

# Effects of University Characteristics and Academic Regulations on Student Persistence, Degree Completion, and Time to Degree Completion

Felice Martinello

MESA2009-5

**MESAMEASURING THE EFFECTIVENESS OF STUDENT AID**

Canadian Education Project | Queen's University School of Policy Studies | Canada Millennium Scholarship Foundation  
Educational Policy Institute | Higher Education Strategy Associates

Toronto, Ontario, Canada - May 2009

[www.mesa-project.org](http://www.mesa-project.org)

### The MESA Project

The Measuring the Effectiveness of Student Aid Project, or the MESA Project, is a four year research effort being conducted by the Canadian Education Project and the School for Policy Studies at Queen's University on behalf of the Canada Millennium Scholarship Foundation. It has been designed to answer the following four questions:

- After graduating from high school, teenagers coming from low-income backgrounds face a choice as to attend college or university, or not. For those who did attend, how do they compare to those who did not?
- Does providing more funding in a student's first few years of further education attract more low-income students to post-secondary education?
- Does providing more funding in a student's first few years of further education make it more likely for low-income students to stay in and graduate?
- Are low-income students different across Canada?

This paper is part of a series of research papers solicited from some of the leading Canadian researchers in the field of post-secondary education; the researchers were asked to write about issues of access and persistence in post-secondary education in Canada. The requirements for the papers were that the researchers use one of several currently-existing Statistics Canada databases or another source of Canadian data. Each of the papers commissioned during this project is available for downloading from the MESA Project website at [www.mesa-project.org](http://www.mesa-project.org).

The findings and conclusions expressed in this paper are those of the authors and do not necessarily represent those of the MESA Project or its partners.

### The Partners

The **Education Policy Institute** is an international, non-profit think tank dedicated to the study of educational opportunity. Our mission is to provide high-level research and analysis to support policymakers and practitioners and expand educational opportunity to all students. EPI handles overall project management and co-ordination, data privacy & cleaning, and integration of the final results at the end of the project. [www.educationalpolicy.org](http://www.educationalpolicy.org)

The **Canadian Education Project** provides research and evaluation expertise in experimental, quantitative, qualitative and mixed methods research approaches. The company has experience working with a broad range of stakeholders including governments (at the federal and provincial levels), secondary and post-secondary educational institutions, elementary and secondary school boards, student groups, non-profit and non-governmental organizations and other stakeholders in the education and public policy arena in Canada and internationally. While much of our work to date deals with students and youth at the post-secondary level, we are increasingly engaging in research at the elementary and secondary levels as well as looking at student mobility through lifelong learning and transitions between K-12 and post-secondary education. [www.canedproject.ca](http://www.canedproject.ca)

The **School of Policy Studies at Queen's University** ([www.queensu.ca/sps](http://www.queensu.ca/sps)) is a leading centre for advanced education, research, debate and interaction with the non-academic world in the fields of public administration and industrial relations. Continuing the long-standing commitment of Queen's University to excellence in these areas, they are training the next generation of leaders for life in a global age. Their master's programs link theory with practice to provide students with fundamental knowledge of the economic, political, social and technological changes that are transforming the way we live and the way we work. Students enhance their communication and research skills, and gain new skills in management, policy analysis, economics and quantitative methods. Their graduates are well prepared to contribute to policy-making, human resource management and industrial relations in a variety of public, private and nonprofit organizations. The School for Policy Studies manages the Research Review Committee for the MESA Project, which is responsible for funding contributory research projects that highlight important policy areas of interest.

The **Canada Millennium Scholarship Foundation** is a private, independent organization created by an act of Parliament in 1998. It encourages Canadian students to strive for excellence and pursue their post-secondary studies. The Foundation distributes \$325 million in the form of bursaries and scholarships each year throughout Canada. Its objectives are to improve access to post-secondary education for all Canadians, especially those facing economic or social barriers; to encourage a high level of student achievement and engagement in Canadian

society; and to build a national alliance of organizations and individuals around a shared post-secondary agenda. The Foundation is funding the MESA Project overall, and has negotiated access to its student administrative lists with each of the provinces on the project's behalf.

[www.millenniumscholarships.ca](http://www.millenniumscholarships.ca)

### **Abstract**

Academic regulations (such as course withdrawal deadlines, whether courses can be repeated, and the weighting of grades on repeated courses), tuition refund policies, and other characteristics (such as school size, entering students' high school grades, and professional or research orientation) vary across Canadian universities. To estimate the effects of these variables on students' persistence, degree completion and time to degree completion in their first university programs, a cross-section regression analysis was performed using data collected from 23 universities in the Youth in Transition Survey, 1997-2005. Results showed that later final course withdrawal dates were correlated with more program-switching in students' first year and lower probabilities of first program completion. More generous tuition refunds were also associated with more program-switching in first year, as well as less leaving in second year and a shorter time to degree completion for those who completed their first program. University characteristics and the other academic regulations yielded mixed results that were generally not robust to different specifications. The implications of these findings and suggested directions for future research are discussed.

Felice Martinello is a Professor of Economics at Brock University. ([fmartinello@brocku.ca](mailto:fmartinello@brocku.ca)).

Please cite as:

Martinello, Felice (2009). *Effects of University Characteristics and Academic Regulations on Student Persistence, Degree Completion, and Time to Degree Completion*. MESA Project Research Paper 2009-5. Toronto, ON: Canadian Education Project. ([www.mesa-project.org/research.php](http://www.mesa-project.org/research.php))

## Table of Contents

Acknowledgements.....	1
Introduction.....	1
Hypothesized Effects, Evidence from the Literature, and Potential Policy Implications.....	3
Data.....	6
Correlations of Academic Regulations and University Characteristics Across Universities.....	9
Estimation Results.....	10
Conclusions and Policy Implications.....	16
References.....	18
Tables and Figures.....	20

## Acknowledgements

I would like to thank Theresa Qiu for her invaluable help with the YITS data set. I would also like to thank Viorela Diaconu, Christine Arnold and Tanya Sibindi for research assistance and Don Murdoch (York) and Elizabeth Felet (Windsor) for their help in assembling the data on academic regulations. This research was financed by the Canada Millennium Scholarship Foundation through the MESA project. Earlier financial support from Brock's SSHRC Institution Grant and Experience Works programs are also gratefully acknowledged.

## Introduction

The dominant model of students' persistence and degree completion in post-secondary education (PSE) posits that students enter PSE with a set of background and current characteristics that interact with the academic and social conditions of their post-secondary institution. While in PSE, students continually evaluate their situation to decide whether to leave, interrupt their studies, or continue in PSE and ultimately complete a degree (or other PSE credential). At the same time, the institution decides whether to allow students to continue in their programs or alternative programs. The basic model is attributed to Tinto (1987), but it has received elaborations and refinements from many other authors. See Pascarella and Terenzini (1991, 2005) and Grayson and Grayson (2003) for summaries.

There is a large body of empirical literature examining the effects of students' background and personal characteristics (such as family structure, parents' education or occupation, race, gender, commitment to completing PSE, and high school performance) on PSE persistence and completion. Other empirical work has examined students' social and academic interactions, including academic performance, faculty-student relations, extracurricular activities and employment on or off campus. The nature and outcomes of these interactions have then been related to students' persistence and program completion. See Pascarella and Terenzini (1991, 2005), Grayson and Grayson (2003), and Kuh, Kinzie and Buckley (2006) for summaries of the empirical work in these areas.

A smaller body of research has investigated the effects of post-secondary institutions' characteristics on students' experiences and outcomes. Institution size, selectivity, the percentage of students living on campus (versus those commuting), and the relative size and comprehensiveness of student orientation and advising services have been examined in the US literature. Very little work, however, has been done in this area for Canadian post-secondary students or schools.

The academic regulations that govern students' progress through their post-secondary programs might be expected to affect students' persistence and program completion. These regulations govern issues such as the last date (within a term) that a student can withdraw from a course without academic penalty, whether and how many times failed or passed courses can be repeated, and whether the grades for repeated courses are included in the student's cumulative average or, alternately, the new grade replaces the old.<sup>1</sup> The importance of academic regulations has also been noted in the literature. For example, Adelman (2006, 8) wrote: "one of the most degree-crippling features of undergraduate histories is an excessive volume of courses from which the student withdrew without penalty and those the student repeated... They are the result of institutional policies [and] how many times an institution allows a student to repeat a course." In the Canadian literature, Gilbert (1991, 19) commented on the analysis of student persistence and degree completion in Canadian universities and wrote that:

---

<sup>1</sup> The contention that academic regulations matter is strongly supported by my experience as an undergraduate academic advisor and work with other advisors.

“Degree completion and non-completion should be related to not just student characteristics but also to institutional structures and processes.”<sup>2</sup>

Another institutional policy that has received no attention in the literature is the timing and generosity of the tuition refund schedule for withdrawal from courses after the initial add/drop period. Despite much literature dealing with the effects of tuition levels and student financial aid, and the fact that there are large differences in refund policies across institutions, there has been no study of the effects of institutions’ refund policies on students’ progress to their degrees.

