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Abstract:

We examine the impact of mandatory retirement on the retirement decisions of professors in Canada using administrative data. Estimation of a discrete time hazard model indicates that faculty members at universities with mandatory retirement at age 65 have exit rates at age 65 that are around 30 to 38 percentage points higher than those of their counterparts at universities without mandatory retirement. Similar results are found for both men and women; however, the magnitude of this effect is somewhat smaller for women. The estimated survival probabilities indicate that only 22.7 percent of faculty members employed at age 64 at universities without mandatory retirement will continue to be employed at the same university at age 72.

I. Introduction

The aging of the population in many western countries has fuelled the debate regarding the elimination of laws that force retirement at a specific age. Although mandatory retirement has been banned in the US, Australia and New Zealand, mandatory retirement is still allowed in many countries. In particular, given the requirement of European Union countries to eliminate employment based age discrimination (by December 2006), there has recently been a large amount of debate in Europe about the legality, as well as the merits, of mandatory retirement laws.

The changing age structure has particularly strong implications for the university sector. In countries such as Canada and the United States, professors, hired initially to teach the baby boom generation, are now reaching retirement age. This aging trend is fuelling an ongoing discussion in universities in Canada which are allowed to enforce retirement at 65 about whether mandatory retirement should be abolished. Consequently, it is crucial to have a complete understanding of how the elimination of mandatory retirement rules affect the retirement propensities of professors.

Due to a general lack of suitable data, the retirement decision of university faculty members has not received a great deal of attention in the economics literature. An important exception is the study by Ashenfelter and Card (2002) of US faculty retirement patterns. The data employed by Ashenfelter and Card originate from a special survey carried out on 16,000 older faculty in the US called the Faculty Retirement Survey (FRS). These data combine payroll records from individual institutions with pension information from the TIAA-CREF pension plan. The survey is based upon older faculty at a random sample of four-year colleges and universities in the mid-1980s. The faculty members are followed for 10 to 11 years overlapping the period of the elimination of mandatory retirement in the US in 1994. They find strong evidence that the abolition of mandatory retirement (at the age of 70) in the United States led to a substantial increase in the fraction of university professors still working into their seventies. In particular, the retirement rates of 70 and 71 year olds fell by two thirds to a level comparable with those of 69-year-old faculty members. They conclude that American universities and colleges will experience a rise in the number of older professors in the future due to the elimination of mandatory retirement.

Using the same econometric approach as Ashenfelter and Card (2002), Clark and Ghent (2008) explore the robustness of these results using data from the University of North Carolina system. Consistent with the findings of Ashenfelter and Card (2002), the elimination of mandatory retirement for university faculty is found to result in a sharp decline in the probability of retirement for university faculty. They find that the drop in retirement rates at age 70 and 71 after the elimination of

mandatory retirement was greater for faculty who were participating in the state defined benefit pension scheme than for those in the defined contribution scheme.[1]

Despite being an important policy issue, there is little research on the impact of mandatory retirement on the age of retirement of academics outside of the two US studies cited above. One exception is the study by Labini and Zapperi (2007) who show that in Italy where the mandatory retirement age can be as high as 75, almost 25 percent of faculty are 60 years of age or older, while in the UK, France and Spain, only 7 to 12 percent of faculty are in this age range.

Our paper makes a number of important contributions to this literature. First, the overall estimation approach follows that of Ashenfelter and Card (2002) and represents an investigation into the overall robustness of their findings when applied to the case of a similar country over a similar time period. Second, the analysis sheds light on the likely impact of the elimination of mandatory retirement policies when the forced retirement age is below the age of 70 (which was the relevant mandatory retirement age for university professors prior to the elimination of mandatory retirement in the US). In many jurisdictions, mandatory retirement policies stipulate retirement at ages below 70 (such as the provinces of Canada which still allow for mandatory retirement as well as many European countries). Consequently, the results of Ashenfelter and Card (2002) may not shed light on the extent to which faculty are likely to work beyond the usual retirement age of say 65 after the elimination of mandatory retirement. Third, the rich interprovincial variation in the mandatory retirement rules in Canada allows for an alternative source of variation in the

[1] Ashenfelter and Card (2002) find that faculty at private research institutions are much more likely to be working in their sixties than are faculty at public research and non-research institutions. As well, they find that once mandatory retirement at age 70 was eliminated, although the percent of 60-year olds who worked until at least age 73 increased at all types of institutions, it was particularly high at private research institutions where at least 30 percent of 60-year olds continued to work until age 73. Clark and Ghent (2008) find that the two research institutions in their sample of fifteen tenure-granting institutions in the University of North Carolina (UNC) system have lower retirement rates relative to the other types of institutions in the UNC system.

retirement rule environment allowing for greater confidence in terms of the estimated relationship between the elimination of mandatory retirement and its impact on the exit behaviour of university faculty. Fourth, to the best of our knowledge, this is the first study to examine the exit behaviour for men and women separately. Finally, the fact that the data employed originate from a census (carried out by Statistics Canada) of all faculty members within Canada (rather than a survey of university faculty) allows for even greater confidence that the estimated relationships are robust and provide reliable representations of the actual behaviour of university faculty.

However, it is important to note that our data does have one main shortcoming relative to the data employed by Ashenfelter and Card (2002). We are unable to distinguish between retirements and other exits from employment at the university. Given the age range of interest, we do not believe that this is an important distinction since the vast majority of exits appear to be into retirement. In addition, unlike Clark and Ghent (2008), we do not have information related to pension eligibility for the individual faculty members in our data.[2]

The empirical results of this paper indicate that mandatory retirement rules act as a constraint on the decision to continue working at their university beyond the age of 65 for professors at Canadian universities. Faculty members are found to have exit rates from the university at age 64 and 65 that are around 30 to 36 percentage points lower than those of their counterparts at universities with mandatory retirement. Similar results are found for both men and women; however, the magnitude of this effect is somewhat smaller for women. This does not support the view that mandatory retirement is a more severe constraint on the behaviour of female academics who are more likely to have had career interruptions than their male

[2] Clark and Ghent (2008) also use information available for state plan participants and find that greater pension wealth is associated with a higher probability of retirement.

counterparts. However, our data lack information related to spousal characteristics. It may be that differences between male and female faculty in terms of average family income are in fact driving this result.

Estimated survival probabilities indicate that male faculty members employed at a university without mandatory retirement at age 64 only have a 22.7 percent probability of continuing to work at the university until age 72. This indicates that while a significant fraction of professors will work past 65 if allowed to, a relatively small fraction of university professors are likely to stay many years past the usual retirement age of 65.

II. Mandatory retirement regimes in Canada

In Canada, the rules related to the retirement of university professors have varied both over time and across institutions. In the university sector, the rules related to retirement fall under provincial jurisdiction allowing for variation across provinces. Gunderson (2003) provides a review of the recent history related to mandatory retirement in Canada and concludes that only two provinces, Manitoba and Quebec, actually banned mandatory retirement over the period of this study (1983 to 2001). In the case of Manitoba, the banning of mandatory retirement in 1982 resulted from a series of court cases (see Flanagan, 1985, for a detailed discussion).[3] In the case of Quebec, mandatory retirement was banned through provincial employment standards legislation in 1983 (see also Kesselman, 2005).

Shannon and Grierson (2004) analyze the importance of mandatory retirement rules in the broader Canadian labour market taking advantage of the inter-provincial

[3] In 1997, universities in Manitoba were allowed to have mandatory retirement at age 65 or older under a special act. However, no universities in Manitoba enacted mandatory retirement until the end of the period studied with the University of Manitoba enacting gradual retirement after age 69 in 2001 and the University of Winnipeg enacting mandatory retirement after age 69 in 2002 (see MacGregor, 2005).

variation in mandatory retirement laws. Using Census data from 1981 through 1996 and Labour Force Survey data over the period 1976 through 2001, they conclude that making mandatory retirement illegal would have little effect on the size of the workforce over the age of 65.

However, one cannot necessarily extend this argument to individual segments of the Canadian labour market such as the segment of interest in this study, university professors. Employment contracts (tenure, union status, work conditions) as well as the preferences of the professors themselves may make employment past the age of 65 attractive. We employ a similar identification strategy to Shannon and Grierson (2004) but with a focus on university faculty.

However, provincial variation in mandatory retirement legislation is not the only sources of variation in retirement rules related to age at retirement in Canadian universities. In provinces where there is no legislative ban on mandatory retirement, individual institutions and faculty associations or unions can choose to include mandatory retirement rules in their collective agreements. In most cases, these rules stipulate that faculty members must retire before the beginning of the academic year following their 65^{th} birthday. However, exceptions exist. The University of Saskatchewan has had mandatory retirement at age 67 over the period relevant to the data used in this study. In addition, a handful of institutions had retirement regime changes over the period.

