Policy change and its anticipated impact on educational outcomes; evidence from a Greek University

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Abstract

Over the last 20 years the expansion in the number of university entrants has been an essential component of the educational policy in Greece. The expansion has taken place via two distinct paths. The first one was by increasing the number of entrants through the dominant mode of general examinations, while the second one was the parallel increase in the number of entrants through ‘other modes’. The group titled ‘other modes’ incorporates eight different categories of university entrants, contributing approximately 20% to the total student body. The expansionary policy has taken place along with a university regulatory framework allowing for an unlimited time horizon for the completion of studies. This framework has been revised in 2007 by the law 3549/2007 imposing the time limit of 8 years for the completion of studies. Given the substantial variation in the academic qualifications among students, it is interesting to know which categories of entrants run the highest risk of failing to complete studies. In this study the individual records of 2,500 students, covering two cohorts of entry in the University of Macedonia are analyzed by means of a binary probit model. After the estimation of our proposed specification, the derived results indicate that the likelihood of failing, that is to exceed 8 years of studies, is much higher for the students from ‘other modes’ than it is for the students from the general examinations.

Keywords: Educational outcomes; dropout rates; modes of entry; probit model.

1. Introduction

After a period of more than 30 years of inertia, in 2007 the Greek Ministry of Education decided to revise the regulatory framework governing the status of university students (law 3549/2007). Since the collapse of the dictatorship in 1974 Greek students enjoyed a highly concessive regime which allowed for an unlimited time horizon for the completion of studies as well as an unlimited number of exams re-sits. In the public discourse this framework became synonymous to a symptom known under various names; ‘eternal’, ‘perpetual’ or ‘pension’ student status describing a situation where the majority of students prolonged the period of studies beyond the normal duration of the programme, some times by many years. The law 3549/2007 imposed a time limit on the duration of studies — set at 2n years, where n denotes the normal duration of the university programme — as well as

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Keywords: Educational outcomes; dropout rates; modes of entry; probit model.
a maximum number of 8 exam re-sits. For the normal duration of the majority of subjects which is 4 years the law implies that students failing to graduate after 8 years of studies or failing to attain a pass mark on a single course after 8 attempts will be dismissed from the university.

While one can hardly disagree that the prolongation of studies constitutes a serious defect of Greek higher education, nevertheless, the way it is confronted underlines the opportunistic nature of the process of policy making. The policy change seems to be uninformed and potentially incoherent. Firstly, the number of students that are influenced by the new law and therefore they are called to readjust their study plans remains unknown. At the aggregate level or at the level of subjects we know neither the fraction nor the composition of students who prolong their studies beyond the 8 years limit. The evidence from three university institutions suggests that this group of students ranges from a low 18% (University of Macedonia) to a high 35% (Panteio University) of the enrollees with the third (Aristotle University) lying somewhere in the middle (Chatzipantelis, 2004; Kalamatianou & McClean, 2003; Katsikas and Katranidis, 2006). There is no doubt that the majority of these students drop out voluntarily. Nevertheless, there exists a sizeable proportion, estimated in the range of 5% to 10% of the enrollees that manage to acquire their degree after 8 years past (Kalamatianou & McClean, 2003; Katsikas & Dergiades, 2006). The possibility for these students to be recorded as failed emerges very clearly.

Secondly, a potential rise in the drop out rates through the recently implemented reforms may come in conflict with fundamental policy options taken in the past. Over the last 15 years Greece, following the example of its European partners, has expanded the number and the diversity of university entrants substantially. Between 1994 and 2008 the number of university entrants, through the traditional mode of general examinations, almost doubled, rising from 21,840 in 1994 to 39,210 in 2008 (Ministry of Education, 2009a). At the same time there was a parallel increase in the number of university entrants through ‘other modes’. According to the existing regulations eight different categories of entrants are registered in university departments over those entering through the system of general examinations (Ministry of Education, 2009b). The new entry modes comprise students with considerable differences in motivations, qualifications and hence abilities to pursue a university degree. As a rule the entry criteria for these students are less strict than those applied for the candidates entering via the mode of general examinations.