To address the aforementioned gaps in the literature, the present analysis looked at data on academic regulations, tuition refund policies, and other institutional characteristics collected for the larger Canadian universities. These data were then merged into the Youth in Transition Survey – Cohort B (YITS-B) data set, which (among other things) documented the educational activities and progress of individual students enrolled in Canadian universities. Regression analysis was used to relate university students’ progress in their first academic program to the academic regulations and tuition refund policies in effect at their institution and other characteristics of the institution. Four measures of student progress were considered: (a) persistence from year 1 to year 2; (b) persistence from year 2 to year 3; (c) likelihood of first program completion; and (d) time to completion (for those who completed their first pro-

gram). Separate analyses were done for each measure.

- The following university characteristics were included in the analysis:
- institution size, measured by full-time equivalent (FTE) enrolments;
- school selectivity, measured by average entering high school grades;
- the number of high profile professional schools (e.g., medicine, dentistry, law) at the institution; and
- the university’s research orientation, measured by the research productivity of faculty.

The academic regulations included in the analysis were:

- how far into a term a student could withdraw from a course without the assignment of a grade (i.e. without academic penalty);
- what percentage of course tuition was refundable at each point in time during the academic term;
- whether students could repeat a previously passed course;
- if a course was repeated, whether the new grade replaced the old or both grades were included in the student’s average (which, in turn, determined access to or continuance in programs, as well as issues related to academic probation or suspension).

<sup>2</sup> Despite the argued importance of academic regulations, there is, to my knowledge, no work in the literature investigating their effects on student persistence and degree completion.

The university characteristics and academic regulations considered here were all the result of policy choices made by the institution itself or its provincial governing body. Given the lack of empirical research on their impacts, it seems clear that these policy decisions were made with inadequate evidence on or consideration of their effects on students' progress through their post-secondary programs. The estimates below provide initial evidence that may help decision-makers understand some of the effects of their policy choices on students, and allow them to revise their regulations, refund policies and institutional characteristics to help improve student outcomes.

### **Hypothesized Effects, Evidence from the Literature, and Potential Policy Implications**

As noted above, the literature contains evidence on the effects of institution size for American colleges and universities. The conventional wisdom is that size has only an indirect effect on students, with larger schools contributing to less social involvement or integration and more isolation and anonymity, which in turn lead to lower persistence and degree completion. Larger institutions usually have lower faculty-student ratios and less interaction between faculty and students, factors also hypothesized to lead to lower persistence. Pascarella and Terenzini (1991) surveyed the empirical literature on the effects of institution size and argued that the results were mixed, and their 2005 update reinforced this overall conclusion; most of the studies they cited showed a negative or inconclusive effect, thereby providing some support for the conventional wisdom. In addition, Kuh et al. (2006) concluded that there

was a negative relationship between institution size and student persistence and degree completion in their summary of the literature. Although the empirical evidence is not unanimous, it provides some guidance for the question of whether there should be more smaller universities or fewer larger ones.

There is a consensus in the literature that more selective schools have higher rates of persistence and degree completion, even after adjusting for the students' ability, high school performance and other characteristics. Peer effects are usually cited as the reason, with higher quality peers leading students to improve their performance. Pascarella and Terenzini (1991, 2005) and Kuh et al. (2006) provided summaries of the American literature. Gilbert (1991) provided the only Canadian evidence, concluding that more selective schools have, on average, higher completion rates but with large variation across individual institutions.

While there is strong consensus on the effects of institutions' selectivity, the evidence is not unanimous. Adelman (2006), for example, found that an institution's selectivity is not an important correlate of the probability of degree completion. There is also evidence that peer effects vary with student abilities and differences between student and peer abilities. See Arcidiacono (2004) for a theoretical and empirical examination of peer effects and the notion of an optimal match between student and school.

The number of high profile professional schools at an institution and the research productivity of faculty have not been in-

cluded in previous studies of student persistence and degree completion, even though the literature argues that an institution's mission, research orientation, emphasis on graduate instruction, and overall environment are important (Pascarella and Terenzini 1991, 2005; Kuh et al. 2006).<sup>3</sup> The professional schools on a university campus were hypothesized to provide tangible goals and career progression for undergraduates, thus improving their degree completion rates. Higher faculty research output, on the other hand, was hypothesized to lower students' persistence and likelihood of degree completion, as faculty would devote more of their scarce time and attention to research rather than teaching; however, other hypotheses would also have been possible.

The estimated effects of faculty research productivity and the presence of professional schools are related to the contentious question of differentiation across universities. For example, should research be promoted and expected in all institutions or should there be designated research-intensive schools and other "teaching" universities? Further, should there be more (presumably smaller) professional schools located on more campuses, or fewer and larger professional schools located on just a few campuses? Although many other factors must be considered in these decisions, their effects on students should not be ignored.

Academic regulations are regularly debated by university senates, but many questions pertaining to the effects of these regulations on students' progress have yet to be

settled. Setting the last date for course withdrawal without academic penalty later in the term (e.g., to the last day of classes, at its most extreme) may induce students to start and withdraw from courses more often, causing them to "mill around" within the institution for longer periods of time. Similarly, an earlier final withdrawal date may force students to make an earlier commitment to course completion and help them accumulate credits towards their degree more quickly. On the other hand, later final withdrawal dates may help students correct missteps in their choices of courses and programs without academic penalties, thus facilitating their transfer to more appropriate courses and programs; in turn, this flexibility may increase the likelihood that students obtain more PSE and a post-secondary credential. Adelman (2006) reported a negative relationship between the number of courses repeated or dropped and the probability of completing a degree (adjusting for other factors). He concluded that the "milling around" effect outweighed the "easier adjustments to shocks and mistakes" effect. Although Adelman did not estimate the relation between the rules governing course repeats and withdrawals and degree completion, the quote in the introduction is evidence of his belief that such a connection exists.

The same reasoning and lack of evidence also apply to the effects of the tuition refunds available to students if they withdraw from a course during the academic term. Typically, students receive a 100% refund if they withdraw within the first two weeks of the term (i.e. during the add/drop period).

---

<sup>3</sup> I contend that faculty research output and the number of professional schools provide good measures of the university type and environment, and that these measures are more discriminating than classifications such as the Carnegie or Maclean's (for Canada) categories.

After that, the percentage refunded declines as the term progresses and the percentages and rates of decline vary across schools. A more generous refund schedule makes it more likely that students withdraw from courses later in the term, so the hypothesized effects were the same as for later withdrawal deadlines.

All the Canadian universities studied allowed students to repeat courses that they had failed, but some did not allow students to repeat courses that they had passed. Some schools made students obtain special permission to repeat a passed course, which was given only in exceptional circumstances. Others set global or individual course limits on the number of times a passed course could be repeated. In all cases, students did not accumulate additional credit towards their degree if they repeated a passed course, but repeating the course gave them the opportunity to improve their academic standing or grade averages.

The arguments for and against repeating courses are similar to those for withdrawal dates and refunds. Allowing students to repeat passed courses may make it easier for them to overcome earlier mistakes or adverse shocks and make new progress towards the completion of their actual or desired program. On the other hand, there may be an incentive effect and students may be less diligent and less willing to work to overcome adverse shocks if there exists the option of repeating the course (possibly several times). Allowing students to repeat previously passed courses may also encourage students to re-attempt the same courses (i.e. more “milling around”), thus slowing their progress

towards completion of a program and inhibiting or delaying their transfer to a more appropriate program.

Canadian universities are split in their treatment of grades for repeated courses. Some include both the old and the new grade in all calculations of grade averages and student standing. Other universities replace the old grade with the new one, regardless of whether it is higher or lower, and the old grade is no longer included in the grade average calculations. A few schools even take the highest of all grades awarded for a course. Like allowing students to repeat passed courses, policies that allow new grades to replace the old ones make it easier for students to overcome earlier mistakes or adverse shocks and make fresh progress towards the completion of a program. On the other hand, such policies carry the risk of the possible incentive effect whereby students know that it will be easier to correct errors or overcome adverse conditions in the future. Allowing new grade to replace old ones certainly increases the incentive to repeat courses (passed or failed), with all of the potential accompanying effects described above.

The policy implications of the above considerations are clear. Academic regulations governing post-secondary education should provide an academic framework and appropriate incentives for students to complete courses and accumulate credits towards a degree. At the same time, regulations need to provide flexibility so that students can adjust to new information acquired in PSE about their abilities, preferences, and options, as well any shocks that inevitably occur.

The impacts of regulations on students' persistence and degree completion are crucial factors to be considered when making decisions with the aim of selecting the best (or better) regulations for university programs. This study reports some first empirical evidence on these effects, which may provide guidance for setting or revising academic regulations.

### Data

Data on academic regulations at 23 of the larger non-Quebec universities were collected from their calendars. The regulations covered the academic years 1997-1998 through 2005-2006, essentially the years of students' university programs in the YITS-B data set. Quebec universities were not included because the analysis concentrated on students' first post-secondary programs and almost all of those were at CEGEPs, rather than universities, in Quebec.

