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Who Stays and for How Long: Examining Attrition in Canadian Graduate Programs

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Abstract

Attrition from Canadian graduate programs is a point of concern on a societal, institutional, and individual level. To improve retention in graduate school, a better understanding of what leads to withdrawal needs to be reached. This paper uses logistic regression and discrete-time survival analysis with time-varying covariates to analyze data from the Youth in Transition Survey. The pre-entry attributes identified in Tinto's (1993) model of attrition are examined to help uncover who is most likely to withdraw from graduate school. A good academic background is shown to be the strongest predictor of entering graduate school. Upon entry, demographic and background characteristics, such as being married and having children, are associated with a reduced likelihood of completing. Policy recommendations at the department and institution level are provided as well as directions for future research.

Résumé

L'attrition dans les programmes d'études supérieures canadiens est un sujet de préoccupation aux niveaux sociétal, institutionnel et individuel. Afin d'augmenter la rétention dans les programmes d'études supérieures, une meilleure compréhension de ce qui mène à l'abandon doit être atteinte. Cet article utilise la régression logistique et l'analyse de survie au temps discrète avec des covariables à temps variés pour analyser les données du sondage Youth in Transition. Les attributs préinscription identifiés dans le modèle d'attrition de Tinto (1993) sont examinés pour aider à dévoiler les candidats les plus susceptibles à abandonner les programmes d'études supérieures. Il a été démontré que posséder de solides antécédents scolaires est une des variables explicatives les plus fortes pour l'entrée dans une école d'études supérieures. Au moment de l'entrée, des caractéristiques démographiques et de contexte social, comme être marié et avoir des enfants, sont associées à

une probabilité réduite de compléter le programme. Des recommandations concernant les politiques au niveau du département et de l'institution sont fournies, de même que des instructions pour des recherches futures.

Introduction

Attrition in Canadian graduate programs has received limited attention in higher education research. It is unclear which types of students are most likely to enrol in graduate school and which are most likely to leave prior to completion. There are competing theories in American research. Some contend that the effects of socioeconomic background, for instance, are weak at higher educational transitions (e.g., Mare, 1980), but some find that gender and socioeconomic status (SES) affect graduate school entry (e.g., Mullen, Goyette, & Soares, 2003). Looking at the baccalaureate level, Canadian research finds a mixed and somewhat weak association between student background and persistence in college and undergraduate university programs, noting the likelihood of positive selection (Finnie & Qiu, 2008). Positive selection refers to the idea that students who attend postsecondary education (PSE) tend to have already overcome barriers, indicating that many of these students are driven to successfully complete their PSE. It needs to be understood whether this same pattern is present in Canadian graduate level programs. Factors thought to be relevant and worthy of further exploration in this context include measures of parental education, socio-demographic characteristics, academic performance and engagement, and social engagement, as these have been found to be relevant in previous American research (Lovitts, 2001; Tinto, 1993).

This goal of this study is to provide a better understanding of graduate school entry and attrition, with a large focus placed on individual characteristics. Data for this research comes from the Youth in Transition Survey, cohort B (YITS-B), a longitudinal Statistics Canada survey. This longitudinal study provides the opportunity to look at a 10-year period of time and uncover not only which students enrol and drop out of graduate school, but when they are most likely to do so. Binomial logistic regression and discrete-time survival analysis with time-varying covariates are used to uncover the variables associated with enrolment, attrition, and time-to-withdrawal.

It is important to understand why students leave their programs prior to completion, because the effects extend beyond the individual. Attrition from graduate programs has an adverse impact at three main levels: (i) societal; failure to complete a graduate degree results in forgone productivity and wealth generation; (ii) institutional; investments made in students who fail to complete their program represent lost investments; and (iii) individual; career opportunities and potential income tend to be reduced with lower levels of educational attainment. It is recognized that for some, the decision to withdraw is in their best interest—for example, when there is a lack of fit, or when personal circumstances do not lend themselves to the graduate student lifestyle. However, if graduate school expectations are effectively communicated prior to entry, the rate of withdrawal could be reduced, leading to lower attrition rates and fewer instances of lost investments.

Canadian research on bachelor-level education is more prevalent than studies about the graduate level, and focus tends to be on access rather than on completion and retention. Further, much of the empirical research on graduate school retention stems from the United States (e.g., Espenshade & Rodriguez, 1997; Lovitts, 2001). It is essential to

conduct research on students in Canadian programs, as the degree to which American research reflects the Canadian experience is not well understood. Not only do the university systems in the two countries differ—the American being highly tiered whereas the Canadian is relatively flat—but it is has been argued that graduate students in the United States are not expected to complete their programs as quickly as in Canada. The literature review includes American research for two reasons: to inform variable selection and to illuminate the extent to which the findings from this study mirror those from the United States. Through comparing the social and academic profiles of students who enter, drop out, and complete graduate programs, we can reach a better understanding of this population and thereby facilitate the development of policies and programs aimed at reducing graduate school attrition.

This research is guided by previous empirical work and a theoretical framework developed for studying attrition. While Tinto's (1993) theoretical framework focuses on undergraduate students, it is thought to be relevant for studying graduate school attrition and is drawn on for variable selection. Literature and theoretical concepts relevant to this research are highlighted prior to describing the samples, models, and methods used for analysis. These are followed by a review of the results and a discussion of the relevant findings.

Literature Review

Tinto's (1993) work on attrition in undergraduate programs provides the framework for this research. His model "seeks to explain how interactions among different individuals within the academic and social systems of the institution and the communities which comprise them lead individuals of different characteristics to withdraw from that institution prior to degree completion" (p. 113). Tinto highlights the following aspects as relevant to attrition: pre-entry attributes (e.g., family and community backgrounds, personal attributes, skills, financial resources, dispositions, and educational achievements and experiences), goals/commitments (e.g., external commitments, educational and occupational goals), institutional experiences (e.g., with peers, faculty, and staff), and integration (e.g., academic and social). He recognizes that measures of these aspects, such as external commitments, are not static over time and often change throughout one's university career. See Appendix A for a reproduction of his schema. Not all aspects of Tinto's model could be addressed in this research due to data limitations. The data set used for this analysis does not address goals/commitments, which led to the exclusion of any substantive discussion of this category. For the purposes of this research, institutional experiences and integration are discussed as school experiences.

