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Profiles of Canadian Postsecondary Education Dropouts

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Using longitudinal data of 18- to 20-year-old youths from the Youth in Transition Survey (YITS), the present analysis identified and profiled Canadian postsecondary education dropouts based on the theoretical framework of Tinto (1993). Pertaining to characteristics of pre-postsecondary education conditions, dropouts tended to be male, set low postsecondary education goals, and have a history of dropping out and drug abuse in high school. Pertaining to characteristics of postsecondary education integration, dropouts demonstrated a first-year postsecondary education GPA of 60% or lower, an avoidance of volunteering on campus, and a lack of personal connections on campus. In addition, dropouts have previously contemplated quitting, have low sense of belonging, rely on social assistance, have neither institutional scholarships nor parental loans, are married, and are pursuing postsecondary programs in trade schools or technical schools. Integration into postsecondary education is far more critical to student attrition than pre-postsecondary education conditions.

Puisant dans les données longitudinales d'une enquête de Statistique Canada auprès des jeunes en transition (Youth in Transition Survey), notamment la cohorte des 18 à 20 ans, la présente analyse a identifié et souligné, selon le cadre théorique de Tinto (1993), les individus ayant décroché en cours d'études postsecondaires. Ceux qui décrochent avant les études postsecondaires sont souvent masculins, ils se fixent des objectifs limités relatifs aux études supérieures et ont des antécédents impliquant des abandons scolaires et la toxicomanie au secondaire. Parmi les caractéristiques des décrocheurs au niveau postsecondaire, notons une moyenne globale inférieure ou équivalente à 60% lors de leur première année d'études supérieures, une absence de participation aux activités bénévoles sur le campus et un manque de liens personnels sur le campus. De plus, les décrocheurs ont souvent déjà pensé à abandonner, manifestent un faible sentiment d'appartenance, comptent sur l'assistance sociale, n'ont pas reçu de bourses institutionnelles ni de prêts de la part de leurs parents, sont mariés et poursuivent des études postsecondaires dans des écoles techniques ou des écoles de métiers. L'intégration joue un rôle beaucoup plus critique dans le taux d'abandon des étudiants au niveau postsecondaire qu'au secondaire.

Introduction

Since the emergence of a global economy, postsecondary education has become vital for all developed countries to maintain domestic prosperity and promote international competitiveness. With increased enrollment, dropouts become a concern. Using data from the Youth in Transition Survey (YITS), Shaienks, Eisl-Culkin, and Bussière (2006) examined a

cohort of Canadian youth who were both 22 years old and not in high school in December 2003. By December 2005, 76% attended postsecondary education, of those 12% had graduated and 12% had dropped out. According to Seidman (1996), Tinto's (1993) theory of student departure is "[w]idely examined, tested and accepted by the educational community" (p. 18). This study will employ and build upon this theory. According to Guiffrida (2006), "Tinto's (1993) theory of student departure is the most widely cited theory for explaining the student departure process and has reached 'near paradigmic status' in the field of higher education" (p. 451). Tinto posits that individual pre-postsecondary education attributes (individual disposition, family background, academic skill and ability, and secondary schooling quality) form individual commitments for postsecondary education. The key disposition is the individual's intention to go to postsecondary education (clear educational and occupational goals and consideration of potential career options prior to postsecondary education). Other dispositions include commitment to meet educational and occupational goals and preparation to comply with academic and social expectations of postsecondary education.

Integration and affiliation are the key concepts of Tinto's (1993) model and are supported by the literature (e.g., Guiffrida, 2003; Handelsman, Briggs, Sullivan, & Towler, 2005; Miller & Pope, 2003; Ryan & Glenn, 2003; Schnell & Doetkott, 2003; Zhao, Kuh, & Carini, 2005). Integration measures experiences of academic and social interactions (quantity and quality of interactions for social and academic supports and perceptions of interactions as meeting personal norms, needs, and interests). Academic integration results from sharing normative information, perspectives, and values; while social integration occurs when the individual develops social ties as a result of daily interactions. Satisfactory interactions with the formal and informal academic and social environments of the institution lead to integration resulting in persistence. Perceived integration emphasizes the subjective sense of being able to fit in, the perception of the existence of warm relationships, and the feeling of being unpressured by normative differences with the academic and social environments (see also Spady, 1971).

Affiliation measures the degree to which an individual is socially and academically associated with the postsecondary education community (informal friendships, supportive groups, and participation in extracurricular activities). It is examined within the context of a sense of belonging and feelings of moral association (see also Bollen & Hoyle, 1990). It is critical for an individual to have multiple affiliations without adopting a single set of social and academic norms. Affinity groups offer social and academic supports that an individual needs to sustain effort during postsecondary education. Individuals evaluate groups cognitively, which results in an affective response (Bollen & Hoyle, 1990). Individuals who have norms, values, and ideas congruent with those of the institution persist.

Finally, integration and affiliation are often facilitated or hindered by individual internal and external conditions, including academic adjustment (e.g., grade point average or GPA), preparatory participation (e.g., orientation), external commitment (e.g., family duties), and financial need. The key limitation of Tinto's (1993) model relates to his assertion that students must break away from past associations to integrate into the social and academic environments of postsecondary education; however, many students, especially students from religious families or ethnic minorities, depend on traditional ties to gain spiritual, cultural, and even material supports that sustain them through postsecondary education (Guiffrida, 2005; Kuh & Love, 2000; Rendon, Jalomo, & Nora, 2000; Walker & Schultz, 2001).