It is quite likely therefore that the two policies, that is the expansion in the number and the diversity of entrants on the one hand and the imposed restrictions on the duration of studies on the other, may contradict each other, thus turning the Greek universities into the Danaides Jar. The purpose of this paper is to explore the question about the number and the type of students, regarding their mode of entry that might be affected by the policy change. The paper is structured in the following way. Section 2, discusses the data and provides some background information. Section 3, presents the model and the method of estimation. The interpretation of the results is given in section 4 and finally, section 5 concludes.

2. Data and background information

Our data set refers to a sample of students who entered the University of Macedonia, of Economic and Social Studies (UM) in two consecutive academic years 1998 and 1999. Students of these two cohorts have already completed 9 and 10 years of studies respectively, thus providing us with sufficient time-span to know whether they have already acquired their degree within the recently imposed time restriction. Students having failed to graduate after 8 years of studies will be considered here as drop-outs.

Ten departments are operating today in UM in which approximately 1.300 students are registered annually. Two departments, Administration of Technology, and Marketing & Operational Administration have only few years of operation and for this reason they were left out of the exercise. In the included departments, with the exception of only one, the subject of economics is a major or a joint major. The exception is the department of Music Studies and Art.

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2 According to the ancient Greek myth the 50 daughters of the hero Danaos, called Danaides, were brought to a forced marriage to the 50 sons of Aegyptus. In a conspiracy instructed by their father they killed their husbands during the first night of their marriage. For the crime they committed Danaides were punished in Tartarus by being forced to carry water into jugs to fill an earth-ware jar and thereby wash off their sins, but the jar was holey so the water always leaked out.
The total number of the two cohorts that entered the 8 departments of the UM is 2,416 students; their composition, regarding the mode of entry and gender are presented in Table 1, where raw ‘failure’ rates are also reported. Students entering through the mode of general examinations represent 72% of the student body while all other modes contribute 28%. The proportion of students coming from the general examinations mode that fails to accomplish studies after 8 years is 7.5%. A more cursory look in Table 1, leaves no doubt that the students who face the highest risk to become ‘victims’ of the newly implemented policy are those coming from other modes. The average failure rate of those students is 37.6%, thus raising the failure rate over all modes to 16%.

### Table 1. Sample composition and summary statistics.

<table>
<thead>
<tr>
<th>Mode of entry</th>
<th>Number of students</th>
<th>Failed to graduate after 8 years of study</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>1. General examinations</td>
<td>668</td>
<td>1068</td>
</tr>
<tr>
<td>2. Greek-Cypriots</td>
<td>34</td>
<td>72</td>
</tr>
<tr>
<td>3 Greek ex-patriots</td>
<td>41</td>
<td>46</td>
</tr>
<tr>
<td>4. Foreign students</td>
<td>29</td>
<td>26</td>
</tr>
<tr>
<td>5. Disable (Law 2640/98)</td>
<td>87</td>
<td>39</td>
</tr>
<tr>
<td>6. Domestic transfers</td>
<td>61</td>
<td>74</td>
</tr>
<tr>
<td>Transfers from abroad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Pursuing second degree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First degree T.I.*</td>
<td>54</td>
<td>38</td>
</tr>
<tr>
<td>First degree U.I.*</td>
<td>31</td>
<td>15</td>
</tr>
<tr>
<td>8. Athletes</td>
<td>24</td>
<td>9</td>
</tr>
<tr>
<td>Sub-total</td>
<td>1029</td>
<td>1387</td>
</tr>
<tr>
<td>General-total</td>
<td>2416</td>
<td>386</td>
</tr>
</tbody>
</table>

*Note: T.I stands for Technological Institutes and U.I. for University Institutions

Apart from gender and mode of entry our data set contains information on the following variables; age of entry, department of study, and family residence. This last variable gives an account of the differences in the direct cost of studies among students. For example, students coming from Thessaloniki area incur a lower cost of studies compared to the rest as they pay neither rent for accommodation nor for fares when traveling from the family residence to the university place and vice versa.

