

Multilevel modeling of persistence in higher education

Maria Eugénia Ferrão ^a

Leandro S. Almeida ^b

Abstract

The dropout or evasion rates in higher education are now a social and institutional concern, justifying the implementation of public policies to prevent this phenomenon. These policies need studies on the most determinant variables of the risk of dropout. The main objective of this study is to analyze the student's persistence in undergraduate courses, and the relationship with the student's previous school trajectory and with the conditions of entrance into higher education, controlling for students' sociodemographic characteristics, such as gender and age. We applied multilevel logistic regression models to data of 2.697 freshmen enrolled in a Portuguese public university in the academic year 2015/16. The results suggest that failure in basic education (ISCED 2) has a long-term effect. According to the estimates obtained, students who declare not having failed in basic education have odds ratio of persistence 2.7 times higher than students who declare having failed in basic education. The conditions of student's admission to the course he/she attends are relevant variables to persistence in Higher Education, for example, whether s/he was admitted to her/his first option course and the student's university entrance score. The results also show that older and male students have lower probability of persistence.

Keywords: Higher Education. Dropout. Persistence. Multilevel logistic regression.

1 Introduction

In Portugal, the annual number of admissions to undergraduate courses has been around 60,000 students in recent years. From 1971 to 2011, the variation in the number of students enrolled in higher education was 700%, ranging from 49,461 in 1971 to 396,268 in 2011. DIAS (2015) presented a detailed analysis

^a University of Beira Interior. Covilhã, Portugal. CEMAPRE – Centro de Matemática Aplicada à Previsão e Decisão Económica. Lisboa, Portugal.

^b University of Minho. Braga, Portugal.

Recebido em: 06 fev. 2018

Aceito em: 09 mai. 2018

of official statistics on how this strong increase was achieved, and raised the question of whether such an increase (“massification”) led to greater equity not only in terms of access but also success in higher education. In fact, this growth implied an increase in the heterogeneity of the student population, in terms of gender, socioeconomic level, age group and past academic trajectories, not always accompanied by changes in attitudes and practices by teachers and institutions.

There is a broad consensus on the need for universities to promote their students’ success, since many of them do not achieve their goals or do not fully realize their potential during university experience, which is a waste of talent and human potential. In the last years, dropout rates have increased in Portugal, and institutions have been questioned about their policies to support student retention (DIAS et al., 2011; FERREIRA; VIDAL; VIEIRA, 2014), in particular with regard to the goals of the Europe 2020 strategy (EUROPEAN COMMISSION, 2013) targeting 40% of young adults with a higher education diploma.

Several authors (for example, TINTO; PUSSER, 2006) report that despite the abundant research and debate on dropout (attrition, withdrawal process or evasion), less attention has been given to the development of a model for action aimed at increasing the persistence and, as such, improving the students’ success. The authors propose a model that includes institutional factors as a complement to the students’ variables. Such a perspective, already present in Tinto and Cullen (1973), for example, considers that each student exists in a particular context that shapes his/her probability of success in post-secondary education. A specific context for student success is shaped by a variety of contextual factors, including demographics, history, culture, state or locality characteristics, the institutional matrix, available resources, and existing policies. Within and around a given context, competition from interest groups generates demands for institutional policies that can change the likelihood of student success. Also Braxton, Hirschy and Mcclendon (2004) argue that the responsibility for success in higher education does not lie solely with the individual student. Instead, the process of dropout is understood as an interaction between the student and the university. According to Georg (2009), students do not consider abandoning due to stress or lack of ability, but mainly due to poor commitment to their course or area of study. According to the results presented by the author, the institutional influence on the student’s propensity for dropping out is therefore modest. In the same sense, the results of the research presented by Pike and Graunke (2015) emphasize student variables in particular vocational and career issues.

Tinto and Cullen (1973) report that evidence-based studies of dropout in only one institution have serious limitations. As institutions differ from one

another, they diverge in dropout rates and associated factors, even after taking into account the characteristics of the students. Different institutions present differential effects on the retention of students from different sociocultural backgrounds. Therefore, according to the authors, studies based on more than one institution are “not only difficult to interpret but also difficult to compare to single institutional studies even when institutional characteristics are taken into account’ (p. 10). It should be borne in mind that such review – one of the most cited in the literature on higher education – is based on a set of 130 articles, books or reports published in the USA between 1951 and 1973. The empirical evidence included in those publications does not use multilevel or hierarchical regression models that are currently more widely disseminated and accessible. Today, multilevel modeling gives us the possibility of analyzing the search for unprecedented empirical evidence, as can be seen in more recent papers (DRAPER; GITTOES, 2004; SOARES, RIBEIRO; CASTRO, 2001). On the other hand, the phenomenon of dropout has some complexity in terms of collecting data to ensure the reliability of the measure. Among the studies considered in the review, diversity was considerable in terms of the definition of dropout and its operationalization through the collection of data. According to those authors, the definitions of dropout can be divided into two main groups: (a) referring to the individuals who leave the higher education institution where they are enrolled; (b) referring only to individuals who, having entered higher education, did not complete their training in any higher education institution and never received a degree.