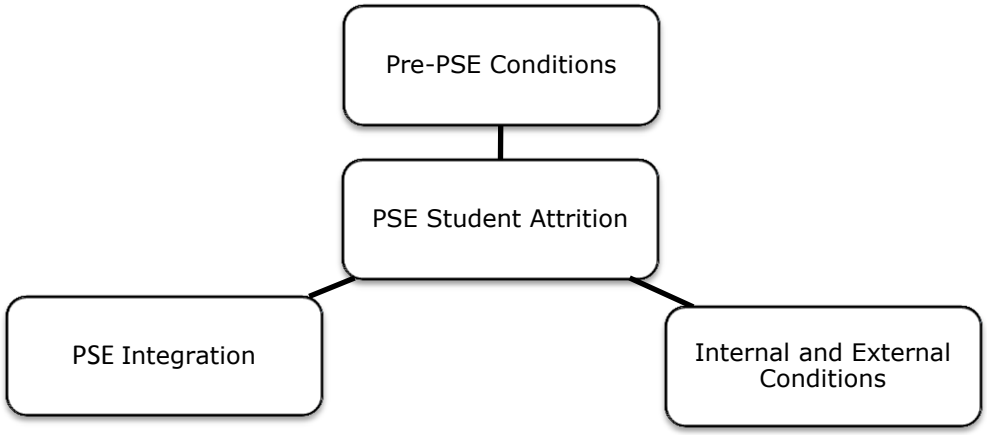

Figure 1. Graphical Summary of Tinto's (1993) Model on Postsecondary Education (PSE) Student Attrition

On the basis of Tinto's (1993) model (see Figure 1 for a summary), Lotkowski, Robbins, and Noeth (2004) conducted a meta-analysis of factors pertaining to pre-postsecondary education conditions, postsecondary education integration, and internal and external conditions that influence postsecondary education student attrition. ACT (American College Testing) score and high school GPA are identified as critical academic factors. Academic goals, achievement motivation, academic self-confidence, academic-related skills (time management skills, study skills, and study habits), contextual influences (financial aid, institution size, and selectivity), general self-concept, institutional commitment, social support, and social involvement (with peers, faculty, and campus activities) are identified as critical non-academic factors.

Postsecondary education attrition has caught the attention of Canadian policymakers and researchers. Table 1 summarizes the recent Canadian empirical studies on this issue. These studies are largely data-driven efforts to either describe dropout (graduation) rates or examine the effects of individual and institutional characteristics on these rates. Our analysis joins this effort in understanding the process of postsecondary education attrition in Canada. We aim to identify critical characteristics of Canadian postsecondary education dropouts.

Overall, empirical studies like ours "allow for more effective policy/program creation by treating students like individuals who may be influenced by a number of factors" (Finnie, Childs, & Qiu, 2012, p. 2 of Stakeholder Summary). Two advantages make our analysis different from existing studies. First, our analysis is heavily theory-driven. We adopted Tinto's (1993) model and meta-analytic results of Lotkowski, Robbins, and Noeth (2004) as our main and supplementary theoretical frameworks making our research scope more systematic and comprehensive. Second, we aim to conduct a longitudinal multivariate analysis that profiles postsecondary education dropouts in Canada. We employed survival analysis as our primary statistical technique making our research methodology more advanced and complicated than the methodologies found in previous studies.

Table 1

Recent Canadian Studies on Postsecondary Education Student Attribution

Article	Database	Finding
Dooley, Payne, & Robb (2012)	Administrative data	High school grades dominate in explaining PSE persistence over other variables such as gender, high school standardized test scores, high school characteristics, neighborhood characteristics, and university program.
Finnie, Childs, & Qiu (2012)	YITS-A (2000-08)	Leaving and switching rates are highest in the first year of PSE and decline substantially over the course of the program (22% in the first three years, 18% in the fourth year). The most common reason for leaving or switching is lack of interest, followed by health (personal) reasons, low achievement, desire to enter workforce, and financial constraints. Disabled students and students from low-income or single-parent families show greater risk of leaving PSE altogether. Students of rural background, Aboriginal students, and "first generation" PSE students also show greater risk of leaving.
Finnie, Mueller, Sweetman, & Usher (2008)	YITS-B (2000-06)	Significance of family background to attendance and persistence arises more from culture than money. Gap between male (26%) and female (39%) attendance is alarming. Retention is not a serious problem at the system (national) level.
Finnie, Mueller, & Wismer (2012)	YITS-A (2006)	25% of youths do not access PSE by age 21. Of this group, 23% have no aspirations for PSE. Among those who do aspire to PSE, 50% face no barriers to attend, while 22% claim finances as one barrier.
Finnie & Qiu (2008)	YITS-B (2000-06)	Five years after entering PSE, graduation rates from the first program are 57% (college) and 52% (university), rise to 73% and 69% if switchers and leavers who return and graduate are included. Rates change to 82% and 90% if those still in PSE are also taken into account.
Martinello (2009)	YITS-B (2000-06)	Later course withdrawal relates to more switching in the first year and a lower probability of first program completion. More generous tuition refunds relate to more switching in the first year as well as less leaving in the second year and a shorter time to completion for those who complete their first program. University characteristics and other academic regulations yield mixed results generally not robust to different specifications.
Shaienks & Gluszynski (2007)	YITS-B (2006)	Overall PSE dropout rate is 15%. Dropout rate differs across types of institutions and by demographic, family, and school characteristics.
Shaienks, Gluszynski, & Bayard (2008)	YITS-B (2006)	Key characteristics frequently related to dropping out of PSE are male, short homework time in high school, a dropout episode in high school, and a resident of Quebec, British Columbia, or Alberta.

Note. PSE = postsecondary education.

