Do Early Signals Count? Exploring Potential Root Causes of University Dropout

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Abstract

This research explores the elements that influence the likelihood of dropout among university students, starting from the study case of Romania. It aims to develop a comprehensive picture of this pressing educational issue using the data from the National Student Survey in Romania (NSSS-RO) and EUROSTUDENT VII conducted between 2020 and 2021. Notably, the NSSS-RO collected responses from various cohorts, ranging from individuals who followed both bachelor's and master's degree programs with the anticipation of their graduation by Summer 2023.

A distinctive feature in the research concerns the latest dropout definition and measurement model for Romanian public higher education institutions. This model, developed by Herteliu et al. in 2022, serves as a conceptual foundation for the analysis. To accurately determine the NSS-RO respondents who dropped out, the analysis utilized the survey results and data from the National Student Enrolment Registry (RMUR). This data merging was indispensable in identifying which respondents from the NSS-RO ultimately abandoned.

The analysis identified several factors that can affect a student's decision to continue or discontinue their academic journey. Its primary objective is to determine which indicators from the NSS-RO and EUROSTUDENT VII survey, such as satisfaction with teaching and learning, university infrastructure, learning outcomes, or student support services, can predict the students' dropout with a higher degree of probability.

A second focus of this study is to understand the extent to which specific student characteristics, as catalogued in the NSS-RO, impact dropout or the completion of their education in Romanian HEIs. Following on students' educational landscape, the study examines pre-entry characteristics, notably the Baccalaureate Exam, and how they could help to forecast dropout tendencies compared to NSS-RO answers.

This paper explores whether students' challenges amid the COVID-19 pandemic led to an enhanced dropout rate among NSS-RO respondents. It examines how their structural and pedagogical changes have affected student dropout rates. It focuses on some indicators that could be used to monitor and improve student retention, especially in a disruptive situation.

This research aims to comprehensively understand the various factors contributing to student dropout rates in Romania. By conducting thorough data analysis and placing the findings in the context of the broader academic debate, it intends to provide actionable insights to policymakers, educators, and stakeholders to improve student retention strategies.

1. Introduction

1.1. What Does Student Dropout Mean?

Student dropout represents one of the top research issues in the scientific literature concerning higher education. Nevertheless, as tertiary education is still subject to expansion, there is still space for improvement in understanding the dropout phenomenon through its multiple characteristics. One of the most comprehensive models was proposed by Tinto (1975) with several dimensions for describing dropouts, such as the individual attributes and pre-college experiences, integration into academic and social systems or goal and institutional commitments. Tinto perceived student dropout as a process rather than as a single event. This longitudinal process involves interactions between the individual and the institution, leading to varying levels of persistence or dropout.

This article refers to student dropout as individuals that leave the university study programs before completion and obtaining a degree (Tinto 2012). Given the complexity of this subject matter, it is crucial to consider numerous layers. For instance, scholars differentiate between "dismissed" students and those who "withdrew" (Vaughan 1968, Tinto 1975) based on the distinction between academic failures and voluntary withdrawals. According to Johnson (1991), the inability to accurately distinguish between these types of dropouts has resulted in discrepancies among study findings and a lack of effective solutions to address the increase in university departures.

Bean and Metzner's model (1985) highlights the dropout process among non-traditional undergraduate students. Their research underlines the significance of environmental factors like financial limitations, work commitments, family obligations, and transfer prospects in comprehending the underlying causes of dropout. Social background variables such as age, enrolment status, residency, educational aspirations, high school performance, ethnicity, and gender also impact this process.

The aim of this study is to explore potential statistical correlations between dropout rates and various variables that share similarities with the models outlined above. These findings will be applied within the unique context of the Romanian university education system. Nevertheless, given their integration into previous models, the conclusions may have broader implications for other higher education systems, particularly those with comparable contextual factors.

1.2. Student Dropout in the Romanian Higher Education Context

Until recently, Romania did not have a system in place for tracking university dropouts, nor did it have many public policies or legal frameworks addressing this issue. However, this changed with the launch of the "Educated Romania" project in 2016 (Herțeliu, et al. 2022). The project placed a particular emphasis on equity and access to higher education, as well as addressing the problem of students dropping out (Presidential Administration 2021). This was to be achieved through various support schemes and a system designed to identify early warning signs of students dropping out.

The project report was released in 2021 and its results have since been incorporated into two new laws on education, including Law no. 199/2023, which specifically pertains to higher education. According to this law, the Romanian Government, through the Ministry of Education (MoE), will adopt a new National Programme for Reducing University Dropout (PNRAU), which aims to tackle educational disengagement and sustain academic attrition, including among first-generation university students.

It is important to note that the initial comprehensive research on student dropout rates in Romania was conducted within the Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI) in 2022. In their study, Alexe-Coteț, Păunescu, and Hâj (2022) utilised data from RMUR to determine student dropout rates. Additionally, applying the same methodology and using the same database, Herțeliu et al. (2022) found that nearly half of the students who enrolled in 2015 failed to complete their studies and obtain a degree by 2021, resulting in a dropout rate of 47.96%. Furthermore, 43.8% of students discontinued their studies during the first year of their bachelor's degree program. Romania's university dropout rate remains lower than that of many European nations (Szabó and Borbála 2023).

The literature review on student dropout rates in the Romanian higher education context reveals that previous studies have primarily focused on individual faculties within universities (Bungău, Pop and Borza 2017, Cocoradă, et al. 2021, Istrate, Bănică and Haralambie 2020, Voiadeș-Cojan and Lazăr 2020), with limited cross-comparisons between institutions (Hatos and Pop 2019). Surveys have been the primary method used to collect and analyse data across all of the studies cited above. Additionally, student unions like the National Alliance of Student Organisations in Romania have addressed the issue of student dropout rates by advocating for the improvement of social-based criteria scholarship systems (ANOSR 2014) and calling for increased investment in higher education financing and counselling centres for students (ANOSR 2017).

2. Methodology

The research methodology includes the analysis of data from the National Student Survey (NSS-RO) which was implemented together with the EUROSTUDENT VII Survey, EUROSTUDENT VII Survey data, as well as data from the National Student Enrolment Registry (RMUR) to address the following research questions:

- RQ1: To what extent are pre-entry characteristics, including demographic details, family educational background, and previous academic performance, associated with student dropout rates?
- RQ2: Which factor (or set of factors)—students' access to academic resources, their sense of belonging to the institution's social community, financial resources, or the perceived effectiveness of teaching—is/are as a better predictor of students' persistence or withdrawal from higher education?
- RQ3: How significantly have the challenges introduced by the COVID-19 pandemic, such as resource limitations, insufficient institutional support for online education, and dissatisfaction with the transition to digital learning, impacted dropout rates among university students?

2.1. National Student Survey (NSS-RO)

The National Student Survey (NSS-RO) was developed by the UEFISCDI and MoE to measure the quality of tertiary education in Romania. The survey included 61 questions divided into 10 sections covering various topics such as satisfaction, social services, teaching activity, and Covid-19 impact. The questionnaire featured a 5-grade scale, with options ranging from "definitely agree" to "definitely disagree," as well as a "not applicable" option (Deaconu, Olah and Hâj 2020).

The completion period for both NSS-RO and ES VII was from 24 November 2020 to 18 January 2021. A total of 24,280 students participated in the survey, and 23,796 students from 76 institutions were

successfully validated. The NSS-RO aimed to provide stakeholders with reliable data on students' perceptions to contribute to evidence-based policymaking at both national and institutional levels (Deaconu and Olah 2022).

2.2. EUROSTUDENT VII (ES VII)

EUROSTUDENT is a comprehensive survey that takes place every three years across more than 20 European countries, including from outside UE. Its central aim is to monitor the living and studying conditions of students. The collected data is intended to be of practical use to public authorities and other stakeholders (Hauschildt, et al. 2015). The seventh round of EUROSTUDENT research was conducted from 2018 to 2021, with the participation of 26 European countries. Of these, 21 conducted fieldworks prior to the COVID-19 pandemic, while five, including Romania, conducted their research during the pandemic period (Hauschildt, Gwosć and Schirmer, et al. 2021). Romania participated in the 7th round and administered the questionnaire to their entire eligible student population, receiving a response rate of 7.2% (Florian, et al. 2022). The final number of subjects, after weighting procedures, was 19,612 cases, which served as the basis for international comparisons on the EUROSTUDENT platform and formed the basis of the analyses in this report. The application mode was the same as NSS-RO, online, through the same platform managed by UEFISCDI (Lazăr, et al. 2022).

2.3. Theoretical approach and survey questions

The current study considers the assessments of school environment and student contentment as the measures of academic and social integration (Tinto 1975), highlighting the significance of the bond between scholars and the university (Pascarella and Terenzini 1980), particularly in light of the Covid-19 pandemic's disruption (Yu and Zadorozhnyy 2023). Tinto (1997) has argued that integrating students into higher education involves both individual and institutional factors. With regard to institutional factors, he has referenced both the social system and the academic system.

