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A PROGRAM FOR RESEARCH ON

SOCIAL AND ECONOMIC DIMENSIONS OF AN AGING POPULATION

Student Enrolment and Faculty Recruitment in Ontario: The Double Cohort, the Baby Boom Echo, and the Aging of University Faculty

Byron G. Spencer

SEDAP Research Paper No. 61

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Abstract

Two demographic events will have significant effects on the Ontario university system this decade. The first is the growth in the population of student age, which will *increase the demand* on the system. That increase is associated with the baby boom echo, but it will be exacerbated by the so-called "double cohort" (which will see two classes of secondary school graduates enter university in the same year) and by the trend towards higher enrolment rates. The second event – the retirement of faculty hired in the late 1960s and the 1970s to meet the demands associated with the baby boom itself – will *reduce the supply* of services that the university system can provide.. The purpose of this paper is to attach some numbers to these two effects and, in particular, to anticipate the need to recruit new faculty. The projections suggest that the minimum need for net recruitment of faculty by the end of this decade is equal to at least half of the current complement, and it may be considerably more.

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Student Enrolment and Faculty Recruitment in Ontario:

The Double Cohort, the Baby Boom Echo, and the Aging of University Faculty

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1. Introduction

Two demographic events will have significant effects on the Ontario university system this decade. The first is the growth in the population of student age, which will *increase the demand* on the system. That increase is associated with the baby boom echo, but it will be exacerbated by the so-called "double cohort" (which will see two classes of secondary school graduates enter university in the same year) and by the trend towards higher enrolment rates. The second event will *reduce the supply* of services that the university system can provide. It is the retirement of the large fraction of the faculty that was hired in the late 1960s and the 1970s to meet the demands associated with the baby boom itself.

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[1] An earlier version of this paper was written in response to an invitation to address the conference on *Hire Education: The Faculty Shortage Crisis in Ontario Universities, Challenges and Options*, organized by the Ontario Confederation of University Faculty Associations (OCUFA) in Toronto, January 26, 2001. A revised version was presented also at the SEDAP (Social and Economic Dimensions of an Aging Population) Research Program conference on *Population Aging, the Health Care System, and the Economy,* held in Burlington, April 28-30, 2001. The author is grateful to Jim Donnelly of Statistics Canada for the provision of unpublished data relating to university enrolment and faculty size, to Christine Feaver who was responsible for all data handling and computer analysis, and to Frank Denton, Henry Jacek, and Leslie Robb for comments and suggestions. The work underlying the paper was carried out as part of the SEDAP Research Program supported by the Social Sciences and Humanities Research Council of Canada, Statistics Canada, and the Canadian Institute for Health Information.

The purpose of this paper is to attach some numbers to these two effects and, in particular, to anticipate the need to recruit new faculty. Some have suggested that recruitment needs are of crisis proportions. Indeed, in the projections described below, the minimum need for net recruitment of faculty by the end of this decade is equal to at least half of the current complement, and it may be considerably more.

The Council of Ontario Universities (COU) and the Ontario Confederation of University Faculty Associations (OCUFA) have drawn attention to the impending shortage of faculty. The COU commissioned a study, "Will there be room for me?", (PriceWaterhouseCoopers, 1999) that focussed attention especially on the prospective growth in student demand in its report. A year later another COU-commissioned study, "Will there be enough excellent profs?", (Smith, 2000), focussed attention on the massive retirement of university faculty in the present decade and on the opportunities that that provides for renewal, and emphasised the importance of maintaining or improving the quality of faculty in the process. A third COU study reviewed the situation as of the year 2000, and compared what happened in the 1990s with its own earlier projections (COU, 2000). Finally, in 2001 OCUFA published its report, "Less Isn't More: Ontario's Faculty Crisis", (OCUFA, 2001). These studies are in broad agreement that Ontario universities face significant problems in this decade.

This paper differs from earlier work in that it develops and articulates a simple but useful model in which emphasis is given to demographic factors. On the demand side, attention is paid

to enrolment by level of study, and the associated requirements for faculty are derived. On the supply side attention is given to the retention in the system of the current complement of full-time faculty, and the instructional requirements that they will be able to meet over the rest of this decade. Comparisons of these demand and supply components are then made, to determine the implied requirements for recruitment. Thus attention is focussed on demographic issues. Important matters relating to the continuing uncertain fiscal environment are not addressed.