The Relevance of Socio-demographics

Socio-demographic characteristics have been shown to be relevant to attrition in undergraduate programs in Canadian institutions. In particular, males, parents, and married students are more likely to withdraw from school prior to completion when compared to their counterparts. First-generation students (i.e., PSE students whose parents have not completed postsecondary education) are also less likely to graduate when compared to non-first-generation students (Lambert, Zeman, Allen, & Bussière, 2004; Lehmann & Tenkorang, 2010; Shaienks & Gluszynski, 2007).

Canadian and American research has shown that first-generation students and those from lower SES backgrounds—two groups that often overlap—have higher likelihoods of dropping out (Bowen, Chingos, & McPherson, 2009; Ishitani, 2006; Lambert et al, 2004). These students are thought to have lower educational expectations and/or aspirations as a result of the educational attainment of their parents. Further, Lehmann (2007) reported that many first-generation students received support for leaving school prior to completion.

Raftery and Hout's (1993) concept of "maximally maintained inequality" may also help to explain differences in enrolling in and completing graduate school between first-generation and non first-generation-students. Maximally maintained inequality refers to the process whereby privileged groups pursue higher levels of education once lower levels have become saturated. Thus, given the massive expansion of higher education, and the influx of students from all socioeconomic backgrounds, bachelor degrees no longer indicate those from privileged rather than non-privileged backgrounds. It is believed that in an effort to maintain their upper-class standing, those from privileged backgrounds will actively pursue graduate and other more prestigious degrees. While the current study does not include parental income or occupation (commonly used proxies for SES), parental education will act as a loose proxy for SES.

Racial background has also been shown to be significantly related to attrition; specifically, students from Asian backgrounds have high rates of completion, while Hispanics and blacks have among the lowest (Espenshade & Radford, 2009; Grayson & Grayson, 2003). Thus, a variable measuring visible minority status is included in the models to see whether it has any significant relationship with enrolling in and dropping out of a graduate program. Immigrant status is a closely related concept, as this group often includes a high proportion of visible minorities. Unlike students from visible minority groups, immigrant students in the United States not only have higher completion rates than their American counterparts, but they are also more likely to have shorter times to completion (Espenshade & Rodriguez, 1997). Immigrant students may have higher educational expectations and aspirations, which can result in better educational outcomes. Previous Canadian research has shown that students with origins in other regions of the world display some of the highest levels of educational attainment in Canada (Boyd, 2009).

Attending PSE involves significant financial costs, including both forgone wages and incurred costs. From a rational choice perspective, financial aid can be a significant predictor of enrolment and withdrawal, particularly for students from less affluent backgrounds; the cost impact of attending PSE is greater for them than for those who come from affluent backgrounds, where family can provide financial support (Breen & Goldthorpe, 1997). Attrition in American institutions has been found to be affected by both financial aid variables and other pre-college attributes (Lovitts, 2001; Strauss & Volkwein, 2004). American institutions are known to have exceptionally large tuition fees compared to Canada; thus, the impact of financial aid may prove to be greater for American PSE students than Canadian.

School Experiences

Prior schooling, including both academic performance and engagement, has been identified as relevant to dropping out of PSE. For example, students in Canadian post-secondary institutions with lower grades in high school are more likely to prematurely

depart from PSE (Lambert et al., 2004). The impact of high school and PSE grades seem obvious—students who struggle academically will likely have lower levels of satisfaction with school and may have greater motivation to drop out. In addition, students who fear academic probation or dismissal from their program may voluntary elect to drop out before such a situation materializes.

Engagement can be both academic (e.g., hours spent on homework) and social (e.g., sense of belonging) and has been shown to be associated with persistence in PSE. Students with lower levels of engagement are less likely to graduate than those with higher levels (Lambert et al, 2004; Shaienks & Gluszynski, 2007). When students are more engaged, they likely will have more reasons to stay in their programs. If students have high levels of social engagement, having a strong social group may help to offset the academic difficulties students are experiencing. Conversely, having high academic engagement may offset a lack of social engagement for some students.

This review of the literature highlights both Canadian and American research on PSE attrition, bringing to light significant contributors. In most cases, the research focuses on attrition in undergraduate programs. Although this cannot be assumed to represent the experiences of graduate students, the pre-entry attributes discussed serve as a good starting point in assessing the types of students most likely to enrol in, graduate from, and drop out of graduate school.

Research Questions

This article addresses three research questions aimed at understanding the relationship between individual characteristics and graduate school outcomes. First, which types of students are most likely to enrol in graduate school? Second, which student characteristics tend to be associated with withdrawing from a graduate program prior to completion? Third, during which year of graduate school are students most likely to withdraw? These research questions will help illuminate whether certain students are more at risk of dropping out than others.

Data Set

This research draws on the Youth in Transition Survey, cohort B (YITS-B), a biennial, longitudinal Statistics Canada survey with five cycles. Broadly speaking, the purpose of this survey is to better understand Canadian youths' transition into and experiences in the labour market and PSE. Youths in this survey were first interviewed in April 2000 and were between the ages of 18 and 20 as of December 31, 1999. A stratified multi-stage sample design was used and was based on the Labour Force Survey sample (see Gambino, Singh, Dufour, Kennedy, & Lindeyer, 1998, for a detailed account of the methodology). The YITS-B was conducted under the Statistics Canada Act, indicating that consent and ethical standards have been met.