Data on university characteristics were collected from publicly available sources. The universities' characteristics (e.g., sizes, entering averages, publishing outputs) did not change much, relative to one another, from year to year, so 1999-2000 or 2000-2001 values were assigned for all years for each university.

Table 1 (page 20) shows the means and standard deviations of the academic regulations and university characteristics. It is important to understand that the descriptive statistics were calculated over "university-years" (where a total of nine "university-year" observations was made for each university, one observation for each school year

from 1997-1998 through 2005-2006). Therefore, the academic regulations from larger universities were given the same weight in the averages as the regulations from smaller schools. Further, regulations at some universities changed over the 1997-1998 to 2005-2006 period, so the averages were taken from the different values for the nine-year period considered here.

The academic regulation variables used are descriptive of the regulatory situations for one-term courses offered in the fall term (i.e., from September to December). These measures provided a good approximation of overall academic regulations at a university, as winter term regulations are usually identical (with the exception of an adjustment for reading week) to fall term regulations and those for courses offered over the whole fall/winter session usually follow the fall course regulations over the doubled time period.

The *withdrl\_date* variable shows the final withdrawal date (the latest date students could withdraw from courses without receiving a grade) expressed as a percentage of the term. Table 1 shows that the average date was around two-thirds of the way through the term. Most terms were 12 to 13 weeks long, so the average final withdrawal date fell at the end of the eighth week or the start of the ninth. Some schools, however, had final withdrawal dates as early as five weeks into the term or as late as the last day of classes, corresponding to the *withdrl\_date* values of 38.5 and 100 percent respectively. The final withdrawal date was the regulation changed most often by universities over the period under consideration. The average final withdrawal date was pushed forward by a few

days over the first half of the period studied, as a few schools started allowing withdrawals up to the last day of lectures, but most of those schools reverted back to the two-thirds mark before 2005. Other schools revised their final withdrawal dates (moving them forward or back) over the period, but the net effect left the overall average final withdrawal date one day earlier in 2005 than it was in 1997.

*per\_crs\_refund* is a dummy variable that equals one if students received tuition refunds for withdrawals on a per course basis. Several universities did not give any tuition refunds if a student withdrew from a course (after the initial add/drop period) but retained full-time status. *per\_crs\_refund* equals zero for these latter schools and Table 1 shows that approximately 30 percent of the schools followed this practice. Note that a typical full load for students was five courses in a term, but that full-time status meant that a student was still enrolled in three, three and a half, or four courses in a term, depending on the school.

All the universities provided only partial tuition refunds for course withdrawals after the initial add/drop period, regardless of whether they were given on a per course basis or only if the student dropped to part-time status. A typical refund policy allowed 100 percent refunds for withdrawals or drops during the add/drop period, which usually covered the first two weeks of the term. After that, later course withdrawals corresponded to lower corresponding refund amounts. There was wide variation in the generosity of refund schedules. The least generous provided less than a 100 percent

refund during the initial add/drop period and zero refund thereafter. The most generous schedules provided a full refund over the add/drop period, 80 percent over the next two weeks of classes, and 50 percent over the next five weeks.

*refund\_gen* is an index of the generosity of the tuition refund schedules. It is bounded by zero and 100 and it equals the sum of the percentage refunds times the proportion of the term where they were available. For example, a school with a 12 week term that provided a 100 percent refund over the first two weeks of term and zero refund thereafter would have *refund\_gen* =  $100 \times (2/12) = 16.6$ . Another school with a 100 percent refund over the first two weeks, followed by a 50 percent refund over the next 4 weeks, would have *refund\_gen* =  $100 \times (2/12) + 50 \times (4/12) = 33.33$  and Table 1 shows that this is close to an average refund schedule. The refund schedules changed at several schools over the period studied and, while there was variation from year to year, they generally became less generous from 1997 to 2005.

The interaction term *ref\_crs\_threshold* is defined as refund generosity times one minus the per course refund dummy variable. This variable equals zero if the university provided refunds on a per course basis and it equals *refund\_gen* if the university required students to drop below a threshold number of courses before issuing course tuition refunds. It shows the difference between students' responses to *refund\_gen* in schools with a course threshold for refunds, as compared to students' responses in schools that gave tuition refunds on a per course basis.

Note that the refund variables only consider course tuitions. Students pay several other fees, usually for student governance or facilities fees, and their refund schedules do not necessarily match those for tuition. Further, the universities usually charge administrative fees before issuing refunds or financial credits. Thus, *refund\_gen* does not provide an exact measure of the refunds students received and modeling all of the charges and schedules would be far too difficult. Tuition makes up the largest portion of the per course cost to students, however, so it should provide a good measure of the variation in refund generosity across universities.

*can\_rep\_pass* is dummy variable that shows the regulations for repeating a previously passed course. It equals one if students were allowed to repeat a passed course with no special permission. It equals zero if students were not allowed to repeat a passed course or if special permission was required.<sup>4</sup> Table 1 shows that in almost three quarters of the university-years students were allowed to repeat previously passed courses with no special permission.

*rep\_grade\_counts* is a dummy variable indicating whether a repeated grade was counted in a student's average. It equals one if, when a course was repeated, both the old grade and the new grade were included in the student's cumulative or session average. *rep\_grade\_counts* equals zero if the new grade replaced the old grade or the highest of the two grades was used in the calculation of students' standing or cumulative average. The mean of this variable shows that the university-years were split evenly on this

regulation, but there was also a clear downward trend, with three universities changing their rules to allow new grades to replace the old over the period studied.

1999-2000 full-time equivalent (FTE) enrolment (*enrol\_99*), measured in thousands of students, was used to measure university size. The data were taken from the 2003 Canadian Association of University Teachers (CAUT) almanac. The research intensity or orientation of the university was measured by the number of publications per faculty member (*pubs\_per\_fac*) in 1999. Publications, including all document types counted by the Institute for Scientific Information (ISI), were divided by the number of faculty at each university in 1999-2000 as reported in the 2003 CAUT Almanac. Although this variable provided no adjustments for the type or quality of publications, which were likely to vary across universities, it should still provide a good measure of the universities' research intensities because the average quantity of faculty research output tends to be correlated with measures of its quality. See, for example, Gomez-Mejia and Balkin (1992) for evidence on this point.

Another measure of the type of university and university environment is the number of high profile professional schools at that university (*prof\_schools*). What constitutes a "high profile" profession is admittedly arbitrary but it is reasonable to include medicine, dentistry, law, veterinary, pharmacy, education and optometry in the count. Data was collected using the Association of Universities and Colleges of Canada (AUCC) database of programs at Canadian universities. Table 1 shows that the number of professional schools at an institution averaged almost two

<sup>4</sup> It is difficult to measure how large a hurdle permission is at each school. It is likely that some universities give permission to repeat passed courses freely, while others rarely allow it. It seems reasonable, however, that there is a qualitative difference between having the right to repeat a course with no questions asked and having to obtain permission, even if it is usually granted.

and varied from zero to six across the universities included. Lastly, the 1999-2000 average high school grade of entering students (*enter\_avg*) was used to reflect the selectivity of the university. The data were taken from the Maclean's survey.

Data on students' PSE programs, personal characteristics, and background variables were taken from cycles one through four of the Youth in Transition Survey – Cohort B (YITS-B). Students' first PSE program was the basic unit of observation and analysis. The data were restricted to students' first programs; started between 1997 and 2005; at the bachelor's level; and at one of the 23 universities where data on academic regulations were collected. YITS-B defined a student's first post-secondary program as their first formal education above the high school level; counting towards a diploma, certificate or degree; and requiring three months or more to complete. The program was classified as ended if: (a) the student graduated; (b) the student left the program and did not enrol in another PSE program; or (c) the student interrupted their studies and the YITS interview occurred during the interruption. Students in the first case were called graduates, while those in the latter two groups were called leavers. The first program was also classified as ended if: (a) the student left the institution and started another PSE program at a different institution; (b) the student changed the level of their study (e.g., from a bachelor's level program to a diploma or certificate); or (c) the student changed to a program with a different name (e.g., from a Bachelor of Arts to a Bachelor of Science program). In these cases the student was classed as a switcher because they trans-

ferred to another institution, level, or type of program.

It is important to note that if a student changed their major field of study (e.g., from economics to philosophy), but their program retained the same name (e.g., both were Bachelor of Arts degrees), then the student was not deemed to have changed their program. Similarly, if a student changed their level of study within a YITS-B category (e.g. from an Honours to a Pass or General bachelor's program), or changed from full-time to part-time study, then the student was not deemed to have changed their program. In both of these cases, the students were not classified as switchers; instead, they were classified as continuers in their programs. All observations were weighted by the population weights provided in the survey.