In order to analyse collected data, this study used Tinto institutional departure model revised and elaborated by Qvortrup and Lykkegaard (2022). The aim is to describe the outcome of the educational process as persistence, meaning the choice or the capacity of a student to continue studying, instead of the word “departure” that was used in earlier versions of the model to describe the choice of dropping out.

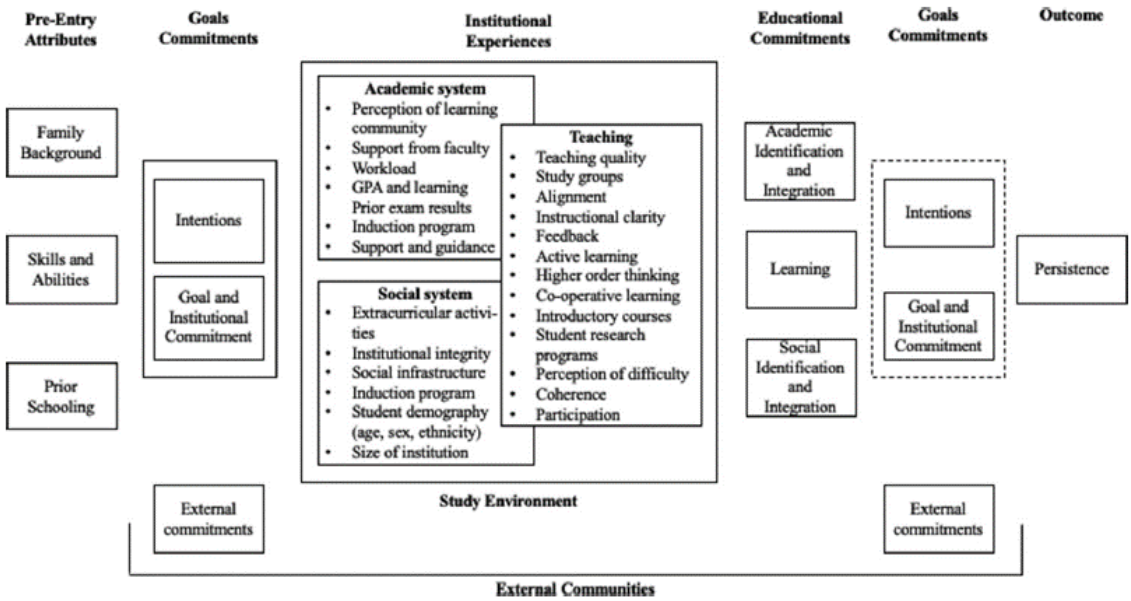
Questions that addressed the *social system* can relate students’ social experience at an institution, including their integration into the social fabric of the institution, participation in extracurricular activities, and the social support infrastructure provided by the institution. Those that address the *academic system* pertain to the academic experience and support, such as perception of the learning community, support from faculty, or other aspects of academic induction program. Nonetheless, survey questions that addressed *Teaching* comprise factors directly related to the act of teaching and instructional quality, including study groups, alignment in teaching or feedback provided. Therefore, the analysis will take into account five analytical categories, adding *Pre-entry attributes* and *Covid-19 impact* to above mentioned categories, as can be seen in Table 1.

Table 1. Survey questions, pre-entry attributes and indicators concerning students' perception of the academic system, social system, teaching and the Covid-19 disruption.

Category	Question/Indicatior	Variable name	Source
Pre-Entry Attributes	Age (at the moment of surveys completion)	age	RMUR
	Baccalaureate exam session average	BAC_average	RMUR
	Birthplace - county (NUTS2)	Birthplace_region	RMUR
	First-generation students	first_gen	RMUR
	Gender	gender	RMUR
Academic system	I believe that the university offers the necessary conditions and a favourable atmosphere for my personal development.	uni_personal_development	NSS-RO
	I benefit from IT resources and other online facilities (e.g. platforms, access to scientific databases, updated software resources relevant to the field of study).	tech_resource_access	NSS-RO
	I am satisfied with the existing common spaces in the university administration for learning (libraries, reading rooms, hubs, etc.).	satisfaction_with_learning_spaces	NSS-RO
	It was easy to access online educational resources on the topics of the disciplines studied.	online_resource_accessibility	NSS-RO
	I would recommend my study programme	recommend_program	ES VII
	It has always been clear to me that I will go to university	university_intent	ES VII
	I am seriously considering changing my study programme	change_study_program	ES VII
	I am seriously considering leaving higher education	consider_leaving_HE	ES VII
Social system	I have the feeling of belonging to a university community, consisting of the staff of the institution and students.	sense_of_community	NSS-RO
	I benefited, if needed, from educational development courses or tutoring activities.	tutoring_benefit	NSS-RO
	It is often difficult to figure out what is expected of me in my study programme.	difficulty_expectations	ES VII
	I often feel that I don't belong in higher education	belonging_in_HE	ES VII
	To what extent are you currently experiencing financial difficulties?	financial_difficulties	ES VII
	Would you be able to cover an unexpected but necessary expense of 1200 lei?	cover_unexpected_expense	ES VII
	I work for a living	work_for_living	ES VII
	Without a job, I couldn't afford to be a student	job_for_study	ES VII
	I work because I have to financially support other people (children, partner, parents, etc.)	work_to_support_others	ES VII
Teaching	I easily understood the subject taught by teachers in courses/seminars/laboratories.	ease_of_understanding	NSS-RO

Category	Question/Indicatior	Variable name	Source
	Teachers use teaching techniques that facilitate the learning process.	teaching_techniques_efficacy	NSS-RO
	By the way a particular topic was taught, I felt it was relevant to my professional training.	topic_relevance_professional_training	NSS-RO
	We received quality feedback (professional, timely) for papers, projects or papers.	quality_feedback_received	NSS-RO
	I have access to educational resources through teachers' personal pages.	teacher_resource_access	NSS-RO
	I am satisfied with the way I was supported to interact with colleagues in the learning process (e.g. working groups).	satisfaction_peer_interaction_support	NSS-RO
Covid-19 impact	The context generated by the COVID-19 pandemic determined me to consider dropping out of university	university_dropout	NSS-RO
	I encountered challenges in the educational process due to impoverishment (e.g. lack of a tablet, laptop, poor Internet connection)	impoverished_students	NSS-RO
	I received support from the higher education institution to participate in online teaching activities (e.g. tablets, laptops)	HEI_support	NSS-RO
	I am satisfied with the way the university has transferred the educational process to the online environment	online_transition	NSS-RO
	I benefited from online educational resources necessary for teaching (e.g. work platforms, access to institutional email addresses, access to dedicated online communication platforms)	online_resources	NSS-RO
	There was constant information from the university regarding the development of the educational process and possible changes	hei_information	NSS-RO

Figure 1. Revised and elaborated version of the institutional departure model (Qvortrup and Lykkegaard 2022).



2.4. Data analysis

The data for the current study are generated by merging NSS-RO and ES VII databases, resulting in 19,715 valid responses. In order to provide relevant information for present analysis, the methodology followed several steps:

1. Initial database was weighted to reduce sampling error and potential non-response bias using a gender and study field (n=19.569), using a model prior validated in Deaconu and Olah (2022).
2. Data was collected in academic year of 2020/2021 (T0 – year of survey), so two dropout variables were defined in order to see if a student withdraw one year after the survey, at the beginning of 2021/2022 (*@dropout_1year*) or two years later, at the beginning of 2022/2023 (*dropout_2years*).
3. Three cohorts are included in the analysis: (1) Three years bachelor's degree programs with students of first year in 2020/2021 (n=4,154), (2) Three years Bachelor's degree programs with students of second year in 2020/2021 (n=4,965) and (3) Two years Master degree programs with students of first year in 2020/2021 (n=1,741). Total number of valid cases after selection was n=10,860. A number of 108 international student were taken into consideration.
4. The student dropout is defined as a student that was enrolled in the previous academic year and withdraw prior to the progression in the next academic year.
5. For each category of survey questions, a model was developed starting from the selected variables in Table 1, where for each cohort the dependent variable that was suitable for each case (*@dropout_1year* or *@dropout_2years*) was applied, according to Table 2.
6. For each above-mentioned dependent variables concerning student academic nonpersistence, a probability (p_i) was associated, and built a Logit model using the variables from the Table 1, divided into 5 categories: (1) Pre-Entry Attributes, (2) Academic system, (3) Social system, (4) Teaching and (5) Covid-19 impact.

$$\ln\left(\frac{p_i}{1-p_i}\right) = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n$$

7. For each category from those five, the above equation was applied for each dependent variable, where p is the probability of the student dropout (at one year or two years from the survey), β_o is the constant (intercept) for each category, β_1 to $\beta_n$are the coefficients for each predictor variable and X_1 to X_n are the predictor variables for each category.
8. The results are presented in this article, where Cox & Snell R^2, Nagelkerke R^2, significance test and Chi^2 was taken into account for each test.

Table 2. Breakout of student dropout variables on academic degrees and study years.