The paper proceeds as follows. The next two sections are concerned with student enrolment: section 2 sketches the model that is used; section 3 provides projections of enrolment over the rest of the decade. Section 4 considers the current complement of university faculty. Section 5 provides projections of future faculty requirements and section 6 discusses the consequent need for recruitment. Section 7 summarizes the discussion, and concludes.

2. Projection of Enrolment: A Sketch of the Approach

A model is developed to provide enrolment projections for the Ontario university system as a whole. The full model is described in detail in Appendix A, but a brief summary description follows. Consider first full-time enrolment at the undergraduate level. Enrolment in first-year studies is related to the projected population of 18- to 21-year-olds, and is calculated as the projected population at each age multiplied by the corresponding age-specific enrolment rates. Those rates, in turn, vary over the projection period for two reasons: (1) to reflect the anticipated reduction in the

typical age at which new students enter university, as the double cohort is phased in; and (2) to reflect a possible increase in the proportion of the age group that will attend university. Undergraduate enrolment beyond the first year is related to first-year enrolment in the previous three years, with allowance for net attrition. Full-time enrolment at the graduate level is related to earlier enrolment at the undergraduate level, with allowance for trends. Hence the system allows for lagged responses to first-year enrolment that last for many years. Part-time enrolment is much smaller than full-time enrolment, when expressed in terms of full-time equivalent students, and somewhat erratic from year to year. However, the main trends appear to be strongly downward, and it has been assumed for the purpose of the projections that those downward trends will continue.

3. Projected Enrolment

Almost all university students are drawn from the population in the age range 18 to 24. That population is shown in Figure 1, for the period from 1988 through to 2010. From the late 1980s through to 1996 there was a decline of about 100,000 in this age group. Since then the number has risen steadily and further increases are projected for the rest of this decade. The increase between 2001 and 2010 is projected to be about 140,000, or 13 percent[2]. It is associated with the baby boom

[2] The "standard" population projection based on the McMaster MEDS system is used. (For a general description of MEDS, see Denton, Feaver, and Spencer, 1994; the version of MEDS that provides provincial demographic projections is known as PMEDS-D, and is described in Denton, Feaver, and Spencer, 1997.) The projection is quite insensitive to changes in underlying assumptions. For example, by 2010 higher or lower rates of fertility have no impact on the population in this age group and alternative assumptions about mortality have only a negligible impact. Immigration matters more. Annual immigration to Canada averaged about

echo, in large part[3].

Figure 2 shows year 1 full-time enrolment over the same period, with actual figures before 1998-99 and projected ones thereafter. Consider, first, enrolment during the period 1988-89 to 1998-99. While the population 18-24 *decreased*, first-year full-time enrolment was relatively flat and, in fact, even *increased* somewhat, from 53,000 in 1988-89 to 57,000 in 1998-99, reflecting notably higher enrolment rates. That leads immediately to the question of what enrolment rates will do in the near-term future. The answer will not be determined by considerations of demand alone. In particular, whether the universities are able to accommodate large increases in numbers (by making adjustments on the side of *supply*) will be important also[4]. However, the approach adopted here is to investigate what enrolment would look like under two alternative assumptions: (1) that the proportion of the age group entering universities remains constant ("low"); and (2) that the proportion increases by 10 percent ("high"). Beyond that there is the need to consider how the double cohort will be phased in. The general idea is that, with recent school reforms in Ontario, students will enter university after four instead of five years of secondary school. More specifically, the class that entered grade 9 in the fall of 1998 will be the last to complete secondary school in five years and the one that entered in the fall of 1999 will be the first to complete in four. Hence both classes will feed

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190,000 in the three years 1998, 1999, 2000. An immediate increase of 60,000 (which would be consistent with recently reported intentions of the federal government; see *National Post Online*, September 6, 2001) would result in an increase of about 15 percent in the Ontario 18-24-year-old population.

[3] Appendix C provides tabulations of the historical and projected series for enrolment (Tables C1 and C2) and population (Table C4).

[4] The analysis of Denton, Feaver, and Spencer (1998) is relevant in this regard.

new students into the university system at the same time – in the fall of 2003. That creates obvious concerns about how to accommodate a very large increase in enrolment in a single year.

If students from both classes did enter the university system in full force in the fall of 2003, first-year enrolment would approximately double for that year, and then decrease in subsequent years to roughly the earlier level. In practice, such a response seems unlikely. Some students who are ahead of the double cohort will anticipate crowded conditions at the universities and opt to complete their secondary school studies in four years instead of five, while some who are in the double cohort or later will (for the same reasons), postpone their entry into the university system. That would result in some smoothing, which is incorporated in the projections.