The response rate for cycle one was 76.7% and included 22,378 respondents. Over time, however, the number of respondents dropped significantly. Looking at the longitudinal response rates, cycle two retained 64.4% of respondents from cycle one, cycle 3, 50.7%, and cycle 4, 42.5%; the final cycle included 34.1% of the original sample. The decrease in response rates between the first and fifth cycle was 42.6 percentage points.

Samples

For the purposes of this study, not all 22,378 respondents were included in the analyses, as the goal is to better understand the types of students who enrol in, complete, or drop out from graduate school. Eligible for this study were respondents who had obtained a bachelor's degree (sample 1), and a subset of this group, respondents who attended graduate school (sample 2). All five cycles of the YITS-B were scanned to identify eligible respondents. There were 3,635 meeting the first criterion and 852 meeting the second.

Measures

Data collection took place by telephone, and information was provided by individuals born between 1979 and 1981. The YITS is designed to facilitate research on major transitions in the lives of young Canadians, which is why the sample was restricted to these birth years. The selection of independent and dependent variables was informed by the literature review. For detailed variable information, please see Appendix B.

Independent variables.

Table 1.
*Independent Variables: Demographic and Background Variable*s

	Coding	
Variable Name	0	1
Female	Males	Females
Visible minority*	No	Yes
Marital status (TV)	All others	Married/common-law
Parent (TV)	No	Yes
Immigrant status	Not a landed immigrant	Landed immigrant
First generation**	No	Yes

* Aboriginal persons are not considered to be members of visible minority groups.
** Parents did not complete postsecondary education.

High school variables. The **academic engagement** sub-scale measures engagement for respondents' last year of formal schooling (high school or less). It was constructed by Statistics Canada and is defined as the behavioural involvement and identification with academic aspects of school. Statistics Canada reports that a total of nine items are loaded on this scale, with values ranging from –5.58 to 4.78. Likert scale response options were used for these nine items, with three questions having five categories—never, rarely, sometimes, often, and always—and the remaining six questions having four: strongly disagree, disagree, agree, and strongly agree. The topics included: hours a week on homework, getting along well with teachers, wanting to just get by, paying attention to the teacher, interest in what they were learning, completing homework on time, learning in class was useless, perceiving school as often being a waste of time, and the number of times they skipped classes in a month. Two reliability measures were estimated: Cronbach's alpha (0.80) and the index of reliability (0.93).

The **social engagement** sub-scale includes four items to measure engagement for respondents' last year of formal schooling (high school or less): feeling like an outsider, being treated with as much respect as others in their class, having friends at school to talk to, and people at school being interested in what they had to say. The response options for each item are: strongly disagree, disagree, agree, and strongly agree. Observed scale scores go from –3.91 to 2.24, and scale reliability estimates are Cronbach's alpha (0.61) and the index of reliability (0.63).

Table 2.
Independent Variables: High School Variables

	Coding			
Variable Name	1	2	3	4
High school grades*	69% and under	70–79%	80–89%	90–100%

* Not all groups are relevant to each sample; for example, in model 2, no one with averages below 70% attended graduate school.

Postsecondary education variables.

Table 3.
Independent Variables: Post secondary Education Variables

Variable Name	Coding				
	0	1	2	3	4
Student loan (TV)	No	Yes	-	-	-
Scholarship (TV)	No	Yes	-	-	-
Grant or bursary (TV)	No	Yes	-	-	-
Number of instructors with strong teaching abilities	-	None/ Very few	Some	Most	All
Number ofinstructors who showed an interest in helping students suceed	-	None/ Very few	Some	Most	All
First-year average (letter grade)	-	C-F	B	A	-

* Not all groups are relevant to each sample; for example, in model 2, no one with averages below 70% attended graduate school.

Dependent variables.

Table 4.
Dependent Variables

	Coding			
Variable Name	0	1	2	3
Student status	-	Graduated	Continuted	Left
Graduate student	No	Yes	-	-

* Not all groups are relevant to each sample; for example, in model 2, no one with averages below 70% attended graduate school.

Models and Analysis

Two models are used to address the research questions guiding this paper. To begin, determining whether females, visible minorities, immigrants, and first-generation students are less likely to enter graduate school, a binomial logistic regression model was run. These variables were chosen because they have been identified in the literature as being relevant and they also allow for a better understanding of the types of students entering graduate school. Only respondents who had attained a bachelor's degree while participating in the YITS-B are included in the analysis.

The second component of this research is developing a better understanding of the types of students most likely to drop out. To understand whether the same populations identified above are more likely to drop out, discrete-time survival analysis with time-varying covariates is employed, allowing for assessment of the risk of dropping out that is associated with each independent variable and covariate included in the model. Not all students included in this sample started graduate school at the same time; thus, all students have been set to year 1, representing their first year in a graduate program. A total of seven years are modeled, as this is the longest amount of time any one respondent remained in graduate school. Note, however, that this does not imply that all students have a final status for their program; some have a continue status at the end of the study, usually a result of the cycle in which they began graduate school. For example, if a student indicates that they started graduate school in the fifth cycle, they can only provide information for up to two years (the YITS-B is retrospective), which is not a sufficient amount of time for a student to start and finish a doctorate program. To address the third research question, life and frequency tables are used, as these will help determine whether there is a particular point during students' programs when they are most likely to drop out.

Weights provided by Statistics Canada have been applied to each of the samples. The first sample uses the standardized cycle 1 weight. The second sample requires that weights from multiple cycles be applied; the application of the cycle weights depends on the cycle of observation. For example, if a respondent was enrolled in graduate school in cycles 1–3, the weights from each cycle are applied accordingly.

