The age of reproduction. The effect of university tuition fees on enrolment in Quebec and Ontario, 1946–2011

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Abstract We are interested in the role tuition fees play in social reproduction. We use retrospective biographical data from a series of surveys on family events, long series on tuition fees and methods from event history analysis to study the effect of the level of tuition fees on university enrolment in two Canadian provinces, Quebec and Ontario. We focus on the variation of their effect on enrolment according to social origin, province, language and immigration status. Not considering age, the level of tuition fees increases enrolment for children of highly educated parents or immigrants, has no effect among the Quebec English-speaking, but decreases enrolment in all other groups. However, in most groups, the deterring effect increases with age. Among immigrants and their children, as well as among the Ontario English-speaking, the slope of the relation between the effect of tuition fees and age is markedly steep: In these groups, there seems to be a limited age window during which parents are willing to invest in their children's education.

1 Introduction

The recent raise of tuition fees in many Western countries – among them England, the United States, Germany and Canada – is renewing interest for the effect of tuition fees on the access to postsecondary education, and especially their role in social reproduction. The most obvious topic is whether increasing tuition fees reduces overall access, but a more complex question is whether the effect of tuition fees on enrolment is the same across social groups. Higher tuition fees could discour-

age the less wealthy to pursue higher education because of the cost and of a pessimistic estimation of future gains, but they could encourage the wealthier to enrol because cost is not a problem and future gains believed to be high thanks to reduced competition. If this were true, the combination of two opposite effects could lead to a null or only very negative effect of increasing tuition fees on overall enrolment. In other words, knowing more about the variation of the effect of tuition fees on enrolment across social groups is important for understanding the role of postsecondary education in social reproduction, but also for understanding the evolution of overall enrolment.

In this article, we examine the variation of the effect of tuitions fees on enrolment across social groups in two Canadian provinces over a 65-year period. We model the effect of tuitions fees on university access using individual biographical data from four cycles of the General Social Survey and aggregate data on Quebec and Ontario tuition fees spanning from 1946 to 2009. Our approach makes use of the non-monotonic variation of tuition fees over the period to disentangle the effect of tuition fees on enrolment from the general growth in enrolment that occurred over the period. It also allows us testing the equality of the effect of tuitions fees across social origin, language and immigration status. Our results show that the level of tuition fees has an impact on enrolling, and that this impact varies across social groups.

2 University education and social reproduction

Studies on the access to postsecondary education and, more generally, the sociology of education inequality as a whole, draw strongly on social reproduction theory. At the core of this view is the notion that despite the democratisation of postsecondary education, schooling is a key element of the intergenerational reproduction of the social structure. Since the seminal work on this topic (Bourdieu and Passeron, 1977, 1979; Bourdieu, 1984), numerous studies in numerous countries have used this perspective and benefited from its fruitfulness.

In its basic formulation, social reproduction theory focuses on social origin and family location in the class structure. Some extensions have proven important. Gender is now recognised as a structural difference of its own that induces differences in education pathways. While women have gained greater access to postsecondary education, their options still bear the mark of the gendered division of labour. (Duru-Bellat, 2001; Marry, 2004; Barone, 2011). In some societies, ethnicity, religion or language are additional components of the social structure. In the USA, race induces differences in education careers (MacLeod, 1987; Ogbu, 1994). In Canada, language – specifically, speaking French or English – is another source of social inequality, especially in education (Dandurand et al., 1980; Dandurand, 1986 et 1991; Laplante et al. 2014; Kamanzi and Doray, 2015). In Quebec, Dandurand was a precursor of a sort. As early as in the 1980s, he promoted that the

process of social reproduction was not driven only by social origin, but by gender and ethno-cultural differences as well. This insight is very close to what is now known at intersectionality (Adamuti-Trache and Andres, 2008; Collins and al., 2015; Beattie, 2002).

In contemporary Canada, immigration adds another dimension to the social structure. Canadian immigration policy overtly favours university graduates, with the consequence that the proportion of university graduates among immigrants is very high, especially among the older generations. Thus, a large fraction of children of immigrants is made of children of university graduates (Laplante et al. 2014).

3 Tuition fees as education policy

Tuition fees are an element of education policy. Assuming they reduce affordability and enrolment in university education, States may regulate them as a means of promoting accessibility (CMEC, 2007; Delaney and Kearney, 2015), This is, or has been, common in Europe. In North America, Quebec followed the European trend as part of a large-scale reform enacted in the 1960s. Tuition fees were 'frozen', which, in a context of moderate to high inflation, amounted to reduce them over time, this reduction being presented at the time as leading to their elimination in the near future. However, in Quebec as in many other jurisdictions, the will to curb public deficits and public spending more generally actually lead to reduce the public funding of universities and to increase their private funding by students and their families through increasing tuition fees. In Quebec as elsewhere, advocates of increasing tuition fees assured that higher tuition fees would not reduce accessibility because in jurisdictions where they had increased, for instance in neighbouring Ontario, enrolment had not decreased. Furthermore, as university graduates get higher wages because of their education, they should pay a large fraction of the cost of their education (e.g. Belzile, 2010; Kozhaya, 2004).

Not surprisingly, insights from scholarly research sometimes differ from those of advocacy. There is a large body of American literature on the effect of tuition fees on enrolment in postsecondary education. According to the meta-analysis by Leslie and Brinkman (1987), youth enrolment is more affected by fees than by financial help whatever its form. According to the studies they reviewed, increasing tuitions by 100 USD decreased enrolment by 0.7% among youth aged 18 to 24 and students from low-income families were more affected by changes in tuition fees. Heller (1997) updated Leslie and Brinkman's meta-analysis by including 15 more studies and drew the same conclusions. More recently, Hemelt and Marcotte (2008) found similar results.