The particular smoothing or phasing-in pattern assumed here is shown in the following table.

Weights associated with phasing in of double cohort

	Age at entry --				*Sum of Weights*	
Year	18	19	20	21	*year*	*cohort*
98/99	0.117	0.691	0.149	0.043	1.000	
99/00	0.117	0.691	0.149	0.043	1.000	
00/01	0.130	0.691	0.149	0.043	1.013	
01/02	***0.170***	0.690	0.149	0.043	1.052	1.000
02/03	0.250	***0.650***	0.140	0.042	1.082	1.000
03/04	0.570	0.600	***0.140***	0.040	1.350	1.000
04/05	0.680	0.300	0.110	***0.040***	1.130	***1.000***
05/06	0.680	0.200	0.100	0.040	1.020	1.000
06/07	0.680	0.200	0.100	0.030	1.010	1.000
07/08	0.680	0.200	0.100	0.020	1.000	1.000
08/09	0.680	0.200	0.100	0.020	1.000	1.000
09/10	0.680	0.200	0.100	0.020	1.000	1.000
	0.680	0.200	0.100	0.020	1.000	1.000

The table shows the age-specific weights (with those for the year 1998-99 based on observed

proportions) that are assumed to apply in each year, and also (looking diagonally) those associated with enrolment for each successive cohort. The weights necessarily sum to 1.000 for each cohort, but their sum will exceed 1.000 in each year as the double cohort is being phased in. (Since almost all full-time enrolment at the first-year level is drawn from the population of 18- through 21-year-olds, only those ages are shown.)

Consider the academic year 1998-99, for example. The highest weight (0.691) is for 19-year-olds, with much lower weights for 18-year-olds (0.117) and 20- and 21-year-olds (0.149 and 0.043, respectively). With the new policy, the weights will change: the younger age of secondary school completion means that the highest weight will come to be associated with 18-year-olds and, in consequence, lower weights with those older. The bold figures show what is assumed for the cohort of age 18 in 2001-02. The 18-year-olds in that cohort are two years ahead of the first class officially in the four-year program, but with the new policy coming into effect, it is assumed that a somewhat higher proportion of this group (about 5 percent; the weight is 0.170 rather than 0.117) will opt to complete secondary school sooner, and enter university at age 18 rather than 19. That trend accelerates in the next two years, and by 2004-05 it is assumed to be complete. At the beginning of the projection about 69 percent of those who continued on to university did so at age 19, but by 2004-05 a similar proportion is assumed to be doing so at age 18. During the transition the sum of the weights in each year exceed 1.000. The sum is greatest in 2003-04, at 1.35. The implication is that the demand for first-year university enrolment is 35 percent greater in that year than it would have been without the phasing-in of the double cohort. That result is achieved because the assumed weight for 18-year-olds increases only to 0.570 (instead of 0.680) and that for 19-year-olds decreases

only to 0.600 (instead of 0.200), reflecting delays in making the transition to the new system. The 35 percent increase is a long way from the doubling of first-year enrolment that would take place if, in fact, the double cohort were to hit the universities all in one year. Even so, the effect is large, as shown below. The phase-in is assumed to be almost complete by 2005-06.

The weighting pattern just described is applied to the overall projected enrolment rate. In 1998-99, the latest year for which data are available, full-time first-year enrolment was equivalent to 39 percent of the 19-year-old population. Of course, not all who enrolled were age 19, but the ratio can be interpreted to indicate that, as a close approximation, 39 percent of the cohort would enrol at some age (most at age 19, but some at 18, others at 20, 21, and so on). We lock on to that idea, and provide two sets of projections, as displayed in Figure 2. The "low" projection assumes that the overall ratio remains at 39 percent; that is, 39 percent of each cohort will eventually have enrolled in first-year studies but the age distribution changes over time, as shown above. In the "high" projection the same change in the age distribution takes place, but the overall rate rises by 10 percent (or 4 percentage points) to 43 percent by 2010-11, the end of the projection period. The increase takes place in equal annual increments.