Methods

Participants

YITS was a multi-component longitudinal survey conducted by Statistics Canada. A target population of the survey was the 18 to 20 year-old cohort (youths who were born in the years of 1979 to 1981 excluding those in northern territories, Indian reserves, Canadian Forces bases, and some remote areas) (referred to as YITS-B but simplified as YITS in the present analysis). A stratified multi-stage sampling design was employed to draw households across Canada. Within each household, one person in the target population was selected. The first cycle of YITS collected data in 2000 when youths were between 18 and 20 years of age (sample size was 29,000). Two and four years later (in 2002 and 2004), data were collected from the same sample again. By the third cycle, the response rate was 79%. Participants in the present analysis were youths who took part in the first three cycles of YITS, including those who took part only in the third cycle of data collection and those who had graduated during the first two cycles. YITS weights were applied in statistical analyses.

It is necessary for research on postsecondary education student attrition to exclude youths who went into the labor market without ever attending postsecondary education. We focused on the sample of youths who attended postsecondary education for any period of time during the first three cycles of YITS. For these youths, the definition of postsecondary education status, as reported in Shaienks et al. (2006), can be simplified to include graduates, dropouts, and continuers. Youths who left their postsecondary education but returned by the end of the third cycle were considered to be continuers. From an analytical perspective, continuers who by the end of the third cycle of YITS were still attending postsecondary education are referred to as *censored cases* (i.e., we are certain that they had not dropped out by the end of the third cycle of YITS but uncertain if they eventually graduated).

Dependent and Independent Measures

A time variable (the length of time the individual persisted until dropping out) and a status indicator (to separate youths who graduated, dropped out, or censored) worked together to define the occurrence of postsecondary education student attrition (the dependent measure). The status indicator was coded categorically as graduates, dropouts, and censors. The time variable was calculated based on survey questions asking whether youths were still taking credits towards their postsecondary programs by the end of a certain cycle.

Based on Tinto (1993) and Lotkowski et al. (2004), postsecondary education dropouts were profiled based on pre-postsecondary education conditions and postsecondary education integration (including internal and external conditions that usually correspond to postsecondary education). Variables descriptive of pre-postsecondary education conditions included individual characteristics, individual disposition, high school academic ability, and personal problems (see Appendix A). For dichotomous variables percentages were reported (e.g., 56.6% of dropouts, 45.4% of censors, and 46.0% of combined youths were male). For continuous variables means were reported (e.g., average age of dropouts, censors, and combined youths was 19.1, 18.9, and 19.0 years respectively).

Variables descriptive of postsecondary education integration included postsecondary education academic ability, social network, attitude toward postsecondary education,

institutional support, financial condition, personal obligation, and program characteristics (see Appendix B). For dichotomous variables, percentages were reported (e.g., 34.6% of dropouts, 41.7% of censors, and 41.3% of combined youths had high computer skills). For continuous variables, means were reported (e.g., average time lag between graduation from high school and entrance into postsecondary education was 6.5, 5.6, and 5.6 months respectively for dropouts, censors, and combined youths).

Statistical Technique

Because of the censored data, survival analysis was our primary statistical technique to analyze postsecondary education student attrition (e.g., Yamaguchi, 1991). If graduates did not exist, we could easily distinguish between dropouts and censors and perform a straightforward survival analysis. To deal with the presence of graduates, Yamaguchi (1991) recommended that graduates be treated as censored cases. Censored individuals were defined as those who, by the end of the observation, had not demonstrated the event of interest (dropping out of postsecondary education in our case). For this study, graduates fit this definition. Yamaguchi's recommendation has the advantage of being parsimonious in model specification, estimation, and interpretation. We argue that this approach is an efficient and appealing option for data analysis even after theories and programs are developed to deal with the differences between graduates and censors (i.e., graduates are immune to postsecondary education attrition).

We used Cox regression within the family of survival analysis to model time-to-event data in the presence of censored cases. Cox regression has an advantage over most life table techniques as it allows for the inclusion of independent variables as predictors of the event of interest. Specifically, we used the continuous-time proportional hazards model in the family of Cox regression to examine the relationship between postsecondary education student attrition and pre-postsecondary education conditions and postsecondary education integration. Results of Cox regression are commonly expressed as odds ratio that denote the regression result in terms of *e* raised to the power of each effect. To deal with time-varying variables (that can take on different values at different time points of data collection) common in longitudinal studies like YITS, we adopted Yamaguchi's (1991) recommendation to stack time points under each individual. This strategy works well with Cox regression where a hazard rate is associated with a time point.

Analytically, we first examined each category separately (pre-postsecondary education conditions and postsecondary education integration). Within each category, we tested the "absolute" effects of each independent variable within its subcategory (e.g., individual characteristics, individual disposition, high school academic ability, and personal problems as subcategories of pre-postsecondary education conditions). We then introduced significant independent variables from all subcategories into a single survival model to test their "relative" effects. We used a backwards process to eliminate non-significant independent variables one by one until all remaining variables were significant. Finally, we introduced significant independent variables from both categories into a single survival model. Using the same backwards process, we derived our grand survival model that identified the most salient independent variables critically related to postsecondary education student attrition.

The statistic that we used to evaluate the fit for our survival models was -2*LL* (log likelihood), which compares a built model with the null model without any independent variables. A significant -2*LL* estimate indicates that, compared with the null model, the built

model significantly improves the model-data-fit. This procedure can apply to both subcategories (within a certain category) and categories (pre-postsecondary education conditions and postsecondary education integration). In any comparison, a smaller significant -2*LL* estimate indicates a better fit.

Statistical Issues

One assumption of the logit hazard regression model is no unobserved heterogeneity. Without an error term in the model, it is assumed that all variation in the hazard rate is captured by the independent variables. A key concern is the "omission of an important independent variable [that] amounts to pooling of heterogeneous populations defined by the different values of the omitted predictor" (Singer & Willett, 1992, p. 38). Cox regression shares the same assumption. We are confident that unobserved heterogeneity was not a major concern in our data analysis because the omission of important variables is less likely to occur when sound theories are used to guide variable selection and model specification. Tinto's (1993) model, supplemented by a comprehensive meta-analysis (Lotkowski et al., 2004), identified critical variables that influence postsecondary education student attrition. In fact, this is a major advantage of the present analysis over existing Canadian studies in the literature (see our discussion earlier).