Our focus is on testing for differences in exit behaviour from a university for faculty age 65 and older according to whether the university has: 1) a mandatory retirement rule at age 65, versus 2) no mandatory retirement rules at all. Consequently, we exclude individuals working at institutions that do not fit into either of these two categories. Faculty employed at the University of Saskatchewan were

excluded since the mandatory retirement age was 67 over the entire timeframe. In addition, we dropped observations on individuals working at Carleton University, the University of Prince Edward Island (UPEI) and York University. In each case, the mandatory retirement rules changed over the period in institution-specific ways. For example, at Carleton University, mandatory retirement was not eliminated but the age at which it applied was increased from age 65 to age 71 in 1986 (rather than being eliminated altogether as had been the case earlier in Quebec and Manitoba). The reintroduction in 1991 of mandatory retirement at age 65 at Carleton University was also complex where there was a phase-in period. We have concerns in both the cases of Carleton University and York University related to the actual implementation of the phase-in period related to the re-introduction of mandatory retirement at age 65. Also, in the case of UPEI where mandatory retirement at age 65 was implemented in 1995 (see MacGregor, 2005), we have very few observations given the size of the institution.

Consequently, respondents employed at University of Saskatchewan, Carleton University, York University and UPEI have been excluded from our analysis so as to allow us to focus on the clean comparison of individuals employed at institutions with mandatory retirement at age 65 in all of the survey years and those employed at institutions without mandatory retirement rules over the survey years (the universities in Manitoba, the universities in Quebec and the University of Calgary). We have carried out extensive sensitivity analyses and we find that the qualitative nature of the results is unaffected by the inclusion of respondents from Carleton University, York University and UPEI.[4]

[4] One important caveat relates to the fact that while mandatory retirement was relaxed at Carleton University and at York University, it still applied in certain years to individuals age 70 and over and age 71 and over at York University and Carleton University, respectively. We factored these age specific constraints into our sensitivity analysis.

III. Faculty sample and summary statistics

Data from the master files of the Full-Time University Teaching Staff Data over the period 1983 to 2001 are employed in the analysis.[5] This administrative data base is collected each year by Statistics Canada from each of the universities in Canada. It contains detailed information on each employee's salary, type of appointment (e.g. tenure and rank), years since first appointment as well as personal information such as age, gender and education. The data contains teaching staff members who are: 1) tenured; 2) leading to tenure; or 3) annual, sessional or other definite term contract.[6]

Since each record in the database contains both a university identifier as well as an employee identifier, it is possible to track employees across time so long as they do not change institutions. Therefore, it is possible to generate an indicator variable for each professor that equals zero if the person remains at the institution across two adjacent years and equals one if the professor is present at the institution in the first year but is not present at the institution in the second year. This indicator variable captures the exit decision of the professor.

The sample employed in the analysis of these exit decisions is restricted to those full-time teachers age 58 through 71. Given the age restriction, these exits are likely to represent retirement decisions. However, some of these exits represent

[5] Our data access was limited to the 1970 to 2001 period. However, we do not extend the data back to 1970 since some years prior to 1983 have a very high number of institutions for which it is not possible to consistently match individual ids across years (See Warman, Woolley and Worswick, 2010 for a discussions of the data). In addition, we have been unable to obtain accurate information on the mandatory retirement rules at most of the institutions during the 1970s.

[6] The data covers all full-time teaching staff, where teaching staff includes academic staff within faculties who are teachers, researchers, and/or senior academic staff, in degree-granting institutions. Full-time research staff who have an academic rank and a salary scale similar to other teaching staff employed are also included. In order to be included, the staff member must be appointed on a full-time basis and the term of appointment must not be less than twelve months. If a staff member was originally appointed to teach full-time but has switched to teaching a reduced workload, they are also included in the survey. As well, staff members on leave are also included. The data does not contain what we would normally think of as "casual sessionals" – individuals teaching one or two courses and being paid at a low rate per course (perhaps $6000 per one semester course).

movements into other jobs (possibly at other Canadian universities). It is important to note that full-time professors may drop down to a reduced teaching load without falling out of the sample. In addition, each professor on sabbatical continues to have a record in the database for the following year. Therefore, exit rates do not capture a faculty member's transition from teaching to being on an academic sabbatical.

Small institutions were excluded based on having less than 100 full-time faculty members as of 2001.[7] The universities are grouped in Appendix 1 according to whether they are: 1) Medical/Doctoral, 2) Comprehensive or 3) Primarily Undergraduate. These groupings are based on the MacLean's Magazine's annual ranking of Canadian universities taken from the 2002 publication. The first grouping includes universities with a large research component, with a medical school and extensive doctoral programs. Universities in the second group do not have medical programs and in many cases have smaller graduate programs. The third group of universities includes those with only small graduate programs and with a primary focus on undergraduate teaching.[8] [9]

Figures 1-5 contain age distributions for selected years in the sample. In Figure 1, data from 1983/84 are employed to calculate the age distributions of universities in Ontario and Quebec. In this year, all of the universities in Ontario had mandatory retirement at the age of 65 while the universities in Quebec had only eliminated mandatory retirement in that year. Given this clear policy difference (and the fact that Ontario and Quebec are the two most populous provinces in Canada),

[7] See Appendix 1 for a list of the 52 included institutions.
[8] The main difference between the universities covered in the 2002 MacLean's survey and those included in our sample is the fact that the sample of professors employed in this paper includes the professors from the Université du Québec group of universities. They have been placed in either the Comprehensive category or Undergraduate category depending on which category their programs fit best.
[9] In addition, the selection of universities described above did lead to a few differences in coverage relative to the MacLean's survey in terms of the primarily undergraduate category. However, given the small number of professors at these institutions, the inclusion or exclusion of these universities is unlikely to have a significant effect on the overall empirical results.

comparisons between them form a useful benchmark for the comparison of similar figures for later years. We see only small differences in the age distributions. A relatively high proportion of faculty members in the 36 to 45 age range are present in the Quebec graph while Ontario has a higher proportion of faculty members in the 46 to 65 age range. Quebec only has a slightly higher fraction of faculty over the age of 65 relative to Ontario. One would expect these proportions to be similar given that the Quebec government had only eliminated mandatory retirement in 1983.

The overall patterns of the age distributions of professors at Canadian universities with mandatory retirement at 65 and those at universities without mandatory retirement are very similar to those for Ontario and Quebec, respectively. The mass of each distribution is centered around the age of 45 with only a small fraction of professors near the age of retirement. Also, differences in the post age 65 range by mandatory retirement regime appear to be small. However, given that most of the universities without mandatory retirement had only recently eliminated mandatory retirement (due to legislative changes in Manitoba in 1982 and Quebec in 1983) it is not surprising that clear differences in the post 65 part of the age distribution have not yet emerged.

In Figure 2, the equivalent age densities are presented for the year 1988/89. The aging of the stock of professors at Canadian universities is apparent when the distributions are compared with those of Figure 1. There is a general shifting to the right of the mass of the distributions. In particular, the fraction of professors near the age of 65 rises over the five year period. The difference in the distributions between the Quebec and Ontario universities at age 66 and older also diverges over the five year period with a greater fraction of professors being over the age of 65 in Quebec compared with in Ontario. The same relationship is present when all universities with

mandatory retirement at the age of 65 are compared with those without mandatory retirement. The fraction of professors over the age of 65 in universities without mandatory retirement is larger at 1.9 percent than the equivalent fraction at universities with mandatory retirement at age 65 at 0.7 percent.

In Figure 3, the same estimated distributions are presented for the academic year, 1993/94. The mass of each distribution has continued to shift to the right indicating that the stock of professors has aged on average over the period. In addition, the difference in the proportion of faculty members over age 65 between the universities in Quebec and the universities in Ontario has risen. A similar increase in the fraction of professors over the age of 65 is apparent in Figure 3 in the age distribution for the universities without mandatory retirement. Therefore, a clear pattern emerges that the relaxation of the mandatory retirement at 65 rules has a significant impact on the fraction of professors over the age of 65. Also, the magnitude of this effect grew over the late 1980s and early 1990s as the fraction of professors over the age of 60 grew.