As is evident from Figure 2, both the "low" and "high" projections are dominated by the arrival of the double cohort. Even the "low" projection sees an increase in year-one enrolment from 57,000 in 1998-99 to 83,000 in 2003-04, when the double cohort has its greatest impact. The "high" projection is only about 3,500 higher at its peak, but the difference between the two projections grows with time as the assumed continued increase in the enrolment rate comes to play a larger role.

Even so, depending on the underlying assumptions, the peak associated with the double cohort clearly dominates, in that projected first-year enrolment is some 18 to 20 thousand higher in 2003-04 than in 2006-07. In subsequent years enrolment is projected to increase, but to remain well below the earlier peak.

The sharply higher first-year enrolment is reflected, with appropriate lags, in second, third, and fourth-year undergraduate studies. Figure 3 shows the implications for the total number of undergraduates, measured in terms of full-time equivalent students[5]. The enrolment peak is much flatter for this broader group. Whereas the projected increase from 1998-99 to the "low" peak is 46 percent over five years for first-year enrolment, it is 27 percent over six years for all undergraduates. The subsequent declines are 23 percent and 11 percent, respectively, both over three years. Similar comments apply to the "high" enrolment case.

As Figure 3 makes clear, the impact of the double cohort on overall undergraduate enrolment will extend over a number of years, and is of considerable magnitude. For example, based on the "low projection" the university system has a total undergraduate enrolment in this decade (calculated as the sum of the annual full-time equivalent enrolment totals) that is projected to be 143 thousand student-years greater with the double cohort than it would have been without. That difference is 40 thousand student-years greater with the "high" projection. In either case, the increase associated with the double cohort is heavily concentrated in the three academic years in the middle of the decade:

[5] In all calculations, in keeping with accepted practice, 3.5 part-time students are deemed equivalent to one full-time student.

full-time equivalent undergraduate enrolment in those three years averages some 35 to 39 thousand more per year with the double cohort than it would have been without it. In subsequent years, once the double cohort has worked its way through the system, enrolment is influenced only by the underlying changes in the population and enrolment rates.

With a further lag, the double cohort also affects graduate enrolment, as shown in Figure 4. The increase is much more gradual at this level, but still strong, and there is a clear peak. The peak at the masters' level (see Appendix C, Tables A1, A2) comes two years after the undergraduate peak, and that at the doctoral level comes another two years after that. In total, full-time equivalent enrolment at the graduate level in the five-year period 2005-06 to 2009-10 is almost 11 thousand greater with the double cohort, or about two thousand per year.

Overall enrolment at all levels, in terms of full-time equivalents, is shown in Figure 5. The projections certainly suggest much higher enrolment figures for the rest of this decade. Even without the double cohort, increases would be in the 40 to 60 thousand range, and that alone would increase the enrolment level as much as one-quarter. However, in the middle of the decade the double cohort clearly will take enrolment (temporarily) to much higher levels than would otherwise be the case – with additional increases of 20 or 30 thousand per year – provided, of course, that the university system can cope with the numbers, and that the acceptance rate for applications is not allowed to decline sharply. In total, the projections indicate that the double cohort alone will add an average of 26 to 30 thousand additional full-time equivalent students per year, on average, in the five-year period 2003-04 to 2007-08.

4. The Faculty: Current and Prospective Availability

We turn now from considerations of *demand* (the annual flow of students who would like to gain access to the university system) to considerations of supply. Attention in this section is focussed on the current complement of full-time faculty, and projections of how many of them will be available over the remainder of the decade.

Figure 6 shows the age distribution of full-time faculty in 1998-99, the latest year for which figures are available[6]. The major and obvious point here is that the current complement of faculty is predominantly in the age groups near the traditional age of retirement. While the male faculty are, on average, much older than female faculty, about *one-third* of all faculty are over the age of 55 and *more than half* are over the age of 50. The modal age was 57 two years ago; it is now (in 2001) 59. It is obvious that there will be much retirement over the next five to ten years.

Figure 7 shows the number of full-time faculty from 1988-89 through to 1998-99 and shows also, for those employed in 1998-99, three projections of how many will still be full-time faculty through the rest of this decade. The near-constancy of faculty numbers in the first five years, 1988-89 to 1993-94, contrasts sharply with the marked growth in student numbers (see Figure 5). The subsequent substantial *reduction* in faculty numbers – of the order of 9 percent between 1993-94 and 1998-99 – coincided with a much smaller reduction in student enrolment – of the order of 3 percent.

[6] Unpublished numbers were obtained from Statistics Canada in five-year age groups, and were converted to single years of age using Sprague multipliers, a demographic technique designed for this purpose.