### **Correlations of Academic Regulations and University Characteristics Across Universities**

Table 1 (page 20) shows that there was variation in university characteristics and academic regulations across universities, so regression analysis could be used to estimate their relations to student persistence and degree completion, adjusting for the other factors. It is also important, however, to show that the variation in university characteristics and regulations was not strongly correlated across universities. This would occur, for example, if there were just two or three basic archetypes of universities with very similar regulations and characteristics. To investigate this, the average value of each regulation and characteristic (over the 1997 to 2005 period) was assigned to each university

and the correlation matrix of these average values across universities is shown in Table 2.

Table 2 (page 20) shows that there were not strong correlations in the characteristics and academic regulations across universities. The highest correlation coefficient was only 0.686 and it shows that universities with higher faculty research output tended to admit students with higher high school averages. These schools also tended to be larger, have more professional schools, restrict students' ability to repeat passed courses, and include the grades of repeated courses in student averages. Not surprisingly, larger universities tended to have more professional schools, higher faculty research output (already mentioned), and higher student entering averages, and were also more likely to restrict repeats of passed courses and include repeated grades in student averages. In general, schools that restrict repeats of passed courses tended to be larger; have higher research output, more professional schools and higher entering averages; and include repeated grades in student averages.

As for the other academic regulations, the final withdrawal date was not strongly correlated with any of the other regulations or characteristics, but it did tend to be earlier in schools with higher research output and higher entering averages. Refund generosity was also not strongly correlated with any of the other variables, although larger schools tended to be less generous.

### Estimation Results

Regression analysis was used to estimate the relations between students' year-to-year

persistence in their first program and university characteristics and regulations. The dependent variable shows whether students enrolled in the first year of their first program were:

enrolled in the same program in the following year, indicating that they continued or persisted from year one to year two of their program. This was the base or omitted case in the multinomial logit regression analysis that follows.

- a) enrolled in a different PSE program (i.e. a program at a different university, a different level, or with a different name in the following year), indicating that they were switchers from year one to year two.
- b) not enrolled in a PSE program in the following year, indicating that they were PSE leavers from year one to year two.
- c) Analogous definitions were used for their persistence (or not) from year two to year three of their first program for students who continued from year one to year two.

Table 3 (page 21) provides definitions for the explanatory (or right hand side) variables included in the regressions and Table 4 (page 23) shows the means of the variables where each observation (student) was weighted by the YITS-B population weights. Note that the descriptive statistics for academic regulations and university characteristics here are different from those shown in Table 1. Table 1 reports the descriptive statistics over university-years where each university-year

received equal weight. The means and standard deviations in Table 4 were calculated for all students enrolled at the universities covered. More students in the data set attended larger universities, so the characteristics and regulations of these universities received more weight. The number of observations in the year 2 to year 3 transition was lower than year 1 to year 2 because those who left, switched out of their first program, or dropped out of the YITS-B before reporting on their year 2 to year 3 transition were not included.

Multinomial logit regression analysis was used to estimate the relations between the right hand side variables and the probability of switching to another program or leaving PSE, as compared to the probability of being in the base category (namely, continuing to the next year in the same program). Table 5 (page 24) reports estimates of the marginal effects for the year 1 to year 2 transition and Table 6 (page 26) reports the same for year 2 to year 3 transition for various specifications.

The next step in the analysis involved estimating the relationships between university characteristics and academic regulations and students' degree completion and time to degree. Table 7 (page 28) reports the estimated marginal effects of the right hand side variables on the probability that students graduated from their first programs, calculated from probit regressions. The dependent variable equals one if the student graduated from their first program and zero if the student left PSE or switched programs. Students continuing their first program at the end of YITS-B cycle four were excluded. Table 7 also reports the coefficients from linear regressions estimating the effects of university characteristics, academic regulations, and the other right hand side variables on the length of time students took to complete their first

university programs. The dependent variable was the number of months between the start and end dates of their first program for those students who completed their degree. The regressions shown in Table 7 were restricted to students (observations) who were interviewed in all four YITS cycles. Further, students were excluded from these regressions if the university they were attending changed one of its academic regulations during the student's first program.

The estimated standard errors of all of the regression coefficients were adjusted for possible correlations in the error terms between students attending the same university. This was done using the cluster option in Stata, which calculates robust standard errors like those set out in White (1980), but with the observations on students grouped according to their university. Therefore, the asymptotic t-statistics reported in Tables 5, 6, and 7 were based on standard error estimates robust to heteroscedasticity and non-zero correlations across students attending the same university. Further, as the name implies, the asymptotic t-statistics have only good asymptotic properties (so they could be called z-statistics) and should be read with some caution, as there were only 23 universities or groupings in the data.

Another caveat is the extent to which the estimated relations presented below may not be causal and, therefore, provide poor guides for policy. Table 2 shows that there was independent variation in the academic regulations and university characteristics across universities. Further, the estimated regressions included all the other regulations and characteristics mentioned above, so they controlled for their effects. However, there might have been other university charac-

teristics, regulations, or procedures (some of which might not have been observable even to an external researcher) that were correlated with the explanatory variables in the regressions and that affected students' progress through their programs. Therefore, students' progress through their programs might actually have been the result of these other factors and simply correlated with, but not caused by, the regulations or characteristics included in the regression. Put another way, the explanatory or right hand side variables considered below and the outcomes of students' programs might all be endogenous. That is, they might simply have been the result of university characteristics, policies, regulations, or even underlying philosophies within the universities. In this case, the relations estimated below may be seriously biased or not causal and, therefore, of little help to policy-makers.

A further problem stems from the fact that students usually have the ability to choose their university, and different types of students (with respect to their likely progress through their university programs) may sort themselves across universities based on the universities' characteristics and regulations. Therefore, any estimated relations between regulations, for example, and students' progress might be due to this sorting and not because the regulation affected students' outcomes. This sorting or selection would become even more problematic if the universities, in turn, reacted to the types of students that they were attracting and changed their regulations or procedures (observed or unobserved) in an attempt to alter students' progress through their programs.

A partial solution to these endogeneity and selection problems would be to estimate the effects (if any) of changes to regulations within a university over the time period. However, there were too few instances of changes to attempt this analysis using the YITS-B at this time.

Rather than examine the estimates from each regression separately, it was considered more instructive to consider the effect of each variable over the various stages of the students' first university program. The estimates reported in Table 5 (showing year 1 to year 2 transitions), Table 6 (showing year 2 to year 3 transitions), and Table 7 (showing the likelihood of first program completion and time required for completion, if the first program was completed) are discussed together for each variable.

Table 5 shows that students attending universities with later final withdrawal dates were much more likely to switch to another program in their first year. If students could withdraw from a course without academic penalty one week later in the term (roughly an eight percent increase in *withdrl\_date*), the probability of their transferring to another institution, level, or program was predicted to be about 1.7 percentage points higher. Table 6, however, shows that the estimated effect was limited to first year, since the coefficients for switching in second year were small and statistically insignificant. Further, the estimates show that final course withdrawal dates were unrelated to the probability that students would leave PSE in either their first or second years.

The positive relation between later withdrawal deadlines and switching programs in first year carried over to the probit regression examining whether students graduated from their first program. Students attending universities with later withdrawal dates were less likely to complete their first program (see Table 7), although this coefficient in the full specification was only significant at the 10% level. According to the estimate, a withdrawal date one week later was associated with a 3.3 percentage point lower first program completion rate at that institution. The lower graduation rate presumably occurred because of the higher switching rate in the first year. Note that this finding does not necessarily imply that the switchers completed less PSE or were less likely to complete a PSE credential. Instead, the greater switching in first year might indicate that students transferred to programs that were more appropriate for them. Students facing later final withdrawal dates might have completed more PSE and be more likely to have obtained a PSE credential if the outcomes of their second programs (which they were more likely to have) were taken into account. Alternatively, the greater switching in first year could be associated with less PSE and fewer credentials if the outcomes of second or even third programs were considered. A conclusion on this point awaits the extension of the analysis to include the outcomes of students' second and third programs.

The generosity of refunds for course withdrawals were estimated to have similar effects as final withdrawal dates. Students eligible for larger refunds, later in the term, were more likely to switch to another program in their first year, although this estimate

in the full specification was only significant at the 10% level. The estimates were also similar to those for *withdrl\_date* in that students reacted differently in their first and second years. Students were much less likely to leave PSE in second year if they received bigger refunds for withdrawing from their courses. The difference between the least generous and the average refund in the sample was estimated to account for a 1.76 percent decrease in the probability of students' leaving their first program during or after their second year. Lastly, students who completed their first university program were estimated to complete it more quickly in universities with more generous tuition refunds. The difference between the least and average generosity was associated with roughly three months shorter time to completion.

The positive and significant coefficients on *ref\_crs\_threshold* in Table 5 suggest that first year students were more sensitive (in the same direction) to the generosity of refund schedules in universities that provided tuition refunds only if students dropped below a minimum threshold of courses. This finding suggests that the refund threshold leads to more "all or nothing" behaviour for switching and leaving, which is consistent with non-linear price/refund schedules (compared to the smoother per course schedules offered at other universities). The estimated impact, however, was only observed for first year transitions; the coefficients on *ref\_crs\_threshold* for second year decisions, graduation rates, and time to degree were insignificant.