In Figure 4, the equivalent age distributions are plotted for the 1998/99 academic year. The distributions are generally similar to those in Figure 3. However, each distribution appears to have shifted further to the right with a growing fraction of professors closing in on age 65. The percentage of professors over the age of 65 at universities without mandatory retirement is higher than the equivalent percentage at universities with mandatory retirement at age 65, at 2.7 and 0.7 percent, respectively. However, this difference does not appear to have grown substantially when compared with the equivalent percentages from Figure 3. This raises the possibility that in the absence of mandatory retirement, some professors may stay on past age 65 but the fraction that do is not large or that they do not stay on many years beyond age 65.

Given the large number of professors that are on the verge of turning 65 in universities without mandatory retirement, their retirement decisions have the potential to have a huge impact on the age structure of those universities.

In Figure 5, the age distributions are presented for the most recent academic year in the sample, 2001/02. The fraction of professors over the age of 65 is higher in Quebec universities (3.4 percent) than in Ontario universities (1.1 percent) and higher in universities without mandatory retirement (3.4 percent) compared with those that have mandatory retirement at age 65 (0.9 percent). Of particular interest is the fact that these differences appear to have grown since the 1998/99 year indicating that the proportion of university professors who stay on past age 65 in the absence of mandatory retirement may increase over time.

Taken together, this evidence indicates that the banning of mandatory retirement coupled with the aging of the stock of university faculty in Canada has led to important differences in the age distributions of universities without mandatory retirement relative to those with mandatory retirement at age 65. Also, given that a large fraction of the 2001/02 stock of university professors are in the 45-64 age range, there is the potential for even larger differences in these age distributions in the future. In order to explore these issues, the next part of the paper reports on the results of the analysis of the exit decisions of university faculty age 58 through 71.

The calculation of exit rates for individual professors relies on the individual identifier being consistent within institutions across subsequent years. Institutions on occasion have changed the definitions of their individual identifiers making it impossible to match faculty members across years.[10] The total number of observations excluded is small representing only around 1.5 percent of the sample of

[10] A complete list of the 19 relevant institution/year pairings where it was not possible to generate exit rates for this reason is presented in Appendix 2.

professor/year observations. In addition, there does not appear to be any pattern in the decision to change the person identifiers in the sense that they appear to be spread fairly evenly over time and across types of institutions. Therefore, it seems unlikely that this selection is an important issue for the analysis and these observations are excluded from the sample used in the analysis of exit rates.

In Table 1, sample means for the exit rates are presented for different age groups and by mandatory retirement regime. Over the entire sample of faculty 58 through 71, exit rates are higher for professors working in institutions with mandatory retirement at age 65 at 14.8 percent compared with 12.7 percent for professors working in institutions without mandatory retirement. At age 64, the exit rates are very similar at the two groups of universities with a slightly lower exit rate of 12.0 percent for faculty at universities with mandatory retirement at 65 relative to 12.4 percent for faculty at universities without mandatory retirement. For each of the other age groups presented, the exits rates are higher at the institutions with mandatory retirement at 65 relative to those without mandatory retirement with the difference being especially large at age 66 at 57.6 percentage points.[11]

These sample means are presented graphically in Figure 6. Exit rates are very similar across the two categories of institutions over the ages 58 through 64 but diverge sharply at older ages.[12] This is strong preliminary evidence that the mandatory retirement at 65 is a significant constraint on the behaviour of university professors since professors not facing this constraint have much lower exit rates over the age range 65 through 68.

[11]In our discussion paper (Warman and Worswick, 2009), age distributions are presented separately for universities with and without mandatory retirement. The overall patterns are consistent with the exit rate differences reported in the sense that the fraction of professors over the age of 65 was larger in the universities without mandatory retirement at age 65 relative to those with mandatory retirement at age 65 and the size of this difference grew over the sample period as the population of professors in Canada aged.

[12] The figures are not presented for the mandatory retirement at age 65 category after the age of 68 due to the sample size dropping below 100.

The next stage of the analysis involves the estimation of a discrete time logit model of exit from employment at a university for professors age 58 through 71. Before describing the results of the analysis, sample means of key variables employed are presented in Table 2. For professors age 58 through 71, 64 percent are employed at universities with mandatory retirement at the age of 65, 36 percent are employed at universities without mandatory retirement. The average age of professors in the universities without mandatory retirement is approximately seven months older than in the universities with mandatory retirement at the age of 65. In addition, the percentage of professors over the age of 65 at universities without mandatory retirement is 12.9 percent while only 4.0 percent of professors are over the age of 65 at universities with mandatory retirement at 65.[13]

The percentage of female faculty members is similar across the universities with mandatory retirement at 65 and those without mandatory retirement, at 13.3 and 13.1 percent, respectively. A somewhat higher percentage of professors at universities without mandatory retirement hold a Ph.D. at 73.4 percent relative to 70.7 percent at universities with mandatory retirement at 65. The breakdown by type of university indicates that mandatory retirement at 65 is less common at universities in the Medical/Doctoral category (58.4 percent versus 74.6 percent) and is much more common in the Comprehensive category (25.6 percent versus 14.0 percent). Finally, as discussed above, the professors in our sample who are employed at universities without mandatory retirement are in Quebec and Manitoba and at the University of Calgary in Alberta.

[13] Universities with mandatory retirement at 65 are more likely to have respondents who are in the "Annual, sessional or other definite term contract" category. Six percent of the observations in the mandatory retirement at age 65 group of universities are in this category compared to only one percent for the no mandatory retirement group, and this difference increases greatly after age 64. It may be that faculty are able to stay on past the age of 65 if they are employed in this type of fixed term contract.

IV. Econometric specification

The analysis of exit rates follows the method employed by Ashenfelter and Card (2002). A logit model of exit from employment is used that has the general specification:

$$\log[P(i,j,a,t)/(1-P(i,j,a,t))] = X(i,j,a,t)\beta + c_a(j,t) \qquad (1)$$

where *P(i, j, a, t)* is the probability that individual *i* employed at university *j* at age *a* in year *t* exits from employment at the university before the start of the following year, conditional on having remained employed up to age *a*; *X(i, j, a, t)* contains a vector of observed characteristics of individual *i* and university *j*; β is a parameter vector, and $c_a(j, t)$ is a set of baseline exit-probability parameters for individuals at age *a* in year *t* at institution *j*. The baseline retirement probabilities are specified as:

$$c_a(j,t) = d_a + \Delta_a \times I[NMR_j] \qquad (2)$$

where $I[NMR_j]$ equals one if the university does not have mandatory retirement and equals zero otherwise. This specification allows for unrestricted variation by age in exit rates in institutions that have mandatory retirement at the age of 65 (captured by the d_a parameters) as well as age specific deviations from these exit rates for faculty members at institutions without mandatory retirement (captured by the Δ_a parameters).

V. Logit results

In Table 3a, parameter estimates are presented from a logit model of the hazard rate of exiting from employment at the university that is consistent with a logistic discrete time duration model. In the first column, results are presented without controls for personal or university characteristics. The specification includes a full set of unrestricted year dummy variables as well as unrestricted age dummy

variables. These age variables are also interacted with a dummy variable for professors at universities without mandatory retirement.

The coefficient on the 'age 64'/'no mandatory retirement' interaction variable is near zero and statistically insignificant indicating that the exit rates are similar between professors at this age at universities without mandatory retirement and those at university with mandatory retirement at 65. The other coefficients on the age interaction terms are statistically significant and indicate a lower rate of exit from employment at the university for professors at universities without mandatory retirement relative to professors at universities with mandatory retirement. The logit coefficients range from -1.16 to -2.83. Near the bottom of the column, the estimated retirement rates are presented indicating that at age 65 the exit rate is 28.6 percentage points lower for professors at universities without mandatory retirement compared with those at universities with mandatory retirement at age 65.[14] At age 66, the difference in the retirement probabilities is even larger at 33.3 percentage points. These estimates are similar in magnitude to those found by Ashenfelter and Card (2002) in terms of the effect on retirement rates of university professors in the US at the age of 70 and 71 of the elimination of mandatory retirement at age 70.

In the second column of Table 3a, results are presented from an equivalent logit model of exit from employment at the university, but where controls for personal characteristics and university characteristics are also included. In particular, a set of seven subject area dummy variables are included[15] as well controls for region.[16] In addition, controls are included for the three types of universities: 1) Medical/Doctoral,

[14] Following Ashenfelter and Card (2002), the retirement rates are generated using the approximation $\Delta_a \times P_a \times (1-P_a)$ where P_a is the average probability of exit at age a for individuals at universities with mandatory retirement at age 65.
[15] The subject areas are: 1) arts, 2) mathematics and science, 3) health, 4) humanities, 5) social science, 6) agriculture, and 7) engineering.
[16] The regions are: 1) British Columbia, 2) Alberta, 3) Manitoba, 4) Saskatchewan, 5) Ontario, 6) Quebec, and 7) the four Atlantic provinces.