With national data, we considered the issue of regional variation as a potential source of heterogeneity because provinces may have differential hazard profiles regarding postsecondary education student attrition due to their social, economic, and cultural variations. Given that "the vast majority of provinces had a dropout rate somewhere between 10% and 12%" (Shaienks et al., 2006, p. 15), we believe that regional variation was not a serious concern.

The comprehensive range of independent variables in our data analysis lets us control the level of unobserved heterogeneity. On the other hand, inter-correlations among this large number of variables can become a statistical issue (concern about confounding and proxy variables). We examined inter-correlations for collinearity among all independent variables. Except for the expected high correlation (-0.90) between university and college as postsecondary educational goals, we did not encounter any alarmingly high correlations (the highest correlation was -0.64).

Results

Relationship Between Pre-Postsecondary Education Conditions and Postsecondary Education Student Attrition

Table 2 presents estimates on the relationship between pre-postsecondary education conditions and student attrition in postsecondary education. For individual characteristics, gender was statistically significant with an odds ratio of 1.39 in favor of female youths. Male youths were 1.39 times more likely than female youths to drop out of postsecondary education. For individual disposition, social engagement in high school was statistically significant (an odds ratio of 1.19 in favor of strong social engagement). Youths with weak social engagement in high school were 1.19 times more likely to drop out. Both measures of educational aspiration were statistically significant (odds ratios of 7.69 and 2.50 in favor of university and college as postsecondary education goals). Respectively, youths who set trade school or lower as postsecondary education goals were 7.69 and 2.50 times more likely than youths who set

Table 2

Effects of Pre-Postsecondary Education Conditions on Postsecondary Education Student Attrition

Variable	Effect	SE	Exp
Individual characteristics			
Male (vs. female)	0.33	0.08	1.39
Individual disposition			
Social engagement (continuous)	-0.18	0.04	[1.19]
University (vs. trade school) as educational aspiration	-2.02	0.14	[7.69]
College (vs. trade school) as educational aspiration	-0.91	0.11	[2.50]
High school academic ability			
Overall GPA $>$ 90% (vs. $\leq$ 60%)	-1.36	0.34	[3.85]
Overall GPA $>$ 80% ($\leq$ 90%) (vs. $\leq$ 60%)	-0.51	0.13	[1.67]
University preparation as last language course (yes vs. no)	-0.51	0.16	[1.67]
Personal problems			
Dropping out of high school (yes vs. no)	0.57	0.14	1.77
Using drugs in high school (yes vs. no)	0.23	0.09	1.26
-2*LL*	10,639		

Note. All effects are statistically significant at the alpha level of 0.05. Exp, commonly expressed as odds ratio, denotes the regression result in terms of *e* raised to the power of each effect. For all negative effects (resulting in odds ratios smaller than 1), reciprocals of odds ratios (reported in parentheses) are used to make the interpretation format consistent throughout the entire analysis.

university and college as postsecondary education goals to drop out.

For high school academic ability, an overall GPA of 90% or higher and an overall GPA of 80% or higher were both statistically significant (odds ratios of 3.85 and 1.67). Respectively, youths with an overall GPA of 60% or lower were 3.85 and 1.67 times more likely than youths with an overall GPA of 90% or higher and youths with an overall GPA of 80% or higher to drop out of postsecondary education. A university preparatory language course as the last language course in high school was statistically significant with an odds ratio of 1.67. As their last language course in high school, youths who took a standard language course were 1.67 times more likely than youths who took a university and college preparation language course to drop out. Finally, both measures of personal problems were statistically significant (odds ratios of 1.77 and 1.26 in favor of youths with no history of dropping out and drug abuse in high school). Respectively, youths who had a record of dropping out and drug abuse in high school were 1.77 and 1.26 times more likely to drop out.

Comparisons of -2*LL* as an indicator of model-data-fit across those subcategories of pre-postsecondary education conditions revealed that the most important subcategory pertained to individual disposition whereas the least important subcategory pertained to individual characteristics.

Table 3

Effects of Postsecondary Education Integration on Postsecondary Education Student Attrition

Variable	Effect	SE	Exp
Postsecondary education academic ability			
College GPA > 90% (vs. ≤ 60%)	-1.07	0.32	[2.94]
College GPA > 80% (≤ 90%) (vs. ≤ 60%)	-0.87	0.19	[2.38]
College GPA > 70% (≤ 80%) (vs. ≤ 60%)	-0.76	0.15	[2.13]
Social network			
Campus volunteering (yes vs. no)	-0.35	0.14	[1.43]
Existence of people to talk about personal issues (yes vs. no)	-0.43	0.14	[1.54]
Attitude toward postsecondary education			
Hours each week spent in studying outside of class (continuous)	-0.04	0.01	[1.04]
Times each month thought about dropping out (continuous)	0.24	0.04	1.27
Felt just a number to this institution (yes vs. no)	0.39	0.14	1.48
Financial condition			
Social assistance (yes vs. no)	1.11	0.27	3.03
Scholarship (yes vs. no)	-1.48	0.31	[4.35]
Parental loan (yes vs. no)	-0.89	0.13	[2.43]
Personal obligation			
Single (not married) (vs. married)	-0.75	0.20	[2.13]
Program characteristics			
University (vs. trade school) as postsecondary program	-1.62	0.26	[5.00]
-2*LL*	4,645		

Note. All effects are statistically significant at the alpha level of 0.05. Exp, commonly expressed as odds ratio, denotes the regression result in terms of *e* raised to the power of each effect. For all negative effects (resulting in odds ratios smaller than 1), reciprocals of odds ratios (reported in parentheses) are used to make the interpretation format consistent throughout the entire analysis.