The results outlined above suggest that later final withdrawal dates and more gener-

ous tuition refunds might have allowed students to make more adjustments to the surprises, shocks, and learning about PSE that occur while in PSE. Students who had access to more generous tuition refunds and later final withdrawal dates were more likely to switch programs in their first year and then less likely to exit PSE in their second year, presumably because they have already made appropriate program adjustments in their first year, although the year 2 to year 3 effects were insignificant for final withdrawal dates. The estimated shorter time spent completing their degrees, for those who did complete them, suggests that later final withdrawal dates and more generous refunds help students make appropriate program adjustments early in their PSE experience and that they do not induce students to “mill around” in their first program. However, once again, several of the estimates for final withdrawal dates were not statistically significant. Further, this interpretation is complicated by the differences in first program completion rates across the different regulations. A better evaluation of whether students were, in general, milling around or, on the other hand, were correcting their mistakes would require an examination of what happened after their first program.

The variation in students’ rights to repeat passed courses (*can\_rep\_pass*) was clearly unrelated to universities’ graduation rates or their average time to degree completion for students’ first programs. There is weak evidence that the unhindered right to repeat passed courses decreased the likelihood of students’ switching programs or leaving PSE in first year while increasing the likelihood that they switch programs in their second

year. However, most of the estimates were only significant at the 10 percent level and were not robust across different specifications, so confident inferences could not be drawn.

The estimates for *rep\_grade\_counts* were similar, in that there were no significant differences in first program graduation rates or time to degree completion between universities that included repeated grades and those where the new grade replaced the old grade. Differences in this rule were also unrelated to students’ first year decisions about switching programs or leaving PSE. In second year, however, students were much more likely to leave PSE if their university allowed the new grade to replace the old one. This result was surprising because a policy allowing the new grade to replace the old one might make it easier for students to make up for past failures, poor grades or other missteps and encourage them to stay in PSE, perhaps with a change in program.

Estimates for university characteristics tended to be more fragile than those for academic regulations, with some big changes across the specifications reported. As for university size, larger schools had significantly lower switching and leaving rates in second year, so more students continued from year 2 to year 3 in their first programs. There was evidence of higher continuation rates among first year students in larger universities as well, but these estimates had larger standard errors and were not robust to the different specifications. These results are at odds with the overall consensus in the literature, which finds lower student persistence in larger schools, but they are consis-

tent with the findings of Kamens (1971) and Titus (2004), who reported positive relationships between institution size and student persistence after controlling for other factors.

The research intensity of the university, as measured by publications per faculty member (*pubs\_per\_fac*), provided some significant coefficients, but they were also not robust to different specifications. There was evidence that the switching rate was higher and the leaving rate lower among first year students in more research-intensive universities, while the leaving rate was higher among second year students. The graduation rate was estimated to be unrelated to the number of publications per faculty member, while the time to degree completion was lower at research-intensive universities. This last result was the most robust across specifications.

The number of professional schools at a university was generally estimated to be unrelated to students' persistence, degree completion or time to degree completion in their first programs.

Finally, students at universities with higher entering averages were estimated to be less likely to leave PSE and more likely to persist in their programs, consistent with the usual results found in the literature. Also consistent with the literature, students at universities with higher entering averages showed a trend of being more likely to graduate from their first programs, but these estimates were not statistically significant. Finally, students in universities with higher entering averages took a longer time to complete their first program.

The control variables in the regressions generally produced the expected estimates. Women were less likely to leave PSE in first year but they were also more likely to switch programs in their second year and neither more nor less likely to graduate from their first program. Lower high school grades were not related to student persistence in first year, but second year students were much more likely to leave PSE if they had lower high school grades. The probit regression also shows that students were much less likely to graduate if they had lower high school grades.

Students' major field of study in their first program was significantly related to many of the outcomes studied. Undecided students were much more likely to switch their programs in both first and second year and, correspondingly, much less likely to complete their first program, compared with students in the omitted category of **health, recreation, and agriculture**. Business and science majors had a lower probability of graduating from their first programs even though business students were less likely to switch programs in their first year. Students who lived with both parents in their last year of high school had higher switching and lower leaving rates in their first year, but family status was insignificant for persistence in second year and the probability of or time to graduation. Higher parental education was associated with lower rates of switching in first year, but, surprisingly, it was estimated to be unrelated to students' persistence in second year, overall probability of graduation, or time to degree completion. Finally, students with higher academic engagement in high school were less likely to switch programs or

leave PSE during their first year, although the latter trend was statistically insignificant at conventional levels. High school academic engagement was unrelated to students' second year persistence decisions, but students who were more engaged in high school were much more likely to graduate from their first programs.

The estimated effects of the control variables on persistence were generally consistent with those reported in Finnie and Qiu (2008), with most of the differences occurring for high school grades and academic engagement.

### **Conclusions and Policy Implications**

Universities are not homogeneous. They differ in size, selectivity, research orientation and overall character. There are also significant differences between the academic regulations that govern students' progress through PSE at different institutions. Evidence in the literature shows that university size and selectivity are related to students' persistence in PSE and degree completion. This paper contributes to the literature by estimating those relationships for Canadian PSE and extends it by considering universities' research orientation and overall environment, as measured by faculty research productivity and number of professional schools. This paper also extends the literature by estimating the relations between university academic regulations and students' persistence and degree completion. There have been no previous studies of the effects of academic regulations, although other authors have cited their likely importance.

The results presented in this paper show that later course withdrawal dates were correlated with more program-switching in students' first year and lower probabilities of first program completion after controlling for the other explanatory variables. More generous tuition refunds were also associated with more program-switching in first year, as well as less PSE leaving in second year and a shorter time to degree completion for those who did complete their first program. The results suggest that later final withdrawal dates and more generous tuition refunds help students make adjustments (switches) to programs that are more appropriate for them before the start of their second year.

The university characteristics and other academic regulations considered above yielded more mixed results that were generally not robust to the different specifications. Students' year-to-year persistence was estimated to be higher in more selective universities and there was greater persistence from year 2 to year 3 in schools with larger enrolments.

The basic method of analysis was a cross-section regression analysis where differences in regulations and characteristics across universities were related to differences in students' progress through their first university program. Therefore, for reasons explained in the text, the estimated relations might not have been causal. Future work to address this problem should extend the sample of universities studied, adjust for student sorting across schools and the possible endogeneity of university policies, and examine the effects of policy changes within universities

(i.e. using panel rather than cross-section data).

There is a second important caveat to the work presented above. The net effect of additional switches (due to later withdrawal dates or bigger refunds) on the total amount of PSE or PSE credentials completed could not be estimated because the analysis was restricted to students' first programs. A large body of literature shows that second programs provide an important means for students to complete more PSE and PSE credentials. Martinello (2008) and Finnie and Qiu (2008) provided evidence on this topic with regard to Canadian PSE, as well as summaries of the American literature. Similarly, any attempt to establish whether academic regulations help students correct mistakes or encourage them to mill around would also require an examination of what students do after they leave or switch out of their first program. Extending the analysis to include the outcomes of students' second or even third programs would be another direction for future work.

It is important to recall that the university characteristics, academic regulations and re-

fund policies considered here are the results of policy choices made by the institutions or their provincial governing bodies. If one is willing to accept that there is some causality in the relations estimated above (from the regulations and refund policies to students' decisions and outcomes), then these estimates provide some guidance for policy decisions. If institutions want to increase persistence and degree completion in students' first programs at that institution, then the present estimates suggest that the schools should set early withdrawal dates for courses and offer limited opportunities for tuition refunds. However, if their goal is to help students complete more PSE, regardless of the institution or program, the opposite policies may be more appropriate. That is, the extra flexibility provided by later withdrawal dates and more generous tuition refunds may help students to make changes to their PSE programs that ultimately improve their persistence and degree completion. A resolution of these conflicting policy prescriptions would require the study of what happens after students' first programs.