Study degree	Study year enrolment when surveyed (2020/2021) – T0	Study year enrolment when @dropout_1year (2021/2022) (T+1)	Study year enrolment when @dropout_2years (2022/2023) (T+2)
Bachelor (BA)	First	Second	Third
	Second	Third	Not applicable
Master (MA)	First	Second	*Graduation*[1]

2.5. Limitations of the study

Regarding data collection, there were certain limitations with both NSS-RO and ES VII that required attention to avoid potential errors. As highlighted by Deaconu and Hâj (2022a), these challenges were addressed through various measures, including: (1) utilizing multiple dissemination channels for surveys, including online options and promotion through HEIs, (2) implementing an innovative survey platform design to address non-responses and survey dropouts, (3) applying the surveys as a census with non-probability sampling that required weighting adjustments, (4) response rate at several questions was low and there are differences between total number of respondents at NSS-RO and ES VII questions and (5) data from RMUR is subject to a particular methodology as dropout rates from academic year 2022/2023 are still to be fully validated now when this article is written.

Regarding data analysis, the models were statistically significant for the vast majority of results with $p<0.001$. The main exception were the first-year master's degree students for both *@dropout_1year* or *@dropout_2years* in some categories such as *Social system* or *Teaching*. Cox & Snell R^2 or Nagelkerke R^2 values were usually between modest intermediate values, depicting incomplete student dropout models, but nevertheless, providing some insightful information about relevant variables that can be linked with early signalling a student intention to dropout.

In terms of student dropout, the present study has several limitations such as: (1) non-differentiation between dropout by types, such as voluntary (e.g. leaving university for job opportunities) or forced (due to financial constraints), (2) the dropout is set at the beginning of the next academic year and do not take into consideration the actual timing of the withdraw, but has a statistical accuracy, (3) Several cases that

[1] The dropout rate among master's degree candidates, specifically after two years of enrolment (@dropout_2years), can be deemed as the final dropout rate for master's degree graduates. For bachelor's degree students, the analysis referred only to active enrolments.

could be considered temporary dropout such as pregnancy or severe illness were not taken into account as non-persistence.

3. Impact of Pre-Entry Characteristics on Student Dropout

Upon analysing data comparing student dropout rates between the global student population and data merged between NSS-RO and ES VII, it was found that the percentage of dropout is lower among surveyed students, regardless of their study cycle or year. This phenomenon can be attributed to self-selection bias, as students who chose to participate in the survey are more likely to be engaged in their studies and less likely to drop out. This could be due to motivated students being more aware of the survey, taking the time to respond, or being involved in academic communities where the survey was distributed (Ferrari and Cowman 2004).

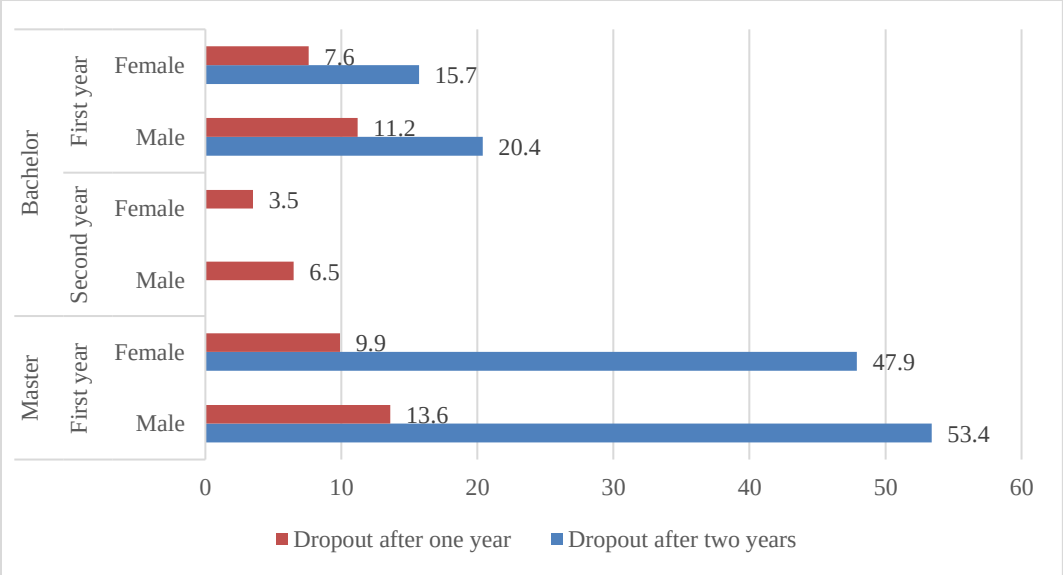
Table 3. Comparative analysis of dropout rates between global and surveyed student population.

Student population from National Student Enrolment Registry (RMUR)					
		2021/2022		**2022/2023**	
2020/2021 cohort	**Total number of students**	**Dropout rate after 1 year**	**Number of students that dropped their studies since first year**	**Dropout rate after 2 years**	**Number of students that dropped their studies since first year**
Bachelor					
First year	135,590	22.46%	30,454	32,88%	44,579
Second year	118,664	16.91%	20,066	-	-
Master					
First year	64,344	22.29%	14,345	60,73%	39,079
Merged database between respondents from NSS-RO and ES VII					
		2021/2022		**2022/2023**	
2020/2021 cohort	**Total number of respondents**	**Dropout rate after 1 year per cohort**	**Number of students that dropped their studies since first year**	**Dropout rate after 2 years per cohort**	**Number of students that dropped their studies since first year**
Bachelor					
First year	4,154	9.32%	387	17,96%	746
Second year	4,965	4,80%	238	-	-
Master					
First year	1,741	11,45%	199	50.15%	873

Looking at the data, the analysis shows that Bachelors' degree dropout rate remains consistent in both the first (9.32%) and second year (9.53%), despite the common expectation of higher dropout rates among newcomers to university. Master's degree dropout rate increases significantly after the first year, with less than half of students completing their program of study. The relative dropout rate in the second year (43.73%) is almost four times higher than the rate in the first year (11.45%).

The average score on the baccalaureate exam is the strongest predictor of bachelor's student dropout rates. An increase in Baccalaureate average score can lead to a 44% greater chance of persistence for second-year students and up to 30% for first-year students. These percentages remain stable two years after the survey is taken, and the findings are consistent with previous research (Alexe-Coteț, Păunescu and Hâj 2022, Herțeliu, et al. 2022). For master's degree students, there is a significant negative relationship with first-year dropout rates, suggesting that higher baccalaureate averages are associated with a decreased likelihood of dropping out, aligning with the notion that clearer academic and career trajectories at the master's level support persistence.
Gender does not play a significant role in predicting the dropout rates for Bachelor students. The difference in dropout rates between male and female students in both Bachelor and Master programs, ranges from 3% to 5.5%.

Figure 2. Gender differences in student dropout rates (%).



First-generation students' status (*first_gen*), geographical factor such as the birthplace region or age (at the moment of completion) were not identified as a relevant or significant predictor of dropout rates.