Studies based on single institution data are classified in the first group and, generally, this group also includes studies that consider as dropping out those students who left the institution where they were enrolled, and decided to transfer to another higher education institution. The higher education system works dynamically. It is a system where institutions and students coexist, where institutions have diversified offers and individuals, with varied characteristics and different expectations, take an active role in the search for higher education (vocational choices and professional career perspectives may be the reason for course or institution changes). It is also usual to classify in this group individuals who temporarily suspend their attendance at higher education. However, we find in the literature concepts that aim to improve the approach to the phenomenon that occurs in reality. The study of phenomena related to dropout, such as the concept of retention (PERMZADIAN; CREDÉ, 2016; TINTO, 2010; WILLSON; HUGHES, 2006), persistence or permanence (ISHITANI, 2016; JOHNSON, 2008) (GROSS et al., 2015; RHEE, 2008), contributes, among other things, to improving the reliability of the measure concerning the phenomenon under research.

Empirical studies have shown that the determinants affecting temporary cessation and transfer are different from those that influence dropout (RHEE, 2008). For example, the study of Pascarella et al. (1981) is illustrative of the differential effects of individual factors for each type of dropout. Specifically, they sought to determine the role of pre-entry characteristics in predicting persistence, suspension, and dropout. The authors found that the patterns of discrimination among the three phenomena were considerably different. In addition to the pre-entry characteristics, the process of admission to higher education, including the conditions of access and choice of institution and course, also has an effect on student persistence and success (ALMEIDA et al., 2006; ENGLISH; UMBACH, 2016; SOARES; RIBEIRO; CASTRO, 2001).

Some authors (BITTENCOURT; MERCADO, 2014) refer that the main causes for dropping out from distance education courses may be related to students' dissatisfaction with the tutor/teachers or with technological problems, in particular with the platform. The limited number of publications on student's persistence in distance education courses shows that the subject has received little attention from researchers in education. Such specificity goes beyond the scope of this article dealing with evasion in face-to-face courses.

The access to Portuguese higher education is guided by a *numerus clausus* system established through a national public tender, in order to prioritize the admission of students with higher access classification. Approximately 40% of students are placed in their first option on course and institution. Portela et al. (2008) have suggested that students rank courses and institutions implicitly when making their choices in the access to the university. This raises questions about the influence of first choice-admission on individual student performance throughout his/her undergraduate course. Thus, the interaction between student and university begins when the student chooses the university and the course he/she intends to attend. Several authors have emphasized that the student's socioeconomic and cultural capital is associated with a preference for more prestigious courses or institutions (TAVARES et al., 2008; TAVARES; FERREIRA, 2012). According to Tavares et al. (2008), students who come from disadvantaged backgrounds have a greater preference for courses related to teacher training and management, while students who have a privileged family background are more likely to choose courses in law, art, health, science and technology.

Studies on Portuguese higher education provide important descriptive analysis, but are mostly based on aggregated data. In the scope of this study, we will

use microdata and the concept of student persistence, an attribute measured through the observation of students enrolled for the first time in the first year at the University of Minho in the academic year 2015/6 and who reached the end of the first year with GPA (Grade Point Average). This means the student did not give up during the first year, did not suspend their studies, did not transfer to another course/institution or did not finish the school year without at least one curricular unit approved. We will use the students' microdata to model the phenomenon of interest. To our knowledge, this is the first study to apply multilevel regression models to Portuguese microdata on persistence in higher education.

As suggested by the literature, the risk of dropping out is higher during the first year (BARDAGI; HUTZ, 2009; CHEN, 2012; GEORG, 2009). Programs and practices aimed at reducing dropout can maximize their effects by placing more emphasis on the permanence of students in the first year. Given the hierarchical structure of the data, we will apply a multilevel logistic regression model, similar to other studies (DRAPER; GITTOES, 2004), where student is the level 1 unit and course is the level 2 unit.

This study aims to answer the following research questions: (1) Is the first choice/admission in the university or in the course important for the persistence of the student enrolled for the first time in the first year? (2) Is there any empirical evidence in Portugal that the classification of university entrance is predictive of the persistence of the student enrolled for the first time in the first year? (3) Is there any evidence of the long-term effect of the school trajectory, namely repetition in primary education and/or secondary education, in the student's persistence in higher education?