2) Comprehensive and 3) Primarily Undergraduate, and these controls are also included as interactions with a female indicator variable. Finally, a dummy variable is included to control for whether the faculty member has a Ph.D.

In general, the pattern of results for the exit by age parameters are similar to those found in column (1). Exit rates are lower for professors at age 65 and older for faculty at universities without mandatory retirement. Exit rates are also slightly larger for professors at age 64 for faculty at universities without mandatory retirement, however, these differences are much smaller than at age 65 and older. At the bottom of the table, the estimated mean retirement rates are also slightly larger than those of column (1) at 36.7 and 37.3 percentage points for professors age 65 and 66, respectively. The coefficient on the interaction between the female variable and the Medical/Doctoral category are more likely to exit from employment than are men at the same category of university. Also worth noting is the fact that holding a Ph.D. is associated with a lower probability of exiting employment at the university with a coefficient of –0.27. [17]

In column (3) of Table 3a, the equivalent logit model is estimated with the inclusion of log earnings from the previous year.[18] The coefficient on the earnings variable is negative and significant implying a lower exit rate for professors with higher earnings. The coefficient, -0.65, has the same sign as that found by Ashenfelter and Card (2002) in a similar specification of their retirement hazard model. The other coefficients are for the most part similar to those from column (2). The coefficients on the age/no-mandatory-retirement variables are very similar to

[17] We investigate the possibility that people who were employed at a university with mandatory retirement move to a university without mandatory retirement to avoid the retirement rules. However, we find that only around one percent of people in the sample age range, who were employed at an institution without mandatory retirement, had been previously employed at an institution with mandatory retirement rules in the previous five years. This analysis is based mainly on the institutions in Manitoba since there were a large number of missing observations for year of appointment for the Quebec institutions whereas in Manitoba, there was almost no missing information. Re-estimating the means for the respondents in Quebec without missing information for year of appointment, we find very similar results.

[18] The earnings variables are converted into year 2000 dollars using the Consumer Price Index.

those in column (2). However, some differences are present. The coefficient on the interaction of the female variable with the Medical/Doctoral variable is no longer significant once the earnings variable is included. Also, the coefficient on the Ph.D. dummy variable drops from –0.27 to –0.22.

Our data includes not only professors but also "annual, sessional or other definite term contract" faculty who meet the requirements described in footnote 6. One concern is that professors may be switching to contract positions once they turn 65 at universities with mandatory retirement, and therefore possibly biasing the implied mean difference in exit behaviour downward in absolute value. Faculty on an "annual, sessional or other definite term contract" make up a higher percentage of the teaching staff in our sample of 58 to 71 year olds at universities with mandatory retirement relative to institutions without mandatory retirement (6% versus 1%), and this difference is more pronounced and increases after age 64. However, after re-estimating the results from Table 3a removing people who had ever been on an "annual, sessional or other definite term contract" over the age range covered by our sample, we find that the estimates of the implied change in mean exit behaviour are very similar to those presented, as are the logit coefficient estimates.

In Table 3b, results for different subsamples are presented to examine the sensitivity of the main findings from Table 3a. In the first 3 columns of Table 3b, we re-estimate the model separately across three broad categories of universities: 1) primarily undergraduate universities, 2) comprehensive universities and 3) universities with medical schools. The implied change in mean exit behaviour is largest for comprehensive universities, and smallest for universities in the medical/doctoral category.

Faculty members employed at universities in Quebec represent a large fraction of individuals in our sample. We re-estimate the model restricting the sample of institutions without mandatory retirement to the universities in Mantioba. The estimated parameters (see column 4 of Table 3b) are very similar to the estimates for the full sample (see column 1 of Table 3a). The implied changes in mean exit at age 65 is 28.8 for the sample with the institutions in Manitoba as the only institution without mandatory retirement included in the analysis and 28.6 for the sample with

all institutions without mandatory retirement included; at age 66, the implied changes in mean exit behaviour are 32.6 and 33.3 percent, respectively.

To further investigate the robustness of the main findings, we examine the hazard rates separately for three broad disciplines: Social Sciences, Health, and Sciences. In terms of the estimates of columns 5 through 7 of Table 3b, there is little difference between the three disciplines, with the mean exit rates being almost identical at age 65 (varying between 30.1 for Social Sciences and 27.3 for Sciences) and also very similar at age 66 (varying between 35.8 for Sciences and 31.2 for Health).

In Table 4, results are presented that are equivalent to those of Table 3a but for the case of male faculty members. The estimated parameters are generally similar to those found in Table 3a. Lower exit rates are found for professors at universities without mandatory retirement relative to universities with mandatory retirement at age 65 for each age group from age 65 through 68. The mean exit rates are 29.3 to 38.8 percentage points lower for male professors at universities without mandatory retirement relative to male professors at universities with mandatory retirement at ages 65 and 66.

An additional column is included in Table 4 which contains the estimates from a model equivalent to that used in generating the Column (3) numbers but estimated over the sample of faculty members who received their highest degree at age 34 or older (approximately 42 percent of the original sample). This group is of interest because age specific exit rates for faculty at universities without mandatory retirement may be lower for professors who graduated later in life and have relatively fewer years after graduation in which to earn a return on their human capital investments. In general, the results in column (4) are very close to those found in column (3). There

are differences in the point estimates; however, the magnitudes of these differences are generally small. The estimated difference in mean exit rates between faculty at universities without mandatory retirement and those with mandatory retirement at age 65 are very close to those found in column (3) at -38.8 percent versus -39.2 percent for age 65 and -38.7 percent and -38.4 percent for age 66.

In Table 5, equivalent results to those in Table 4 are presented but the exit rate hazard model is estimated over the sample of female professors. Due to the smaller sample size, it was not possible to get reliable estimates for each of the age-specific exit rate parameters. Therefore, the estimated parameters are only presented if at least 100 female faculty members are present in the sample at the relevant age. The results are generally similar to those found in Tables 3 and 4. The coefficients on the age/no-mandatory-retirement variables are generally similar in sign and magnitude to the corresponding estimates in each of the columns of Tables 3 and 4. The estimated mean exit rates at the bottom of the table (columns 1 to 3) imply 24.1 to 32.1 percentage points lower exit rates at age 65 and 66 for female faculty members at universities without mandatory retirement relative to their female counterparts at universities with mandatory retirement at age 65. These estimates are generally smaller in magnitude than those found in Table 4 indicating that mandatory retirement may have a smaller impact on the exit behaviour of female faculty members relative to male faculty members.

This is an important finding since one of the arguments often made against mandatory retirement is that it may be an especially large constraint for women who may spend years out of the labour market in the early part of their careers caring for young children. Neither of the comparable earlier studies (Ashenfelter and Card, 2002, and Clark and Ghent, 2008) report retirement probabilities for women

separately for the cases of: 1) mandatory retirement and 2) no mandatory retirement. This is likely due to sample size concerns. The fact that the Canadian data set employed in the analysis of this paper is a complete census of all university faculty members each year in Canada, allows for a disaggregated analysis by gender.

One possibility is that a subset of female faculty (those who finished their highest degree relatively late in their career) are greatly affected by mandatory retirement constraints while most female faculty are not. In order to explore this possibility, it is useful to compare the results of column (4) in both Table 5 and Table 4 since the sample in each case is restricted to faculty who received their highest degree at age 34 or older. The point estimates in column (4) of Table 5 are very similar to those of column (3) of Table 5 indicating that women who received their highest degree later in their working lives are not more sensitive to the presence of mandatory retirement rules relative to those women who received their highest degrees relatively early in their careers. In fact, the estimated mean exit rates at the bottom of each column are very similar in Table 5 as is also the case for the mean exit rates by age across columns (3) and (4) of Table 4. Therefore, focusing on faculty who completed their highest degree later in their career does not affect the overall finding that the exit rates of female faculty at the age of 65 and 66 do not appear to be more sensitive to the absence of mandatory retirement rules than is the case for male faculty members.

There are several possible explanations for these findings. One possibility is that female faculty are likely to be married, potentially to other faculty members or high-earning workers and therefore are not reliant solely on their own pension. Unfortunately, information on marital status is not collected in our data source so we cannot explore this issue further.