Relationship Between Postsecondary Education Integration and Postsecondary Education Student Attrition

Table 3 presents estimates on the relationship between postsecondary education integration and student attrition in postsecondary education. For postsecondary education academic ability, students with a first-year postsecondary education GPA of 60% or lower were respectively 2.94, 2.38, and 2.13 times more likely to drop out of postsecondary education than students with a GPA of 90% or higher, 80% or higher, and 70% or higher. For social network, the students most likely to drop out were those who did not volunteer on campus (1.43 times) and did not have people on campus with whom they could talk about personal issues (1.54 times).

For attitude toward postsecondary education, students were more likely to drop out of

postsecondary education if they spent less time studying outside of class (1.04 times with one less hour each week), thought more often about dropping out (1.27 times with one more contemplation each month), and felt that they were just numbers (statistics) to their institutions (lack of sense of belonging) (1.48 times). Institutional support, as a subcategory, was not important to postsecondary education student attrition.

For financial condition, students were more likely to drop out of postsecondary education if they collected social assistance (3.03 times), did not obtain any scholarships (4.35 times), and did not receive loans from parents (2.43 times). For personal obligation, married students were 2.13 times more likely to drop out than students who were not married. Finally, for program characteristics, students who attended trade school or lower were 5.00 times more likely to drop out than those who attended university.

Comparisons of -2*LL* as an indicator of model-data-fit across those subcategories of postsecondary education integration revealed that the two most important subcategories pertained to program characteristics and social network whereas the two least important subcategories pertained to personal obligation and financial condition.

Overall Relationship of Pre-Postsecondary Education Conditions and Postsecondary Education Integration to Postsecondary Education Student Attrition

In this step, we combined all significant predictors from pre-postsecondary education conditions (Table 2) and postsecondary education integration (Table 3) to examine their relative importance to student attrition in postsecondary education (see Table 4). Most significant predictors identified within the category of postsecondary education integration were highly stable. A comparison between Tables 3 and 4 showed that all but one significant predictor maintained their predictive significance. A comparison in -2*LL* between the pre-postsecondary education conditions model (10,639) and the postsecondary education integration model (4,645) also indicated that postsecondary education integration accounted for considerably more variance in postsecondary education student attrition than pre-postsecondary education conditions.

According to Table 4, students with a first-year postsecondary education GPA of 60% or lower were, respectively, 3.57, 2.22, and 1.92 times more likely to drop out of postsecondary education than students with a GPA of 90% or higher, 80% or higher, and 70% or higher. Students who did not volunteer on campus were 1.39 times more likely to drop out. Students who did not have people on campus to talk with about personal issues were 1.45 times more likely to drop out. One additional instance of thinking about dropping out each month increased the likelihood of students' dropping out by 1.24 times. Students who lacked a sense of belonging to their institutions were 1.39 times more likely to drop out. Respectively, students who collected social assistance, obtained no scholarships, and received no loans from their parents were 2.21, 3.85, and 2.22 times more likely to drop out. Married students were 1.85 times more likely to drop out. Students who attended trade school or lower as their postsecondary programs were 1.92 times more likely to drop out than those who attended university as their postsecondary programs.

Table 4

Overall Effects of Pre-Postsecondary Education Conditions and Postsecondary Education Integration on Postsecondary Education Student Attrition

Variable	Effect	SE	Exp
Pre-postsecondary education conditions			
Individual characteristics			
Male (vs. female)	0.49	0.13	1.64
Individual disposition			
University (vs. trade school) as educational aspiration	-2.37	0.23	0.09
College (vs. trade school) as educational aspiration	-1.35	0.17	0.26
Personal problems			
Dropping out of high school (yes vs. no)	1.01	0.26	2.74
Using drugs in high school (yes vs. no)	0.30	0.14	1.35
Postsecondary education integration			
Postsecondary education academic ability			
College GPA $>$ 90% (vs. $\leq$ 60%)	-1.27	0.36	[3.57]
College GPA $>$ 80% ($\leq$ 90%) (vs. $\leq$ 60%)	-0.81	0.19	[2.22]
College GPA $>$ 70% ($\leq$ 80%) (vs. $\leq$ 60%)	-0.65	0.16	[1.92]
Social network			
Campus volunteering (yes vs. no)	-0.33	0.15	[1.39]
Existence of people to talk about personal issues (yes vs. no)	-0.38	0.14	[1.45]
Attitude toward postsecondary education			
Times each month thought about dropping out (continuous)	0.22	0.04	1.24
Felt just a number to this institution (yes vs. no)	0.33	0.15	1.39
Financial condition			
Social assistance (yes vs. no)	0.79	0.28	2.21
Scholarship (yes vs. no)	-1.34	0.31	[3.85]
Parental loan (yes vs. no)	-0.81	0.13	[2.22]
Personal obligation			
Single (not married) (vs. married)	-0.62	0.21	[1.85]
Program characteristics			
University (vs. trade school) as postsecondary program	-0.66	0.30	[1.92]
-2*LL*	4,441		

Note. All effects are statistically significant at the alpha level of 0.05. Exp, commonly expressed as odds ratio, denotes the regression result in terms of *e* raised to the power of each effect. For all negative effects (resulting in odds ratios smaller than 1), reciprocals of odds ratios (reported in parentheses) are used to make the interpretation format consistent throughout the entire analysis.

Male youths were 1.64 times more likely to drop out of postsecondary education than female youths. Respectively, youths who set trade school or lower as their postsecondary education goals were 11.11 and 3.85 times more likely to drop out than youths who set university and college as their postsecondary education goals. Youths with a history of dropout and drug abuse in high school were, respectively, 2.74 and 1.35 times more likely to drop out.