As one indicator of the change over the decade, in 1988-89 there were 17.4 full time equivalent students per full-time faculty member. By 1993-94 that ratio had increased to 19.2, and by 1998-99 to 20.5.

Let us turn now to the projections of the number who will remain full-time faculty. One projection, "continued early retirement", shows what would happen if faculty continue to leave the system at ages before 65 at the same rate as they did in the last five years for which we have data. A second projection shows what would happen if no one were to retire before age 65[7]. These two cases presumably place outer bounds on what will happen. On the one hand, it is unlikely that the universities will provide more encouragement to faculty to take early retirement packages than they did in recent years, particularly in view of the prospective difficulties in hiring replacements. On the other, unless mandatory retirement at age 65 is eliminated, everyone will be required to retire at that age. In either case, the extent of attrition is evident. The first projection shows that even if no one retires before age 65, about 4,300 of the current 12,000 will be lost through retirement. With continued early retirement about 7,000 will be lost.

The third projection shows what would happen if retirement were no longer mandatory. This is a case of considerable interest since support for the elimination of mandatory retirement in Canada appears to be building. (It has long since been eliminated in the US.) For example, in 1999 the

[7] As explained in Appendix A, the term "retirement" is used here to include all departures or exits from full-time faculty status. Hence it includes moves to university appointments outside the province, moves to non-university appointments anywhere, and deaths, as well as regular retirements. However, almost all departures would be retirements in the usual sense.

federal Minister of Justice appointed a panel to review the Canadian Human Rights Act. Among other things, the panel was asked to give attention to the exceptions to the scope of the Act, one of which is mandatory retirement. In its Final Report, which was released in 2000, the Canadian Human Rights Act Review Panel stated that in its view "mandatory retirement is age discrimination", that there should be "no blanket defences for mandatory retirement" (Chapter 18, recommendation 132), and that "a thorough review of the issue of mandatory retirement" should be undertaken (recommendation 131). The Ontario Human Rights Commission also drew attention to this matter by launching a "consultation on age" [8]. Its final report "emphasizes that mandatory retirement is discriminatory. It recommends that the Ontario Human Rights Code be amended to eliminate the defence of mandatory retirement at age 65 and to provide protections against age discrimination to workers over 65."[9] [10]

The projection shown here draws on US experience. Mandatory retirement in postsecondary institutions in the US has been prohibited since the beginning of 1994. (Before that a 1986 amendment to the US Age Discrimination in Employment Act allowed postsecondary institutions to enforce mandatory retirement for faculty who reached the age of 70. However, that exemption was temporary and, after review, the US Congress allowed it to expire on January 1, 1994.) In the

[8] The issues are discussed in Gillin and Klassen (2000), Ontario Human Rights Commission (2000), and Canadian Human Rights Act Review Panel (2000, Chapter 18).

[9] Ontario Human Rights Commission (2001, Executive Summary)

[10] Of related interest, Denton and Spencer (1999, 2000) argue that with continuing reductions in rates of mortality and morbidity, and the associated strong increases in life expectancy, the marker for "old age" should increase also.

projection we assume that the retirement rates of Ontario faculty come to resemble the 1994-96 observed rates in postsecondary institutions in the US[11]. More specifically, it is assumed that there is a transition from the current Ontario retirement pattern to the US pattern that is complete by 2003-04. What difference would that make?

It is evident from Figure 7 that the attrition would be greatly reduced. By 2004-05, the middle of the projection period, there would be 14 percent more faculty with the US retirement pattern than with continued early retirement. By the end of the projection period there would be 32 percent more.

5. Projected Requirements for Faculty

In common with the projection of student enrolment, the projection of faculty requirements is based on some relatively simple assumptions. Full details are provided in the Appendix A, but the approach can be summarized as follows. Faculty requirements are assumed to be related to student enrolment, and to depend on the level of study and whether it is on a full- or part-time basis. The ratios used in the projections that start from 1998-99 are shown in the table below. The overall student-faculty ratio was 20.5 in that year. Among full-time students, the ratio was estimated to be highest for first-year students, somewhat lower for other full-time undergraduates and masters level

[11] The US age-specific exit rates are drawn from Ashenfelter and Card (2000, Figure 4). Ahenfelter and Card (2000, p. 30) concluded that the recent elimination of mandatory retirement in the US will lead to a significant rise in the fraction of older faculty: "We find that about 25 percent of 60-year-old faculty at public research universities will remain employed until age 70, compared with about 40 percent at private research universities and just under 25 percent at doctoral granting, comprehensive, and liberal arts institutions."

students, and lowest for doctoral students.