4. Determinants of Student Retention: Resources, Belonging, and Teaching Quality

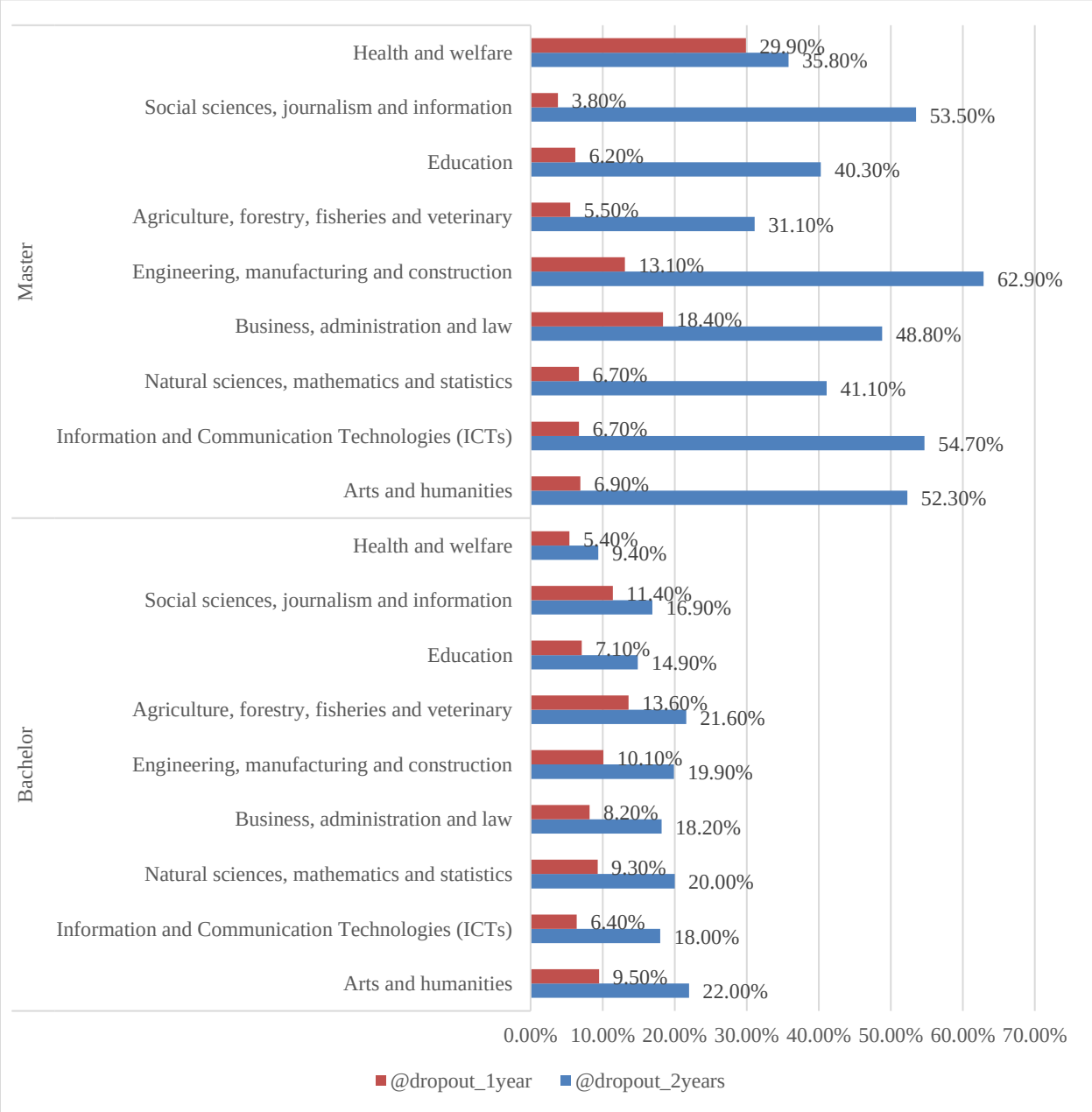
4.1. Academic system

For both first year bachelor's and master's degree students, whether one or two years after the surveys, the likelihood of dropping out increases significantly when considering leaving higher education, ranging from 12% to 21% (*consider_leaving_HE*). This suggests that if a student is considering withdrawing from higher education, early identification and academic support are essential.

This leads to highlight the importance of academic identification, a psychological relationship of a student to their study program, meaning that the risk of dropping out is low if students manage to identify themselves with their studies (Osborne and Jones 2011, Finn 1989). While academic identification remains under-researched in connection with student dropout (Walker, Greene and Mansell 2006), including in terms of empirical application with the Tinto's concept of normative academic integration (Elias, Masjuan and Sanchez 2012), the data provides an insight into the dropout rates differences across various ISCED-F study fields.

At the bachelor's degree level, students enrolled in *Health and Welfare*, *Social Sciences, Journalism and Information*, and *Education* programs tend to exhibit lower dropout rates after the first year, indicating a potentially higher level of initial student engagement or satisfaction in these fields. However, by the second year, dropout rates tend to increase significantly in fields such as *Arts and humanities* (+12,50%), *Information and Communication Technologies (ICTs)* (+11,60%), *Natural sciences, mathematics and statistics* (10,70%). By the second year, the highest dropout rates are in *Arts and humanities* (22,00%), *Agriculture, forestry, fisheries and veterinary* (21,60%) or *Natural sciences, mathematics and statistics* (20,00%).

Figure 3. ISCED-F 2013 study field differences in student dropout rates (%).



The explanations for these differences are manifold and vary from one ISCED-F domain to another. A common feature that is often highlighted, and not only in the case of dropouts, is the inadequacy of career guidance and counselling at the time of admission to higher education. The latter is reflected in an increased drop-out rate of up to 29% for students who are considering changing their programme compared to those who aren't (*change_study_programme*). This trend persists across both years of study and underlines the importance of providing support and guidance, such as mentoring and other counselling services, from pre-university education onwards., to promote student wellbeing (Braxton and

Hirschy 2004). The difficulty of certain types of studies and the lack of induction and integration activities in the university community also contribute to this situation.

This trend suggests that students may become more aware of the challenges and demands of these programs as they progress, which could affect their decision to continue. Notably, fields related to *Information and Communication Technologies* (ICTs) show a relatively low increase in dropout rates from the first to the second year, which may be due to a strong academic fit (Valentín, et al. 2013) or a market-driven motivation due to the growing demand in this sector (Deaconu and Hâj 2022b).

At the master's level, there are notable differences compared to the bachelor's level. *Engineering, Manufacturing, and Construction* have the highest dropout rates, possibly due to the rigorous nature of advanced studies or a potential mismatch between student expectations and program realities. Meanwhile, *Social Sciences, Journalism, and Information* experience a significant increase in dropout rates by the second year, which contrasts with the bachelor level. This could reflect the unique nature of postgraduate studies in these fields or the availability of job opportunities that may cause students to leave their programs. *Agriculture, Forestry, Fisheries, and Veterinary*, on the other hand, exhibits notably high retention (in comparison with other study fields) from the first to the second year, indicating that those who pursue master's studies in this field have a clear calling or commitment to the profession.

Bachelor students' who were more likely to recommend their program were less likely to drop out, regardless of the surveyed generation they represented (*recommend_program*). A positive answer to this question could be associated with a 16% increase in the chances of positive educational advancement (for BA students from the second to third year, one year after the implementation of ES VII). In addition to measuring overall student satisfaction, positive feedback about a program entails an evaluation of its academic content and rigor, faculty expertise and reputation, program location and culture, and potential career outcomes. This ultimately confirms alignment between the individual and the academic institution.

However, a correlation between students dropping out and their perception of how the university provides opportunities for personal growth has yet to be established. This suggests that while personal development is highly valued, other factors, such as academic performance or external support systems, may significantly influence dropout rates (*uni_personal_development*). Interestingly, the data indicates that satisfaction with the learning environment, which undoubtedly contributes to the overall university experience, does not decisively impact students' decision to drop out. This could be attributed to the unprecedented COVID-19 pandemic, during which most educational processes were shifted online for extended periods (*satisfaction_with_learning_spaces*). Similar trends can be observed regarding the accessibility of online educational resources *(online_resource_accessibility*) and the benefits of IT resources (*tech_resource_access*). This does not imply that the aforementioned factors do not contribute to quality education but have a lesser impact on students' persistence in higher education.

Students who express a desire to withdraw from their studies are statistically more likely to follow through with that decision. In addition, there are certain fields of study at both undergraduate and postgraduate level where dropout rates tend to be higher. It's important to note that the reasons for these differences vary and are influenced by the unique characteristics of each field. Another possible factor contributing to dropout rates is the desire of students to change programmes. This could be due to a lack of sufficient career guidance during pre-university education or a lack of proper orientation when entering the new programme. Satisfaction with personal development at university, satisfaction with learning spaces, or accessibility of online and other IT resources are less likely to influence a student's decision to drop out.

4.2. Social system

In the data analysis, the critical factor in retaining a social system is a sense of community (*sense_of_community*). Specifically, first-year bachelor's degree students who have a positive perception of this aspect witness a noteworthy 67% increase in their chances of not dropping out. This finding applies to both bachelor's and master's degree students, and the lowest value recorded was 34%.

This finding confirms previous studies highlighting the importance of social integration, which Tinto (1975) defines as the alignment between a student and the institution's social fabric. Larsen et al. (2013) note various operational definitions, ranging from the simple metric of campus residency to complex psychometric evaluations of a student's connection to their social milieu. McQueen (2009) also emphasizes a critical oversight in persistence theories: the affective dimension. The student's subjective experience of integration is pivotal, emphasizing that the emotional and perceptual aspects of integration cannot be overlooked. Empirical evidence robustly backs the impact of social integration on both commitment to the institution and student persistence (Braxton, Shaw Sullivan and Johnson 1997). This analysis firmly supports the crucial role of social integration in a student's well-being and underscores its importance in addressing the issue of student dropout.

In the case of BA students' academic transition between their second and third study year, one year after the census, perceived difficulty comprehending staff and institutional expectations could be associated with student dropout (*difficulty_expectations*). Students who disagreed with this statement were less likely to leave university (a 16% difference).

There appears to be no direct link between financial struggles (*financial_constraints*) and the ability to handle unforeseen expenses of up to 250 euros (*cover_unexpected_expense*), in relation to academic persistence. While surprising, this can be explained by the context of the particular cohorts that were analysed. Firstly, the COVID-19 pandemic and the move to online learning has decreased the financial pressure on students that could stay at home. Secondly, once students started face-to-face courses, the survey on student employability showed that a vast majority of students were employed (part-time) during studies generating the basic needed income. The survey showed that over half of bachelor's degree graduates (54.8%) and nearly three-quarters of Master degree graduates (73.9%) in the 2020/2021 academic year were employed while studying. Additionally, among bachelor's degree students who worked, half had full-time jobs (Deaconu and Hâj 2022b), suggesting that financial concerns were likely a primary motivator for working while studying. Thirdly, these cohorts were beneficiaries of increased student social support with increased scholarships, including social scholarships. This is in line with (Moline 1987) that argues that a financial support system in place helps students in need to continue their education and with (Alexe-Coteț, Hâj and Murgescu 2015) that show that the situation in Romania improved significantly after the integration in Bologna Process The total funding for student support (including scholarships, transportation, student housing and cafeterias) almost doubled from 107.755.770 euro to 202.029.265 between 2008 and 2022

No relevant statistical results were found concerning additional educational support or tutoring in relation with students at risk of dropping out (*tutoring_benefit*). The results do not align with the perspectives shared by other scholars such as Roberts (1984) or Ortiz-Lozano, et al. (2020), that stress the significance of tutoring and induction programs as a foundational element of academic and social integration within an institution. While these authors suggest that a concise, one-week induction program may be optimal for initial student integration, the absence of statistical significance for ongoing tutoring benefits could imply that the effectiveness of extended support services like tutoring may depend on their integration

within the broader induction and engagement strategies of the institution. Thus, while initial induction programs are substantiated in their effectiveness, the long-term benefits of continued educational support, such as tutoring, require further empirical exploration to establish their impact on student retention.