The recent introduction or increase in tuition fees in some European countries has fostered new research. In the UK, Dearden, Fitzsimons and Wyness (2011) found that increasing tuition fees by 1,000 GBP was associated with a 3.9% de-

crease in enrolment among youth ages 18 to 29. Croxford and Raffe (2012) less students from Scotland and Northern Ireland in English universities, those who come from tend Scotland attend elite universities. Wales (2013) found similar results in England: increasing fees by 10% was associated with a 1.7% decrease in enrolment. Bolton (2014) reports that applications have dropped in England, but not in Scotland. Universities UK (2014) report lower enrolment especially in part-time studies. Sá (2014) found a decrease in applications especially for programs that lead to lower salaries and lower employment rates, but no evidence of a larger reduction for students from disadvantaged backgrounds.

In Germany, the decision to implement tuition fees belongs to the *länder*, which created a natural experiment. Taking advantage of this setting, Hübner (2012) found a negative effect of tuition fees on enrolment, larger than in previous studies for European countries, but similar to those reported for the USA. Dietrich and Gerner (2012) found that the introduction of tuition fees reduced the propensity of high school graduates to enrol at a university and favoured the vocational training option, whereas Bruckmeier and Wigger (2014) found no evidence that the introduction of tuition fees had a general negative effect on enrolment.

During the 1990s, as advocates of higher tuition fees gained influence on education policy, tuition fees increased simultaneously in most Canadian provinces. This stimulated Canadian research on the effect of tuition fees on enrolment. Most Canadian studies found that tuition fees have an impact on enrolment (Hui, 2004; Michael, 1999; Coelli, 2004; Johnson et Rahman, 2005; Neil, 2009; Hansen et Liu, 2013). Several had mixed findings (Corak et al, 2003; Drolet, 2005; Finnie et al., 2004; Frenette 2005). These studies focused on the 1990s, the period of widespread increase. They looked at the evolution of enrolment in a time where tuition fees are increasing, but they did not estimate the effect of tuition fees on enrolment. Still, Finnie et al. (2004) and Frenette (2005) found that increasing tuition fees had a greater impact on people from more vulnerable background. Moreover Frenette (2005) found increasing inequality in the access to university education in provinces where the deregulation had been more thorough: among people from low-income families, access to university education decreased more in provinces where tuition fees for programs leading to organised professions such as medicine, dentistry and accounting have been deregulated and thus increased the most. Two studies concluded that there is no relation between tuition fees and enrolment. Compared to the bulk of the studies, these two are outliers. One focused on a very short period (Rivard and Raymond, 2004), the other on a period during which tuition fees were almost stable (Christofides, Cirello and Hoy, 2001).

4 Tuition fees and enrolment in Quebec and Ontario

We are interested in the effect of tuition fees on enrolment and more specifically in the differences in their effect across social groups defined by social origin, lan-

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guage and immigration. Comparing the effect of tuition fees in Quebec and in Ontario allows contrasting two societies that are reasonably similar, but whose governments have conducted different policies on tuition fees over the years (see below) and where language shapes the social structure in contrasted ways. The proportion of university graduates is the same within the French-speaking Quebec majority and within the English-speaking Ontario majority. However, in Quebec, the English-speaking minority is still concentrated in the upper classes and has a higher proportion of university graduates than the French-speaking majority, whereas the Ontario French-speaking minority is 'underrepresented' in the upper classes and has a lower proportion of university graduates than the English-speaking majority (Laplante et al. 2014).

Comparing tuition fees and enrolment rates in Quebec and Ontario to understand the relation between fees and enrolment may be tricky. First, the education systems are different. In Quebec, students graduate from secondary education after 11 years, go to college for two years and then may enter university where a typical program lasts three years. In Ontario, students go directly from high school to university, but a typical undergraduate program lasts four years. Second, Ontario secondary education underwent an important change in the 2000s: in 2003, the number of years students spent in primary and secondary education has been reduced from 13 to 12. Therefore, the number of students who enrolled into university in 2003 was about twice the number of the previous and the next year. Third, although most young Ontarians who enrol into university tend to do it in their early 20s, young Quebeckers tend to spread enrolment into university over all their 20s (Chenard and Doray, 2013). Because of this difference in timing, comparing Quebec and Ontario using enrolment rates computed for people aged between 18 and 24 excludes a significant portion of Quebec enrolment. Finally, there is no reason to limit the comparison to the 1990s and 2000s. Tuition fees have been an important part of education policies at least since the beginning of the expansion of university education in the 1960s and there are data that allow reconstructing the series on tuition fees and enrolment rates from this period.
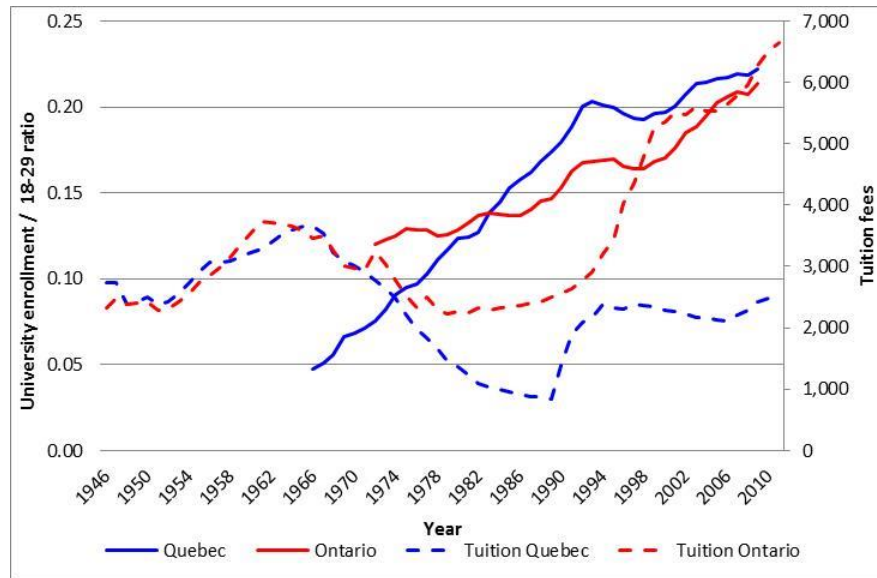
Fig. 1: Ratio of university enrolment to population aged 18–29, Quebec 1966–2009, Ontario 1972–2009, and average tuition fees, Quebec and Ontario 1966–2009 in 2011 constant dollars.[1]