Assumed Ratios of Students per Full-Time Faculty Member, 1998-99

Undergraduate Studies, Full-Time	
- year 1	24.5
- years 2+	21.5
- other	21.5
Undergraduate Studies, Part-Time	
- degree studies	21.9
- other	21.9
Graduate Studies, Full-Time	
- Masters level	21.7
- PhD level	7.3
- other	12.8
Graduate Studies, Part-Time	
- Masters level	14.9
- PhD level	15.1
- other	14.7
Overall	20.5

Source: The ratios are based on unpublished numbers provided by Statistics Canada and OCUFA.

Faculty/student ratios are applied to enrolment, as projected, to derive faculty requirements. As shown in Figure 8, the projections are made under two sets of "standards". One refers to the latest available student-faculty ratios, namely 1998-99, while the other refers to the ratios of 1990-91, when faculty numbers were at their highest level in the decade. By showing calculations relating to these two standards, we are able to distinguish between the faculty requirements necessary to maintain more or less current student-faculty ratios and requirements that would be necessary to regain the standards (in terms of those ratios) that were in place before the major reduction in the size

of the faculty. To avoid clutter, Figure 8 shows faculty requirements from 1998-99 for only the "low" enrolment projection (i.e., constant enrolment ratio at the first-year level), and from 1991-92 based on both the "high" (i.e., increasing first-year enrolment ratio) and "low" enrolment projections.

Faculty requirements are generally trending upwards, in consequence of the projected increases in enrolment over the longer term, but it is evident from the figure that the double cohort will result in a very sharp temporary increase that is especially large for the four academic years 2003-04 and 2006-07. In order to maintain current standards, 2,000 more faculty would be needed by the end of the decade than in 1998-99. But a further 600 will be needed before that, in mid-decade, to accommodate the double cohort when its demands are greatest.

If instead the target were to return to the standards of 1990-91, then by 1998-99 the system was already short by 1,870 faculty, and the gap is projected to grow. By 2004-05, when the faculty requirements are greatest, the gap between the two "low" projections is about 2,400; "high" enrolment implies the needs for an additional 580 faculty in that year.

6. Projected Shortfall of Faculty: Implications for Recruitment

While Figure 8 indicates that faculty requirements will increase by at least 17 percent between 1998-99 and 2010-11 if the target is just to maintain current standards, Figure 7 indicates that the current complement of faculty will decrease by at least 36 percent over that same period. Those two figures alone suggest a very substantial shortfall, and the need for net recruitment

equivalent to more than 50 percent of the current faculty complement.

Table 1 provides further calculations relating to the two targets (maintain current standards; return to earlier standards), the two enrolment projections ("low"; "high"), and three assumptions about faculty retirement (early; only at age 65; US pattern). With the combination of current standards, low enrolment, and early retirement taken as the reference case, the implication is that (in round numbers) an additional 7,000 full-time faculty would be needed by mid-decade and 9,000 by the end of the decade. As compared to the current complement of less than 12,000, that represents an enormous recruitment challenge.

It is evident that possible changes in retirement practices would make a big difference. For example, with a transition to US patterns the need for faculty recruitment would be reduced by more than 1,100 at the middle of the decade and more than 1,500 at the end -- or by roughly one-sixth. That would be more than enough to offset the additional faculty needs associated with higher enrolment which, even by the end of the decade, would increase requirements by only one-eighth. With all retirement at age 65 recruitment needs would be reduced by even more -- by about 2,600. That would be more than enough to offset the additional recruitment (about 2,400) that would be necessary for a return to earlier standards (as shown in the lower panel of Table 1).