Data Issues

Program response inconsistencies. The YITS-B data on PSE include some "ineligible programs," which relate to inconsistencies from students across cycles. Finnie and Qiu (2008) proposed three means of dealing with this data, recommending one method above all others. Statistics Canada includes an ineligible variable for each cycle, indicating whether the respondent provided ineligible program information. There are three distinct groups of students: (i) students who at the end of a cycle were enrolled in a program but were no longer in the program at the beginning of the next cycle because they had graduated from the program, (ii) students who at the end of a cycle were enrolled in a program but were no longer in the program at the beginning of the next cycle because they dropped out, and (iii) students who had no final status for the program identified in the previous cycle and deny the existence of the program (Finnie & Qiu, 2008). To address these ineligible program records, students that had in fact graduated and dropped out of their program are coded as such. All others with valid ineligible codes are right-hand censored (end point unknown) at the point when they become ineligible.

A second data issue was respondents with duplicate cases. Respondents who were enrolled in more than one program or institution during a cycle have multiple PSE records; only the first graduate program was retained. A total of 29 duplicate/problem cases were grouped according to similar attributes. The first group had a leave status associated with a program that took place in a cycle prior to the cycle where additional information is given (a second line of data). The cycle with the leave status was retained (n = 10). The next group had ineligible codes and had multiple records of program information. In this instance, when a respondent had an ineligible code, their subsequent information was deleted (n = 13). The third group had two lines of almost identical information, so only one line of data was retained (n = 4). The final two respondents with multiple cases did not fall into any of these categories. One respondent had complete information for all cycles and full information for one cycle but with a different institution ID. The complete record was retained. The final case was one in which the respondent had two lines of identical data for one cycle only; the line of data that contained information for only one cycle was deleted.

Missing values. Three variables had fairly high proportions of missing data. During the first cycle, students in PSE were asked: (i) to provide their average grades for their first year in PSE, (ii) to indicate the number of instructors they had had during their first year that were interested in seeing their students succeed, and (iii) the number of instructors who had strong teaching abilities. Some respondents were still in high school or had not completed their first year of university during cycle one and thus were ineligible for this question. The percentage of respondents missing information on average grades was 19.5, and on the second and third questions 18.2. Multiple imputation was used for each of these variables so that these cases could be retained and used for analyses.

Results and Discussion

Tables 5 and 6 provide the descriptive statistics of the variables included in models 1 and 2. Notable is the higher proportion of females who have obtained a bachelor's degree as well as attended graduate school, and the small proportion of both visible minorities and immigrants in both samples.

Descriptive Statistics

Table 5.
Descriptive Statistics: Bachelor Degree Holders

Variable Name	Mean/ Proportion	*SD*	*n*
Female (proportion)	.57	.494	3635
Visible minority (proportion)	.14	.351	3635
Academic engagement (scale) (mean)	.42	.882	3635
Social engagement (scale) (mean)	.28	.980	3635
Number of instructors with strong teaching abilities* (mean)	2.64	.840	3635
Number of instructors who showed an interest in helping students succeed* (mean)	2.64	.922	3635
First generation (mean)	.61	.487	3635
First-year average (letter grade)* (mean)	2.16	.722	3635
High school grades (mean)	2.85	.721	3635
Immigrant (proportion)	.08	.264	3635
Graduate student (proportion)	.21	.389	3635

*Imputed variables; multiple imputation.

Table 6.
Descriptive Statistics: Graduate Students

Variable Name	Mean/ Proportion	*SD*	*n*
Female (proportion)	.57	.495	852
Visible minority (proportion)	.08	.275	852
Academic engagement (scale) (mean)	.52	.939	852
Social engagement (scale) (mean)	.32	.982	852
Number of instructors with strong teaching abilities* (means)	2.74	.831	852
Number of instructors who showed an interest in helping students succeed* (mean)	2.75	.870	852
First generation (proportion)	.56	.497	852
First-year average (letter grade)* (mean)	2.37	.690	852
High school grades (mean)	3.10	.688	852
Immigrant (proportion)	.05	.217	852
Marital1 (proportion)	.24	.425	852
Child1 (proportion)	.03	.159	852
Scholarship1 (proportion)	.48	.500	852
Loans1 (proportion)	.51	.500	852
Grants1 (proportion)	.31	.463	852
End status (mean)	1.68	.711	852

*Imputed variables; multiple imputation.

Research question 1. Using logistic regression, this analysis attempts to better understand which types of students are most likely to attend graduate school given that they have completed a bachelor's degree—in particular, whether females, visible minorities, and first-generation students are less likely to attend graduate school. Results are presented as odd ratios. An odds ratio is a measure of association that represents the probability of an outcome; a value of one represents an equal probability. Results that are statistically significant at $\alpha = 0.05$ are interpreted. Table 7 displays the odds ratios and the significance levels associated with each variable included in the model.

Table 7.
Enrolment in Graduate School

Variables	*OR*	Sig.	*SE*
Female**	.83	.028	.087
Visible minority	.86	.316	.148
Immigrant	.96	.821	.190
First-year average (As)**	2.40	.000	.153
First-year average (Bs) **	1.68	.003	.166
First generation**	.65	.000	.086
HS grades (70–79%)**	5.45	.008	.642
HS grades (80–89%)**	7.77	.001	.638
HS grades (90–100%)**	11.39	.000	.642
HS academic engagement**	1.19	.001	.054
HS social engagement**	.902	.025	.046
Number of instructors with strong teaching ability			
None/Very few	1.23	.443	.263
Some	1.09	.690	.207
Most	1.09	.601	.169
Number of instructors with an interest in seeing students succeed			
None/Very few	1.11	.628	.207
Some	.83	.254	.163
Most	1.14	.389	.150
Constant	.02	.000	.659

*Baselines: First-year average (C to F); high school grades (69% and under); instructor variables (all).
**Significant at $\alpha = 0.05$.

Females, visible minorities, and first-generation students have historically been underrepresented in graduate programs. Thus, the goal was to assess whether these trends currently hold true in the Canadian context. While females have significantly increased their educational attainment in the past two decades, they are still less likely to attend graduate school. It was shown, however, that more females are enrolled in graduate school (Table 6). Thus, conditional on obtaining a bachelor's degree, and holding all other variables constant, females are less likely to enter graduate school. However, because there are a higher proportion of female graduates with bachelor's degrees, they make up a larger share in graduate programs.