Figure 1 graphs enrolment rates – defined as the proportion of the population aged 18–29 which attends university in a given year – and tuition fees – measured in 2011 constant dollars – in Quebec and Ontario from 1946 to 2011. From the beginning to the end of the series, enrolment rates grew in both provinces, from 4.7% to nearly 22.2% from 1966 to 2009 in Quebec, and from 12.0% to 21.4% from 1972 to 2009 in Ontario. The growth was not steady over the whole period. In both provinces, the enrolment rates levelled off or decreased slightly in the 1990s, and did not resume their previous trend until the end of the decade.

Over the same period, tuition fees in constant dollars did not follow a simple trend, but rather waxed and waned, conveying changes and continuities in education policies. In Quebec, they decreased from 1968 to 1989, actually remaining constant in current dollars, implementing a recommendation of the 'Commission

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[1] Source. *Tuition fees*: Survey of higher education 1946–1948, 1950–1952, 1952–1954, Dominion Bureau of Statistics; University student expenditure and income in Canada, 1961–1962 , Dominion Bureau of Statistics; Tuition and living accommodation costs at Canadian degree-granting universities and colleges, 1966–1967, 1967–1968, 1968–1969, 1969–1970, 1970–1971, Dominion Bureau of Statistics; Tuition and Living Accommodation Costs for Full-time Students at Canadian Degree-granting Institutions , Statistics Canada, 1972-–2011.
Population aged 18–29: Statistics Canada, Table 051-0001 & 051-0026 – Estimates of population, by age group and sex, Canada, provinces and territories, CANSIM.
Enrolment: Association of Universities and Colleges of Canada.
Note: Ontario enrolment figures have been smoothed to reduce the impact of the 2003 "double cohort".

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royale d'enquête sur l'enseignement dans la province de Québec' (Royal Commission of Inquiry on Education in the Province of Quebec). Over that period, in 2011 constant dollars, they went down from nearly 3,700 CAD to about 800 CAD. The Quebec government increased tuition fees in steps from 1990 to 1994, raising them to nearly 2,400 CAD. They decreased anew in constant dollars between 1995 and 2006. From 2007 onwards, they increased steadily by 100 CAD each year, thus getting back in 2009 to what they were in 2004. The 2012 student protest followed that intent to increase further tuition fees so that, by 2016, they would have reached the level they were in 1968.

In 1966, the average tuition fees, in Ontario, were 3,500 CAD, slightly lower than in Quebec. The Ontario government kept tuition fees under strict control until the 1990s. They decreased in constant dollars from the late 1960s to the mid-1970s, and then levelled off until the beginning of the 1980s. They increased slowly through the 1980s, and sharply from the beginning of the 1990s onwards. By the end of the 2000s, they were closing to 6,300 CAD, about two and a half times those of Quebec.

Enrolment rates were increasing before the government of both provinces increased tuition fees in the 1990s. Soon after the increase in tuition fees, enrolment rates levelled off for a few years. Kozhaya (2004) dismisses that the Quebec increase in the tuition fees of the 1990s may have caused enrolment rates levelling off afterwards because the fees were not increasing when the enrolment rates levelled off. The argument is weak. The increase was sudden and substantial, and changed markedly the cost of university education. What happened in the following years is what could have been expected: breaking the increasing trend of university enrolment.

More interesting is that the effect of the increase in tuition fees was not to push down enrolment rates, but rather to stop their increase. Still more interesting is that they started increasing again a few years later. This should not come as a surprise. For an individual, enrolling into university is a decision that involves a variety of factors, among which tuition fees. At the aggregate level, however, the enrolment rate is a function of education policies not only on tuition fees, but also on the sustained increase of the supply of university education, and as well, of a strong trend in the economy towards increasing demand for university graduates. Enrolment rates levelling off soon after tuition fees had increased gives the naked eye a glimpse into the difference between the secular trend in increasing enrolment rates that depends on the transformation of the economy and the more mundane relation between tuition fees and enrolment rates.

Table 1. Descriptive statistics

	Quebec	Ontario
Proportion enrolling into university by cohort		
Before1936	0.044	0.054
1936–1950	0.199	0.170
1951–1974	0.560	0.524
1975–1990	0.197	0.252
Independent variables		
Cohort		
Before1936	0.126	0.122
1936–1950	0.204	0.184
1951–1974	0.465	0.471
1975–1990	0.205	0.222
Sex		
Male	0.492	0.489
Female	0.508	0.511
Sociolinguistic group		
Quebec French-speaking	0.924	
Quebec English-speaking	0.033	
Quebec immigrants	0.043	
Ontario English-speaking		0.687
Ontario French-speaking		0.054
Ontario immigrants		0.259
Social origin		
No PSE	0.691	0.629
Non-university PSE	0.157	0.166
University	0.152	0.206
Size		

Data from cycles 10, 15, 20 and 25 of the General Social Survey. Weighted estimation.