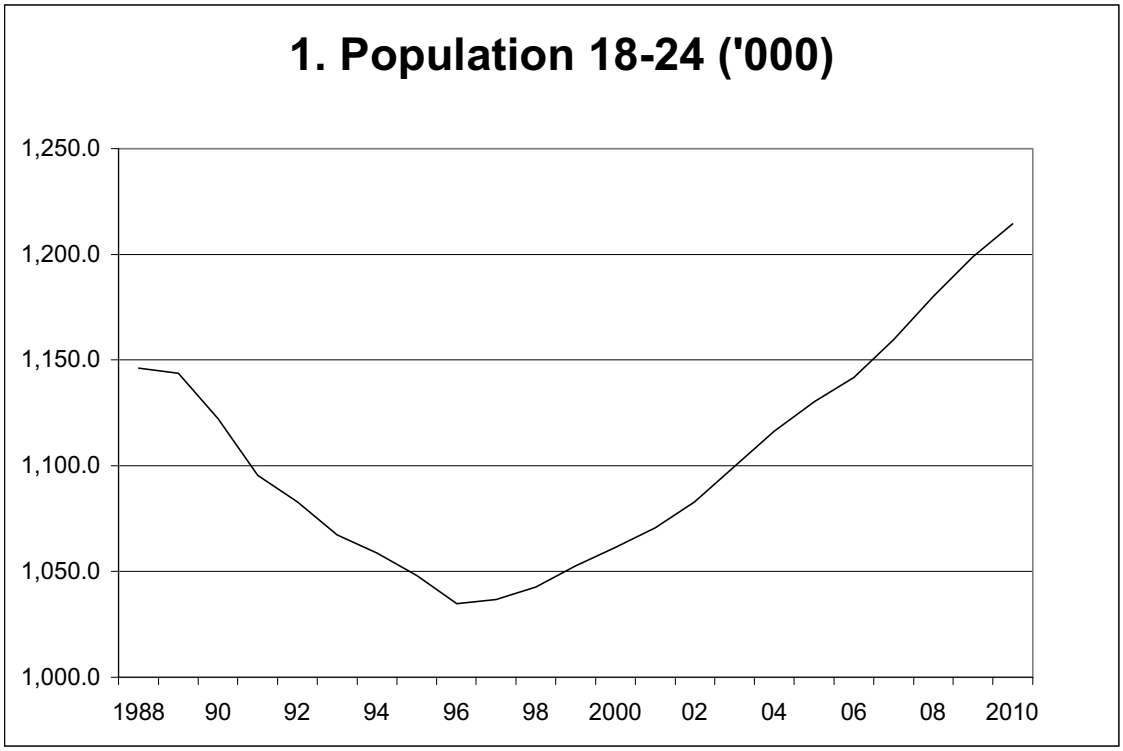
Could a successful recruitment effort in the next few years leave the universities with a surplus of faculty once the double cohort has entered the system? The calculations for all years are shown in Figure 9. They indicate that the answer is "no". All projections suggest that recruitment

needs will be much greater in the first part of the decade than in the last part, and that recruitment would approximately cease between 2004-05 and 2007-08 before resuming thereafter. However, no surplus is evident.