## References

- Adelman, Clifford. 2006. *The Toolbox Revisited: Paths to Degree Completion from High School Through College*. Washington: U.S. Department of Education.
- Arcidiacono, Peter. 2004. "Ability Sorting and the Returns to College Major," *Journal of Econometrics* 121 (1-2):343-75.
- Canadian Association of University Teachers (CAUT). 2003. *CAUT Almanac of Post-Secondary Education in Canada*. Ottawa: CAUT.
- Finnie, Ross, and Hanqing Qui. 2009. "The Patterns of Persistence in Post-Secondary Education in Canada: Evidence from the YITS-B Dataset," in *Who Goes? Who Stays? What Matters? Accessing and Persisting in Post-Secondary Education in Canada*, ed. R. Finnie, R.E. Mueller, A. Sweetman, and A. Usher. Montreal and Kingston: McGill-Queen's University Press and Queen's University School of Policy Studies.
- Gilbert, Sid. 1991. *Attrition in Canadian Universities Research Report #1*. Commission of inquiry on Canadian University Education.
- Gomez-Mejia, Luis R. and David B. Balkin. 1992. "Determinants of Faculty Pay: An Agency Theory Perspective," *Academy of Management Journal* 35 (5):921-55.
- Grayson, Paul J. and Kyle Grayson. 2003. *Research on Retention and Attrition*. Montreal: Canada Millennium Scholarship Foundation.
- Kuh, George D., Jillian Kinzie and Jennifer A. Buckley. 2006. *What Matters to Student Success: A Review of the Literature, Commissioned Report for the National Symposium on Postsecondary Student Success: Spearheading a Dialog on Student Success*. Washington DC: National Postsecondary Education Cooperative.
- Kamens, David H. 1971. "The College 'Charter' and College Size: Effects on Occupational Choice and College Attrition," *Sociology of Education* 44(3):270-296.
- Martinello, Felice. 2009. "Transitions and Adjustments in Students' Post-Secondary Education," in *Who Goes? Who Stays? What Matters? Accessing and Persisting in Post-Secondary Education in Canada*, ed. R. Finnie, R.E. Mueller, A. Sweetman, and A. Usher. Montreal and Kingston: McGill-Queen's University Press and Queen's University School of Policy Studies.
- Pascarella, Ernest T. and Patrick T. Terenzini. 1991. *How College Affects Students*. San Francisco: Jossey-Bass.
- Pascarella, Ernest T. and Patrick T. Terenzini. 2005. *How College Affects Students, Volume 2*. San Francisco: Jossey-Bass, a Wiley imprint.
- Tinto, Vincent. 1987. *Leaving college: Rethinking the causes and cures of student attrition*. Chicago: University of Chicago Press.
- Titus, Marvin A. 2004. "An Examination of the Influence of Institutional Context on Student Persistence at 4-Year Colleges and Universities: A Multilevel Approach," *Research in Higher Education* 45(7):673-99.

19 Effects of University Characteristics and Academic Regulations on Student Persistence, Degree Completion, and Time to Degree Completion

White, Halbert. 1980. "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity," *Econometrica* 48 (4):817-30.

## Tables and Figures

**Table 1.** Means and standard deviations of university characteristics and academic regulations (averaged over university-years)

Variable	Mean	Std. Dev.	Min	Max
<i>withdrl_date</i> Final withdrawal date as a % of the term	67.92	15.09	38.5	100
<i>per_crs_refund</i> (Dummy variable) Refunds given on a per course basis	0.70	0.46	0	1
<i>refund_gen</i> Refund generosity	31.43	9.36	11	45.5
<i>can_rep_pass</i> (Dummy variable) Can repeat a passed course	0.73	0.45	0	1
<i>rep_grade_counts</i> (Dummy variable) Repeated grade counts in average	0.49	0.50	0	1
<i>enrol_99</i> FTE enrolment in 000's	16.92	8.84	4.93	44.01
<i>pubs_per_fac</i> Number of publications per faculty member	1.29	0.63	0.17	2.29
<i>prof_schools</i> Number of professional schools	1.91	1.50	0	6
<i>enter_avg</i> Students' average entering grade	81.43	3.02	76	87.1

Author's compilation.

**Table 2.** Correlations across universities between characteristics and academic regulations

	<i>withdrl_date</i>	<i>per_crs_refund</i>	<i>refund_gen</i>	<i>can_rep_pass</i>	<i>rep_grade_counts</i>	<i>enrol_99</i>	<i>pubs_per_fac</i>	<i>prof_schools</i>
<i>withdrl_date</i>	1							
<i>per_crs_refund</i>	0.116	1						
<i>refund_gen</i>	0.109	-0.280	1					
<i>can_rep_pass</i>	0.221	0.022	-0.162	1				
<i>rep_grade_counts</i>	0.176	0.367	-0.179	-0.472	1			
<i>Enrol_99</i>	-0.140	0.225	-0.319	-0.441	0.509	1		
<i>Pubs_per_fac</i>	-0.251	0.228	-0.084	-0.550	0.669	0.592	1	
<i>prof_schools</i>	-0.055	0.276	0.079	-0.397	0.180	0.523	0.414	1
<i>Enter_avg</i>	-0.313	0.197	-0.044	-0.463	0.381	0.354	0.686	0.311

Author's compilation.

**Table 3.** Definitions of right hand side variables used in the regression analysis

Variable Name	Definition (dv represents dummy variable)
female	dv =1 if student is female
immigrant	dv =1 if student is an immigrant
visible minority	dv = 1 if student is a visible minority
grade_hs_under_80	dv = 1 if average grade in last year of high school was under 80
student loans	dv = 1 if student received a government sponsored student loan in their first program
age_under19	dv = 1 if student started first university program at age under 19
age_over19	dv = 1 if student started first university program at age over 19
<b>started first university program at age 19 is the omitted category</b>	
mjr_humanities	dv = 1 if majored in humanities, education, fine arts, comm. in first university program
mjr_social_science	dv = 1 if majored in social, behavioural sciences or law in first university program
mjr_business	dv = 1 if majored in business management or public admin in first university program
mjr_science	dv = 1 if majored in math, science, engineering, architecture in first university program
mjr_undecided	dv = 1 if was undecided, did not have a major field of study in first university program
<b>agriculture, recreation, health, transportation is the omitted category</b>	
two_parents	dv = 1 if student lived with both parents in last year of high school
parent_less_hs	dv = 1 if student's parents did not complete high school
parent_college	dv = 1 if student's most educated parent completed a college credential
parent_university	dv = 1 if student's most educated parent completed a university degree
parent_dk	dv = 1 if student did not know parents highest education level achieved
<b>most educated parent completed high school is the omitted category</b>	
hs_engage_acad	scale variable measuring student's academic engagement in the last year of high school
withdrl_date	last date to withdraw from a course with no grade assigned, as a proportion of the term
refund_gen	measure of generosity of tuition refunds after withdrawal from a course
ref_crs_threshold	interaction term between refund_gen and a dv equalling one if tuition refunds are only given when a student's course load drops below a threshold
can_rep_pass	dv = 1 if students can repeat passed courses without special permission
rep_grade_counts	dv = 1 if both old and new grades are included in grade average when previously passed or failed courses are repeated

Table 3 continued

Variable Name	Definition (dv represents dummy variable)
<b>enrol_99</b>	FTE enrolment in 1999 in 000's
<b>pubs_per_fac</b>	total number of publications per faculty member
<b>prof_schools</b>	number of professional schools at the university
<b>enter_avg</b>	average high school grade of first year entering students
<b>norm_length_3</b>	dv = 1 if normal time to complete first program is three or fewer years
<b>norm_length_5</b>	dv = 1 if normal time to complete first program is five or more years
<b>normal length of time equal to 4 years</b> is the omitted category	

Author's compilation.

**Table 4.** Means and standard deviations of variables, weighted by YITS population weights

	First Program Year 1 to Year 2 Transitions		First Program Year 2 to Year 3 Transitions	
	mean	standard deviation	mean	standard deviation
<b>female</b>	0.579	0.494	0.598	0.490
<b>immigrant</b>	0.136	0.343	0.144	0.351
<b>visible minority</b>	0.227	0.419	0.238	0.426
<b>grade_hs_under_80</b>	0.309	0.462	0.282	0.450
<b>student loans</b>	0.262	0.440	0.266	0.442
<b>age_under19</b>	0.316	0.465	0.320	0.467
<b>age_over19</b>	0.129	0.335	0.107	0.309
<b>mjr_humanities</b>	0.197	0.398	0.204	0.403
<b>mjr_social_science</b>	0.264	0.441	0.275	0.447
<b>mjr_business</b>	0.101	0.302	0.106	0.308
<b>mjr_science</b>	0.297	0.457	0.296	0.457
<b>mjr_undecided</b>	0.044	0.204	0.024	0.152
<b>two_parents</b>	0.866	0.341	0.857	0.350
<b>parent_less_hs</b>	0.041	0.198	0.045	0.207
<b>parent_college</b>	0.245	0.430	0.256	0.436
<b>parent_university</b>	0.519	0.500	0.516	0.500
<b>parent_dk</b>	0.037	0.188	0.033	0.179
<b>hs_engage_acad</b>	0.369	0.851	0.427	0.842
<b>withdrl_date</b>	68.911	15.656	68.140	15.803
<b>refund_gen</b>	31.140	8.834	30.842	8.916
<b>ref_crs_threshold</b>	11.304	17.286	10.683	16.889
<b>can_rep_pass</b>	0.654	0.476	0.672	0.470
<b>rep_grade_counts</b>	0.606	0.489	0.607	0.489
<b>enrol_99</b>	17.731	9.244	17.603	9.424
<b>pubs_per_fac</b>	1.522	0.715	1.563	0.735
<b>prof_schools</b>	2.010	1.579	2.097	1.597
<b>enter_avg</b>	81.665	3.102	81.731	3.113
<b>Proportion of continuers</b>	0.813		0.868	
<b>Proportion of switchers</b>	0.110		0.094	
<b>Proportion of leavers</b>	0.078		0.039	
<b>Number of observations</b>	2383		1748	

Author's compilation.