5 Hypotheses

Most studies on the effect of tuition on enrolment in higher education find some negative effect. Some studies found the negative effect to be more important among children of less favourable background, such as those who come from low-income families, have low-educated parents or live in lone-parent families. We are interested in the variation of this effect across social groups. We look at variation across social origin, as in some of the studies we reviewed, but also across groups defined by province, language and immigration status. As we explain in the previous section, there are reasons to believe that the effect of tuition fees may vary

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across the traditional dimensions of social structure, at least in Quebec. The political turmoil associated with attempts at increasing tuition fees, larger in Quebec than in the rest of Canada, could be a consequence of different effects of tuition fees on enrolment in the groups that comprise the population in each province. Specifically, if tuition fees were a stronger barrier among French-speaking Quebeckers than among English-speaking ones, and if immigrants and their children – who account for a large fraction of Ontario population – were not sensitive to tuition fees in the same way as French-speaking Quebeckers are, the policy consequences of increasing tuition fees, as well as the political aspects of implementing such increase, could be very different in the two provinces. If it were so, the differences in the politics of tuition fees between Quebec and Ontario – and maybe between Quebec and the rest of Canada – could be accounted for by different effects of tuition fees across social groups, and the relative importance of these social groups in the population of each province.

6 Data and method

Verifying our hypotheses requires disentangling the effect of tuition fees from that of the general growth in enrolment that was part of the massification of higher education, but also modelling this effect in a way that allows it to vary across social groups defined by parents' education, language, province and immigration status. Furthermore, enrolling is an event that occurs or not over the life course, which itself requires proper modelling.

   To disentangle the effect of tuition fees on enrolment from that of growth in enrolment, we use long series on tuition fees in which these vary non-monotonically, whereas we model the secular growth in the enrolment rate monotonically. We use event history analysis (i.e. survival models for the social sciences) to model enrolling as a life course event at the individual level. We model the effect of tuition fees conditional on parents' education and on membership in groups defined by province, language and immigration status. Finally, we allow the effect of tuition fees to vary across the life course – i.e. over age – within each of the groups we are considering.

6.1 Data

Our study requires data on persons who may have enrolled into university between 1946 and 2011, and on tuition fees in Quebec and in Ontario for the same period.
   Ideally, we need individual data collected from a population or a probabilistic sample: age at enrolment in university studies, date of birth, province of birth, province of residence at the time of enrolment and a series of sociodemographic

characteristics including mother tongue. There are several sources of individual data on education in Canada, but none includes all the data we need. We use data from four 'cycles' – 1995, 2001, 2006 and 2011 – from a retrospective survey on family which Statistics Canada carries out every five years or so since 1995 within the General Social Survey (GSS) program. Each cycle uses a probabilistic sample of the Canadian population aged at least 15 and living in a province. These surveys are not designed to gather information on education, but they do collect most of the information we need. They have already been used for studying education dynamics in Canada by McIntosh (2009), and also by Sen and Clemente (2010) and Turcotte (2011) who did it combining data from several cycles.

Our data on tuition fees for the 1972–2011 period come from Statistics Canada's survey on 'Tuition and Living Accommodation Costs for Full-Time Students at Canadian Degree-Granting Institutions' (TLAC). These data are the average, weighted by enrolment figures and expressed in 2011 constant dollars, of the tuition fees paid by students enrolled full-time in undergraduate programs in each province. They are the best available estimates of the average tuition fees. For the 1946–1971 period, we gathered figures from publications of the Dominion Bureau of Statistics. These publications provide average tuition fees by year and by province, sometimes detailed by universities. We have not been able to gather complete annual series and have completed the series by interpolation within each province before converting all values in 2011 constant dollars. We provide references to these publications with Figure 1.

6.2 Method

We use an approach known, in the social sciences, as event history analysis. Our dependent variable is the age at which an individual enrols into a university program for the first time. We use the Cox's relative risk model (Kalbfleisch and Prentice, 2002: 42–43, 95–147). This model allows estimating the effect of independent variables on the dependent variable taking into account that some people never enrol into university.

The Cox's model may be written as

$$h(t) = h_0(t)e^{\mathbf{x}\boldsymbol{\beta}},\tag{1}$$

where t represents age, $h(t)$ is the hazard, i.e. the probability of enrolling into university at age t if it has not occurred before, $h_0(t)$ is the "baseline" hazard – i.e. the relation between hazard and age for the "reference" individual, i.e. the person who belongs to the reference category of each independent variable–, $\mathbf{x}$ is the vector of independent variables and $\boldsymbol{\beta}$ is the vector of the coefficients associated with the independent variables.

Some of the equations we estimate include conditional relations that involve qualitative and quantitative variables. In these equations, the effects of trend and

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tuition fees are not represented by a single coefficient, but rather by one coefficient for each category of social origin or each sociolinguistic group. These equations may be written as

$$h(t) = h_0(t)e^{\mathbf{x\beta}}e^{Az\gamma_A}e^{Dz\gamma_D}. \tag{2}$$

where A is the trend, D stands for tuition fees, $\mathbf{z}$ represents the categories of social origin or the sociolinguistic groups, γ_A represents the coefficients associated with trend for each category of social origin or each sociolinguistic groups, and γ_D represents the coefficients associated with tuition fees for each category of social origin or each sociolinguistic group.

Some of the equations we estimate include conditional relations involving time-varying effects. In these equations, the effect of tuition fees varies according to age in a different fashion for each category of social origin or each sociolinguistic group. These equations may be written as

$$h(t) = h_0(t)e^{\mathbf{x\beta}}e^{Az\gamma_A}e^{Dz\gamma_D}e^{DTz\gamma_{DT}}. \tag{3}$$

where $\mathbf{z}$ represents again the three categories of social origin or sociolinguistic groups, vector γ_D represents the intercept of the relation between the effect of tuition fees and age for each category of social origin or each sociolinguistic groups, and vector γ_{DT} represents the slope of this relation for each category of social origin or each sociolinguistic group.