2 Methods

2.1 Participants and variables

The sample consists of 2,697 first year students who were enrolled in the University of Minho, a public university in the north of Portugal, in the academic year 2015/2016. The data used for the purpose of this work relates to the following attributes of the student: persistence (1: if the student reached the end of the first year with academic performance assessed through an average score; 0: otherwise), university entrance classification; first option-admission (yes/no) in the institution and in the undergraduate course; sex (1: male; 0: female); trajectory of schooling assessed by the experience of early repetition (0: yes; 1: no); education of parents as a proxy for student'

socioeconomic status. Most of the students are female (57%), enrolled in their first choice course (59%) and in the first choice college (72%). Almost half of the students (47%) enrolled in a STEM (Science, Technology, Engineering and Mathematics) course, 17% in Economics, Administration or Public Administration, 13% in Humanities, 10% in Social Sciences, 8% in Health or nursing and 5% in Law. The students' ages range from 16 to 61 years, with an average of 18.9 (SD = 3.6) and 91.9% are full-time students. The average entrance classification at the university is 152.4 (SD = 18.9). Most students (83.3%) state that they have been always promoted throughout their schooling trajectory and 13.9% mentioned at least one repetition. The distribution of students by parents' education shows that 34.4% of students have parents with no more than basic education (ISCED 2) and 15.7% of students have parents with a higher education (at least ISCED 4) diploma. Student's academic performance (GPA) data is available for 72% of the students. The other cases (28%) are not available due to different situations, such as non-achievement in all curricular units, dropout or transfer to other institutions. Descriptive statistics for this subset of students with no academic scores at the end of the first year show that they are generally older, most likely to have been repeaters in primary (ISCED 2) or secondary education (ISCED 3), and have, on average, lower grades of university entrance.

2.2 Procedures

The students were informed about the objectives of the Observatory study and we guaranteed the confidentiality of the data. The students gave their informed written consent, also allowing access to their classifications (GPA) at the end of the first semester and at the end of the first year. The remaining data was collected at the time of the student's registration at the university. For statistical modeling purposes, we decided to standardize the variable that represents the university entrance score.

The GPA of the first year is missing for 757 students, of whom 57% are in the "dropout" situation from the University of Minho, 17% did not enroll in any course, and the remaining 27% may have suspended their studies temporarily or did not get approval in any curricular unit. The majority (53%) are female students.

Statistical modeling aims to contribute to defining the profile of students who enter for the first time the University of Minho and reach the end of the year with GPA, a proxy for persistence, compared to students who for any reason – suspension, dropout, transfer or failure – did not obtain an average grade at the end of the first year.

2.3 Statistical modeling

For the modeling of persistence, we considered a two-level logistic regression model (students grouped in courses), with a logit link function. The variable of interest, Y , represents the situation of the student in relation to the demonstration of persistence in the course in which he/she enrolled. It is a binary variable with a value of 1 if the student reached the end of the first year and obtained GPA score and 0 otherwise.

The probability of persistence of student i in course j is denoted by $P(y_{ij} = 1)$, with $i = 1, \dots, n_j, j=1, \dots, J$, where J is the number of courses ($J = 54$) and n_j is the number of students in course j . The equation of the multilevel logistic regression model is written as follows,

$$\log \frac{P(y_{ij}=1)}{1-P(y_{ij}=1)} = \beta_{0j} + \beta_1 x_{1(ij)} + \dots + \beta_9 x_{9(ij)}, \quad (1)$$

$$\beta_{0j} = \beta_0 + u_{0j},$$

$$u_{0j} \sim N(0, \sigma_{u_0}^2),$$

where there are additive terms referring to nine explanatory variables, and the function is designated by logit function, or by logite in Portugal, logito in Brazil (SOCIEDADE PORTUGUESA DE ESTATÍSTICA; ASSOCIAÇÃO BRASILEIRA DE ESTATÍSTICA, 2011). Details about the model can be found, for example, in Goldstein (2011) or in the synthesis presented by Ferrão (2015a).

The explanatory variables, X1 through X9 in equation (1), are defined as follows. The variables X1 and X2 represent individual characteristics of students, gender and age, respectively. The variables X3 and X4 are dummies and refer to the level of education of parents or guardians, that is, X3 represents the group of students whose fathers and mothers do not have more than basic education, and X4 represents the group of students whose fathers and mothers hold a higher education diploma. In this design, the reference group consists of the group of students whose parents hold any other combination in terms of level of education. With such a design, we have attempted to represent in X3 the lower tail of the parents' education distribution and in X4 the upper tail. Variables X5 and X6 represent the student's situation in relation to the experience of repetition in primary and secondary education, respectively. The variable X7 represents the student's university entrance score. The conditions of admission to the university are also obtained through variables X8 and X9, indicating if the student was admitted to the course and the university, respectively, in his/her first option.

We used the MLwiN 2.31 statistical software (RASBASH et al., 2014) and the estimation procedure PQL2 (GOLDSTEIN; RASBASH, 1996). We considered missing values occurring completely at random (LITTLE; RUBIN, 2002).

3 Results

Table 1 contains the estimates of the fixed and random parameters of the multilevel logistic regression model.

Table 1. Estimates of fixed and random parameters.