Discussion

Profiling Postsecondary Education Dropouts

Our grand survival model (Table 4) provides a good lens to look at the issue of postsecondary education student attrition. Our profile of postsecondary education dropouts is about a national population of Canadian youths who attended postsecondary education between the ages of 18 to 20 and 22 to 24 (i.e., there was a 4-year window to follow this group as they pursued their postsecondary education). Postsecondary education dropouts in Canada tended to be male, set low postsecondary education goals (instead of university or college they opted for trade school or technical school), and had a history of dropping out and drug abuse in high school. These factors pertained to pre-postsecondary education conditions.

Once in postsecondary education, there were a variety of institutional factors that influenced dropouts. In Canada, dropouts tended to struggle with academic work in their first year (GPA of 60% or lower), fared poorly in social networking, avoided volunteering on campus, and had no one on campus to talk with about their personal issues. Dropping out of postsecondary education was a well-thought-out and deeply felt event as dropouts tended to struggle (at least monthly) with the thought of quitting and lacked a sense of belonging to their institutions. On the personal side, dropouts tended to collect social assistance and received neither scholarships from institutions nor loans from parents. Dropouts tended to be married students and enrolled in trade school or technical school as their postsecondary education programs. These factors pertained to postsecondary education integration.

Most Important Factors Related to Postsecondary Education Student Attrition

Both pre-postsecondary education conditions and postsecondary education integration have multiple subcategories of factors (variables) that are identified in the literature as important to postsecondary education student attrition. To single out the most important factors, we relied both on model-data-fit statistics (of subcategories) and odds ratio magnitudes (of factors). Overall, program characteristics, social network, postsecondary education academic ability, and attitude toward postsecondary education (all pertaining to postsecondary education integration) in this order, showed major importance to Canadian postsecondary education student attrition (*-2LL* estimates not reported). These subcategories reduced variance in postsecondary education student attrition more than twice as much as other subcategories.

Canadian youths tended to drop out of postsecondary education if they pursued programs in trade school or technical school. We realize that this may be a surrogate of issues (e.g., motivation, commitment, and ability) that prevent them from pursuing programs at university. Unfortunately, trade schools usually have fewer resources than universities to deal with those issues.

An inadequate social network was significantly related to postsecondary education student

attrition. Common wisdom speaks to the danger of having nobody on campus with whom students feel comfortable speaking about personal issues. What was intriguing to us was the potential opportunities for on campus volunteering held for creating personal connections. We believe that community work by itself does not matter to student attrition. Instead, volunteering is very effective in establishing an on-campus social network.

Common wisdom also speaks to the danger of not being able to do well in academic work during the first year of postsecondary education. If a first-year postsecondary education GPA reveals the cognitive side of postsecondary education student attrition, then attitude toward postsecondary education reveals the affective side. A lack of sense of belonging to their institutions is heavily related to Canadian postsecondary education student attrition. In addition, the thought of dropping out is highly harmful. Previously, we mentioned that dropping out is a well-thought-out and deeply felt event. This implies that postsecondary education dropout is a process that takes time. To some extent, this is good news in that there is time for intervention.

Policy Implications

In deriving our policy implications, we intend to avoid the all too common conclusion that postsecondary education problems are mainly a consequence of weaknesses in pre-postsecondary education. In fact, we have good evidence to suggest that postsecondary education integration is far more important to student attrition than pre-postsecondary education conditions. For example, although high school grades are an important determinant of entry into postsecondary education (e.g., Finnie et al., 2012), our grand survival model clearly indicates that high school GPA is less of an indicator of postsecondary drop out potential than first-year postsecondary education GPA. Therefore, we suggest that student attrition in postsecondary education is a postsecondary education problem and a consequence of weaknesses in postsecondary education integration. Our policy implications, thus, center around the importance of program characteristics, social network, postsecondary education academic ability, and attitude toward postsecondary education to postsecondary education student attrition.

Academically weak students are likely to find themselves in trade schools. It is typical in Canada that trade programs (and even college programs) offer few opportunities for part-time studies or for a "cafeteria" style of course selections. Instead of helping these students to succeed, the program structure actually makes it difficult for students to overcome their academic weaknesses. Our results suggest that if trade schools can connect with universities (i.e., reduce the differences in, say, program policy and practice between these two types of postsecondary education), student attrition in postsecondary education may decline greatly. One way to promote this connection is to make trade schools a professional campus of formal universities. Of course, policymakers ought to realize that legislations and resources are needed to make this reform happen.

Additionally, our results highlight the importance of people on campus with whom youths can talk about personal issues. We recommend that postsecondary education institutions create opportunities for various support groups on campus. Many religious groups offer good services that support youths' spiritual needs, which may influence their desire to sustain their postsecondary education. Counseling services may not meet the expectation of many youths to deal with personal issues in a relational, non-threatening environment. Our grand survival

model illustrated that campus social support was not a predictor of student attrition. From our analysis on social network and attitude toward postsecondary education, we can clearly sense that personal relationships rather than professional services are what youths seek. We believe that this is a gap religious groups could fill.

Under the stressful academic demands of postsecondary education, youths seek out volunteer work on campus for various reasons (e.g., to pursue social network, to enhance their resumes). No matter the reason, students who pursue volunteer work on campus have a valuable opportunity to establish a social network. It is simply a good way to get to know more people and make friends. We are concerned about youths who do not have either the time or the energy to pursue volunteering work on campus. One way to get these youths involved in on-campus relationship building is to offer extracurricular activities that are designed to help youths deal with the academic challenges and demands of their programs. For example, a study group closely related to coursework is an effective way to engage youths in relationship building while surviving academically. Governments may consider providing industries with tax credits to encourage their support of campus programs (e.g., engineering companies developing campus programs aimed at helping engineering students).

