Cause Analysis of students’ dropout rate in higher education study program

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Abstract

The main problem of higher education modernization is the balance between inputs and relevant outputs, specifically, the right balance of enrolled and graduated students. The strategic policy of higher education institutions may cause the number growth but not necessarily the education quality increase of the graduated students. Therefore, the purpose of this paper is, to analyse the causes of the first year students’ dropout rates in higher education institutions using the real data of engineering study program in Latvia University of Agriculture. The following factors were evaluated using the Proportional hazard model of Survival analysis, i.e., students’ gender; secondary school grades the priority of the program to study (first, second, or third) and the finance source (government-financed or self-finance). The results of this study show that the main reasons for dropping out are students’ low secondary school knowledge and low motivation to study engineering.

Introduction

The main problem of higher education (HE) modernization is the balance between inputs and relevant outputs, specifically the right balance of enrolled and graduated students. The university students’ dropout rates result the waste of taxpayers’ money, a lower proportion of the undergraduates and, consequently, lower employment opportunities in highly qualified positions. The university dropout is an important topic in many countries, as well as in Latvia since it is not only the waste of taxpayers’ money but now it is also one of the criteria for evaluating HE institutions. Unfortunately, the strategic policy of HE institutions may increase the number but not necessarily the quality of the undergraduates.

Several studies indicate that one of the important factors of students’ dropout rate is the subject studied at university as well as the secondary school grades. Indeed, dropout rate is higher among students in engineering
disciplines, and among students with relatively low levels of prior qualifications (Arulampalam, Naylor, & Smith, 2005; Min, Zhang, Long, Anderson, & Ohland, 2011; Smith & Naylor, 2005).

Various research in different countries indicate that there are several others factors which are associated with the students’ dropout rate in HE institutions including individual characteristics, interactions within colleges, and institutional characteristics (Breier, 2010; Werblow, 2009).

The purpose of this paper is to analyse the causes of the first year students’ dropout rates in HE institutions using the real data of engineering science faculties in Latvia University of Agriculture (LUA).

1. Materials and methods

The data set includes 677 full-time students from five faculties of engineering science enrolled in 2011-2012 academic year at the LUA. Information about students’ study duration or survival time (in month), gender, secondary school scores, the priority of the program to study (first, second, third and lower) and finance source (government-financed, self-finance) were included in the data set.

According to the Latvian enrolment rules all potential students may choose several programs during the application process. Students must indicate the priority for each program separately (first, second, third etc.) identifying the financial source (government-financed or self-finance). In our case all data have been divided in 3 groups: 1st, 2nd, 3rd (3rd and lower priority). Students’ dropout has been defined in situations when a student who had registered for a study program leaves the University during the first academic year. Situations in which students had left university for a study break were not considered to be a dropout and therefore were eliminated from the analysis.

Proportional hazard model (Cox model) was used for evaluating the students’ dropout causes:

\[
 h_i(t) = \left[ h_0(t) \right] e^{(b_0+ b_1x_i1+ b_2x_i2+ b_3x_i3+ b_4x_i4+ b_5x_i5)}
\]

where

- \( h_i(t) \) – the hazard rate for the \( i \)th case at time \( t \)
- \( h_0(t) \) – the baseline hazard at time \( t \)
- \( b_j \) – the value of the \( j \)th regression coefficient
- \( x_i1 \) – gender (1 male, 2 female)
- \( x_i2 \) – faculty (Rural Engineering, Engineering, Forest, Food Technology, Information Technologies)
- \( x_i3 \) – finance source (government-financed, self-finance)
- \( x_i4 \) – priority to study in the program (first, second, third and lower)
- \( x_i5 \) – secondary school scores (1st group \( \leq 25 \), 2nd group 26-35, 3rd group \( \geq 36 \))

Statistical analyses were carried out with the program IBM SPSS Statistics 20, IBM, New York, USA.

2. Results and Discussion

The number of students decreases over time and the censored students’ proportion after the first study year is 64.1%. During the first academic year 34.4% of students leave the University (Fig.1).

![Fig.1. Proportion of censored (start 2nd study year) and uncensored (dropout) students during the study year (n=677)](image-url)
Only 1.5% of students’ did not initiate the studies. Students’ dropout rate during the first 6 months is 23.2% and reached their highest peak in 5 months. Relatively high percentage of students decided not to continue their studies and left the University during the first academic year.

Breier (2010) has estimated that during the study time in different months there are different rates and causes of students’ dropout. Based on our data it is noticeable that students leave university every month with a higher dropout rate – 12.3% and 4.4% in the 5th and 12th study months accordingly. It is worth to stress that this phenomenon occurs after the examination time when students do not pass some exams.

Students’ dropout risk is associated with Faculty or subject studied at University and study program curriculum. The number of students enrolled to the University in different faculties has decreased over time, and at the end of the first academic year, from 24.3% to 51.6% of students left the faculties of the University.