	M1		M2		M3	
	Estimate	SE	Estimate	SE	Estimate	SE
Fixed parameters						
Constant	1.709	0.174	0.881	0.365	0.471	0.385
Male vs. Female	-0.456*	0.124	-0.416*	0.128	-0.336*	0.131
Age > 19	-1.856*	0.161	-1.701*	0.169	-1.771*	0.176
Parents' education: Less than lower secondary education	-0.129	0.118	-0.121	0.128	-0.140	0.130
Parents' education: Higher education	-0.099	0.167	-0.201	0.173	-0.186	0.176
Repetition at Basic Education (No vs. Yes)			0.939*	0.319	0.955*	0.323
Repetition at Upper Sec Education (No vs. Yes)			0.301	0.186	0.299	0.188
Entrance HE classification score			0.224*	0.085	0.148**	0.088
first option course (Yes vs. No)					0.591*	0.132
first option university (Yes vs. No)					0.070	0.142
Random Parameters						
Level 2: Course						
Variance	1.102	0.251	1.084	0.253	1.102	0.261
Level 1: Student						
Variance	1.000	0.000	1.000	0.000	1.000	0.000
Number of level 2 units: Course	55		55		55	
Number of level 1 units: Student	2,438		2,378		2,328	
Estimation procedure	RIGLS (PQL2)		RIGLS (PQL2)		RIGLS (PQL2)	

Source: own calculation (2018).

* p value < 0.05; ** p value < 0.10.

Model M1 considers the individual variables of the student and the family background, the M2 model additionally includes the variables of the previous schooling trajectory and the M3 model adds the variables that represent the conditions of admission to the university. Finally, the model was adjusted with variables whose coefficient parameters are statistically different from zero at the significance level of 10% and the results are presented in Table 2.

The relationship of the individual variables remained statistically significant in all models, indicating that females and individuals up to 19 years of age were more likely to persist in the first year of studies. The estimates obtained in the final model suggest that the odds ratio in the persistence of students aged up to 19 years is almost six times (5.94) higher when compared to students over 19 years of age.

Table 2. Estimates of fixed and random parameters in the final model.

	Final model		
	Estimate, $\hat{\beta}$	SE	Exp($\hat{\beta}$)
Fixed parameters			
Constant	0.374	0.365	1.454
Male vs. Female	-0.333*	0.129	0.717
Age >19	-1.782*	0.172	0.168
Parents' education: less than lower secondary education	-	-	-
Parents' education: Higher education	-	-	-
Repetition at Basic Educ (No vs. Yes)	1.008*	0.318	2.740
Repetition at Upper Sec Educ (No vs. Yes)	-	---	---
Entrance HE classification score	0.140**	0.084	1.150
first option course (Yes vs. No)	0.614*	0.126	1.848
first option university (Yes vs. No)	-	-	-
Random Parameters			
Level 2: Course			
Variance	1.102	0.264	
Level 1: Student			
Variance	1.000	0.000	
Number of level 2 units: Course	55		
Number of level 1 units: Student	2,392		
Estimation procedure:	RIGLS (PQL2)		

Source: own calculation (2018).

* p value < 0.05; ** p value < 0.10.

The association between family background variables that assess the parents' educational level and the probability of persistence is not statistically different from zero in any of the M1, M2, M3 models, so they were not included in the final model. This result shows that we did not find evidence of the influence of the socioeconomic status of the student's family, as measured by the parents' schooling, in the probability of persistence.

We found a statistically significant association between the situation regarding repetition in basic education and the probability of persistence in the first year of higher education. The estimate obtained in the final model, 1.008 with a standard error of 0.318, suggests that students who declare not to have failed in primary, elementary and lower secondary education present odds ratio in the persistence of 2.7 times higher than students who declare to have failed in any of the basic education levels. No statistically significant association was found between the failure in secondary education and the probability of persistence in the first year. The influence of the university entrance score is positive and statistically significant, indicating that the higher the score, the greater the probability of persistence, but in model M3 and the final model, this is verified only for the level of significance of 10%. That is, when the variable that captures the admission condition in the undergraduate course is included in the model, the influence of the entrance score loses magnitude and is no longer statistically significant at the 5% level. The odds ratio in the persistence of students who are admitted in the first option course is 1.85, for example, the probability of persistence over the probability of dropping out, suspending or transferring is almost twice as high in the group of students who are admitted in the first option course compared to what happens in the group of students who are not admitted in their first choice.

4 Discussion and Conclusion

In this study, we used the concept of student's persistence, measured by the observation of 2,697 students enrolled for the first time in the first year of the University of Minho in the academic year 2015/16 and who reached the end of the first year. We applied a multilevel logistic regression model, considering student as the level 1 unit and course as the level 2 unit, with multiple objectives: to quantify the effect of the admission conditions in the course and university in the behavior of the student concerning the persistence; to verify whether university entrance score is predictive of student's persistence; to verify the long-term effect of the schooling trajectory, namely repetition in primary education and/or secondary education, in student's persistence.