The GSS samples are probabilistic, but not simple random: their sampling design involves strata and sometimes clusters. Estimation must be done using sampling weights and standard errors must be estimated taking the sampling design into account. We use the sampling weights and we correct the standard errors using average design effects (Kish, 1995).

6.3 Variables

We define the birth cohorts so they represent, as much as can be, the evolution of the demographic, social, and economic context as well as the changes in education policies and in the education system. The oldest cohort, 'Before 1936', groups together people born before the baby boom; the second one, '1936–1950', the people born about the first half baby boom – this cohort came of age during the 30-year period of growth that followed the end of World War II; the third one, '1951–1974', the people born during the second half of the baby boom and a few years after it ended; the fourth one, '1975–1990', the people born later and old enough in 2011so that they could provide useful information for a study on university enrolment. Each cohort came of age in a different economic context. The two first cohorts reached the age at which people typically enrol in university for the first time before the expansion of the postsecondary education system in Quebec and Ontario, which occurred mostly in the late 1960s and the early 1970s. The two last

cohorts reached that age respectively at the time where the new system was taking shape or was already in place.

We define sociolinguistic groups by combining the respondent's place of birth, their parents' place of birth and mother tongue. The Quebec French-speaking and the Ontario English-speaking are people who were born in the province where they live. They speak the language of the majority, and have access to a well-developed network of universities in their own province. The effects of education policies are the most easily observed for these groups.

The Ontario French-speaking are the French-speaking people born in Ontario and living in Ontario at the time of survey. They are the linguistic minority and university training in their language in their province is in short supply: there is no French-language only university in Ontario and few academic institutions that offer university education in French. The Quebec English-speaking are the English-speaking people born in Quebec and living in Quebec at the time of survey. They are the linguistic minority, but, unlike the Ontario French-speaking, they have access to a complete supply of university training in their province and language: there are three English-language only universities in Quebec. In Ontario, there are no French-language only university and a limited number of programs given in French in bilingual or English- language universities.

We define and measure social origin through parents' education level. People are grouped in three categories: 1) neither father nor mother has any postsecondary education – abbreviated as "No PSE" in the tables –, 2) at least one of the two parents has a non-university postsecondary diploma – "Non-university PSE–, and 3) at least one of the two parents has a university diploma or degree – "University".

We include gender in all our equations.

Using the Cox model allows using time-varying independent variables. We use two such variables: tuition fees and 'trend'. As we explain above, tuition fees have a different value for each year and for each province. For a given individual, this variable takes a different value for each calendar year he or she was at risk of enrolling.

We are interested in the effects of tuition fees and of certain sociodemographic characteristics on individual enrolment. However, as we explain above, individual enrolment depends in part on the supply of university training and on demand for people having university education. There is no easy way to measure these. However, it is reasonable to assume that, unlike tuition fees that have fluctuated ion a non-monotonic fashion over the period we are studying, both the supply of university training and the demand for people having university education of them have increased in a monotonic way. In our equations, we account for this growth using a trend. This allows disentangling the effect of tuition fees from those of the expansion of university education and of changes in the labour market. The trend variable increments by one each year, and thus varies from 0, in 1946, to 65, in 2011.

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Table 2. Enrolment into university according to selected sociodemographic characteristics, tuition fees and trend. Ontario and Quebec, 1946–2011. Cox model.

	1	2	3
Cohort [1975–1990]			
Before1936	0.403***		
1936–1950	0.837**		
1951–1974	0.881***		
Sex [Male]			
Female	1.009		
Sex and cohort [Male, 1975–1990]			
Female, Before 1936		0.331***	0.672*
Female, 1936–1950		0.886	1.48**
Female, 1951–1974		1.109	1.372***
Female, 1975–1990		1.573***	1.572***
Male, Before 1936		0.758*	1.532*
Male, 1936–1950		1.264**	2.11***
Male, 1951–1974		1.123	1.382***
Sociolinguistic group [Quebec French-speaking]			
Quebec English-speaking	1.077	1.068	1.070
Quebec immigrants	1.769***	1.763***	1.727***
Ontario English-speaking	1.039	1.041	1.076
Ontario French-speaking	0.826	0.821	0.848
Ontario immigrants	1.578***	1.592***	1.643***
Social origin [No PSE]			
Non-university PSE	1.825***	1.832***	1.787***
University	4.22***	4.239***	4.12***
Trend			1.015***
Tuition fees ($ thousands)			0.970

* $p<0.05$; ** $p<0.01$; *** $p<0.001$.Reference categories between brackets.
Coefficients expressed as relative risks ratios. Data from cycles 10, 15, 20 and 25 from the General Social Survey. Weighted estimation. Standard errors corrected using average design effect.

Age at enrolment was most delicate. Our data source records the age at which the highest diploma was awarded, not the age at enrolment in university. We do as is commonly done is such a case and determine the age at enrolment from the age at graduation. Dealing with people who never enrolled is easy. Dealing with people who got their diploma at the end of an uninterrupted trajectory is straightforward. Dealing with people who got their diploma later than the age at which such diploma would have been awarded to someone who attended school without interruption is more challenging. In such cases, we drew the age at enrolment from a normal distribution with mean at the most likely age at enrolment given the duration of the program and variance estimated from GSS data. Given that the draw is random, it does not induce a bias and can only increase the variance of the estimates of the coefficients associated with the independent variables.

7 Results

Table 2 shows results from the estimation of a series of equations relating the risk to enrol into university to sociodemographic characteristics, trend and tuition fees. The first equation provides the net effect of each characteristic. In the second equation, we combine sex and cohort. In the third, we add trend and tuition fees. Comparing equation 1 and 2 shows that the differences between men and women appear only when looking at their evolution across cohorts. Women's hazards increase from the oldest to the youngest cohort. Men's hazards peak within the 1936–1950 cohort, then decrease. In the youngest cohort, women's hazard is about one time and a half that of men. Immigrants, whether in Quebec or Ontario, are more prone to enrol in university than all other sociolinguistic groups. Enrolment is strongly related to parents' education level. Having at least one parent with a non-university postsecondary diploma increases the hazard of enrolling by about 80%. Having at least one parent with a university diploma increases it fourfold. According to equation 3, the hazard of enrolling increases as a function of age, i.e. over the life course, but tuition fees have no effect.