To keep away from unnecessary confusion, when reporting the results we shall avoid the identification of the department of studies as well as students’ mode of entry. Needless to say, the information is disposable for interested researchers and policy makers.

### 3. The model and estimation

Distinctive characteristic of our analysis is the dichotomous nature of the dependent variable; therefore, the expected way to deal with such variables is the use of the probit model. To model students’ capacity to graduate within the pre-specified limit of 8 years of study, the specification adopted for the linear index function has the following form:

\[
y_i = c + \beta_0 x_i + \beta_1 d_{1,i} + \sum_{j=1}^{2} \beta_{2,j} d_{2,j,i} + \sum_{k=1}^{8} \beta_{3,k} d_{3,k,i} + \sum_{m=1}^{7} \beta_{4,m} d_{4,m,i} + \varepsilon_i
\]

where, \(y_i\) is the binary dependent variable which receives the value of 1 for those students who fail to graduate after 8 years of study and 0 otherwise, \(c\) is the constant term, \(x_i\) is age, \(d_{1,i}\) is gender, 1 for females and 0 for males, \(d_{2,1,i}\) and \(d_{2,2,i}\) are dummies showing permanent residence in islands and permanent residence in the mainland of Greece, respectively, \(d_{3,1,i}\) to \(d_{3,8,i}\) are dummies revealing the mode of entry, \(d_{4,1,i}\) to \(d_{4,7,i}\) are also dummies making known the department of study, \(\varepsilon_i\) is the error term and finally, \(\beta\)’s are parameters to be estimated.

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3 For further details regarding the probit model and the associated log-likelihood see Green (2003).
Parameter estimates for equation (1) along with their associated standard errors, z-statistics and p-values are analytically illustrated in Table 2. The estimated sign for every single parameter is theoretically meaningful and almost all the parameters are statistically significant or marginally significant at the conventional level of 0.05. Additionally, the last column in Table 2 presents the related marginal effects and their corresponding standard errors.