According to the results, the admission of the student in the course chosen as first option is important for his/her persistence. The estimates obtained suggest that the odds ratio in the persistence of students who are admitted in the first option course is 1.85. This means that the probability of persistence over the probability of dropping out, suspending or transferring is almost twice as high in the group of students who are admitted to the first option course compared to students not admitted in their first choice. The conditions of access to higher education, namely the condition underlying the entrance classification, can contribute to the student's choice being conditioned. The interaction between the first option and the entrance classification is shown by comparing the results of the model M2 and the model M3, where the relationship between classification and persistence probability loses magnitude and is no longer statistically significant at the significance level of 5%. However, that ratio remains statistically significant at the 10% level. Even if conditioned to the university entrance score, the effect of admission to the first option course seems to catch the motivation and commitment of the student to finish the course successfully. This corroborates the literature according to which the higher the motivation and commitment, the less likely the student is to drop out of higher education (ENGLISH; UMBACH, 2016; TINTO; CULLEN, 1973; TINTO; PUSSER, 2006).

The research conducted by Ferrão and Almeida (2018) showed that the university entrance score is the best predictor of the GPA obtained at the end of the first year at the University of Minho. The authors refer that the student's prior knowledge and preparation are essential to his/her success in higher education, confirming the international literature. By extension, if students are not well prepared for the course they enroll in, they are not successful regardless of persistence. The more students learn and value this learning, the more likely they are to stay in courses and get a diploma. In this sense, an institutional program that aims to increase the rate of persistence in undergraduate courses through early intervention should pay special attention to the group of students at risk. According to the results reported above, such group consists mainly of students who were admitted to a course other than the first option and/or students who entered higher education over the age of 19. For the time being, our discussion leaves open the analysis of student's success and persistence as a result of successful learning in the classroom. The student's success and persistence is a consequence of student-institution interaction that aims at academic progression. One of the results to highlight in this interaction is the role of the teaching staff for the institutional efforts to promote student success (UMBACH; WAWRZYNSKI, 2005). Some research findings (for example, ANDRIOLA; ANDRIOLA; MOURA, 2006) indicate that most teachers and coordinators sustain the opinion that student's evasion could be reduced if the role of the mentoring teacher or tutor was rescued.

Regarding the long-term effect of the student's school trajectory – specifically the repetition in basic and/or secondary education – in his/her persistence in higher education, our results suggest that the group of students who declare to have failed in basic education level have lower probability of persistence. According to the estimates obtained, those who declare that they did not fail in basic education have odds ratio 2.7 times higher than students who declare to have failed. This result refers to the marginal effect associated with the student's age, which suggests that the student entering higher education aged 19 years or younger has a persistence odds ratio almost six times higher than his/her older colleagues. The delay in the age of admission may be due to failure in primary or secondary education, although it may also be due to the postponement of the university application after obtaining a high school diploma. Thus, there is a cumulative effect associated with age and failure in primary education. We noted that if the age variable was not included in the linear predictor of the model, the odds ratio in persistence between the groups – non-failure vs. failure in basic education – would increase to 4. This study is the very first to report the long-term effect of early repetition on higher education, and reinforces the argument presented by Ferrão (2015b) according to which the early repetition is a strong predictor of late repetition. According to the author, based on PISA 2012 data, the probability of early repetition is 35 times higher in the first tenth of the distribution of students' socioeconomic conditions compared to the tenth higher, indicating a lack of social equity in the Portuguese educational system. She adds “These results state a problem of equity in the Portuguese educational system. The distribution of educational resources does not guarantee the full development of the children or young adult regardless of their socioeconomic level” (p. 14). This kind of evidence brings to the debate the theme of the selection made by the education system and the process of access/admission to higher education (CHIROLEU, 2012; TAVARES et al., 2008; TRAVITZKI, FERRÃO and COUTO, 2016), jeopardizing future social mobility. However, studies on affirmative action programs in other countries, such as Brazil, show that the rate of persistence of the beneficiary students (quota holders) is higher, which corresponds to the higher graduation rate (MENDES JUNIOR, 2014). That is, despite the fact that these students enter the State University of Rio de Janeiro with a lower average score and obtain the diploma with lower GPA, the graduation rate in this group was always higher in 2009, 2010 and 2011 compared to non-beneficiaries.

The “Third Commitment”, enunciated by Raymond and Negassi (2015), “aims at equity of exposure to fundamental knowledge and skills, sometimes called equal treatment or equal opportunities”, in other words, from the point of view of curriculum development, the system must ensure that all Portuguese young people “are ready to embrace the challenges of higher education or to achieve a

viable job”. However, the goals of learning for secondary education have been mostly focused on general education, giving access to higher education. Although the growth of alternative vocational training has provided greater freedom of choice to students of secondary education level, the learning goals for vocational studies are more heterogeneous, often linked to specific professional skills and knowledge of the craft. Specifically, this

basis can improve the low levels of completion [of secondary education] – about 50 per cent – that are taking place in Portugal today and improve the wage differential between vocational training students and those who have followed a path of general education throughout their careers (RAYMOND; NEGASSI, 2015, p. 17).