Our results also highlighted the need to support youths in their academic coursework, particularly during their first year. A high first-year GPA is essential as it anchors youths firmly in their programs. Postsecondary education institutions can use remediation and intensive instruction as possible means to improve students' academic performance. An example of such support is offered by the National Science Foundation in the United States. This organization regularly distributes grants to develop remedial programs that either prepare students for postsecondary education programs or improve their academic performance in those programs.

Students' attitudes toward postsecondary education also bear policy implications. These attitudes are related, to a large degree, to their social network. It is hard to detect youths contemplating dropping out of postsecondary education when there are no on-campus individuals with whom youths feel comfortable speaking about personal issues. Without the presence of support groups on campus, it is hard for students to develop a sense of belonging to their institutions. This, again, illustrates the need to develop deep personal relationships between individual youths and support groups. Once more, various community groups, especially religious groups, have much to offer on this regard. Overall, the potential benefit of religious groups on campus needs to be adequately appreciated.

Apart from the policy implications we have derived from our four critical subcategories, we have also paid attention to significant variables with large odds ratios in other subcategories, with specific attention to two variables. One is educational aspiration (pertaining to individual disposition) and the other is scholarship (pertaining to financial conditions). Recall that, respectively, youths who set trade school as their postsecondary education goals were more than 11 and 4 times as likely to drop out of postsecondary education than youths who set university and college as their goals. Students, therefore, who have high expectations or motivations are less likely to drop out of postsecondary education. We argue that secondary education systems need to prepare high school graduates not only cognitively but also affectively for postsecondary education (e.g., motivated, determined, confident, and excited about their future). Role models are an effective way to motivate students to have high future expectations.

Compared with youths who received scholarships from their institutions, youths who did not were almost 4 times as likely to drop out of postsecondary education. We realize that scholarships can be a critical financial support for youths to sustain through their postsecondary

education. We also think that scholarships may have another meaning to youths. Scholarships as a form of recognition for academic excellence are one of the best ways for youths to realize their own potential for success in postsecondary education. Such a self (and public) recognition can anchor youths for their postsecondary education. We suggest that postsecondary education institutions develop multiple forms of scholarships (both need-based and merit-based). For example, scholarships can be awarded to youths who have shown the best improvement in academic work or youths who have demonstrated the most resilience to pressures and factors that lead toward dropping out of postsecondary education.

Revisiting the Literature

We would like to reiterate two major findings from our analysis. One is that postsecondary education integration is far more critical than pre-postsecondary education conditions regarding student attrition in postsecondary education. Tinto's (1993) model does not explicitly assign priority to these categories of "forces," but integration and affiliation (membership) are declared as the key concepts of the model. Lotkowski et al. (2004) largely avoided prioritizing specific issues in their meta-analysis by classifying influential forces into academic and non-academic factors. Nevertheless, the two important academic factors pertain to pre-postsecondary education conditions and more than half of the important non-academic factors can trace their roots and critical developments back to pre-postsecondary education. With a nationally representative sample and a reasonable balance between the number of highly relevant variables pertaining to both categories, we are confident in our claim that postsecondary education integration is more important for student attrition than pre-postsecondary education conditions.

It appears to us that pre-postsecondary education conditions function to carry youths into a more "robust" position (in postsecondary education) against postsecondary education dropout. For example, we have demonstrated that superior high school academic ability lands youths in university programs (rather than trade school programs) where they are more likely to persist with their education. Once in postsecondary education, pre-postsecondary education conditions become less important (or even unimportant) to student attrition. We see this point clearly in comparison between Tables 2 and 4 (i.e., half of the significant variables pertaining to pre-postsecondary education conditions in Table 2 cease to be significant in Table 4). In contrast, a comparison between Tables 3 and 4 indicates that all but one significant variable in Table 3 maintained their significance in Table 4.

Our second major finding also supports our argument regarding the importance of postsecondary education integration. We identified program characteristics, social network, postsecondary education academic ability, and attitude toward postsecondary education as the major forces related to postsecondary education student attrition. All of these forces pertain to postsecondary education integration. Tinto's (1993) model, in contrast, does not explicitly single out key elements of postsecondary education integration that contribute to dropouts. Our analysis is equipped with a nationally representative sample of youths and a comprehensive theory-driven coverage of influential factors that allow us to confidently mark out key elements in the model for further confirmation.

Further Research

The present analysis employed YITS-B database under the principle of obtaining a longer observation of youths in their postsecondary education (YITS-B tracked a representative sample of youths from age 18 to 20 to age 28 to 30). We could have, however, used data from a younger population (YITS-A tracked a representative sample of high school students from age 15 or 16 to age 22 or 23). Although YITS-A and YITS-B are similar in many ways (e.g., both started in 2000, followed youths at two-year intervals, and contained five cycles) and both databases have been used in empirical studies (see Table 1), YITS-A includes more detail on family background and high school experience than YITS-B. Even though we have shown the importance of postsecondary education integration over pre-postsecondary education conditions, a parallel study using YITS-A (with better and more measures of pre-postsecondary education conditions) would add valuable insights into the critical findings of our analysis.

In addition, some statistical models, such as a multinomial logit model, are less sensitive to unobserved heterogeneity. A multinomial logit model can also avoid combining continuers and graduates into one category. There is no doubt that the three categories of dropouts, continuers, and graduates would produce a richer understanding of postsecondary education student attrition. Nevertheless, this model needs to accommodate censored data. Finally, further analysis between provinces or between different types of postsecondary education institutions offers additional ways to reduce unobserved heterogeneity. For example, Shaienks and Gluszynski (2007) illustrated that postsecondary education dropout rate differs across all types of institutions. Overall, improved measurements and sensitivity towards unobserved heterogeneity are very promising ways of refining empirical studies on postsecondary education student attrition.