In order to gain a fuller understanding of the estimated hazard rates derived from the estimates of Tables 4 and 5, discrete hazard rates for men and women are presented in Figure 7 and the associated survival probabilities are presented in Figure 8. The results are based on the estimated hazard models of column (2) of Tables 4 and 5. In Figure 7, male and female faculty members at institutions without mandatory retirement have much lower exit rates than their counterparts at universities with mandatory retirement at age 66. Once again, the estimated hazard rate is only plotted if at least 100 observations are available in the data to calculate the statistic; therefore, only the curve for men at universities without mandatory retirement extends beyond age 68. The survival probabilities in Figure 8 are derived from the hazard rates of Figure 7 and represent the probability of continuing employment at the same university for professors employed there at age 64. The survival probabilities are much higher for both men and women employed at universities without mandatory retirement. For men at universities without mandatory retirement the sample size of men over the age of 65 is large enough to allow for the calculation of the survival probability through age 72. While these men have much lower exit rates than their counterparts at universities with mandatory retirement at age 65, the survival probability to age 72 is 22.7 percent. This is somewhat surprising given the fact that Ashenfelter and Card (2002) found much lower retirement rates for university faculty at age 70 and 71 after the elimination of mandatory retirement at age 70. In the Canadian case, a significant proportion of faculty will work past age 65 in the absence of mandatory retirement but a relatively small fraction of faculty will work into their early seventies. It may be that other differences in institutional features between the American and Canadian academic settings lead to much earlier exit from employment in Canada relative to in the United States.

VI. Conclusions

The implications of mandatory retirement rules on the retirement behaviour of university faculty members have been analyzed using administrative data for Canada. The age distributions of professors at universities without mandatory retirement and those at universities with mandatory retirement at age 65 have diverged over time with a higher fraction of professors over the age of 65 at universities without mandatory retirement. Three main contributions are made.

First, the estimates from the estimation of a discrete time hazard model generally support the findings in the two existing (US) studies. In the absence of mandatory retirement, university faculty members are much less likely to retire in the first two years after the usual retirement age.

Second, the magnitude of this effect is found to be comparable between women and men. This does not support the view that mandatory retirement is a more severe constraint on the behaviour of female academics who may be more likely to have had career interruptions (relative to their male counterparts). Equivalent results were found by gender group when the sample was restricted to faculty members who received their highest degree at age 34 or older indicating that duration of the remainder of the career does not appear to be an important determinant of the exit rates of either male or female faculty members over the age of 64 at universities without mandatory retirement rules. The earlier studies in this literature do not report comparable results by gender. However, the lack of information related to spousal income means that we cannot fully account for all sources of current income and retirement income. If female faculty members are more likely to be married to spouses with high incomes and generous pensions than are male faculty members then this difference could mask a possible greater need to work past the usual mandatory

retirement age on the part of female faculty relative to male faculty. This is an important issue which should be researched in the future hopefully with new sources of data.

Third, since Canadian mandatory retirement policies typically involve retirement at age 65 (as opposed to age 70 for the case of the mandatory retirement policy relevant for US academics in the earlier studies), this study provides insights on the impact mandatory retirement rules can have on the retirement behaviour of university academics at earlier ages. Of particular interest, is the fact that the estimated survival probabilities indicate that only 22.7 percent of faculty members employed at age 64 at universities without mandatory retirement will continue to be employed at the same university at age 72. This finding is in contrast to the US studies that indicate that retirement rates at age 71 and 72 at universities without mandatory retirement were comparable to the retirement rates at age 69 and 70. It may be that this difference between the Canadian and American findings is due to institutional factors, not fully captured by the mandatory retirement policy, having a significant impact on the retirement decisions of university faculty.

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Table 1
Exit rates of university professors by age (%):
1983/84 through 2000/01

	Mandatory retirement at 65	No mandatory retirement
Age 58 to 71	14.8	12.7
	(0.15)	(0.18)
Age 64	12.0	12.4
	(0.46)	(0.67)
Age 65	55.5	29.1
	(0.75)	(1.00)
Age 66	86.4	28.8
	(0.79)	(1.19)
Age 67	54.9	21.6
	(3.01)	(1.29)
Age 68	65.6	28.4
	(4.16)	(1.63)
Age 69		28.0
		(1.98)
Age 70		33.9
		(2.53)
Age 71		24.3
		(2.89)

Note: Standard errors are in parentheses.

Table 2
Sample means of key variables for professors age 58 to 71: 1983 through 2001

	All universities	Universities with mandatory retirement at 65	Universities with no mandatory retirement
Mandatory retirement at 65	64	100	0
	(0.16)		
No mandatory retirement	36	0	100
	(0.16)		
Age (years)	61.3	61.1	61.7
	(0.01)	(0.01)	(0.02)
Over age 65	7.2	4.0	12.9
	(0.08)	(0.08)	(0.18)
Female	13.2	13.3	13.1
	(0.11)	(0.14)	(0.18)
Holds a Ph.D.	71.6	70.7	73.4
	(0.15)	(0.19)	(0.24)
Medical/Doctoral university	64.2	58.4	74.6
	(0.16)	(0.20)	(0.24)
Comprehensive university	21.4	25.6	14.0
	(0.13)	(0.18)	(0.19)
Primarily undergraduate	14.3	16.0	11.3
university	(0.12)	(0.15)	(0.17)
Newfoundland and Labrador, PEI	9.8	15.3	0
Nova Scotia and New Brunswick	(0.1)	(0.15)	
Quebec	26.6	0	73.9
	(0.15)		(0.24)
Ontario	36.8	57.5	0
	(0.16)	(0.20)	
Manitoba	6.00	0	16.7
	(0.08)		(0.2)
Saskatchewan	1.3	2.0	0
	(0.04)	(0.06)	
Alberta	8.5	8.1	9.4
	(0.09)	(0.11)	(0.16)
British Columbia	11.0	17.1	0
	(0.10)	(0.15)	
Sample size	92,742	59,309	33,433

Notes: Means presented as percentages unless otherwise noted. Standard errors are in parentheses. The percentage of universities without mandatory retirement and those with mandatory retirement do not add up to 100 percent because of the universities with other mandatory retirement ages.

Table 3a
Parameter estimates for pooled logistic hazard model of exit from the university

Variables	(1) No controls	(2) Controls	(3) Controls and earnings
No mandatory retirement/Age interaction variables			
Age 64	0.00	-0.31***	-0.33***
	(0.08)	(0.10)	(0.10)
Age 65	-1.16***	-1.49***	-1.53***
	(0.06)	(0.09)	(0.09)
Age 66	-2.83***	-3.16***	-3.21***
	(0.09)	(0.12)	(0.12)
Age 67	-1.67***	-1.99***	-1.98***
	(0.14)	(0.16)	(0.16)
Age 68	-1.75***	-2.07***	-2.06***
	(0.20)	(0.22)	(0.22)
Personal/university characteristics			
Comprehensive	__	-0.02	-0.03
		(0.03)	(0.03)
Primarily undergraduate	__	0.13***	0.06*
		(0.04)	(0.04)
Female at medical/doctoral	__	0.11***	0.02
		(0.04)	(0.04)
Female at comprehensive	__	0.11	0.02
		(0.07)	(0.07)
Female at primarily under.	__	0.03	-0.05
		(0.08)	(0.08)
Hold Ph.D.	__	-0.27***	-0.22***
		(0.02)	(0.02)
Log earnings in previous year	No	No	-0.65***
			(0.05)
Controls for region and subject	No	Yes	Yes
Implied change in mean exit behaviour (%)			
At age 65	-28.6***	-36.7***	-37.8***
	(1.4)	(2.3)	(2.3)
At age 66	-33.3***	-37.3***	-37.8***
	(1.1)	(1.4)	(1.4)
Pseudo-R^2	0.19	0.19	0.20
Sample size	92,742	92,237	91,633

Notes: Robust standard errors are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Models are fit to retirement probabilities for ages 58 to 71 for the period 1983/84-2000/01. All models include unrestricted year dummy variables, as well as unrestricted age dummy variables on their own and interacted with the 'no mandatory retirement' dummy variable.