While visible minorities and immigrants are less likely to enrol in graduate school, the coefficients associated with these variables are not statistically significant. First-generation students are less likely to enrol in graduate school, which was expected, as parents' education influences their children's future educational and occupational opportunities and aspirations. For example, if a student's parents graduated from university, it is expected that this child was raised with the same educational expectations of obtaining a university degree. The negative association between first-generation students and attending graduate school may lend support to the idea that students' educational expectations and aspirations are shaped by their family and impact their educational attainment.

Students with stronger academic backgrounds in high school and PSE are more likely to attend graduate school. Students with A-level high school and university grades are much more likely to enrol in graduate school. A closely related variable, high school academic engagement, also shows a positive association with attending graduate school, while social engagement is associated with a decreased likelihood of enrolling in graduate school. This is likely a result of academic performance being a primary factor for acceptance into graduate school. Additionally, students who have high levels of social engagement, and who place a good deal of importance on it, may be less likely to enrol in graduate school, as their social supports if they do so will likely be greatly reduced due to the smaller number of students who enter graduate school.

Perception of instructors does not serve as a good predictor of graduate school enrolment. These findings demonstrate that many of the types of variables that Tinto (1993) identifies as relevant to attrition from PSE are also relevant for entry to graduate school. Pre-entry attributes are most relevant to enrolment in graduate school, while the variable that serves as a proxy for student contact with faculty (i.e., number of instructors with an interest in seeing students succeed), which was an important aspect in Tinto's work, is not.

Research question 2. Once students enter graduate school, who is most likely to withdraw? The results reveal that several variables are significant for predicting graduation and withdrawal from graduate school. The focus is again on variables that are statistically significant at $\alpha = 0.05$. Looking first at the types of students most likely to graduate, Table 8 displays the odds ratios and the significance levels associated with each variable included in the model. It was demonstrated that females are less likely to enter graduate school, but upon enrolment are more likely than males to graduate. Immigrants have an extremely small likelihood of dropping out prior to completion, yet surprisingly, they do not have a statistically significant increased likelihood of graduating. The incongruence between these two findings may be a reflection of when immigrants began graduate school. That is, if they enrolled in graduate school in the latter cycles, there may not have been enough time for them to complete their degrees in the period covered by the YITS-B. It may also be the case

that immigrants had longer times to completion, so graduation from their degree did not take place within the YITS-B timeframe. Additional research is needed to uncover whether the findings are a result of the methodology and time frame of the data set.

Table 8.
Graduating from Graduate School

End Status (graduate)	*OR*	Sig.	*SE*
Female**	1.29	.037	.155
Visible minority	.91	.690	.220
HS academic engagement	1.07	.320	.072
HS social engagement**	1.14	.043	.072
Loans**	1.46	.001	.171
Grants**	1.57	.000	.194
Scholarship	1.02	.843	.123
Married	.81	.086	.101
Parent**	.43	.005	.129
First generation**	.75	.014	.087
Immigrant	.94	.839	.277
Number of instructors with strong teaching ability			
Some	1.03	.853	.184
Most	1.34	.165	.285
All	1.80	.057	.555
Number of instructors with an interest in seeing students succeed			
Some	.74	.063	.120
Most	.87	.461	.170
All	.67	.136	.182
First-year average			
As	.92	.743	.225
Bs	.70	.136	.166
HS grades			
90–100%	1.42	.076	.280
80–89%	1.02	.901	.181
Constant	1.20	.556	.369

*Baselines: First-year average (C); high school grades (79% and under); instructor variables (none/very few).
**Significant at $\alpha = 0.05$.

Loans, grants/bursaries, and scholarships all have positive effects associated with a successful graduate school experience. Loans and grants/bursaries are associated with higher probabilities of graduating, while receiving a scholarship is associated with a decreased likelihood of withdrawing prior to completion.

Family responsibilities often force individuals to alter their priorities, and graduate school is no exception. Being a parent is associated with a fairly dramatic reduction in the probability of completing a graduate program. This is expected, as it is often argued that caring for a family requires substantial amounts of time. A surprising finding, however, is that having a child is also significantly related to a decreased likelihood of dropping out. This may indicate that parents lie at either ends of the completion spectrum. It may also be the case that the timing of when these students began graduate school led them to be censored, not allowing for the full observation of their time in their program.

Academic performance is not shown to be a significant predictor of graduating from or dropping out of graduate school, with the exception of having a B-level average in the first year of university. The weak and limited relationship between academic performance and graduate school outcomes likely reflects that most students enrolled in graduate school are academically strong, and the difficulty of the material has little effect on decisions to withdraw. High school academic engagement is shown to be associated with increased probability of dropping out, while high school social engagement is associated with increased likelihood of graduating.

These findings demonstrate that pre-entry attributes, such as those identified by Tinto (1993), impact the likelihood of successfully completing a degree and do so to a greater extent than academic ability and engagement. If it is assumed that academic variables have a lesser impact on successful completion than social variables, it may be the case that other social aspects of graduate school, such as department climate and the student–supervisor relationship, are associated with successful graduate school outcomes, as has been suggested by Lovitts (2001). The importance of interactions between students and the institution is a central concept of Tinto's model, but the ability to uncover the relevance of this to graduate school attrition in Canada was impeded by the variables available in the data set.

Turning to those who withdraw (Table 9), there are fewer statistically significant variables that serve as predictors of withdrawing from a graduate program when compared to variables that predict graduation.