4.3. Teaching

This study has found that students' positive perception of interaction with their peers during the learning process (*satisfaction_peer_interaction_support*) is a significant factor in reducing dropout rates. This is particularly true for bachelor's degree students, where the odds of not dropping out increase by up to 34% during the first year of study. Furthermore, this effect persists in the following years, with a reduction of up to 18% two years after the students were surveyed.

This finding is consistent with previous studies, which have shown that cooperative learning can decrease the risk of dropout (Cámara-Zapata and Morales 2020, Poellhuber, Chomienne and Karsenti 2008). Collaborative learning could be also linked to a commitment for group working that has also positive results in tackling dropout (Umbach and Wawrzynski 2005).

First-year bachelor's degree students' perception of the relevance of academic topics to their professional training has been shown to significantly impact their likelihood of dropping out (*topic_relevance_professional_training*). Specifically, research has found that a perceived lack of relevance can increase the odds of dropout by up to 34%. To address this issue, an improved curriculum that aligns with students' perceptions of academic significance can be a powerful tool for reducing attrition rates and promoting learning outcomes (Grove, Hershberger and Bretz 2008). Therefore, particularly for first-year students, it is crucial to foster a deep understanding of their coursework's practical applications and value to bolster student engagement and retention.

No statistically relevant results were found for the question that sought to gauge the quality of teachers based on how well students understood during their classes (*ease_of_understanding*). Therefore, it is not possible to establish whether the teachers' teaching methods significantly predicted retention.

It was assumed that having access to education through university professors' web pages could be related to institutional efforts to overcome economic constraints (***teacher_resource_access***). From the beginning, it was clear that the association between the mentioned indicator and student dropout is not strong, but there is one exception. BA students transitioning from the second to the third study year one year after the census have a 22% chance of progress if they are satisfied with the educational resources available through their teachers' personal webpages. All other results are relevant from a statistical point of view. It is important to emphasize that in Romania, there is no mandatory requirement for teachers to create such pages; alternatively, they may be established through institutional work platforms, such as Moodle.

Additionally, the effectiveness of teaching techniques in enhancing the overall learning experience does not necessarily associate with students' concerns. Despite facing social or economic hardships, students are more likely to persist when they feel they are gaining valuable knowledge and skills. Evaluating the quality of teaching and academic support can be done by examining how teaching techniques facilitate learning, as measured by teaching technique efficacy. However, according to NSS-RO responses, there were no statistically significant results for either generation, indicating that the effectiveness of teaching methods cannot reliably predict lower student dropouts (*teaching_techniques_efficacy*).

While some studies have highlighted the importance of positive student-teacher relationships in reducing dropout rates (Hatos and Pop 2019), there was no clear link between students' perceptions of their teachers' performance and their likelihood to drop out.

Lastly, even quality feedback, which can significantly impact a student's learning experience and academic confidence (*quality_feedback_received*), failed to relate to lower student dropout rates. Although it was assumed that quality feedback for student work, as part of academic support, could reduce the likelihood of students dropping out, the results did not establish any statistically relevant relationships between the variables under consideration for any of the generations surveyed. Receiving constructive feedback may make students feel more supported academically, but it does not appear to be a reliable predictor of lower student dropout rates.

5. COVID-19 Pandemic Challenges and Their Influence on University Dropout Rates

Students' perceptions of the pandemic's impact on their educational journey are closely intertwined with their intentions (OR decision) to drop out, particularly as negative experiences have been shown to amplify the likelihood of withdrawal from university studies (***University dropout***). This correlation holds true across various cohorts—BA first-year students experienced up to a 38% surge in potential dropouts, BA second-year students up to 40%, and MA first-year students 38%. The pattern persists for BA students who began their studies in 2020/2021, with a 39% increased risk of dropping out as they approach their third year, demonstrating the deep-seated and enduring influence of the pandemic on student retention across different academic stages.

Moreover, financial constraints that affect students' ability to participate in the educational process due to the Covid-19 pandemic context—such as inadequate access to IT tools or unreliable internet connections—have been identified as significant predictors of retention (***Impoverished students***). This is especially the case for BA students who were in their first year in 2020/2021, as they were less likely to drop out if they had the proper means to connect to courses, up 24% (one year after the survey) and up to 15% (two years after NSS-RO implementation).

First-year BA students who received comprehensive support from their institutions to facilitate online learning exhibited up to an 18% decrease in the likelihood of ending their studies prematurely. (***HEI support***). Though the study did not encounter other significant results, the results of BA new enrolees of 2020/2021 indicate that having the necessary resources for online learning (like institutional email, learning platforms, etc.) is associated with a decreased likelihood of dropout consideration, highlighting the role of resource availability in supporting students during remote learning. Also, this means that for years of further study, HEIs have tackled dropout concerns due to immediate support received and successful adaptation to online education. Adequate institutional support for online education, including material aid such as laptops and internet access, had a buffering effect on dropout rates during the pandemic.

In contrast, BA first-year students were up to 66% more likely to advance to the subsequent academic year when they had access to important online educational resources conducive to teaching, such as robust working and communication platforms (***Online resources***). The situation maintains for the same generation even two years after the survey while passing from their second to third year, as the odds to advance in their last study year was 56% higher in comparison with those that had the perception of not having such resources. These findings reveal that BA students who commenced their studies in 2020/2021

and reported access to online resources were consistently less inclined to consider dropping out over time.

Statistical analysis did not uncover significant correlations between student dropout rates and the students' perceptions of how higher education institutions (HEIs) transitioned educational processes to online platforms (***Online transition***). The same situation occurred when trying to associate students' leaving with the lack of constant and proper information from the university on potential changes concerning the educational process in a period of uncertainty and frequent changes. This absence of evidence points to a general satisfaction with the transition and underscores the pivotal role of a well-executed shift to remote learning for maintaining student engagement. It also suggests that institutions that communicated effectively and offered clear guidance might have alleviated some of the uncertainty and stress induced by the pandemic, contributing to improved student retention.

6. Discussion and conclusions

The research questions and analysis clearly demonstrate the significance of early signals in addressing potential student dropout. These findings can serve as a valuable resource for the development or updating of public policies to combat dropout, at both the institutional and government levels. It is imperative for higher education institutions to understand the factors that influence student dropout in order to create effective retention strategies. These findings can contribute to the development of policies and practices that combat student dropout and promote successful academic achievement. Romania's completion rates of full-time tertiary students, both at the Bachelor's and Master's level, are not outliers in the broader European context. This is supported by the OECD data presented in Table 4.

As the research methodology proposed binary logistic regressions on clusters of indicators based on the models described above, the indicators are correlated within the same category, increasing the relevance of the results.

Table 4. Completion rates of full-time tertiary students, by level of education and gender (2020).

	Bachelor	**Master**
Austria	26	38
Estonia	43	43
Finland	46	-
France	36	58
Iceland	39	-
Italy	21	-
Lithuania	59	72
Netherlands	29	-
Norway	49	42
Poland	50	48
Portugal	38	67
Romania	**48**	**39**
Slovenia	38	41
Spain	37	58
Sweden	33	38

	Bachelor	Master
Switzerland	39	-
United Kingdom	69	-

Source: OECD (2022). See Source section for more information and Annex 3 for notes (https://www.oecd.org/education/education-at-a-glance/EAG2022_X3-B.pdf). For administrative data on Romania, see Alexe-Coteț, Păunescu and Hâj (2022) for Bachelors' degree. For Master's degree, data was calculated for 2022.

Preuniversity and general factors

- **Pre-university performance at the Baccalaureate is the most significant predictor of retention rates for bachelor's students.** Higher averages are strongly correlated with higher retention rates. Bachelor's degree students can maintain enrolment while achieving a higher average with a probability ranging from 30% to 44%. A high average among master's students does indicate potential dropout. It is important to note this. While pre-university factors such as gender, age, or birthplace have been studied, they have not been shown to have a significant influence.
- **Early identification of students considering leaving higher education is crucial to tackling dropout rates.** Institutions can implement national or institutional instruments to measure students' perceptions of continuing their studies, even from the early stages. This will help to reduce dropout rates and ensure that students are supported throughout their studies. Tailor-made measures will prevent dropouts by identifying students who need academic support.