A new strand of research on equity may be opened as one confronts the alternatives of education and training offered by the education system and the results obtained in this work, particularly concerning the conditions of access to higher education. Therefore, the implications of this study for future research fall on the detail of the area of study associated with the first option of the course and the quantification of its predictive capacity in the probability of persistence. We believe that this study contributes in an innovative way to the research in the sub-area of higher education, specifically on the subject of student’s persistence: by analyzing and modeling the microdata of a large sample of students enrolled for the first time in the first year, taking into account the hierarchical structure of the data and thus contemplating simultaneously the statistical units of student and course, considering the long-term effect of student’s schooling trajectory, namely the effect of school failure, and taking into account the conditions of admission to the university. However, some caution is needed not to generalize the results. The study concerns the enrollment cohort of 2015/16. If other cohorts had been selected, the results could be slightly different. In this perspective, it is very important to develop a broader research project involving samples from different cohorts of newcomers and multiple institutions in order to obtain national results.

5 Acknowledgments

This research was supported in part by the Cemapre - UID/MULTI/00491/2013 project from the Foundation for Science and Technology, FCT/MCTES, through national funds.

Modelagem multinível de persistência no ensino superior

Resumo

As taxas de abandono ou evasão no ensino superior são hoje preocupação social e das instituições, justificando a implementação de políticas públicas de prevenção do fenômeno. Estas políticas carecem de estudos sobre as variáveis mais determinantes do risco de abandono ou evasão. Nesta linha de preocupações, o objectivo central deste estudo é analisar o impacto da trajetória escolar prévia do estudante e das condições de ingresso no ensino superior, controlando a origem socioeconômica, a idade e o gênero dos estudantes. Aplicámos o modelo de regressão logística multinível, considerando alunos agrupados por curso, aos dados dos estudantes ingressados pela primeira vez no 1º ano numa universidade pública portuguesa no ano lectivo 2015/16. Os resultados do modelo sugerem que a reprovação no ensino básico tem efeito de longo prazo, isto é, a probabilidade de persistência durante o 1º ano é influenciada por esse atributo da trajetória escolar do indivíduo, mesmo controlando pela respectiva classificação de ingresso na universidade. De acordo com as estimativas obtidas, os alunos que declaram não ter reprovado no ensino básico têm razão de vantagens na persistência 2,7 vezes maior do que os estudantes que autodeclaram ter reprovado no ensino básico. A admissão do aluno no curso de 1ª opção, bem como a classificação de ingresso na universidade também estão associadas à probabilidade de persistência. Os resultados também mostram que os estudantes mais velhos e do sexo masculino têm menor probabilidade de persistência.

Palavras-chave: *Ensino Superior. Evasão. Persistência. Regressão logística multinível.*

Modelado multinivel de la persistencia en la educación superior

Resumen

Las tasas de abandono o evasión en la enseñanza superior son hoy preocupación social y de las instituciones, justificando la implementación de políticas públicas de prevención del fenómeno. Estas políticas carecen de estudios sobre las variables más determinantes del riesgo de abandono o evasión. El objetivo principal de este estudio es analizar la persistencia del estudiante en los cursos de pregrado y la relación con la trayectoria escolar previa del alumno y con las condiciones de ingreso a la educación superior, controlando las características sociodemográficas de los estudiantes, como el género y la edad. Se aplicó el modelo de regresión logística multinivel, teniendo en cuenta los estudiantes agrupados por curso, a los datos de los estudiantes que entraron en el primero año de una universidad pública portuguesa en el año académico 2015/16. Los resultados del modelo sugieren que la reprobación en la enseñanza básica tiene efecto a largo plazo, es decir, la probabilidad de persistencia durante el primeiro año es influenciada por ese atributo de la trayectoria escolar del individuo, aun controlando por la respectiva clasificación de ingreso en la universidad. De acuerdo con las estimaciones obtenidas, los alumnos que declaran no haber reprobado en la enseñanza básica tienen razón de ventajas en la persistencia 2,7 veces mayor que los estudiantes que autodeclararon haber reprobado en la enseñanza básica. La admisión del alumno en el curso de 1ª opción, así como la clasificación de ingreso en la universidad también están asociadas a la probabilidad de persistencia. Los resultados también muestran que los estudiantes mayores y varones tienen menos probabilidades de persistencia.

Palabras clave: Enseñanza superior. Evasión. Persistencia. Regresión logística multinivel.