Surprisingly, higher scores of high school academic engagement are associated with an increased probability of withdrawing prior to completion. As was seen in Table 8, sources of funding—with the exception of scholarships—were positively associated with graduating from a graduate program. In this model, scholarships are the only statistically significant source of funding for predicting withdrawal. However, the association is a protective one; graduate students with scholarships have lower odds of withdrawing prior to completion when compared to students who did not receive scholarships. Immigrants are also significantly less likely to withdraw prior to completion. Table 9 also shows that parents have a lower likelihood of withdrawing prior to completion, which contradicts the results shown in Table 4, indicating that parents may lie at both ends of the completion spectrum.

Research question 3. The final research question seeks to understand at what point students are most likely to withdraw from graduate school. A life table showing the cumulative failure rates, and frequency tables showing student status for the first three years of study, are used to make an assessment of when students are most likely to withdraw. The frequency tables below represent student status after the first three years of study (Tables 10–13). It is only possible to present the data for the first three years because subsequent

cell sizes are too small to meet the release requirements of Statistics Canada. While it is not possible to show the last two lines of data, the intervals have been retained so that the reader may understand at what point all students who withdrew from graduate school did so in this sample.

Table 9.
Withdrawing from Graduate School

End Status (leave)	*OR*	Sig.	*SE*
Female	1.99	.319	.218
Visible minority	1.08	.837	.410
HS academic engagement	1.35	.004	.142
HS social engagement	.96	.694	.097
Loans	1.07	.715	.193
Grants	1.03	.890	.204
Scholarship	.62	.010	.115
Married	.96	.823	.182
Parent	.33	.026	.164
First generation	1.38	.076	.254
Immigrant	.164	.018	.126
Number of instructors with strong teaching ability			
Some	1.01	.969	.271
Most	.902	.750	.292
All	.601	.350	.328
Number of instructors with an interest in seeing students succeed			
Some	1.11	.707	.296
Most	1.35	.335	.425
All	.618	.379	.338
First-year average			
As	.54	.059	.176
Bs	.40	.004	.126
HS grades			
90–100%	.81	.484	.294
80–89%	1.17	.538	.249
Constant	.19	.003	.107

*Baselines: First-year average (C); high school grades (79% and under); instructor variables (none/very few).

Table 10 shows the cumulative failure rate (withdrawal rate) of those who withdrew between each year, with the majority of students leaving after their first two years and the greatest percentage withdrawing after the first year. Withdrawal after one year may reflect a mismatch between the student and the program, the department, and/or the institution.

It should be mentioned that not all students who withdrew from graduate school failed to enrol in another postsecondary program. Appendix C shows that of the 123 students who withdrew, 51 of them enrolled in another program, indicating that withdrawal from graduate school does mean the student has completely withdrawn from PSE.

Table 10.
Life Table for Graduate School Leavers

Interval	(Year)	Beginning Total	Dropouts	Cumulative Failure	*SE*
1	2	123	62	.504	.045
2	3	61	35	.789	.037
3	4	26	20	.951	.019
4	5	6	–	–	–
5	6	–	–	–	–

Table 11.
Student Status after Year 1

	n	%
Graduate	59	7
Continue*	731	86
Withdraw	62	7
Total	852	100

*Note that some people with continue status were in the final year of the survey and thus will not carry over to the next year.

Table 12.
Student Status after Year 2

	n	%
Graduate	155	26
Continue	404	68
Withdraw	35	6
Total	594	100

Table 13.
Student Status after Year 3

	n	%
Graduate	125	41
Continue	162	53
Withdraw	20	7
Total	307	101

Scope and Limitations

While this research has provided new evidence and insight into students' backgrounds and their likelihoods of enrolling in and completing graduate school, there are variable limitations. One pre-entry attribute thought to be highly relevant is the socioeconomic backgrounds of students. As has been previously noted, parental education can be conceived of as a loose proxy for SES. However, a more complete measure would have included parental occupation and income. Having a larger age range of students and a longer follow-up period would also have been beneficial to this research. Age was not included in this analysis, as the age range of the sample is only three years. While it is true that people complete an undergraduate degree and enter graduate school at different points in their lives, the YITS-B does not lend itself to capturing these differences very well.

Turning to the theoretical framework guiding this research, Tinto's (1993) model includes goals/commitments, institutional experiences, and integration, yet many of these aspects cannot be measured with the available data. Lovitts (2001) also outlined many factors that can help students succeed or fail, but these could not be measured. Examples include the student–supervisor relationship and conceptual maps of a department and of program requirements.

Despite the lack of complete coverage of attrition-relevant variables in the YITS-B, it provides good coverage of the concepts addressed by this research. Further, the sample sizes and duration covered by the YITS-B provide enough respondents and time so that students can be followed from the start and in many cases to the completion of their graduate degree.

Policy Recommendations

While the policy recommendations provided here are primarily based on pre-entry attributes, they do act as a good starting point for addressing attrition in graduate programs. A notable point of concern is first-generation students, as they are less likely to enrol in graduate school and to have successful graduate school outcomes. Interventions with these students may help improve their rates of enrolment in, and completion of, graduate school. It may be the case that these students lack the social networks to provide them with relevant information. Thus, a more systemic approach to the dissemination of graduate school information should be enacted.

Given the positive student outcomes associated with scholarships, loans, and grants, graduate student funding needs to continue to be provided to universities, and this fund-

ing should be increased when possible. Providing funding packages is a good way to recruit students from all backgrounds and may help increase access for underrepresented groups, an ongoing priority of certain governments.

Family responsibilities are difficult to control or alter; however, it may be possible to design programs in such a way as to give students more time for their personal lives. For example, students rarely are enrolled part-time in graduate programs. It seems that departments are often unwilling to accept part-time students. If departments were to change their stance, that might lead to lower levels of attrition for students with family responsibilities. In addition, tuition rates are lower for part-time students; thus, if the financial responsibilities associated with raising a family are also associated with withdrawing from graduate school, having a part-time student status would aid in this respect as well.