Academic system

- **Tailoring strategies to combat dropout rates is crucial and requires different approaches for each study cycle.** By acknowledging these differences and tailoring the strategies accordingly, HEI's can effectively combat dropout rates and ensure student success. It is important to consider individual students' unique needs and experiences, including their educational backgrounds, years of study, and timing. While the dropout rate for bachelor's degrees increases gradually over time, master's degree students face a sudden spike due to final exams and thesis defences.
- **Early identification of students who are considering leaving higher education is crucial to combat dropout rates, with an increased likelihood of dropping out by between 12% and 21%, regardless of the study cycle.** To achieve this, national or institutional instruments should be implemented to measure students' perceptions of continuing their studies. By identifying students who may be at risk of dropping out, tailor-made measures can be taken to provide the academic support necessary to prevent this from happening.
- **Additionally, study field represents a good predictor of potential dropout.** For instance, bachelor's degree students from ISCED-F 2013 study fields like *Health and Welfare*, *Social Sciences, Journalism and Information*, and *Education* programs tend to have lower dropout rates. For master's degree students, the highest retention rate was observed in *Agriculture, Forestry, Fisheries, and Veterinary*.
- **Students who want to change their study programme should be taken into account as they could potentially drop out.** Their likelihood of dropping out is up to almost a third (29%) compared to those who are satisfied with their option, especially for undergraduates. Students who recommend their studies to others are less likely to drop out. The likelihood of such a student dropping out is up to 16%, especially for bachelor students. The Covid-19 pandemic and the shift

to online learning have made students' lack of access to university resources and learning spaces strongly associated with potential dropout. This may be particularly the case for academic years that were heavily affected by the pandemic. Apart from overall student satisfaction, a programme's recommendation depends on several factors, such as its academic content, quality of faculty, location and culture, and potential career outcomes. This ultimately confirms a match between the individual and the academic institution.

Social system

- **Students who feel a sense of community are much less likely to drop out.** Particularly for first year students, an increased sense of belonging at university increases the probability of not dropping out by up to 67% for Bachelor students. An increase in the sense of belonging between the first and second year of Bachelor's degree students reduces the probability of not persisting by 16%.
- **HEIs should take into account students' perceived difficulties in completing their bachelor's degree, especially after the first year, as this can increase the probability of dropping out by up to 15%.** The findings highlight that this is about how students find out what is expected of me in my programme. In this sense, academic staff could improve their combination of formal channels and informal interactions to provide better and more useful information, as well as advice and guidance.

Teaching

- **Peer learning is a key determinant of student attrition for undergraduate (and first year masters) students.** Those with a positive perception of peer learning are between 18% and 34% more likely to drop out. And this is true across all years of study. Students who feel that their courses are relevant to their future career are less likely to drop out, by more than a third (34%) at Bachelor's level.

Covid-19

Institutions that surveyed students on this topic in the 2020/2021 academic year were able to get an accurate picture of potential students on the verge of dropping out. Access to online resources was crucial for first-year undergraduate students, as it increased their chances of academic persistence by up to 66%.

Up to 40% of students who considered dropping out of their higher education studies actually did so in the context of Covid-19. Even master's degree students had a high dropout rate, with 38% of them likely to end their studies. Institutional support was provided for first-year students of 2020/2021, not only for online education participation (up to 18%) but also for addressing challenges faced by students in actively participating in (online) classrooms due to poverty (up to 24%). This support could have significantly reduced potential student dropout rates.

Table 5. Statistical relevant and un-relevant factors on student dropout after analysis.

Category	Statistical relevant factors on student dropout	Statistical un-relevant factors on student dropout
Pre-university and general	• High Baccalaureate average correlates with higher retention in BA	• Gender • Age • Birthplace
Academic	• Early identification of students considering leaving (12-21% increased risk). • Study field (ISCED-F) • Changing study program increases dropout risk (29%). • Recommending program reduces dropout risk (16%). • Perceived difficulty in graduating increases dropout risk (15%).	• Personal development opportunities • Learning environment satisfaction • Accessibility of online resources • Benefits of IT resources
Social	• Strong sense of community reduces dropout risk (67% for first-year bachelors). • Perceived difficulty in academic progress increases dropout risk (15%).	• Financial struggles • Ability to cover unexpected expenses
Teaching	• Collaborative learning reduces dropout risk (18-34%). • Feeling courses are relevant to future career reduces dropout risk (34%).	• Quality of teacher explanations • Access to teacher resources on webpages • Effectiveness of teaching techniques • Quality of feedback received
Covid-19	• Up to 40% of students considering dropping out did so during pandemic. • Institutional support for online learning and poverty-related challenges could have reduced dropout rates.	• Perception of online learning transition • Lack of information on changes within HEI due to Covid-19 context

Table 5 shows that there are several statistically irrelevant factors related to student dropout, based on data from NSS-RO and EUROSTUDENT VII. Financial struggles or unforeseen expenses up to 250 euros tend not to statistically influence student dropout. This is just one example. It is common for students to work part-time while studying to meet their basic needs. In addition, support systems have been developed to address such issues. However, this study serves as a foundation for further analysis of student dropout rates in relation to academic, social, and teaching factors, using the institutional departure model derived from Tinto's original findings. The survey was conducted during the early stages of the Covid-19 pandemic, and the results yielded interesting insights that are relevant to various stakeholders.

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8. Annex 1 – Binary logistic regression predicting the impact of pre-entry characteristics on student dropout

@dropout_1year[2] BA - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
age	Age	-0,013	0,015	0,674	1	0,412	0,987
BAC_average	Baccalaureate exam session average	0,259	0,071	13,367	1	0,000	1,295
Birthplace_region	Birthplace - county (NUTS2)	-0,002	0,006	0,161	1	0,688	0,998
first_gen	First-generation students	-0,002	0,183	0,000	1	0,990	0,998
gender	Gender	0,194	0,157	1,515	1	0,218	1,214
-	Constant	7,963	3,891	4,188	1	0,041	2873,582
@dropout_1year[3] BA – 2nd year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
age	Age	0,040	0,032	1,551	1	0,213	1,041
BAC_average	Baccalaureate exam session average	0,363	0,095	14,515	1	0,000	1,437
Birthplace_region	Birthplace - county (NUTS2)	0,003	0,008	0,181	1	0,671	1,003
first_gen	First-generation students	0,018	0,251	0,005	1	0,942	1,018
gender	Gender	0,307	0,212	2,095	1	0,148	1,359
-	Constant	2,809	4,995	0,316	1	0,574	16,596
@dropout_1year[4] MA - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
age	Age	-0,038	0,025	2,274	1	0,132	0,963
BAC_average	Baccalaureate exam session average	-0,247	0,116	4,564	1	0,033	0,781
Birthplace_region	Birthplace - county (NUTS2)	0,018	0,009	4,230	1	0,040	1,018
first_gen	First-generation students	-0,016	0,265	0,003	1	0,953	0,985
gender	Gender	0,553	0,228	5,885	1	0,015	1,739
-	Constant	4,161	5,685	0,536	1	0,464	64,150
@dropout_2years[5] BA - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
age	Age	-0,006	0,012	0,225	1	0,635	0,994
BAC_average	Baccalaureate exam session average	0,261	0,053	24,349	1	0,000	1,298
Birthplace_region	Birthplace - county (NUTS2)	-0,002	0,004	0,136	1	0,712	0,998
first_gen	First-generation students	-0,003	0,136	0,000	1	0,985	0,997
gender	Gender	0,123	0,117	1,106	1	0,293	1,131
-	Constant	-0,214	2,895	0,005	1	0,941	0,807
@dropout_2years[6] MA - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
age	Age	-0,012	0,017	0,515	1	0,473	0,988
BAC_average	Baccalaureate exam session average	-0,046	0,069	0,433	1	0,511	0,955
Birthplace_region	Birthplace - county (NUTS2)	-0,004	0,005	0,648	1	0,421	0,996
first_gen	First-generation students	-0,159	0,163	0,947	1	0,330	0,853
gender	Gender	0,287	0,144	3,999	1	0,046	1,332

[2] R^2 = .027 (Nagelkerke). Cox & Snell R^2 = .012. Chi^2 = 26.778, p < .001
[3] R^2 = .029 (Nagelkerke). Cox & Snell R^2 = .008. Chi^2 = 21.106, p = .002.
[4] R^2 = .032 (Nagelkerke). Cox & Snell R^2=.016. Chi^2 = 14.378, p = .026.
[5] R^2 = .024 (Nagelkerke). Cox & Snell R^2=.014. Chi^2 = 31.572, p < .001.
[6] R^2 = .023 (Nagelkerke). Cox & Snell R^2=.017. Chi^2 = 15.653, p = .016.