### Table 2. Binary Probit Estimation Results.  

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. error</th>
<th>z-statistic</th>
<th>p-value</th>
<th>Marginal effect (Std. error)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personal attributes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.085498</td>
<td>0.018732</td>
<td>4.564417</td>
<td>0.0000</td>
<td>0.016906 (0.003846)</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.278120</td>
<td>0.071171</td>
<td>-3.907777</td>
<td>0.0001</td>
<td>-0.054994 (0.013933)</td>
</tr>
<tr>
<td>Mode of entry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode 2</td>
<td>0.968140</td>
<td>0.148981</td>
<td>6.498432</td>
<td>0.0000</td>
<td>0.191436 (0.028444)</td>
</tr>
<tr>
<td>Mode 3</td>
<td>1.112229</td>
<td>0.196511</td>
<td>5.659895</td>
<td>0.0000</td>
<td>0.219928 (0.038041)</td>
</tr>
<tr>
<td>Mode 4</td>
<td>1.393885</td>
<td>0.140827</td>
<td>9.897836</td>
<td>0.0000</td>
<td>0.275622 (0.026267)</td>
</tr>
<tr>
<td>Mode 5</td>
<td>0.289984</td>
<td>0.143888</td>
<td>2.015351</td>
<td>0.0439</td>
<td>0.057340 (0.028548)</td>
</tr>
<tr>
<td>Mode 6</td>
<td>0.538073</td>
<td>0.195664</td>
<td>2.749979</td>
<td>0.0060</td>
<td>0.106396 (0.038669)</td>
</tr>
<tr>
<td>Mode 7</td>
<td>1.683023</td>
<td>0.267546</td>
<td>6.290588</td>
<td>0.0000</td>
<td>0.332795 (0.052803)</td>
</tr>
<tr>
<td>Mode 8</td>
<td>1.228870</td>
<td>0.227241</td>
<td>5.407777</td>
<td>0.0000</td>
<td>0.242992 (0.044474)</td>
</tr>
<tr>
<td>Mode 9</td>
<td>0.257566</td>
<td>0.171436</td>
<td>1.502400</td>
<td>0.1330</td>
<td>0.050930 (0.034192)</td>
</tr>
<tr>
<td><strong>Permanent residence</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Region 1</td>
<td>-0.601401</td>
<td>0.225009</td>
<td>-2.672791</td>
<td>0.0075</td>
<td>-0.118919 (0.044060)</td>
</tr>
<tr>
<td>Region 2</td>
<td>-0.044268</td>
<td>0.077336</td>
<td>-0.572410</td>
<td>0.5670</td>
<td>-0.008753 (0.015469)</td>
</tr>
<tr>
<td><strong>Department of study</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department 1</td>
<td>-1.288241</td>
<td>0.354772</td>
<td>-3.631182</td>
<td>0.0003</td>
<td>-0.254732 (0.069205)</td>
</tr>
<tr>
<td>Department 2</td>
<td>-0.158583</td>
<td>0.115109</td>
<td>-1.422150</td>
<td>0.1550</td>
<td>-0.031357 (0.022243)</td>
</tr>
<tr>
<td>Department 3</td>
<td>-0.362043</td>
<td>0.201630</td>
<td>-1.795576</td>
<td>0.0726</td>
<td>-0.071589 (0.040131)</td>
</tr>
<tr>
<td>Department 4</td>
<td>-0.325533</td>
<td>0.135289</td>
<td>-2.406208</td>
<td>0.0161</td>
<td>-0.064369 (0.026693)</td>
</tr>
<tr>
<td>Department 5</td>
<td>-0.314246</td>
<td>0.126005</td>
<td>-2.493916</td>
<td>0.0126</td>
<td>-0.062137 (0.024846)</td>
</tr>
<tr>
<td>Department 6</td>
<td>-0.065198</td>
<td>0.181091</td>
<td>-0.360028</td>
<td>0.7188</td>
<td>-0.012892 (0.036218)</td>
</tr>
<tr>
<td>Department 7</td>
<td>-0.185107</td>
<td>0.094394</td>
<td>-1.961007</td>
<td>0.0499</td>
<td>-0.036602 (0.018823)</td>
</tr>
<tr>
<td>Constant</td>
<td>-2.613101</td>
<td>0.357241</td>
<td>-7.314674</td>
<td>0.0000</td>
<td>-</td>
</tr>
</tbody>
</table>

**Regression Diagnostic Statistics**

- McFadden $R^2$-squared: 0.24
  - Pesaran-Timmermann Stat. ($p$-value): 20.51 (0.00)
- Goodness-of-fit: 0.86
  - LM-Stat. for hetero. ($p$-value): 10.81 (0.21)
- Hosmer-Lemeshow Stat. ($p$-value): 2.86 (0.41)
  - LM-Stat. for normality ($p$-value): 2.14 (0.34)
- Andrew’s Stat. ($p$-value): 4.68 (0.45)
  - Akaike information criterion: 0.67
- Somer’s D Statistic: 0.62
  - Schwarz information criterion: 0.72
- Goodman-Kruskal Gamma Stat.: 0.63
  - LR Statistic ($p$-value): 525.97 (0.00)

Apart from model’s ability to fit the data, it is well documented in the literature that, failure to specify correctly the log-likelihood function, results to inconsistent estimates, rendering this way model’s validity questionable. In practice, evidence of misspecification is detected through the presence of heteroskedasticity or non-normality in the errors.

To appraise the accuracy of our model to describe the observed data, a set of statistics is presented in Table 2. We initially report the McFadden-$R^2$ statistic which in fact compares model (1) with a model that has only the constant term as an explanatory variable. In practice the McFadden-$R^2$ moves significantly below the theoretical maximum value of 1 and values between 0.2 and 0.4 are considered highly satisfactory. Consequently, the reported value of 0.24 signifies that the information added in our specification is considered more than reasonable. Moreover, the overall percentage of correct predictions is communicated through the value of the Goodness-of-fit statistic also know as model’s hit rate and the reported value of 0.87 is pretty acceptable.