The gender gap is something that cannot be overlooked. While historically women have had lower educational attainment rates, the trend is being reversed, with men tending to lag behind females. This issue needs to be addressed, as the goal should be gender parity, dependent on academic performance. If males are underperforming at the high school level, then appropriate measures need to be taken to increase their level of performance. This may require testing multiple intervention programs or different pedagogical approaches. These programs and pedagogical approaches should be coupled with research to uncover whether there are any underlying issues leading males to underperform, such as lack of motivation.

Steps should be taken by faculty and departments to encourage social supports, as social engagement is positively associated with completion. This could be in the form of providing opportunities for students to interact in both academic and non-academic settings. Supervisors could organize working groups for their students, with the aim of facilitating a sense of belonging and supporting interest in each other's ideas. Departments could organize outings in the communities that surround universities, to provide more opportunity for relationship building among students.

Conclusion and Future Research

This research provides a national perspective on the socio-demographic characteristics associated with entry to and completion of graduate school and is a good starting point for understanding graduate student experiences in Canadian PSE. It has uncovered characteristics that are relevant for positive graduate school outcomes and has demonstrated that past educational performance predicts future performance, but only to a certain extent. Lastly, this research has also confirmed the relevance of social engagement for graduate school attrition. While this study has supported previous findings at the undergraduate level and in the American context, the experiences of students in Canadian graduate programs has been shown in some cases to differ, reinforcing the need for additional research so that a more complete understanding of attrition from Canadian graduate programs can be reached.

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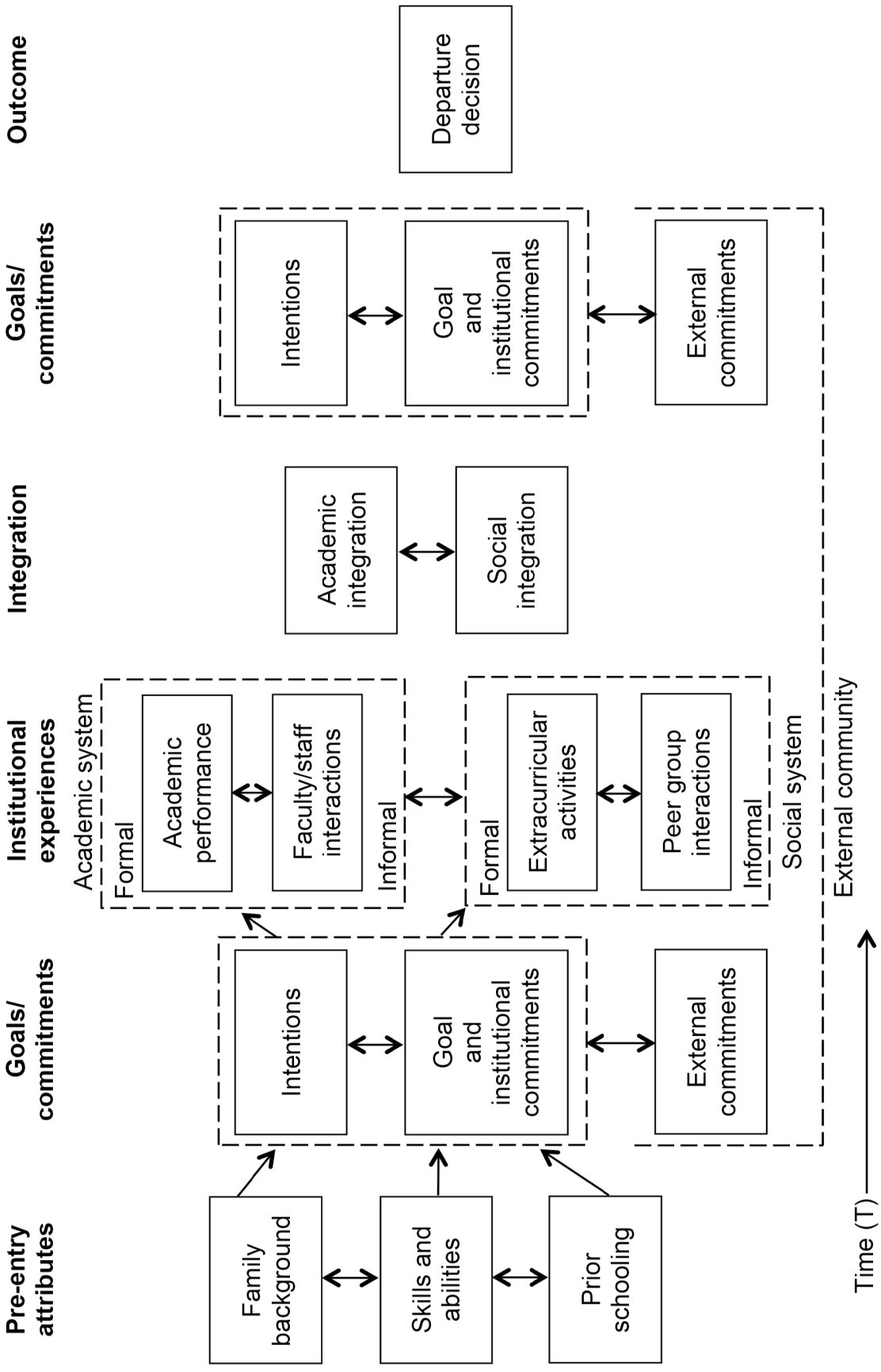
Appendix A:
Re-creation of Tinto's (1993) Longitudinal Model of Institutional Departure



Appendix B

Independent Variables

Demographic and Background Variables. Female is dummy coded, with "0" representing "males" and "1" representing "females."

Marital status is dummy coded from its original state with six categories (single, married, living with a partner/common-law, separated but still legally married, divorced, and widowed). Respondents who reported being married, common-law, or separated but still legally married are recoded as "1," indicating a marital status equivalent to "married/common-law," and all others are coded as "0," representing a marital status of "single." This is a time-varying covariate, indicating that the value of this variable may change over time. All subsequent time-varying covariates will be identified by the acronym TV.