Students with a higher proportion of dropping out are those who enrolled in Faculty of Information technology (51.6%) and Faculty of Food technology (47.7%), whereas the students of Faculty of Engineering have the highest rate of studying students (Fig.2). At LUA the curricula of engineering study program contains such subject as mathematic, physic and chemistry, which influence the number of dropout. According to Min et al. (2011) research, a low SAT math score elicits poor knowledge in Mathematics, and therefore causes the student’s dropout rates in engineering sciences.

The student secondary school grades range between 15.28 and 58.14 with average 31.2. Students, who leave the faculties, on average, are with lower secondary school grades (Fig.3). As our previous study demonstrates, Faculty of Information technologies have government-financed students who leave University with good grades (higher than average). It means that although students had motivation to study, the study process was not what they had expected.

According to our investigation by Survival analysis, one of the most important causes of students’ dropout is the students’ secondary school scores (Table1). Students with higher scores have a lower dropout rate than students with lower scores (p<0.001). Students with scores lower than 25 and with scores in range 26-35 are at higher risk to be dropout (HR 3.978, p<0.001; HR 2.513, p<0.001).

Effects of scores in Math, English etc. have been reported in Chimka (2002) and Chimka & Lowe (2008) research, i.e., “students with better SAT Math scores as well as the female students are more likely to graduate” (p. 527); similarly, “students with the greater English ACT and Science ACT scores are more likely to graduate engineering science” (p. 32). However, even though Guimarães, Sampaion, & Sampaino (2010) investigation demonstrates a positive correlation between enrolment test scores and dropout, the authors have concluded that “high ability students had a wrong career choice” (p. 607).
The estimated hazard rate for male is \( \exp(0.409) = 1.505 \) of that of the female; that is, a male dropout risk is 1.5 times higher than female \((p<0.05)\). Johnson (1997) found the differences depending on gender and he notes “that early studies suggested that men often continued on in education because of their attitude to the economic necessity and career advancement” (p.323).

Table 1. Results of the evaluation of the effects by Proportional hazard model \((n=677)\)

<table>
<thead>
<tr>
<th>Factors</th>
<th>B</th>
<th>SE</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>0.409</td>
<td>0.169</td>
<td>5.849</td>
<td>1</td>
<td>0.016</td>
<td>1.505</td>
</tr>
<tr>
<td>Faculty</td>
<td></td>
<td></td>
<td>19.345</td>
<td>4</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>Rural Engineering</td>
<td>-0.219</td>
<td>0.215</td>
<td>1.040</td>
<td>1</td>
<td>0.308</td>
<td>0.803</td>
</tr>
<tr>
<td>Engineering</td>
<td>-0.781</td>
<td>0.238</td>
<td>10.738</td>
<td>1</td>
<td>0.001</td>
<td>0.458</td>
</tr>
<tr>
<td>Forest</td>
<td>-0.572</td>
<td>0.209</td>
<td>7.459</td>
<td>1</td>
<td>0.006</td>
<td>0.565</td>
</tr>
<tr>
<td>Food Technology</td>
<td>-0.046</td>
<td>0.239</td>
<td>0.037</td>
<td>1</td>
<td>0.848</td>
<td>0.955</td>
</tr>
<tr>
<td>Finance source</td>
<td>-0.104</td>
<td>0.146</td>
<td>0.500</td>
<td>1</td>
<td>0.479</td>
<td>0.902</td>
</tr>
<tr>
<td>Priority</td>
<td></td>
<td></td>
<td>0.525</td>
<td>2</td>
<td>0.769</td>
<td></td>
</tr>
<tr>
<td>Priority (1)</td>
<td>0.036</td>
<td>0.176</td>
<td>0.041</td>
<td>1</td>
<td>0.840</td>
<td>1.036</td>
</tr>
<tr>
<td>Priority (2)</td>
<td>-0.087</td>
<td>0.186</td>
<td>0.217</td>
<td>1</td>
<td>0.641</td>
<td>0.917</td>
</tr>
<tr>
<td>Scores</td>
<td></td>
<td></td>
<td>24.980</td>
<td>2</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Scores (&lt; 25)</td>
<td>1.381</td>
<td>0.278</td>
<td>24.732</td>
<td>1</td>
<td>0.000</td>
<td>3.978</td>
</tr>
<tr>
<td>Scores (26-35)</td>
<td>0.921</td>
<td>0.222</td>
<td>17.189</td>
<td>1</td>
<td>0.000</td>
<td>2.513</td>
</tr>
</tbody>
</table>
Students’ dropout risk is associated with the Faculty (p<0.01). Dropout rate is higher among students from the Faculty of Information Technology and Food Technology. Students from Faculties of Rural Engineering, Engineering and Forestry are at lower risk to be dropped than students from Faculty of Information technology (HR 0.803, HR 0.458, HR 0.565). However, the factors of the finance source and priority are not statistically significant; therefore any observed difference in survival between factors groups could be due to the chance.

Conclusions

1. The results of this study show that approximately 34.4% of students leave the LUA faculties of engineering sciences during the first study year and it depends on the faculty’s curriculum and students’ secondary school grades.
2. School scores (p<0.001), gender (p<0.05) and faculty (p<0.001) factors are the main causes for students’ dropout at the LUA in faculties of engineering sciences.
3. Data from different academic years are recommended to include for further investigations of students dropout rates.

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References