Table 3b
Parameter estimates for pooled logistic hazard model of exit from the university

Variables	(1) Primarily Undergraduate	(2) Comprehensive	(3) Medical/ Doctoral	(4) Manitoba	(5) Social Sciences	(6) Health	(7) Sciences
No mandatory retirement/Age interaction variables							
Age 64	0.26	-0.18	-0.02	0.11	0.05	-0.03	-0.03
	(0.21)	(0.21)	(0.09)	(0.15)	(0.11)	(0.17)	(0.14)
Age 65	-1.26***	-1.46***	-1.09***	-1.16***	-1.22***	-1.12***	-1.11***
	(0.19)	(0.16)	(0.07)	(0.12)	(0.08)	(0.13)	(0.10)
Age 66	-2.50***	-2.24***	-3.42***	-2.77***	-2.82***	-3.16***	-2.67***
	(0.26)	(0.19)	(0.13)	(0.16)	(0.12)	(0.22)	(0.16)
Age 67	-2.20***	-1.21***	-2.03***	-1.39***	-1.51***	-2.28***	-1.60***
	(0.43)	(0.26)	(0.22)	(0.21)	(0.20)	(0.35)	(0.27)
Age 68	-1.41***	-2.15***	-1.65***	-2.31***	-1.66***	-2.49***	-1.57***
	(0.53)	(0.34)	(0.34)	(0.30)	(0.28)	(0.60)	(0.34)
Implied change in mean exit behaviour (%)							
At age 65	-30.8***	-36.1***	-26.9***	-28.8***	-30.1***	-27.7***	-27.3***
	(4.6)	(3.8)	(1.7)	(3.1)	(2.1)	(3.3)	(2.6)
At age 66	-34.1***	-43.4***	-24.7***	-32.6***	-32.6***	-31.2***	-35.8***
	(3.6)	(3.8)	(0.9)	(1.9)	(1.5)	(2.1)	(2.2)
Pseudo-R^2	0.19	0.19	0.19	0.23	0.18	0.20	0.20
Sample size	13,305	19,862	59,575	64,896	47,765	16,086	28,386

Notes: Robust standard errors are in parentheses. Models are fit to retirement probabilities for ages 58 to 71 for the period 1983/84-2000/01. All models include unrestricted year dummy variables, as well as unrestricted age dummy variables on their own and interacted with the 'no mandatory retirement' dummy variable.

Table 4
Parameter estimates for pooled logistic hazard model of exit from the university:
Results for men

Variables	(1) No controls	(2) Controls	(3) Controls and earnings	(4) Graduated age 34 or older
No mandatory retirement/Age interaction variables				
Age 64	-0.01	-0.33***	-0.36***	-0.43**
	(0.08)	(0.11)	(0.11)	(0.17)
Age 65	-1.19***	-1.53***	-1.57***	-1.58***
	(0.06)	(0.10)	(0.10)	(0.15)
Age 66	-2.85***	-3.20***	-3.24***	-3.00***
	(0.10)	(0.13)	(0.13)	(0.19)
Age 67	-1.72***	-2.05***	-2.03***	-1.80***
	(0.15)	(0.17)	(0.17)	(0.25)
Age 68	-1.73***	-2.06***	-2.04***	-2.33***
	(0.21)	(0.23)	(0.23)	(0.33)
Personal/university characteristics				
Comprehensive	__	-0.03	-0.04	-0.02
		(0.03)	(0.03)	(0.05)
Primarily undergraduate	__	0.13***	0.06*	0.05
		(0.04)	(0.04)	(0.05)
Hold Ph.D.	__	-0.24***	-0.20***	-0.34***
		(0.03)	(0.03)	(0.05)
Log earnings in previous year	No	No	-0.67***	-0.61***
			(0.05)	(0.10)
Controls for region and subject	No	Yes	Yes	Yes
Implied change in mean exit behaviour (%)				
At age 65	-29.3***	-37.9***	-38.8***	-39.2***
	(1.5)	(2.5)	(2.5)	(3.8)
At age 66	-33.9***	-38.3***	-38.7***	-38.4***
	(1.1)	(1.5)	(1.5)	(2.4)
Pseudo-R^2	0.19	0.20	0.20	0.20
Sample size	80,487	80,073	79,583	30,830

Notes: Robust standard errors are in parentheses. Models are fit to retirement probabilities for ages 58 to 71 for the period 1983/84-2000/01. All models include unrestricted year dummy variables, as well as unrestricted age dummy variables on their own and interacted with the 'no mandatory retirement' dummy variable.

Table 5
Parameter estimates for pooled logistic hazard model of exit from the university: Results for women

Variables	(1) No Controls	(2) Controls	(3) Controls and earnings	(4) Graduated age 34 or older
No Mandatory retirement/Age interaction variables				
Age 64	0.07	-0.1	-0.12	-0.45
	(0.21)	(0.28)	(0.29)	(0.35)
Age 65	-0.98***	-1.18***	-1.25***	-1.34***
	(0.16)	(0.25)	(0.26)	(0.31)
Age 66	-2.71***	-2.95***	-3.02***	-3.25***
	(0.26)	(0.33)	(0.34)	(0.43)
Age 67	-1.27***	-1.55***	-1.53***	__
	(0.44)	(0.49)	(0.51)	
Personal/university characteristics				
Comprehensive	__	0.03	0.01	-0.11
		(0.08)	(0.08)	(0.10)
Primarily under.	__	0.06	0.02	-0.05
		(0.09)	(0.09)	(0.11)
Hold Ph.D.	__	-0.38***	-0.32***	-0.37***
		(0.06)	(0.06)	(0.08)
Log earnings in previous year	No	No	-0.51***	-0.46***
			(0.11)	(0.16)
Controls for region and subject	No	Yes	Yes	Yes
Implied change in mean exit behaviour (%)				
At age 65	-24.1***	-29.1***	-30.9***	-32.1***
	(3.9)	(6.2)	(6.3)	(7.4)
At Age 66	-29.2***	-31.0***	-32.1***	-34.4***
	(2.8)	(3.5)	(3.6)	(4.6)
Pseudo-R^2	0.19	0.2	0.2	0.2
Sample size	12,255	12,157	12,043	7,486

Notes: Robust standard errors are in parentheses. Models are fit to retirement probabilities for ages 58 to 71 for the period 1983/84-2000/01. All models include unrestricted year dummy variables, as well as unrestricted age dummy variables on their own and interacted with the 'no mandatory retirement' dummy variable.

Figure 1
Age distributions of professors at Canadian universities
by region and retirement rule type: 1983/84

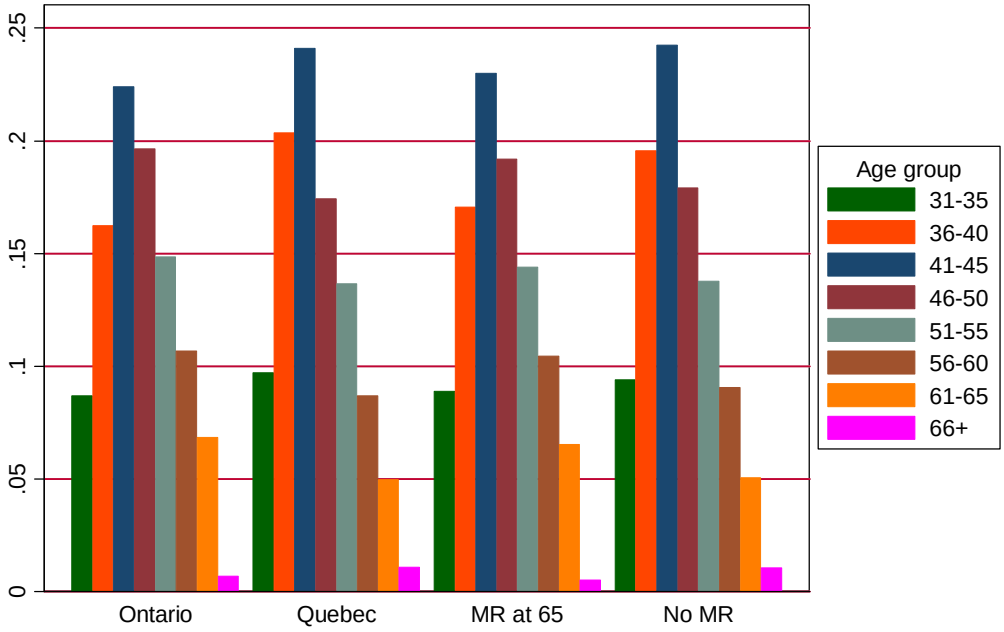


Figure 2
Age distributions of professors at Canadian universities
by region and retirement rule type: 1988/89