As the effect of sex that appears only when allowing it to vary across cohorts, the effect of tuition fees become apparent only when allowing it to vary according to dimensions of the social structure such as social origin and sociolinguistic groups. In equation 4 (Table 3), we estimate the effect of trend and tuition fees conditional on social origin. In equation 5, we estimate the effect of tuition fees conditional on social origin as a function of age. In equation 4 and 5, the effect of trend increases slightly with parents' education level. In equation 4, the effect of tuition fees varies according to parents' level of education. Tuition fees decrease the hazard of enrolment when parents do not have any university education, but increase it when at least one parent has a university diploma.

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Table 3 Enrolment into university according to selected sociodemographic characteristics, tuition fees and trend. Ontario and Quebec, 1946–2011. Effect of tuition fees conditional on social origin. Cox model.

	4	5
Cohort and sex [Male, 1975–1990]		
Female Before 1936	0.675[*]	0.773
Female 1936–1950	1.623[***]	1.688[***]
Female 1951–1974	1.436[***]	1.629[***]
Female, 1975–1990	1.594[***]	1.591[***]
Male, Before 1936	1.549[*]	1.766[**]
Male 1936–1950	2.308[***]	2.388[***]
Male 1951–1974	1.446[***]	1.641[***]
Sociolinguistic group [Quebec French-speaking]		
Quebec English-speaking	1.135	1.136
Quebec immigrants	1.770[***]	1.830[***]
Ontario English-speaking	1.113[*]	1.086
Ontario French-speaking	0.875	0.854
Ontario immigrants	1.684[***]	1.644[***]
Trend by social origin		
No PSE	1.010[***]	1.010[**]
Non-university PSE	1.016[***]	1.017[***]
University	1.023[***]	1.025[***]
Tuition fees by social origin		
No PSE	0.811[**]	
Non-university PSE	0.932[*]	
University	1.100[***]	
Tuition fees according to age by social origin		
Intercept (γ_D)		
No PSE		0.963[**]
Non-university PSE		1.075[***]
University		1.264[***]
Slope (γ_{DT})		
No PSE		0.979[***]
Non-university PSE		0.980[***]
University		0.978[***]

[*] $p<0.05$; [**] $p<0.01$; [***] $p<0.001$. Reference categories are between brackets.

Coefficients expressed as relative risks ratios. Data from cycles 10, 15, 20 and 25 from the General Social Survey. Weighted estimation. Standard errors corrected using average design effect.
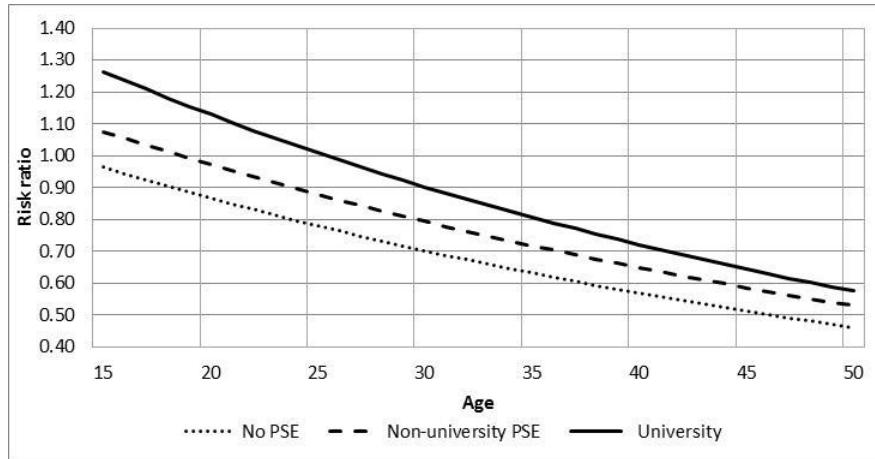
Fig. 2: The effect of tuition fees on enrolment according to age by social origin.

In equation 5, the effect of tuition fees on enrolment is modelled as a function of age for each category of social origin. The results are best understood when presented in graphic form. Figure 2 shows the functions defined by the intercepts and slopes of equation 5. The functions appear as curves rather than straight lines because we present the effects as risk ratios, which are easier to interpret than their logarithms. The relative risk is 1 for an individual aged 15 whose parents do not have any postsecondary diploma. The three curves come on top of each other and do not intersect. Over the whole age range, the hazard of enrolling is the highest when having at least one parent holding a university diploma and the lowest when having two parents who do not hold any postsecondary diploma. The gap between categories is the largest for young people and decreases with age. The negative effect of increasing tuition fees by 1,000 CAD is larger when having one parent with a non-university postsecondary diploma than when having at least one parent with a university diploma, and even larger when having two parents who do not hold any postsecondary diploma. The hazard ratio decreases with age within each category: in other words, the negative effect of a 1,000 CAD raise in tuition fees increases with age in all categories.

Table 4 is similar to table 3, but focuses on relations conditional on sociolinguistic groups rather than on social origin. Thus, in equation 6, we estimate the effect of trend and tuition fees conditional on sociolinguistic groups, and in equation 7, we estimate the effect of tuition fees conditional on sociolinguistic groups as a function of age. The effect of trend is positive for all sociolinguistic groups. It is relatively low for the Ontario English-speaking and relatively high for the Ontario French-speaking. This is not unexpected. The trend variable captures not only the growth in contextual factors such as the supply of the university education and the demand for university graduates, but also all residual increase in enrolment not explained by other independent variables. This is not a bug, it is a feature, as we

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use this variable to capture all trends. Here it captures the catching up of French-speaking Ontarians as well as the fact that enrolment among the English-speaking Ontarians was relatively high already in the oldest cohorts (Laplante et al. 2014). Equation 6 shows that tuition fees reduce the hazard of enrolling among the Quebec French-speaking and even more among the Ontario French-speaking.