-	Constant	-10,861	3,546	9,380	1	0,002	0,000

9. Annex 2 – Binary logistic regression predicting dropout status on variables related to the academic system

@dropout_1year[7] BA - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q1.2	uni_personal_development	-0,111	0,111	1,008	1	0,315	0,895
@2020_Q2.1	tech_resource_access	0,196	0,101	3,761	1	0,052	1,217
@2020_Q2.7	satisfaction_with_learning_spaces	0,005	0,116	0,002	1	0,968	1,005
@2020_Q8.2	online_resource_accessibility	0,084	0,102	0,675	1	0,411	1,087
Q3.6_6_2	recommend_program	0,147	0,058	6,391	1	0,011	1,158
Q3.6_6_4	university_intent	0,086	0,053	2,591	1	0,107	1,089
Q3.6_6_5	change_study_program	-0,344	0,053	42,320	1	0,000	0,709
Q3.6_6_6	consider_leaving_HE	-0,084	0,056	2,272	1	0,132	0,919
-	Constant	1,927	0,451	18,232	1	0,000	6,870
@dropout_1year[8] BA – 2nd year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q1.2	uni_personal_development	0,131	0,124	1,116	1	0,291	1,140
@2020_Q2.1	tech_resource_access	-0,179	0,124	2,061	1	0,151	0,836
@2020_Q2.7	satisfaction_with_learning_spaces	0,149	0,116	1,644	1	0,200	1,161
@2020_Q8.2	online_resource_accessibility	-0,039	0,117	0,109	1	0,741	0,962
Q3.6_6_2	recommend_program	0,158	0,071	4,883	1	0,027	1,171
Q3.6_6_4	university_intent	0,052	0,068	0,586	1	0,444	1,053
Q3.6_6_5	change_study_program	-0,283	0,062	20,798	1	0,000	0,753
Q3.6_6_6	consider_leaving_HE	-0,239	0,067	12,787	1	0,000	0,788
-	Constant	3,110	0,501	38,481	1	0,000	22,424
@dropout_1year[9] MA - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q1.2	uni_personal_development	-0,004	0,151	0,001	1	0,978	0,996
@2020_Q2.1	tech_resource_access	0,229	0,137	2,778	1	0,096	1,257
@2020_Q2.7	satisfaction_with_learning_spaces	0,071	0,131	0,298	1	0,585	1,074
@2020_Q8.2	online_resource_accessibility	-0,086	0,147	0,343	1	0,558	0,917
Q3.6_6_2	recommend_program	0,103	0,080	1,660	1	0,198	1,108
Q3.6_6_4	university_intent	0,093	0,081	1,310	1	0,252	1,097
Q3.6_6_5	change_study_program	-0,124	0,078	2,527	1	0,112	0,883
Q3.6_6_6	consider_leaving_HE	-0,189	0,076	6,173	1	0,013	0,828
-	Constant	1,275	0,604	4,452	1	0,035	3,580
@dropout_2years[10] BA - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q1.2	uni_personal_development	-0,086	0,085	1,015	1	0,314	0,917
@2020_Q2.1	tech_resource_access	0,086	0,080	1,156	1	0,282	1,090

[7] R^2 = .094 (Nagelkerke). Cox & Snell R^2 = .042. Chi^2 = 130.787, p < .001.
[8] R^2 = .089 (Nagelkerke). Cox & Snell R^2 = .029. Chi^2 = 106.766, p < .001.
[9] R^2 = .051 (Nagelkerke). Cox & Snell R^2=.026. Chi^2 = 35.930, p < .001.
[10] R^2 = .075 (Nagelkerke). Cox & Snell R^2=.045. Chi^2 = 140.360, p < .001.

@2020_Q2.7	satisfaction_with_learning_spaces	-0,021	0,088	0,055	1	0,814	0,980
@2020_Q8.2	online_resource_accessibility	0,057	0,079	0,518	1	0,472	1,059
Q3.6_6_2	recommend_program	0,130	0,044	8,790	1	0,003	1,139
Q3.6_6_4	university_intent	0,049	0,041	1,420	1	0,233	1,051
Q3.6_6_5	change_study_program	-0,260	0,042	38,764	1	0,000	0,771
Q3.6_6_6	consider_leaving_HE	-0,122	0,045	7,441	1	0,006	0,885
-	Constant	1,533	0,355	18,630	1	0,000	4,633
@dropout_2years[11] MA - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q1.2	uni_personal_development	0,124	0,104	1,414	1	0,234	1,132
@2020_Q2.1	tech_resource_access	-0,166	0,097	2,949	1	0,086	0,847
@2020_Q2.7	satisfaction_with_learning_spaces	0,174	0,088	3,906	1	0,048	1,191
@2020_Q8.2	online_resource_accessibility	0,078	0,102	0,577	1	0,448	1,081
Q3.6_6_2	recommend_program	0,092	0,054	2,865	1	0,091	1,097
Q3.6_6_4	university_intent	-0,074	0,056	1,729	1	0,189	0,929
Q3.6_6_5	change_study_program	-0,025	0,059	0,176	1	0,675	0,975
Q3.6_6_6	consider_leaving_HE	-0,180	0,061	8,705	1	0,003	0,835
-	Constant	-0,280	0,434	0,416	1	0,519	0,756

10. Annex 3 – Binary logistic regression predicting dropout status on variables related to the social system

@dropout_1year[12] BA - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q1.4	sense_of_community	0,514	0,119	18,569	1	0,000	1,671
@2020_Q10.3	tutoring_benefit	0,115	0,114	1,012	1	0,314	1,122
Q3.6_6_1	difficulty_expectations	0,168	0,064	6,863	1	0,009	1,183
Q3.6_6_3	belonging_in_HE	-0,141	0,059	5,727	1	0,017	0,868
Q4.19_19_1	financial_difficulties	-0,059	0,070	0,695	1	0,405	0,943
Q4.20	cover_unexpected_expense	-0,001	0,126	0,000	1	0,997	0,999
-	Constant	0,712	0,452	2,482	1	0,115	2,039
@dropout_1year[13] BA – 2nd year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q1.4	sense_of_community	0,295	0,126	5,452	1	0,020	1,343
@2020_Q10.3	tutoring_benefit	-0,028	0,120	0,053	1	0,817	0,973
Q3.6_6_1	difficulty_expectations	0,022	0,074	0,087	1	0,768	1,022
Q3.6_6_3	belonging_in_HE	-0,279	0,062	19,990	1	0,000	0,756
Q4.19_19_1	financial_difficulties	-0,098	0,081	1,464	1	0,226	0,907
Q4.20	cover_unexpected_expense	-0,041	0,139	0,088	1	0,767	0,960
-	Constant	3,152	0,522	36,537	1	0,000	23,392
@dropout_1year[14] MA - 1st year		B	S.E.	Wald	df	Sig.	Exp (B)

[11] R^2 = .042 (Nagelkerke). Cox & Snell R^2=.032. Chi^2 = 43.743, p < .001.
[12] R^2 = .044 (Nagelkerke). Cox & Snell R^2 = .020. Chi^2 = 37.720, p < .001
[13] R^2 = .042 (Nagelkerke). Cox & Snell R^2 = .013. Chi^2 = 35.763, p < .001.
[14] R^2 = .029 (Nagelkerke). Cox & Snell R^2=.015. Chi^2 = 14.609, p = .024..

@2020_Q1.4	sense_of_community	0,350	0,147	5,686	1	0,017	1,419
@2020_Q10.3	tutoring_benefit	0,159	0,140	1,297	1	0,255	1,172
Q3.6_6_1	difficulty_expectations	-0,027	0,084	0,104	1	0,747	0,973
Q3.6_6_3	belonging_in_HE	-0,024	0,085	0,079	1	0,778	0,976
Q4.19_19_1	financial_difficulties	0,089	0,088	1,038	1	0,308	1,094
Q4.20	cover_unexpected_expense	0,054	0,143	0,141	1	0,707	1,055
-	Constant	0,557	0,549	1,029	1	0,310	1,746
@dropout_2years[15] BA - 1st year		B	S.E.	Wald	df	Sig.	Exp (B)
@2020_Q1.4	sense_of_community	0,292	0,092	10,066	1	0,002	1,339
@2020_Q10.3	tutoring_benefit	0,106	0,085	1,549	1	0,213	1,112
Q3.6_6_1	difficulty_expectations	0,037	0,048	0,617	1	0,432	1,038
Q3.6_6_3	belonging_in_HE	-0,115	0,044	6,746	1	0,009	0,891
Q4.19_19_1	financial_difficulties	-0,041	0,052	0,636	1	0,425	0,960
Q4.20	cover_unexpected_expense	-0,024	0,093	0,068	1	0,794	0,976
-	Constant	0,753	0,350	4,611	1	0,032	2,123
@dropout_2years[16] MA - 1st year		B	S.E.	Wald	df	Sig.	Exp (B)
@2020_Q1.4	sense_of_community	0,296	0,108	7,529	1	0,006	1,344
@2020_Q10.3	tutoring_benefit	0,058	0,092	0,402	1	0,526	1,060
Q3.6_6_1	difficulty_expectations	-0,089	0,055	2,553	1	0,110	0,915
Q3.6_6_3	belonging_in_HE	-0,022	0,058	0,136	1	0,712	0,979
Q4.19_19_1	financial_difficulties	-0,083	0,058	2,030	1	0,154	0,921
Q4.20	cover_unexpected_expense	-0,051	0,092	0,300	1	0,584	0,951
-	Constant	-0,319	0,387	0,681	1	0,409	0,727

11. Annex 4 – Binary logistic regression predicting dropout status on variables related to teaching

@dropout_1year[17] BA - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q6.1_s	ease_of_understanding	0,095	0,108	0,766	1	0,381	1,099
@2020_Q6.3_s	teaching_techniques_efficacy	-0,029	0,126	0,054	1	0,817	0,971
@2020_Q6.6_s	topic_relevance_professional_training	0,293	0,103	8,054	1	0,005	1,341
@2020_Q7.2_s	quality_feedback_received	0,005	0,090	0,003	1	0,956	1,005
@2020_Q8.3_s	teacher_resource_access	0,007	0,084	0,008	1	0,930	1,007
@2020_Q8.6_s	satisfaction_peer_interaction_support	0,290	0,087	11,028	1	0,001	1,336

[15] R^2 = .026 (Nagelkerke). Cox & Snell R^2=.016. Chi^2 = 29.679, p < .001.
[16] R^2 = .035 (Nagelkerke). Cox & Snell R^2=.027. Chi^2 = 25.890, p < .001.
[17] R^2 = .045 (Nagelkerke). Cox & Snell R^2 = .022. Chi^2 = 75.251, p < .001.