Additionally, we carried out the Hosmer and Lemeshow (1989) test as well as the Andrews (1988a, 1988b) test. What both tests do is to compare, over different groups, the observed values with the fitted expected values derived

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4 Further discussion about the signs, size and significance of the coefficients follows in the subsequent section of the paper.

5 The marginal effects and their standard errors were estimated by the formulas provided by Anderson and Newell (2003) and Carlevaro and Senegas (2006).
from the estimated model. The Hosmer-Lemeshow Statistic, under the null hypothesis (the model adequately describes the data), is approximately distributed as a $\chi^2$ with J-2 degrees of freedom (J is the number of groups used), while the Andrews statistic, under the same null hypothesis, is asymptotically distributed as a $\chi^2$ with J degrees of freedom (J defined as previously). Based on the provided p-values, both tests fail to reject the null hypothesis for the conventional levels of significance.

To assess further model’s predictive ability we present some extra statistics in Table 2, which in turn are the following: Somers’ D Statistic, Goodman-Kruskal Gamma statistic and finally the Pesaran-Timmermann statistic (1992). The Somers’ D statistic and the Goodman-Kruskal Gamma statistic measure the strength of association between the observed responses and the predicted probabilities. The reported values of 0.62 and 0.63 for the Somers’ D and the Goodman-Kruskal Gamma statistics respectively, reveal pretty satisfactory predictive performance. Additionally, the Pesaran-Timmermann statistic determines the proportion of the correct predictions made for $y_i$ by the estimated specification. The null hypothesis of no predictive power is clearly rejected since the associated p-value is well below the 0.01 significance level.

Turning our attention to specification testing, we tested for heteroskedasticity by employing the procedure proposed by Davidson and MacKinnon (1993). The null hypothesis of homoscedasticity is tested against the following general form of heteroskedasticity:

$$\text{Var}(\varepsilon_i) = e^{(2z^T\gamma)}$$

where, $e$ is the neperian number, $\gamma$ is a vector of unknown parameters and $z$ is a vector of independent variables. The LM-Statistic is computed by the explained sum of squares resulting from an artificial regression which is analytically specified in Davidson and MacKinnon (1993). In that case the LM-Statistic is asymptotically distributed as a $\chi^2$ with degrees of freedom equal to the number of the variables introduced into the $z$ vector. By inspecting the associated p-value of the LM-Statistic, in Table 2, we clearly fail to reject the null hypothesis of homoscedasticity.

To test for normality we applied the LM test proposed by Papke and Wooldridge (1996). Under the null hypothesis of normality the LM statistic is asymptotically distributed as a $\chi^2$ with two degrees of freedom. Examining the p-value of the LM-Statistic, in Table 2, we fail to reject the null hypothesis.

Overall, judging by the presented diagnostic statistics, it could be argued, that our model is well specified and describes the data in a satisfactory way.

4. Discussion of the Results

The first thing to note is that the coefficients on all modes of entry are positive and significant, with the only exception regarding significance to be the last mode, which is mode 9. Such results indicate that students from all modes, including foreign students, face higher probability, with respect to the students entering via the general examinations, to exceed the limit of 8 years of studies and thus to drop out. Mode 7 shows the worst record, 33% more likely to drop out than the general examinations, while both modes 5 and 9, show just 5% higher probability. Similar findings are reported by studies in other countries (see for example, Johnes & McNabb, 2004).

The second interesting result concerns the effect of the department of study. The estimated coefficients on all departments are negative meaning actually that, in comparison to the reference department, students who belong to other departments are more likely to complete studies within the time span of 8 years. Although it has to be noticed that the effect of two departments, that is department 2 and department 6, proves to be insignificant even at the 10% significance level. Another interesting finding is that only the students who belong to department 1, demonstrate substantially (25%) lower probability to fail than the reference department; for the remaining three departments (3, 4, and 5) the difference with respect to the reference department is moderate and moves between the range of 6% to 7%.