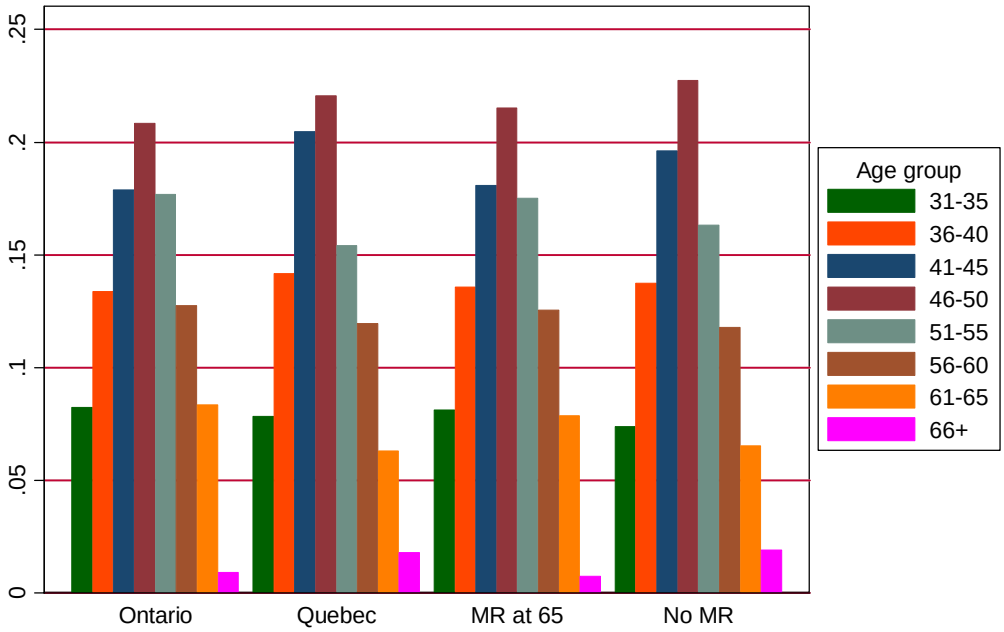


Figure 3

Age distributions of professors at Canadian universities by region and retirement rule type: 1993/94

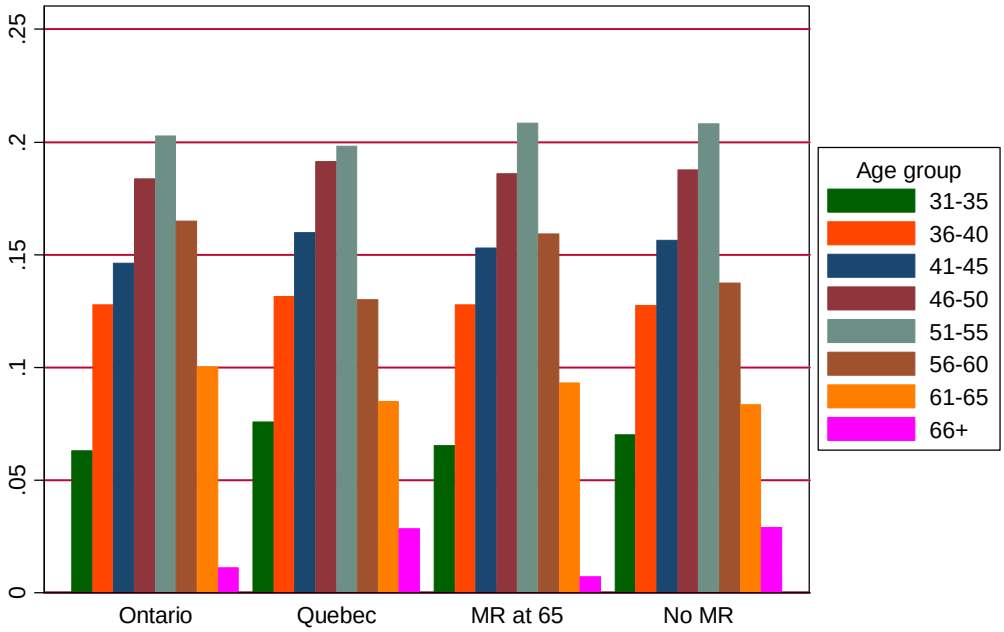


Figure 4
Age distributions of professors at Canadian universities by region and retirement rule type: 1998/99

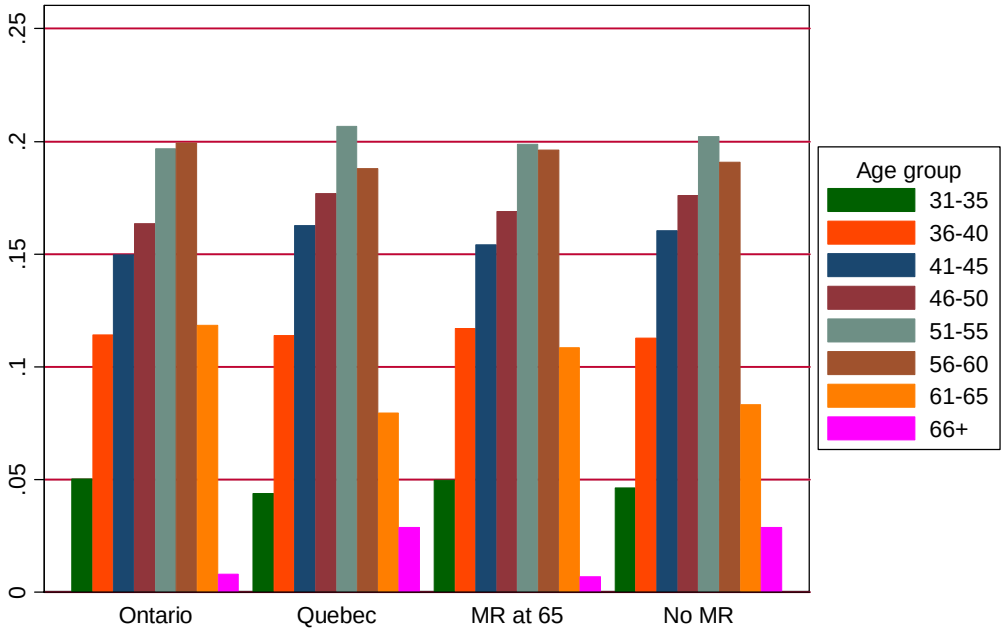


Figure 5

Age distributions of professors at Canadian universities
By region and retirement rule type: 2001/02

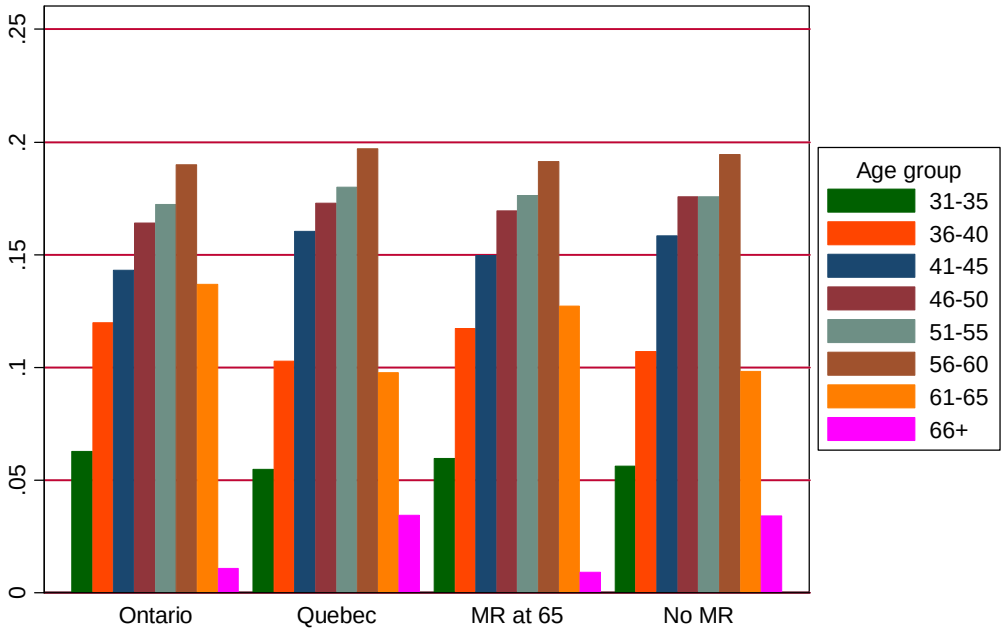


Figure 6
Exit rates of full-time professors in Canadian universities
by age and retirement rule
1983/84 through 2000/01