Referências

- ALMEIDA, L. S. et al. Acesso e sucesso no Ensino Superior em Portugal: Questões de gênero, origem sócio-cultural e percurso acadêmico dos alunos. *Psicologia: Reflexão e Crítica*, v. 19, n. 3, p. 507-14, 2006. <https://doi.org/10.1590/S0102-79722006000300020>
- ANDRIOLA, W. B.; ANDRIOLA, C. G.; MOURA, C. P. Opiniões de docentes e de coordenadores acerca do fenômeno da evasão discente dos cursos de graduação da Universidade Federal do Ceará (UF). *Ensaio: Avaliação e Políticas Públicas em Educação*, v. 14, n. 52, p. 365-82, 2006. <https://doi.org/10.1590/S0104-40362006000300006>
- BARDAGI, M. P.; HUTZ, C. S. “Não havia outra saída”: percepções de alunos evadidos sobre o abandono do curso superior. *Psico-USF*, v. 14, n. 1, p. 95–105, 2009. <https://doi.org/10.1590/S1413-82712009000100010>
- BITTENCOURT, I. M.; MERCADO, L. P. L. Evasão nos cursos na modalidade de educação a distância : estudo de caso do Curso Piloto de Administração da UFAL / UAB. *Ensaio: Avaliação e Políticas Públicas em Educação*, v. 22, n. 83, p. 465–504, 2014. <https://doi.org/10.1590/S0104-40362014000200009>
- BRAXTON, J.; HIRSCHY, A.; MCCLENDON, S. Understanding and reducing college student departure. San Francisco: [s.n.], 2004.
- CHEN, R. Institutional characteristics and college student dropout risks : a multilevel event history analysis. *Research in Higher Education*, v. 53(5), p. 487-505, 2012. <https://doi.org/10.1007/s11162-011-9241-4>
- CHIROLEU, A. Políticas de Educación Superior en América Latina en el Siglo XXI: ¿Inclusión o Calidad? *Archivos Analíticos de Políticas Educativas*, v. 20, n. 13, p. 1-16, 2012.
- DIAS, D. Has massification of higher education led to more equity? Clues to a reflection on Portuguese education arena. *International Journal of Inclusive Education*, v. 19, n. 2, p. 103-20, 11 fev. 2015. <https://doi.org/10.1080/13603116.2013.788221>
- _____. et al. The democratisation of access and success in higher education the case of Portugal and Brazil. *Higher Education Management and Policy*, v. 23, n. 1, p. 23-42, 2011.

DRAPER, D.; GITTOES, M. Statistical analysis of performance indicators in UK higher education. *Journal of the Royal Statistical Society. Series A*, v. 167, n. 3, p. 449-74, 2004.

ENGLISH, D.; UMBACH, P. D. Graduate school choice: An examination of individual and institutional effects. *The Review of Higher Education*, v. 39, n. 2, p. 173-211, 2016.

EUROPEAN COMMISSION. *Europe 2020 target: early leavers from education and training*. [S.l.]: European Commission, 2013. Disponível em: <http://ec.europa.eu/europe2020/pdf/themes/29_early_school_leaving.pdf>. Access: 2017 Aug. 14

FERRÃO, M. E. Modelos de regressão multinível em Educação e Psicologia. In: SILVA, M. C. R. et al. (Eds.). *Métodos estatísticos avançados aplicados à psicologia e educação*. São Paulo: Vetor, 2015a. p. 25-36.

_____. Tópicos sobre retenção em Portugal através do PISA: qualidade e equidade. *Arquivos Analíticos de Políticas Educativas*, v. 23, n. 114, p. 1-22, 2015b.

FERRÃO, M. E.; ALMEIDA, L. S. Differential effect of university entrance score on first-year students' academic performance in Portugal. Submitted, 2018.

FERREIRA, C.; VIDAL, J.; VIEIRA, M. J. Student guidance and attention to diversity in the processes of quality assurance in higher education. *European Journal of Education*, v. 49, n. 4, p. 575-89, dez. 2014. <https://doi.org/10.1111/ejed.12098>

GEORG, W. Individual and institutional factors in the tendency to drop out of higher education: a multilevel analysis using data from the Konstanz Student Survey. *Studies in Higher Education*, v. 34, n. 6, p. 647-61, 2009. <https://doi.org/10.1080/03075070802592730>

GOLDSTEIN, H.; RASBASH, J. Improved approximations for multilevel models with binary responses. *Journal of the Royal Statistical Society. Series A*, v. 159, n. 3, p. 505-13, 1996.

GROSS, J. P. K. et al. Institutional merit-based aid and student departure: a longitudinal analysis. *The Review of Higher Education*, v. 38, n. 2, p. 221-50, 2015.

ISHITANI, T. T. Time-varying effects of academic and social integration on student persistence for first and second years in college : National data approach. *Journal of College Student Retention: Research, Theory & Practice*, v. 18, n. 3, p. 263-86, 2016. <https://doi.org/10.1177/1521025115622781>

JOHNSON, I. Enrollment, persistence and graduation of in-state students at a public research university: does high. *Research in Higher Education*, v. 49, p. 776-93, 2008. <https://doi.org/10.1007/s11162-008-9105-8>

LITTLE, R. J. A.; RUBIN, D. B. *Statistical analysis with missing data*. 2. ed. New Jersey: John Wiley & Sons, 2002.