**Table 5.** Estimated marginal effects on the probability of year 1 to year 2 transitions: switching programs or leaving PSE compared to the omitted category of continuing in first PSE program

	Without University Characteristics		Without Academic Regulations and Refund Policies		Full Specification	
	Switching	Leaving	Switching	Leaving	Switching	Leaving
<b>Withdrl_date</b>	0.0021** (5.92)	0.0007 (1.12)			0.0024** (7.01)	-0.0001 (-0.23)
<b>refund_gen</b>	0.0017** (2.27)	0.0002 (0.25)			0.0018* (1.71)	-0.0001 (-0.10)
<b>ref_crs_threshold</b>	0.0012** (2.77)	0.0010** (2.10)			0.0012** (2.96)	0.0008** (2.28)
<b>can_rep_pass</b>	-0.0279* (-1.81)	-0.0123 (-0.65)			-0.0187 (-1.16)	-0.0401* (-1.76)
<b>rep_grade_counts</b>	-0.0152 (-0.89)	-0.0122 (-0.75)			-0.0311 (-1.60)	0.0214 (1.54)
<b>enrol_99</b>			-0.0023* (-1.83)	-0.0011 (-1.46)	-0.0001 (-0.04)	-0.0012 (-1.15)
<b>pubs_per_fac</b>			0.0034 (0.13)	-0.0086 (-0.62)	0.0268** (2.26)	-0.0319** (-3.07)
<b>prof_schools</b>			0.0067 (0.96)	0.0073** (2.08)	-0.0001 (-0.03)	0.0055 (0.91)
<b>enter_avg</b>			-0.0021 (-0.46)	-0.0064* (-1.74)	-0.0011 (-0.44)	-0.0070** (-2.98)
<b>female</b>	-0.0047 (-0.31)	-0.0387* (-1.88)	-0.0041 (-0.25)	-0.0368* (-1.75)	-0.0050 (-0.32)	-0.0361* (-1.81)
<b>immigrant</b>	-0.0138 (-0.49)	0.0046 (0.16)	-0.0201 (-0.70)	0.0046 (0.16)	-0.0147 (-0.51)	0.0050 (0.19)
<b>visible minority</b>	-0.0278* (-1.71)	-0.0179 (-0.98)	-0.0360* (-1.94)	-0.0181 (-1.08)	-0.0280* (-1.71)	-0.0134 (-0.79)
<b>grade_hs_under_80</b>	0.0071 (0.38)	0.0188 (1.30)	0.0123 (0.59)	0.0097 (0.67)	0.0080 (0.42)	0.0081 (0.60)
<b>student loans</b>	0.0261 (1.46)	-0.0125 (-0.96)	0.0302 (1.61)	-0.0106 (-0.82)	0.0264 (1.50)	-0.0118 (-0.99)
<b>age_under19</b>	0.0159 (0.76)	0.0248* (1.69)	-0.0113 (-0.55)	0.0065 (0.43)	0.0163 (0.78)	0.0187 (1.40)
<b>age_over19</b>	0.0394 (1.27)	0.0478* (1.92)	0.0335 (0.96)	0.0466* (1.94)	0.0382 (1.23)	0.0435** (2.00)

Table 5 continued

	Without University Characteristics		Without Academic Regulations and Refund Policies		Full Specification	
	Switching	Leaving	Switching	Leaving	Switching	Leaving
<b>mjr_humanities</b>	0.0341 (1.44)	-0.0154 (-0.66)	0.0310 (1.15)	-0.0103 (-0.42)	0.0341 (1.41)	-0.0082 (-0.35)
<b>mjr_social_science</b>	0.0305 (1.26)	-0.0231 (-0.98)	0.0325 (1.29)	-0.0122 (-0.48)	0.0281 (1.24)	-0.0089 (-0.39)
<b>mjr_business</b>	-0.0403** (-2.16)	0.0163 (0.36)	-0.0320 (-1.44)	0.0290 (0.58)	-0.0397** (-2.14)	0.0265 (0.58)
<b>mjr_science</b>	0.0226 (1.02)	0.0170 (0.59)	0.0185 (0.84)	0.0288 (0.98)	0.0206 (0.96)	0.0243 (0.90)
<b>mjr_undecided</b>	0.2996** (5.92)	0.0503 (1.25)	0.2813** (5.47)	0.0484 (1.19)	0.3046** (6.22)	0.0472 (1.20)
<b>two_parents</b>	0.0496** (4.05)	-0.0447** (-2.12)	0.0572** (3.94)	-0.0364* (-1.76)	0.0493** (3.94)	-0.0409** (-2.10)
<b>parent_less_hs</b>	-0.0349* (-1.95)	-0.0439** (-2.95)	-0.0311 (-1.40)	-0.0405** (-2.63)	-0.0349* (-1.93)	-0.0383** (-2.81)
<b>parent_college</b>	-0.0420** (-2.16)	-0.0063 (-0.33)	-0.0358 (-1.57)	-0.0007 (-0.03)	-0.0423** (-2.17)	-0.0031 (-0.17)
<b>parent_university</b>	-0.0355* (-1.86)	-0.0037 (-0.20)	-0.0373* (-1.77)	0.0032 (0.17)	-0.0375* (-1.93)	0.0005 (0.03)
<b>parent_dk</b>	-0.0472** (-2.05)	-0.0289 (-1.16)	-0.0533** (-2.40)	-0.0255 (-0.96)	-0.0464** (-2.08)	-0.0243 (-0.99)
<b>hs_engage_acad</b>	-0.0148** (-2.09)	-0.0119 (-1.40)	-0.0129* (-1.77)	-0.0094 (-1.10)	-0.0156** (-2.32)	-0.0099 (-1.30)
<b>N</b>	2383	2383	2383	2383	2383	2383

\* and \*\* indicate statistical significance at the 10 and 5 percent levels, respectively. Asymptotic t-statistics are in parentheses. Author's compilation.

**Table 6.** Estimated marginal effects on the probability of year 2 to year 3 transitions: switching programs or leaving PSE compared to the omitted category of continuing in first PSE program

	Without University Characteristics		Without Academic Regulations and Refund Policies		Full Specification	
	Switching	Leaving	Switching	Leaving	Switching	Leaving
<b>Withdrl_date</b>	-0.0002 (-0.33)	-0.0001 (-0.52)			-0.0005 (-1.04)	-0.0001 (-0.75)
<b>refund_gen</b>	-0.0002 (-0.18)	-0.0008** (-3.76)			-0.0011 (-1.30)	-0.0011** (-5.81)
<b>ref_crs_threshold</b>	0.0004 (0.71)	0 (0.27)			0.0003 (0.59)	0.0001 (0.36)
<b>can_rep_pass</b>	0.0317* -1.79	-0.0071 (-0.77)			0.0208 -1.24	-0.0065 (-0.90)
<b>rep_grade_counts</b>	0.0028 -0.2	-0.0223** (-2.41)			0.0247 -1.23	-0.0193** (-2.07)
<b>enrol_99</b>			-0.0022** (-2.01)	-0.0012** (-2.49)	-0.0033** (-2.72)	-0.0015** (-3.70)
<b>pubs_per_fac</b>			0.0112 (0.82)	0.0085 -1.28	0.0052 (0.3)	0.0167** -3.43
<b>prof_schools</b>			0.0005 (0.08)	0.0007 (0.17)	0.0084 -1.32	0.0023 (1.07)
<b>enter_avg</b>			-0.0043* (-1.80)	-0.0008 (-0.56)	-0.0042 (-1.41)	-0.0017* (-1.80)
<b>female</b>	0.0314** -2.09	0.0099 -1.36	0.0325** -2.33	0.0096 -1.31	0.0312** -2.21	0.0089 -1.36
<b>immigrant</b>	0.0301 -0.9	-0.0271** (-3.60)	0.0387 -1.11	-0.0272** (-3.23)	0.034 -1	-0.0247** (-3.64)
<b>visible minority</b>	-0.0265 (-1.16)	-0.0095 (-0.87)	-0.0177 (-0.83)	-0.0032 (-0.26)	-0.02 (-0.90)	-0.0059 (-0.54)
<b>grade_hs_under_80</b>	0.0322 (1.32)	0.0310** (2.12)	0.0255 (1.13)	0.0306** (2.2)	0.029 (1.3)	0.0269** (2.04)
<b>student loans</b>	0.0022 (0.1)	0.0105 -0.88	0.0019 (0.08)	0.0097 -0.81	0.0026 (0.11)	0.0089 -0.8
<b>age_under19</b>	0.0041 (0.28)	0.0107 (0.9)	0.0004 -0.03	0.0102 (0.8)	-0.0085 (-0.53)	0.0054 (0.55)
<b>age_over19</b>	-0.0551** (-4.23)	-0.0092 (-0.92)	-0.0564** (-4.92)	-0.0117 (-1.17)	-0.0573** (-5.20)	-0.0112 (-1.35)