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Appendix A

Coding and Descriptive Information of Pre-Postsecondary Education Condition

Pre-postsecondary education condition	Dropouts	Censors	Overall
INDIVIDUAL CHARACTERISTICS			
Male (= 1 vs. female = 0)	56.6	45.4	46.0
Age (in years)	19.1	18.9	19.0
Urban (non-rural) (= 1 vs. rural = 0)	67.5	70.6	70.5
INDIVIDUAL DISPOSITION			
Academic engagement (standardized score × 10)	-1.6	2.2	2.0
Social engagement (standardized score × 10)	-1.9	1.4	1.2
Postsecondary educational goals: university (= 1 vs. trade school = 0)	24.4	58.0	55.9
Postsecondary educational goals: college (= 1 vs. trade school = 0)	58.0	37.5	38.7
HIGH SCHOOL ACADEMIC ABILITY			
Overall GPA > 90 % (= 1 vs. < 60 % = 0)	1.7	9.2	8.8
Overall GPA > 80 % < 90 % (= 1 vs. < 60 % = 0)	20.5	37.7	36.7
Overall GPA > 70 % < 80 % (= 1 vs. < 60 % = 0)	51.2	40.6	41.2
Last language course: university preparation (= 1 vs. standard = 0)	51.7	21.5	66.2
Last language course: college preparation (= 1 vs. standard = 0)	67.1	10.5	11.2
PERSONAL PROBLEMS			
Dropping out of high school (yes = 1 vs. no = 0)	13.3	3.8	4.4
Using drug in high school (yes = 1 vs. no = 0)	29.7	20.0	20.6

Note. Most variables are dichotomous with means indicating percentages. Censors include both continuers and graduates. For the sake of space, within each block, only statistically significant variables are presented. Variables not statistically significant include minority status and immigration status in the block of individual characteristics; occupational aspiration in the block of individual disposition; and mathematics GPA, language GPA, advanced placement (AP) mathematics coursework, AP language coursework, and level of last mathematics course in the block of high school academic ability.

Appendix B

Coding and Descriptive Information of Postsecondary Education Integration

Postsecondary education integration	Dropouts	Censors	Overall
POSTSECONDARY EDUCATION ACADEMIC ABILITY			
Time lag (graduation from high school and entry into postsecondary education) (in month)	6.5	5.6	5.6
Computer skill (high = 1 vs. low = 0)	34.6	41.7	41.3
First-year postsecondary education GPA $>$ 90 % (= 1 vs. $<$ 60 % = 0)	4.3	41.7	41.3
First-year postsecondary education GPA $>$ 80 % $<$ 90 % (= 1 vs. $<$ 60 % = 0)	17.1	28.6	28.1
First-year postsecondary education GPA $>$ 70 % $<$ 80 % (= 1 vs. $<$ 60 % = 0)	30.7	41.5	41.1
SOCIAL NETWORK			
Left home to attend postsecondary education (yes = 1 vs. no = 0)	19.3	16.0	16.2
Campus residence (yes = 1 vs. no = 0)	8.8	20.8	20.3
Small class size (35 or fewer) (yes = 1 vs. no = 0)	63.9	48.5	49.1
Campus social support (standardized score $\times$ 10)	-1.2	1.6	1.5
Campus volunteering (yes = 1 vs. no = 0)	28.1	40.6	39.9
Existence of people to talk about personal issues (yes = 1 vs. no = 0)	66.6	83.8	83.2
ATTITUDE TOWARD POSTSECONDARY EDUCATION			
Hours each week spent in studying outside of class	7.7	11.2	11.0
Times each month thought about dropping out	1.8	0.6	0.6
Missed deadlines for assignments (yes = 1 vs. no = 0)	32.1	15.0	15.7
Consulted the instructor due to a lack of understanding (yes = 1 vs. no = 0)	81.0	81.1	81.2
Felt just a number to this institution (membership or sense of belonging) (yes = 1 vs. no = 0)	60.3	45.5	45.9
Became a good friend with others during the first year (yes = 1 vs. no = 0)	78.2	92.0	91.4
INSTITUTIONAL SUPPORT			
Number of instructors who had strong teaching abilities	2.7	2.8	2.8
FINANCIAL CONDITION			
Employment insurance (yes = 1 vs. no = 0)	7.0	5.0	5.0
Social assistance (yes = 1 vs. no = 0)	8.0	5.1	6.1
Scholarship (yes = 1 vs. no = 0)	4.0	21.0	20.0
Parent loan (yes = 1 vs. no = 0)	44.0	61.0	60.0
Government loan (yes = 1 vs. no = 0)	15.1	17.0	16.5

PERSONAL OBLIGATION			
Single (= 1 vs. married = 0)	91.5	96.1	95.8
Dependent children (yes = 1 vs. no = 0)	3.9	1.7	1.9
PROGRAM CHARACTERISTICS			
University program (= 1 vs. trade school program = 0)	9.0	34.4	32.0
College program (= 1 vs. trade school program = 0)	33.9	34.9	34.8

Note. Most variables are dichotomous with means indicating percentages. Censors include both continuers and graduates. For the sake of space, within each block, only statistically significant variables are presented. Variables not statistically significant include academic skills in reading, writing, oral communication, problem solving, and mathematics in the block of postsecondary education academic ability; participation in programs to help first-year students and part-time work reducing opportunities of making friends in the block of social network; times each month cut or skipped class, trouble in keeping up with the workload, and ability to relate what was taught to future lessons during the first year in the block of attitude toward postsecondary education; number of instructors who showed an interest in helping students succeed in the block of institutional support; and mathematics, science, and technology as postsecondary discipline and humanity and social science as postsecondary discipline in the block of program characteristics.