Figure 3 depicts the relation between the effect of tuition fees and age within sociolinguistic groups. The relative risk is 1 for a Quebec French-speaking individual aged 15. The three curves have very different intercepts and slopes, all negative, and they intersect. The slope of the Quebec English-speaking is practically zero. For them, increasing tuition fees has no effect on the hazard of enrolment. The slope of the Quebec French-speaking is negative, but its intercept is practically equal to that of the Quebec English-speaking: for them, the negative effect of increasing tuition fees increases with age. The intercept and slope of the Ontario English-speaking are greater than those of the Quebec French-speaking are: the negative effect of increasing tuition fees is greater among the Quebec French-speaking than among the Ontario English-speaking for the conventional age of university enrolment, but the gap closes down with age and could reverse after age 35. The slope of the Ontario French-speaking is about the same as that of the Quebec French-speaking, but their intercept is smaller: for them, the negative effect of increasing tuition fees is comparatively large at age 15 and increases still with age. The intercept of Quebec immigrants is greater than that of the Quebec French-speaking and even greater than that of the Quebec English-speaking, but their slope is also greater. At age 15, the negative effect of increasing tuition fees is not as strong for them as for the natives, but it increases faster with age. The same can be said of the Ontario immigrants. Their intercept is higher than that of the Ontario English-speaking, and thus the highest of all groups, but their slope is steep, the steepest of all groups. At age 15, the negative effect on increasing tuition fees is smaller among them than in any other group, but it increases faster with age.

Table 4. Enrolment into university according to selected sociodemographic characteristics, tuition fees and trend. Ontario and Quebec, 1946–2011. Effect of tuition fees conditional on sociolinguistic group. Cox model.

	6	7
Cohort and sex [Male, 1975–1990]		
Female Before 1936	0.692	0.804
Female 1936–1950	1.496**	1.576***
Female 1951–1974	1.399***	1.607***
Female, 1975–1990	1.577***	1.576***
Male, Before 1936	1.571*	1.813**
Male 1936–1950	2.137***	2.245***
Male 1951–1974	1.410***	1.619***
Social origin [No PSE]		
Non-university PSE	1.789***	1.806***
University	4.100***	4.116***
Trend by sociolinguistic group		
Quebec French-speaking	1.015***	1.016***
Quebec English-speaking	1.017**	1.017**
Quebec immigrants	1.023***	1.026***
Ontario English-speaking	1.007	1.007*
Ontario French-speaking	1.032***	1.031***
Ontario immigrants	1.019***	1.019***
Tuition fees by sociolinguistic group		
Quebec French-speaking	0.900**	
Quebec English-speaking	0.881	
Quebec immigrants	0.950	
Ontario English-speaking	1.038	
Ontario French-speaking	0.721**	
Ontario immigrants	1.025	
Tuition fees according to age by sociolinguistic group		
Intercepts (γ_D)		
Quebec French-speaking		1.008
Quebec English-speaking		0.935
Quebec immigrants		1.094
Ontario English-speaking		1.217***
Ontario French-speaking		0.818
Ontario immigrants		1.271***
Slopes (γ_{DT})		
Quebec French-speaking		0.988*
Quebec English-speaking		0.997
Quebec immigrants		0.982*
Ontario English-speaking		0.979***
Ontario French-speaking		0.987
Ontario immigrants		0.968***

* $p<0.05$; ** $p<0.01$; *** $p<0.001$. Reference categories are between brackets.
Coefficients expressed as relative risks ratios. Data from cycles 10, 15, 20 and 25 from the General Social Survey. Weighted estimation. Standard errors corrected using average design effect.
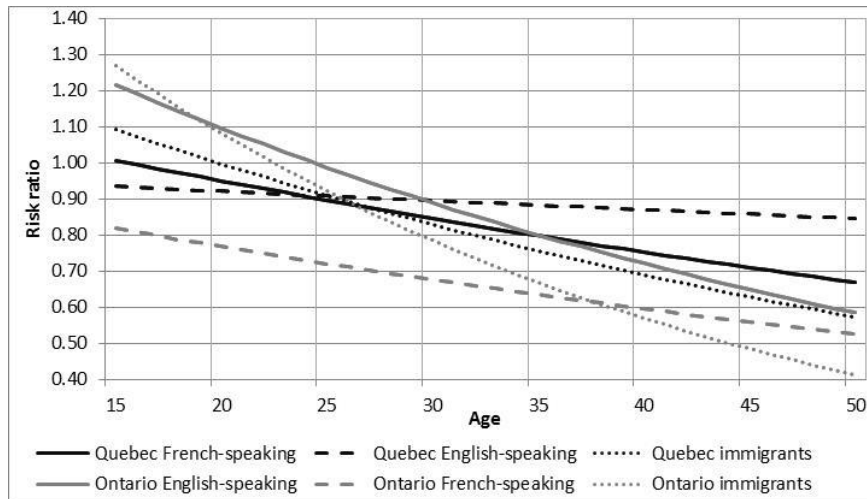
Fig. 3: The effect of tuition fees on enrolment according to age by sociolinguistic groups.