-	Constant	0,353	0,223	2,496	1	0,114	1,423
@dropout_1year[18] BA – 2nd year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q6.1_s	ease_of_understanding	0,125	0,127	0,967	1	0,325	1,133
@2020_Q6.3_s	teaching_techniques_efficacy	0,127	0,146	0,757	1	0,384	1,135
@2020_Q6.6_s	topic_relevance_professional_training	0,170	0,114	2,238	1	0,135	1,186
@2020_Q7.2_s	quality_feedback_received	0,103	0,106	0,937	1	0,333	1,108
@2020_Q8.3_s	teacher_resource_access	-0,317	0,094	11,295	1	0,001	0,728
@2020_Q8.6_s	satisfaction_peer_interaction_support	0,264	0,100	6,990	1	0,008	1,302
-	Constant	1,604	0,261	37,899	1	0,000	4,973
@dropout_1year[19] MA - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q6.1_s	ease_of_understanding	-0,096	0,159	0,365	1	0,546	0,908
@2020_Q6.3_s	teaching_techniques_efficacy	0,110	0,186	0,350	1	0,554	1,116
@2020_Q6.6_s	topic_relevance_professional_training	0,098	0,148	0,438	1	0,508	1,103
@2020_Q7.2_s	quality_feedback_received	-0,103	0,141	0,526	1	0,468	0,903
@2020_Q8.3_s	teacher_resource_access	-0,164	0,112	2,142	1	0,143	0,849
@2020_Q8.6_s	satisfaction_peer_interaction_support	0,181	0,132	1,887	1	0,170	1,199
-	Constant	0,807	0,340	5,640	1	0,018	2,242
@dropout_2years[20] BA - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q6.1_s	ease_of_understanding	-0,062	0,083	0,548	1	0,459	0,940
@2020_Q6.3_s	teaching_techniques_efficacy	-0,070	0,097	0,515	1	0,473	0,933
@2020_Q6.6_s	topic_relevance_professional_training	0,171	0,081	4,487	1	0,034	1,187

[18] R^2 = .033 (Nagelkerke). Cox & Snell R^2 = .011. Chi^2 = 49.762, p < .001.
[19] R^2 = .029 (Nagelkerke). Cox & Snell R^2=.015. Chi^2 = 23.741, p = .005.
[20] R^2 = .028 (Nagelkerke). Cox & Snell R^2=.018. Chi^2 = 62.268, p < .001.

@2020_Q7.2_s	quality_feedback_received	0,061	0,070	0,777	1	0,378	1,063
@2020_Q8.3_s	teacher_resource_access	-0,077	0,064	1,414	1	0,234	0,926
@2020_Q8.6_s	satisfaction_peer_interaction_support	0,168	0,069	5,912	1	0,015	1,183
-	Constant	0,156	0,185	0,713	1	0,398	1,169
@dropout_2years[21] MA - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q6.1_s	ease_of_understanding	0,033	0,110	0,089	1	0,766	1,033
@2020_Q6.3_s	teaching_techniques_efficacy	0,071	0,126	0,320	1	0,572	1,074
@2020_Q6.6_s	topic_relevance_professional_training	0,172	0,105	2,679	1	0,102	1,188
@2020_Q7.2_s	quality_feedback_received	-0,128	0,097	1,724	1	0,189	0,880
@2020_Q8.3_s	teacher_resource_access	0,036	0,073	0,246	1	0,620	1,037
@2020_Q8.6_s	satisfaction_peer_interaction_support	-0,063	0,095	0,440	1	0,507	0,939
-	Constant	-0,957	0,256	13,988	1	0,000	0,384

12. Annex 5 – Binary logistic regression predicting dropout status on Covid-19 pandemic impact in students' perception (NSS-RO)

@dropout_1year BA[22] - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q0.1	university_dropout	-0,477	0,084	32,473	1	0,000	0,621
@2020_Q0.2	impoverished_students	0,219	0,079	7,698	1	0,006	1,245
@2020_Q0.3	HEI_support	-0,198	0,093	4,485	1	0,034	0,820
@2020_Q0.5	online_transition	0,099	0,096	1,082	1	0,298	1,105
@2020_Q0.6	online_resources	0,508	0,116	19,002	1	0,000	1,661
@2020_Q0.7	HEI_information	0,042	0,104	0,163	1	0,686	1,043
-	Constant	1,078	0,375	8,285	1	0,004	2,940
@dropout_1year BA[23] – 2nd year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q0.1	university_dropout	-0,509	0,086	34,818	1	0,000	0,601
@2020_Q0.2	impoverished_students	0,062	0,081	0,588	1	0,443	1,064
@2020_Q0.3	HEI_support	-0,007	0,123	0,003	1	0,957	0,993
@2020_Q0.5	online_transition	0,184	0,100	3,402	1	0,065	1,202
@2020_Q0.6	online_resources	0,064	0,119	0,294	1	0,588	1,066

[21] R^2 = .027(Nagelkerke). Cox & Snell R^2=.020. Chi^2 = 32.257, p < .001.
[22] R^2 = .57 (Nagelkerke). Cox & Snell R^2 = .028. Chi^2 = 75.422, p < .001
[23] R^2 = .033 (Nagelkerke). Cox & Snell R^2 = .011. Chi^2 = 50.554, p < .001.

@dropout_1year BA[22] - 1st year		B	S.E.	Wald	df	Sig.	Exp (B)
@2020_Q0.7	HEI_information	-0,032	0,101	0,102	1	0,750	0,968
-	Constant	3,265	0,409	63,674	1	0,000	26,175
@dropout_1year MA[24] - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q0.1	university_dropout	-0,475	0,114	17,464	1	0,000	0,622
@2020_Q0.2	impoverished_students	0,139	0,108	1,653	1	0,198	1,149
@2020_Q0.3	HEI_support	-0,072	0,122	0,348	1	0,555	0,930
@2020_Q0.5	online_transition	-0,046	0,139	0,109	1	0,741	0,955
@2020_Q0.6	online_resources	0,248	0,174	2,031	1	0,154	1,282
@2020_Q0.7	HEI_information	0,070	0,141	0,250	1	0,617	1,073
-	Constant	1,838	0,530	12,051	1	0,001	6,286
@dropout_2years BA[25] - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q0.1	university_dropout	-0,500	0,066	56,558	1	0,000	0,607
@2020_Q0.2	impoverished_students	0,136	0,061	4,995	1	0,025	1,146
@2020_Q0.3	HEI_support	-0,136	0,074	3,397	1	0,065	0,873
@2020_Q0.5	online_transition	0,057	0,075	0,573	1	0,449	1,059
@2020_Q0.6	online_resources	0,444	0,099	19,943	1	0,000	1,558
@2020_Q0.7	HEI_information	-0,051	0,084	0,374	1	0,541	0,950
-	Constant	0,940	0,316	8,842	1	0,003	2,560
@dropout_2years MA[26] - 1st year		**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
@2020_Q0.1	university_dropout	-0,194	0,084	5,383	1	0,020	0,824
@2020_Q0.2	impoverished_students	-0,073	0,070	1,077	1	0,299	0,930
@2020_Q0.3	HEI_support	0,024	0,081	0,088	1	0,767	1,024
@2020_Q0.5	online_transition	0,133	0,090	2,175	1	0,140	1,143
@2020_Q0.6	online_resources	0,061	0,126	0,233	1	0,630	1,063
@2020_Q0.7	HEI_information	0,027	0,094	0,080	1	0,778	1,027
-	Constant	-0,217	0,385	0,318	1	0,573	0,805

[24] R^2 = .032 (Nagelkerke). Cox & Snell R^2 = .016. Chi^2 = 23.150, p = .001.
[25] R^2 = .057 (Nagelkerke). Cox & Snell R^2 = .036. Chi^2 = 96.062, p < .001.
[26] R^2 = .018 (Nagelkerke). Cox & Snell R^2 = .014. Chi^2 = 19.428, p = .003.