MENDES JUNIOR, A. A. F. Uma análise da progressão dos alunos cotistas sob a primeira ação afirmativa brasileira no ensino superior: o caso da Universidade do Estado do Rio de Janeiro. *Ensaio: Avaliação e Políticas Públicas em Educação*, v. 22, n. 82, p. 31-56, 2014. <https://doi.org/10.1590/S0104-40362014000100003>

PASCARELLA, E. T. et al. Pre-enrollment variables and academic performance as predictors of freshman-year persistence, early withdrawal, and stopout behavior in an urban, nonresidential university. *Research in Higher Education*, v. 15, n. 4, p. 329-49, 1981.

PERMZADIAN, V.; CREDE, M. Do first-year seminars improve college grades and retention? A quantitative review of their overall effectiveness and an examination of moderators of effectiveness. *Review of Educational Research*, v. 86, n. 1, p. 277-316, 2016. <https://doi.org/10.3102/0034654315584955>

PIKE, G. R.; GRAUNKE, S. S. Examining the effects of institutional and cohort characteristics on retention rates. *Research in Higher Education*, v. 56, n. 2, p. 146-65, 2015. <https://doi.org/10.1007/s11162-014-9360-9>

PORTELA, M. et al. Evaluating student allocation in the Portuguese public higher education system. *Higher Education*, v. 56, n. 2, p. 185-203, 2008. <https://doi.org/10.1007/s10734-007-9097-x>

RASBASH, J. et al. MLwiN 2.31. Bristol: Centre for Multilevel Modelling, University of Bristol, 2014.

RAYMOND, M. E.; NEGASSI, Y. *O quinto compromisso: desenvolvimento de um sistema de garantia de desempenho educativo em Portugal*. Lisboa: Fundação Francisco Manuel dos Santos, 2015.

RHEE, B.-S. Institutional climate and student departure: a multinomial multilevel modeling approach. *Review of Higher Education*, v. 31, n. 2, p. 161-83, 2008.

SOARES, J. F.; RIBEIRO, L. M.; CASTRO, C. M. Valor agregado de instituições de ensino superior em Minas Gerais para os cursos de Direito, Administração e Engenharia Civil. *Dados*, v. 44, n. 2, p. 363-96, 2001. <https://doi.org/10.1590/S0011-52582001000200005>

SOCIEDADE PORTUGUESA DE ESTATÍSTICA; ASSOCIAÇÃO BRASILEIRA DE ESTATÍSTICA. *Glossário inglês-português de estatística*. 2011. Disponível em: <<http://glossario.spestatistica.pt/>>. Access: 2017 Aug. 14

TAVARES, D. et al.. Students' preferences and needs in Portuguese higher education. *European Journal of Education*, v. 43, n. 1, p. 107-22, 2008. <https://doi.org/10.1111/j.1465-3435.2007.00331.x>

TAVARES, O.; FERREIRA, J. B. Choices and motivations: the why and how of Portuguese students' enrolment choices. *European Journal of Education*, v. 47, n. 2, p. 310-26, jun. 2012. <https://doi.org/10.1111/j.1465-3435.2012.01527.x>

TINTO, V. From theory to action: Exploring the institutional conditions for student retention. In: SMART, J. C. (Ed.). *Higher education: handbook of theory and research*. [S.l.]: Springer, 2010. p. 51-89.

TINTO, V.; CULLEN, J. Dropout in higher education: a review and theoretical synthesis of recent research Office of Education (DHEW), Washington, D.C. Office of Planning, Budgeting, and Evaluation. New York: Columbia University, 1973.

TINTO, V.; PUSSER, B. Moving from theory to action: Building a model of institutional action for student success National Postsecondary Education Cooperative. Virgínia: National Postsecondary Education Cooperative, 2006.

TRAVITZKI, R.; FERRÃO, M. E.; COUTO, A. P. Educational and socio-economic inequalities of pre-university Brazilian population: a view from the ENEM data. *Education Policy Analysis Archives*, v. 24, p. 74, 2016. <https://doi.org/10.14507/epaa.24.2199>

UMBACH, P. D.; WAWRZYNSKI, M. R. Faculty do matter: the role of College Faculty in student learning and engagement. *Research in Higher Education*, v. 46, n. 2, p. 153-84, mar. 2005. <https://doi.org/10.1007/s11162-004-1598-1>

WILLSON, V. L.; HUGHES, J. N. Retention of Hispanic/Latino students in first grade: Child, parent, teacher, school, and peer predictors. *Journal of School Psychology*, v. 44, n. 1, p. 31-49, 2006. <https://doi.org/10.1016/j.jsp.2005.12.001>



Informações das autores

Maria Eugénia Ferrão: PhD in the field of Statistics and Control Theory (PUC-Rio), affiliated to University of Beira Interior and full researcher at Cemapre (University of Lisbon). Contato: meferrao@ubi.pt

Leandro S. Almeida: PhD in Psychology (Universidade do Porto), affiliated to University of Minho. Contato: leandro@ie.uminho.pt