Child status (TV) is dummy coded from the number of children a respondent has (ranging from 1 to 6), with "0" representing "no children" and "1" indicating "at least one child."

Visible minority represents respondents who are non-Caucasian in race or non-white in colour. Aboriginal persons are not considered to be members of visible minority groups. This variable was not recoded and retains its original coding from Statistics Canada, with "1" representing "visible minority status" and "0" capturing "all others." **Immigrant status** is a Statistics Canada-derived variable that measures whether a respondent who is not Canadian by birth has ever been a landed immigrant. The original coding is retained: "0" captures respondents who are "not a landed immigrant" and "1" represents those that are "landed immigrants." **Parents' education** variable originally consisted of 12 education categories: (i) less than Grade 6 (includes no schooling); (ii) completed at least Grade 6; (iii) completed at least Grade 9 (Québec Secondary 3); (iv) high school diploma or equivalent; (v) some college, CEGEP, or university-level courses (no certificate, diploma, or degree); (vi) private business school or training institute certificate or diploma; (vii) community college, CEGEP, trade/vocational, apprenticeship, teacher's college, or nursing diploma or certificate; (viii) university undergraduate certificate or diploma (below a bachelor's degree); (ix) university bachelor's degree (e.g., BA, BSc, BEd); (x) first professional degree in medicine, dentistry, veterinary medicine, law, optometry, or divinity; (xi) master's degree (e.g., MBA, MEd, MA, MSc) or doctorate degree (e.g., PhD, DSc, DEd); and (xii) other education or training. This variable is dummy coded, with "1" representing "first-generation student" (parents did not complete postsecondary education) and "0" representing "not a first-generation student."

High School Variables. The **academic engagement** sub-scale measures engagement for respondents' last year of formal schooling (high school or less). It was constructed by Statistics Canada and is defined as behavioural involvement and identification with academic aspects of school. Statistics Canada reports that a total of nine items were loaded on this scale, with values ranging from –5.58 to 4.78. Likert scale response options were used for these nine items, with three questions having five categories—never, rarely, sometimes, often, and always—and the remaining six questions having four: strongly disagree, disagree, agree, and strongly agree. These variables included: hours a week on homework, getting along well with teachers, wanting to just get by, paying attention to the teacher, interest in what they were learning, completing homework on

time, learning in class perceived as useless, perceiving school as often being a waste of time, and the number of times they skipped classes in a month. Two reliability measures were estimated: Cronbach's alpha (0.80) and the index of reliability (0.93). The **social engagement** sub-scale includes four items to measure engagement for respondents' last year of formal schooling (high school or less): feeling like an outsider, being treated with as much respect as others in their class, having friends at school to talk to, and people at school being interested in what they had to say. The response options for each item are: strongly disagree, disagree, agree, and strongly agree. Observed scale scores went from −3.91 to 2.24, and scale reliability estimates were Cronbach's alpha (0.61) and the index of reliability (0.63).

High school average in the respondent's last year was provided. This variable was recoded. A value of "4" represents "90–100%," "3" represents "80–89%," "2" corresponds to "70–79%," and "1" indicates "69% and under." Not all groups were relevant to each sample; for example, in model 2, no one with averages less than 70% attended graduate school.

Postsecondary Education Variables. Student loan (TV) measures whether a respondent received a student loan while attending PSE. The original dummy coding has been retained; "0" indicates "no" student loan, and "1" indicates "received a loan."

The **scholarship** (TV) variable is used to assess whether respondents received a scholarship based on outstanding academic achievement while attending PSE. Dummy coding has been retained; "0" indicates "no" scholarship and "1" indicates "received a scholarship."

Grant or bursary (TV) refers to whether respondents received a grant or bursary from a number of different sources (an educational or charitable foundation, the government, or a corporation) while attending PSE. This variable has retained its dummy coding; "0" indicates "no" grant or bursary and "1" indicates "received a grant or bursary."

First-year average grade in PSE was computed from two variables: students' letter grade and students' numerical grade. These questions were mutually exclusive and thus were combined into one variable, with certain categories being collapsed. The original coding of students' grades was: A+ (90% and higher), A– to A (80–89%), B– to B+ (70–79%), C– to C+ (60–69%), D– to D+ (50–59%), and E to F (under 50%). The recoding is as follows: 3 = A (the A+ and A– to A categories were combined), 2 = B, 1 = C to F. Grades ranging from C to F have been combined due to the small number of cases in each of these grade levels.

Number of instructors with strong teaching abilities measures how many students in their first year of PSE studies perceived their teachers to have strong teaching abilities. Because of infrequent responses, the first two categories (none of them and very few) were combined. This variable has four ratings: "1" corresponds to "none of them/very few," "2" to "some," "3" to "most," and "4" to "all."

Number of instructors who showed an interest in helping students succeed was also assessed by respondents for their first year of PSE. This variable, like "number of instructors with strong teaching abilities," was also recoded to collapse the first two categories due to their infrequent response. The four ratings include: "1" for "none of them/very few," "2" for "some," "3" for "most," and "4" for "all".

Dependent Variables

Status is the main dependent variable of interest in this study. This variable assesses whether students "graduated" ("1") from their program, "continued" ("2"), or "left" ("3"). This variable originally distinguished between those who graduated and continued and those who graduated and did not continue. Because the focus is exclusively on program graduation and not continuation, these categories were collapsed to represent all those who have graduated.

Graduate student measures whether the respondent was a graduate student during each cycle. Graduates students have been coded "1," while all others have been coded "0."

Appendix C: Frequencies

Table C-1.
End Status: Graduate Students

	n	%
Graduate	394	46
Continue	335	39
Withdraw	123	14
Total	852	99

Table C-2.
End Status: Graduate Students

	n	%
Graduate	394	46
Continue	335	39
Withdraw	72	9
Switch	51	6
Total	852	100