1993; Schneider & Preckel, 2017) impacts positively on students' performance in years one to four. Regarding fifth-year students, the only variable that impacts students' grades is the percentage of absences, although with a very small effect. Commuting distance does not impact academic performance.

Regarding the second question about the effect of attendance policies on students and the hypothesis H2, which states that the student behaviour regarding compulsory attendance policy differs between groups, the results also support the hypothesis providing evidence of three behavioural styles with respect to compulsory attendance: (1) 'attend' students who attend correctly and perform well, (2) 'manager' students with around 20% absenteeism who manage their absences so as not to exceed the standard of continuous assessment, and present lower grades, and (3) 'absent' students who present higher levels of absenteeism and the worst academic results. Groups 1 and 2 could be classified as 'rational', in the Rendleman (2017) sense, including the group of 'attend' students who are aware of the added value of attending class and the group of 'managers' who rationally decide according to the maximum allowed absences of the mandatory policy when to attend class or otherwise. Finally, there is a small third group of 'non-rational' students who may not be worried about their performance. In line with Snyder et al. (2014), the study concluded that the effects of compulsory attendance are not uniform for all students. Indeed, it only impacts the group of students who 'manage' their absences, around 42% to 52%, because the application of attendance policies neither seems relevant to students who attend classes regularly nor to students who commonly avoid classes. Based on the results found by Büchele (2021) we suggest that in future research the variables mediating between class attendance and academic performance, such as commitment, and motivation in the classroom, be explored primarily in the group of "managers" student.

Additionally, the present study tries to overcome some limitations of previous research by using recorded information of a complete academic course, containing records from 694 students with information on all the years of a five-year university degree. The first point is to avoid the reliance on one-time cross-sectional assessments, based on a single module, subject or programme of study (Azab et al., 2016; Bati et al., 2013; Massingham & Herrington, 2006), isolating a minimum unit of time from a broader context and not taking into account the development of the complete course. The second point is that with a total 694 students and records on 4,043 subjects we overcome the use of small student samples (Cortright et al., 2011; Kelly, 2012; 2016; O'Sullivan et al., 2015;) which may generate a bias of sample size, conditioning in some cases the generalization of the results. Third, using recorded behavioural data, instead of self-reported data to measure attendance, avoids the discrepancies between self-reported data and actual data in the assessment of absenteeism and performance (Barrett et al., 2007; Kelly, 2012) and the serious threat regarding validity, memory bias and social desirability (Porter, 2011; Standish & Umbach, 2019), although this limitation has been overcome in previous studies using electronic attendance measures (Newman-Ford et al., 2008). Finally, but no less relevant, having recorded data on all students, we collect information on absent students, who otherwise would not participate.

One limitation of the present study is that it was restricted to a single university and a single geographical location with potentially unique characteristics. Nevertheless, the authors consider that the results may be useful for universities in European countries that are involved in the development of a European Higher Education Area model and share the same standards dealing with teaching-learning styles.

Our study concludes that class attendance is especially beneficial for certain groups of students, such as 1st and 2nd year students. In addition, the study shows the existence of different behavioral styles in university students when monitoring class attendance.

Declaration of interest

The authors have no conflicts of interest to declare.

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