8 Discussion and Conclusions

In Quebec and Ontario, over the last two decades, tuition fees have mostly increased even in constant dollars. Enrolment has increased over that period. However, there are reasons to believe that increasing tuition fees decreases enrolment. There is also a set of sound reasons to believe that enrolment should have increased over this period even if the net effect of increasing tuition fees is to decrease enrolment. The proportion of foreign-born Canadians has been increasing steadily over that period. A large fraction of immigrants to Canada are selected on their education level, which increases the proportion of university degree-holders in the Canadian population and fosters enrolment of children from immigrants either because of simple intergenerational transmission, or because immigrants invest highly in their children's education as a means of social and professional integration (Zéroulou, 1988). The transformation of the economy towards knowledge-based production of value convinced parents and children of the virtues of higher education. The demand for higher education has been strong despite its rising cost. Disentangling the effect of tuition fees from those of other factors is an intricate problem.

As we saw earlier, some researchers acknowledged this difficulty. Some relied on comparing provinces with different levels of tuition fees and increases. Some used long series, as we do. Our strategy was using long series of tuition fees that include non-monotonic variation, and model the growth in enrolment net of the effect of tuition fees and of the other variables that we included in our equations.

This allowed us isolating the effect of tuition fees. However, this solved only the first part of the problem.

Enrolling into university is an event that occurs, or not, over the life course. Although a large fraction of students enrol in their early twenties, enrolling later has become more common, and, in Canada, more so in Quebec. Furthermore, previous researches lead to believe that the effect of tuition fees on enrolment could vary across social origins and across groups defined by their immigration status, language and province. Modelling the effect of tuition fees while taking all these aspects into account and especially its variation over the life course, had not been attempted before, although there were sound reasons to think it could a rather complex function of all these factors. Our results show that indeed, the effect of tuition fees varies across social groups and, within social groups, as a function of age.

Tuition fees have a negative effect on enrolment and this effect increases over the life course. When comparing groups define by their social origin, as measured by parents' level education, the effect of tuition fees varies in a relatively simple fashion. The effect of increasing tuition fees by 1,000 CAD is positive when having at least one parent with a university diploma, but negative when having one parent with a non-university postsecondary diploma, and more so when having two parents who do not hold any postsecondary diploma. However, these effects vary according to age with a negative slope within each group. Considering this variation provides a different picture. Tuition fees have a positive effect on enrolment for children from families where at least one parent has university education up to age 25, but have a negative effect on older children. They have a positive effect for children from families where at least one parent has non-university PSE up to age 20, but the effect turns negative afterwards. The effect is negative for children form families where parents do not have any postsecondary education and this effect increases with age.

When comparing sociolinguistic groups, the effect of tuition fees varies in a more complex way. For the Quebec English-speaking, increasing tuition fees has no effect on enrolment. For the Quebec French-speaking, the negative effect of increasing tuition fees increases with age. The negative effect of increasing tuition fees is greater among the Quebec French-speaking than among the Ontario English-speaking for the conventional age of university enrolment, but the gap closes down with age and could reverse after age 35. For the Ontario French-speaking, the negative effect of increasing tuition fees is comparatively large at age 15 and increases still with age. These differences do not come as surprises. The Quebec English-speaking are concentrated among the upper strata of society and money may not be the most important factor when considering enrolment. The cost of university education is a greater concern for the Quebec French-speaking, and a growing one as age increases, which is of some consequence in a group that is known for enrolling late. Tuition seem to be less of a problem among the Ontario English-speaking for the young, but it becomes one later on for those who did not enrol early in the life course.

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Among children of immigrants, as among the Ontario English-speaking, the effect of tuition fees is strongly related with age. At younger ages, the effect of high tuitions fees, when comparing with native, seems to attract rather than deter, but their negative effect increases faster with age than among native groups. Apparently, parents, who are likely those who pay when the children are young, believe that money spent of university education is worth it for their children, but do not believe that it is worth spending money on older children or on themselves later. Immigrants, behave as if investing in education was worthwhile for the young, and presumably their children, rather than on adults.

The general finding is that the level of tuition fees has a negative effect on enrolment, except for children of highly educated parents and for children of immigrants. Even for these children, the effect becomes negative after the conventional enrolment age. Apparently, their parents are willing to pay some kind of education premium when they are young–maybe as long as they look 'promising'– but not afterwards. Our results suggest that in an era where university education contributes to social reproduction, this process is age-dependent and children from favoured background are not allowed missing the window of the age of reproduction.

The political implications are straightforward. Tuition fees are a real concern for children whose parents have little or no postsecondary education, especially if they do not enrol early. There may be several reasons for this, ranging from limited resources to limited understanding of the costs and benefits of higher education (Boudon, 1974; Usher, 2005). Nevertheless, whatever the mechanism that leads children of low-educated families to be less prone to enrol in higher education and whatever the motives for raising them, tuition fees seem to be a barrier to intergenerational mobility and increasing them may simply strengthen social reproduction.

The differences between sociolinguistic groups are revealing of the differences between Quebec and Ontario, and maybe most of Canada outside Quebec, on tuition fees. About 80% of the Quebec population belongs to a group for which tuition fees are a concern. For this very reason, increasing tuition fees in Quebec, whatever the motives for doing so, is not an easy political task. In their vast majority, Quebec English-speaking and immigrants – for whom tuition fees are not a concern – support the Liberal party, which supports increasing tuition fees. However, the French-speaking vote is spread across four parties. This configuration makes likely that tuition fees will remain a divisive political issue in Quebec for the near future. Things are different in Ontario, where a large fraction of the population belongs to groups for whom tuition fees are not a concern. This does not mean that high tuition fees do not have adverse effects on enrolment for children from low-educated families outside Quebec. However, it implies that promoting affordable university tuition fees as evidence-based policy, difficult in Quebec, is likely to remain even more difficult elsewhere in Canada. Advocacy for increasing tuition fees, despite not being based on solid evidence, matches very well the in-

terests of some social groups. Whether something similar could be found in England, the United States or Germany is an open question.

Acknowledgements

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