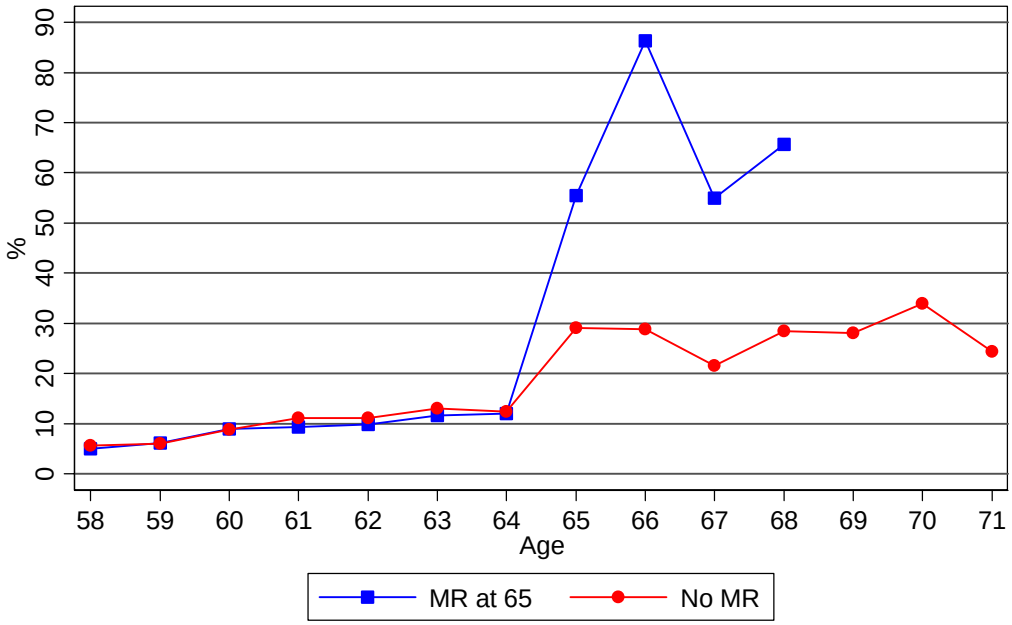


Figure 7

Discrete hazard rates for men and women:
1983/84 through 2000/01

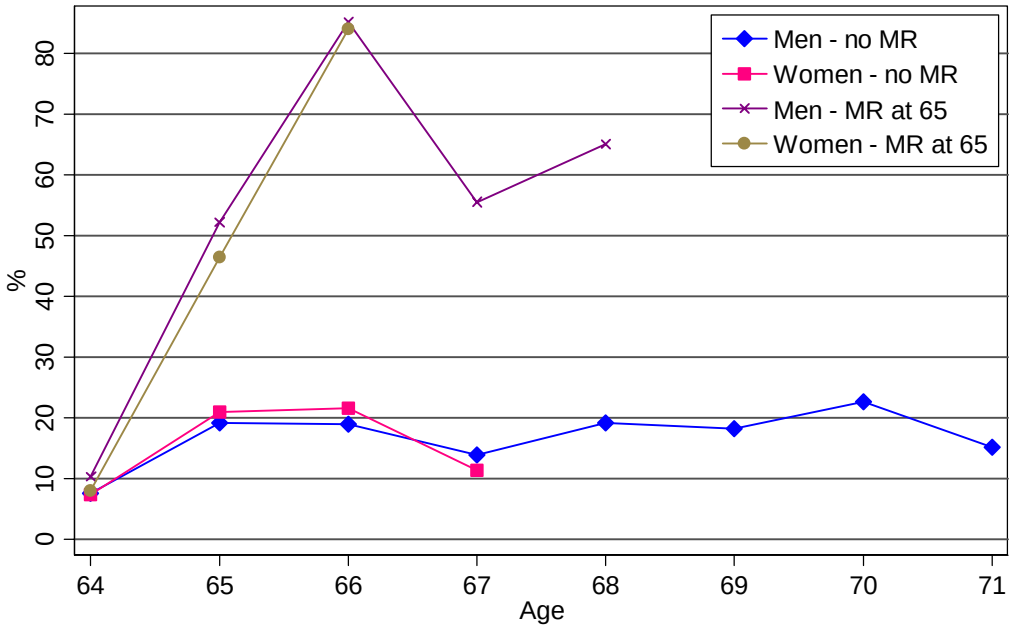
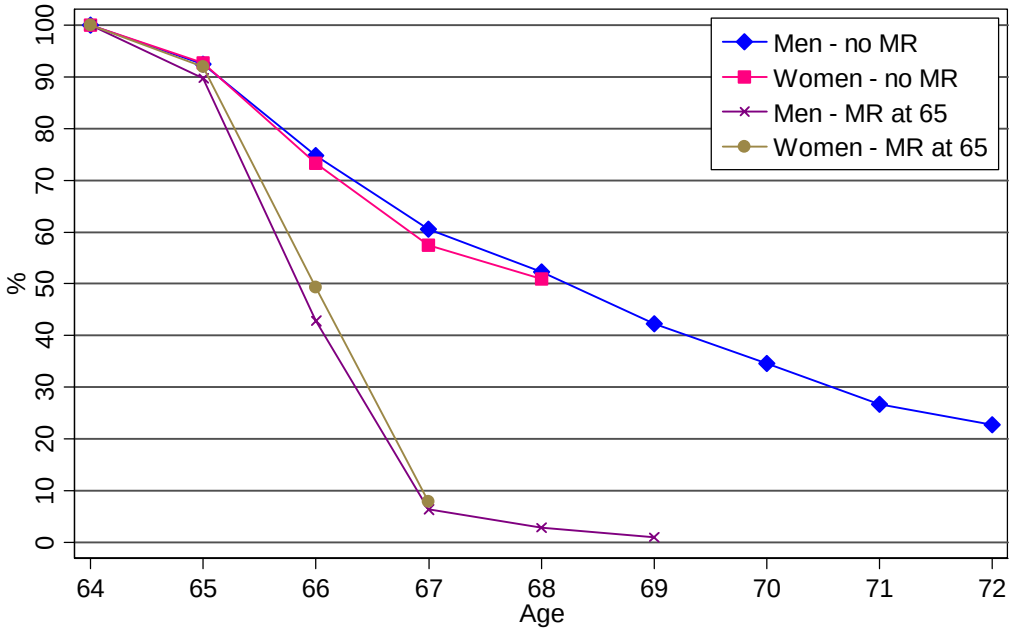


Figure 8
Survival probabilities for men and women:
1983/84 through 2000/01



Notes: Calculated using derived hazard rates using the estimated parameters of Column (2) of Table 4 and Table 5 for men and women, respectively. The survival probabilities are based on full-time employment at the institution at age 64.

Appendix 1

List of Universities:

Medical/Doctoral:
Dalhousie University
McGill University
Université de Montréal
Université Laval
Université de Sherbrooke
McMaster University
University of Ottawa
Queen's University
University of Toronto
University of Western Ontario
University of Manitoba
University of Saskatchewan
University of Alberta
University of Calgary
University of British Columbia

Comprehensive:
Memorial University of Newfoundland
University of New Brunswick
Université du Québec à Montréal
Concordia University
Carleton University
University of Guelph
University of Waterloo
University of Windsor
York University
University of Regina
Simon Fraser University
University of Victoria

Primarily Undergraduate:
University of Prince Edward Island
Acadia University
Mount St. Vincent University
St. Francis Xavier University
Saint Mary's University
University College of Cape Breton
Mount Allison University
Université de Moncton
Bishop's University
École polytechnique
École des hautes études commerciales
Université du Quebec à Hull
Inst. Nat. Recherche Scient.
Université du Québec à Chicoutimi
École De Technologie Superieure
Université du Québec à Trois-Rivieres
Université du Québec à Rimouski
Brock University
Lakehead University
Laurentian University
Trent University
Wilfrid Laurier University
Ryerson Polytechnic University
Brandon University
University of Winnipeg
University of Lethbridge
University of Northern British Columbia

Appendix 2

University/Year combinations in which person identifier not consistent across adjacent years:

Brock University	1984/85 – 1985/86
Dalhousie University	1999/00 – 2000/01
Guelph University	1993/94 – 1994/95
Inst. Nat. Recherche Scient.	1988/89 – 1989/90
Laurentian University	1992/93 – 1993/94
University of Lethbridge	1992/93 – 1993/94
Memorial University	1986/87 – 1987/88
University du Quebec à Rimouski	1985/86 – 1986/87
Université du Quebec à Trois-Rivieres	1985/86 – 1986/87
University of Northern British Columbia	1995/96 – 1996/97
University of Ottawa	1996/97 – 1997/98
University of Regina	1996/97 – 1997/98
University of Victoria	1994/95 – 1995/96
University of Western Ontario	1997/98 – 1998/99
University of Windsor	1999/00 – 2000/01
University of Winnipeg	1990/91 – 1991/92
University of Winnipeg	2000/01 – 2001/02
York University	1984/85 – 1985/86
York University	1985/86 – 1986/87