Table 6 continued

	Without University Characteristics		Without Academic Regulations and Refund Policies		Full Specification	
	Switching	Leaving	Switching	Leaving	Switching	Leaving
<b>mjr_humanities</b>	0.0039 (0.13)	0.0099 -0.53	0.0189 (0.56)	0.0161 -0.71	0.0154 (0.47)	0.0138 -0.72
<b>mjr_social_science</b>	-0.0164 (-0.59)	-0.0052 (-0.38)	-0.0057 (-0.18)	-0.0024 (-0.17)	-0.0088 (-0.29)	-0.0035 (-0.27)
<b>mjr_business</b>	-0.0366 (-1.27)	0.0172 (0.71)	-0.0304 (-0.94)	0.0169 (0.71)	-0.0301 (-0.96)	0.0183 (0.78)
<b>mjr_science</b>	-0.0036 (-0.14)	0.0042 (0.27)	0.0008 (0.03)	0.006 (0.38)	0.0011 (0.04)	0.0045 (0.32)
<b>mjr_undecided</b>	0.3427** (3.82)	0.0766 (0.85)	0.3587** (3.7)	0.0795 (0.86)	0.3393** (3.81)	0.0863 (0.96)
<b>two_parents</b>	-0.0208 (-0.72)	-0.0059 (-0.41)	-0.0205 (-0.74)	-0.0077 (-0.50)	-0.02 (-0.72)	-0.006 (-0.45)
<b>parent_less_hs</b>	-0.0055 (-0.15)	0.0372 -1.02	0.0015 -0.04	0.0309 -0.92	0.002 -0.05	0.0415 -1.09
<b>parent_college</b>	-0.0022 (-0.09)	0.0074 -0.55	-0.0018 (-0.08)	0.007 -0.51	-0.0012 (-0.05)	0.0077 -0.62
<b>parent_university</b>	0.0102 -0.4	-0.0037 (-0.33)	0.01 -0.37	-0.0043 (-0.37)	0.0098 -0.37	-0.0048 (-0.45)
<b>parent_dk</b>	-0.0056 (-0.08)	0.0091 -0.26	0.0018 -0.02	0.0101 -0.28	-0.0023 (-0.03)	0.0081 -0.24
<b>hs_engage_acad</b>	-0.0123 (-1.08)	0.0004 -0.08	-0.0135 (-1.24)	0.0001 -0.02	-0.0123 (-1.13)	-0.0006 (-0.13)
<b>N</b>	1748	1748	1748	1748	1748	1748

\* and \*\* indicate statistical significance at the 10 and 5 percent levels, respectively.  
Asymptotic t-statistics are in parentheses.  
Author's compilation.

**Table 7.** Program completion and time to completion regression estimates

	Probit Regression (marginal effects)			Linear Regression		
	dep var = 1 if graduated 1st program			dep var = time taken to complete 1st program (months)		
	without univer- sity characteris- tics	without academic regulations and refund policies	full specifica- tion	without univer- sity characteris- tics	without academic regulations and refund policies	full specifica- tion
<b>withdrl_date</b>	-0.0049** (-2.14)		-0.0042* (-1.64)	-0.056 (-1.25)		-0.050 (-1.10)
<b>refund_gen</b>	0.0048 (1.24)		0.0059 (1.26)	-0.173** (-2.85)		-0.204** (-2.85) 0.204**
<b>ref_crs_threshold</b>	-0.0022 (-1.06)		-0.0020 (-0.89)	0.021 (0.59)		0.040 (1.06)
<b>can_rep_pass</b>	-0.0340 (-0.56)		-0.0347 (-0.44)	-0.838 (-0.65)		-0.527 (-0.35)
<b>rep_grade_counts</b>	0.0123 (0.16)		-0.0325 (-0.48)	0.486 (0.42)		1.684 (1.20)
<b>enrol_99</b>		-0.0004 (-0.11)	0.0030 (0.72)		0.169** (2.43)	-0.008 (-0.08)
<b>pubs_per_fac</b>		0.0560 (0.93)	0.0437 (0.85)		-1.477 (-1.65)	-2.137** (-2.21) 2.137**
<b>prof_schools</b>		-0.0003 (-0.01)	-0.0294 (-1.39)		-0.691 (-1.61)	0.138 (0.19)
<b>enter_avg</b>		0.0142 (1.10)	0.0056 (0.48)		0.479 (1.61)	0.514** (2.53)
<b>norm_length_3</b>				-3.728** (-3.37)	-3.850** (-3.54)	-3.837** (-3.55)
<b>norm_length_5</b>				7.323** (4.32)	6.529** (3.30)	6.941** (4.30)
<b>female</b>	0.0483 (0.95)	0.0419 (0.81)	0.0476 (0.94)	-1.355 (-1.39)	-1.054 (-0.98)	-1.285 (-1.31)
<b>immigrant</b>	-0.0538 (-0.68)	-0.0464 (-0.59)	-0.0488 (-0.61)	-1.343 (-0.78)	-1.390 (-0.87)	-1.438 (-0.89)
<b>visible minority</b>	-0.0200 (-0.24)	-0.0200 (-0.25)	-0.0251 (-0.30)	0.270 (0.19)	0.718 (0.48)	0.334 (0.23)
<b>grade_hs_under_80</b>	-0.1538** (-3.43)	-0.1508** (-3.28)	-0.1463** (-3.11)	0.739 (0.70)	1.098 (0.90)	0.972 (0.84)
<b>student loans</b>	-0.0365 (-0.94)	-0.0380 (-0.98)	-0.0374 (-0.93)	1.699* (1.90)	1.491 (1.63)	1.652* (1.85)

Table 7 continued

	Probit Regression (marginal effects)			Linear Regression		
	dep var = 1 if graduated 1st program			dep var = time taken to complete 1st program (months)		
	without univer- sity characteris- tics	without academic regulations and refund policies	full specifica- tion	without univer- sity characteris- tics	without academic regulations and refund policies	full specifica- tion
<b>age_under19</b>	-0.0016 (-0.03)	-0.0006 (-0.01)	0.0231 (0.44)	3.890** (3.81)	5.037** (3.65)	4.063** (2.91)
<b>age_over19</b>	0.0232 (0.35)	0.0110 (0.16)	0.0251 (0.37)	-5.930** (-4.14)	-5.169** (-3.36)	-5.651** (-3.84) 5.651**
<b>mjr_humanities</b>	-0.1109 (-1.05)	-0.1154 (-1.07)	-0.1187 (-1.09)	3.565** (2.19)	2.810* (1.81)	2.909** (2.23)
<b>mjr_social_science</b>	-0.1124 (-1.34)	-0.1318 (-1.54)	-0.1316 (-1.55)	2.591 (1.36)	1.879 (1.01)	1.959 (1.15)
<b>mjr_business</b>	-0.1883** (-2.18)	-0.2092** (-2.64)	-0.2006** (-2.56)	1.686 (0.75)	0.517 (0.24)	0.934 (0.49)
<b>mjr_science</b>	-0.1642** (-2.25)	-0.1766** (-2.31)	-0.1793** (-2.34)	2.855 (1.51)	2.245 (1.16)	2.304 (1.38)
<b>mjr_undecided</b>	-0.4830** (-13.61)	-0.4819** (-12.87)	-0.4812** (-13.67)	2.331 (0.30)	2.482 (0.35)	2.197 (0.31)
<b>two_parents</b>	-0.0232 (-0.28)	-0.0210 (-0.27)	-0.0198 (-0.24)	0.054 (0.04)	0.292 (0.21)	0.197 (0.16)
<b>parent_less_hs</b>	0.0222 (0.20)	0.0028 (0.02)	0.0165 (0.14)	1.219 (0.63)	0.161 (0.08)	1.790 (0.95)
<b>parent_college</b>	0.0400 (0.74)	0.0382 (0.72)	0.0347 (0.63)	0.279 (0.18)	-0.298 (-0.17)	0.621 (0.44)
<b>parent_university</b>	0.0250 (0.37)	0.0236 (0.33)	0.0174 (0.26)	-1.121 (-0.82)	-1.401 (-0.93)	-0.777 (-0.62)
<b>parent_dk</b>	-0.0988 (-0.68)	-0.0949 (-0.64)	-0.1146 (-0.81)	0.968 (0.42)	0.937 (0.40)	1.254 (0.54)
<b>hs_engage_acad</b>	0.0778** (4.33)	0.0741** (3.89)	0.0752** (3.89)	0.037 (0.08)	0.136 (0.30)	0.000 (0.00)
<b>Constant</b>				53.239** (11.34)	5.130 (0.22)	13.466 (0.74)
<b>N</b>	1343	1343	1343	625	625	625

\* and \*\* indicate statistical significance at the 10 and 5 percent levels, respectively. Asymptotic t-statistics are in parentheses. Author's compilation.