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6The tests differ by the way that the observations are classified within a particular group. The number of groups selected to perform both tests is six (Hosmer and Lemeshow suggest using a minimum of six groups)

7In our testing for heteroskedasticity the z vector incorporates all the variables associated to the different modes of entry. As a result the estimated LM statistic follows the $\chi^2$ distribution with eight degrees of freedom.

8Exactly the same value for the LM statistic received when we applied the simple representation of the Bera-Jarque-Lee test (1984) as proposed by Wilde (2007).
It is difficult to assess what these differences in the completion rates amongst the departments reflect. However, whatever the true reason is, the evidence of noticeable interdepartmental variation in the completion rates, suggest one thing; provided that these differences do not reflect differences in department’s size which is centrally determined, there exists much scope for improving outcomes by handling factors lying within the control of the institutions. Research in Britain on retention and completion rates reached to similar conclusions (see for example, Davies, 1999; Davies & Rudden, 2000; York & Tomas, 2003).

The impact of gender and age on the completion rates does not reveal great surprises. Female students are 5% less likely to prolong their staying at the university beyond 8 years than male students. Mature students also face higher probabilities to fail than their younger peers. Considering age the finding suggests that on an average each additional year on the registration age increases the likelihood to fail by 1.7%. This implies that a student registering in our university in the age of 23 has about 10% higher probability to fail than a student entering the university in the age of 17. Our findings with respect to gender and age, are in accordance with the findings in the relevant literature (see for example, Dayioğlu & Türüt-Aşık, 2007; Johnes & McNabb, 2004; Hyde & Kling, 2001; McNabb, Pal, & Sloane, 2002; Smith & Naylor, 2001; Hoskins, Newstead & Dennis, 1997).

A slightly surprising result comes from students’ family residence. The inclusion of this variable into the model intended to grasp the differential cost of studies, which is mainly attributed to the cost differences in accommodation and transportation. Of the various specifications we tried in this regard the only one that gave statistically significant effect concerns students coming from the islands, denoted by Region 1 in our model. Compared to the reference category – which is students living with their families in the area of Thessaloniki – the coefficient on Region 2, signifying permanent residency in the mainland of Greece but outside Thessaloniki, is statistically insignificant.

We take this result as an indication that the financial considerations do not impact upon the educational outcomes. If the private cost of studies played some role, given that it’s larger part concerns rent (Psacharopoulos & Papakonstantinou, 2005), the demarcation line should be between students coming from the district of Thessaloniki on the one hand and those whose families live elsewhere on the other. Most probably the beneficial effect of students’ families residing in islands underlines the burden of travelling for many hours and the need to change transportation means. Students from islands need to take ferries which, apart from being slow, they are also subject to the hazards of weather changes, especially during the winter. By way of contrast, for students using land transportation means the differences in the time and the cost spent on travelling to the location of the university do not appear to affect the completion time.

5. Concluding remarks and policy Recommendation

There exists ample evidence that the mode of university entry affects the prospects of graduation considerably. Compared to the mode of general examinations students from all other modes show a higher probability to drop out, that is to exceed the recently imposed limit of 8 years on the duration of studies. In view of this evidence it appears that the implemented policy will hit, ceteris paribus, more severely students from other modes. The verified existence of substantial differences in the drop out rates between the various categories of students, records primarily the existence of large variation in academic backgrounds. It constitutes also an indication of how ineffective our system is at supporting disadvantaged students to succeed in higher education. The expansion in the number of entrants from other modes has not been complemented by the adoption of strategies to improve academic quality and provide support, guidance and advise to the needy students. The statistical evidence suggests that some departments do better than others though it is difficult to tell why and how. Until further research is conducted to reveal the causes of the high failure rates for students from other modes a reasonable policy might be to keep the implemented restrictions for the students from the general examinations and allow the rest to stay in the university over an unlimited time horizon.

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