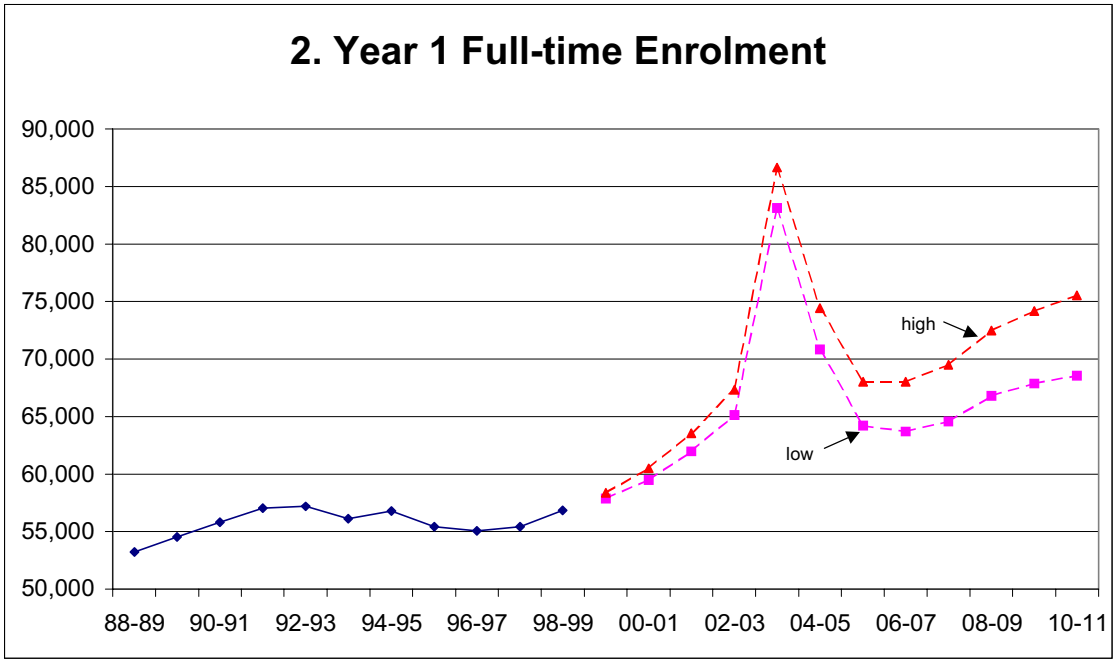
7. Conclusions

In summary, this analysis suggests that:

1. The effects of the double cohort on Ontario universities will peak in 2004/05, but will be felt both before and after that, and will dominate the middle five or six years of this decade;
2. The impact of the double cohort will coincide with large-scale retirement of faculty, since the current complement of faculty is heavily concentrated in the ages just before retirement;
3. The ability of the university system as a whole to cope with the increase in enrolment will be importantly affected by the rate at which faculty take early retirement – or opt to retire at age 65;
4. In any event, recruitment of new faculty in very large numbers – somewhere between 600 and 1,000 per year – will be essential if the university system at the end of this decade is to have standards even close to those now in place; and
5. Eliminating mandatory retirement could reduce the need for recruitment by about one-sixth if university faculty in Canada were to adopt retirement patterns similar to those found in the US.

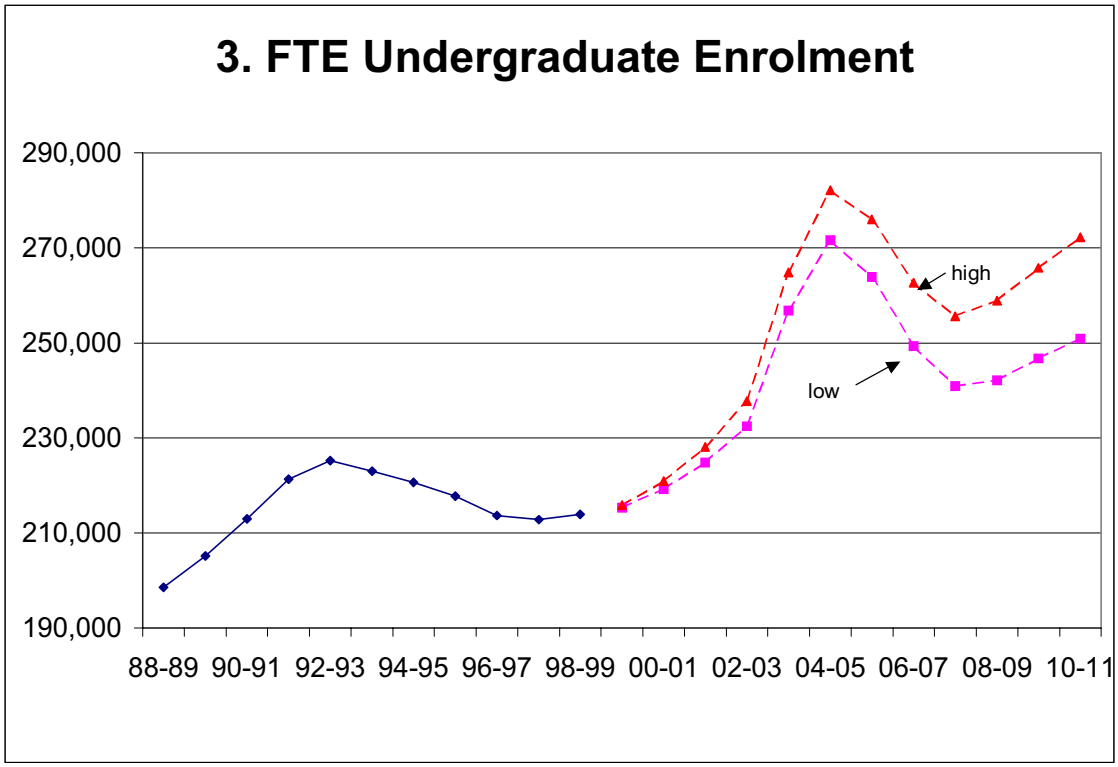


Source: Figures for 1988 to 1996 from Statistics Canada; figures for 1997 to 2010 from McMaster MEDS projection system (standard projection).

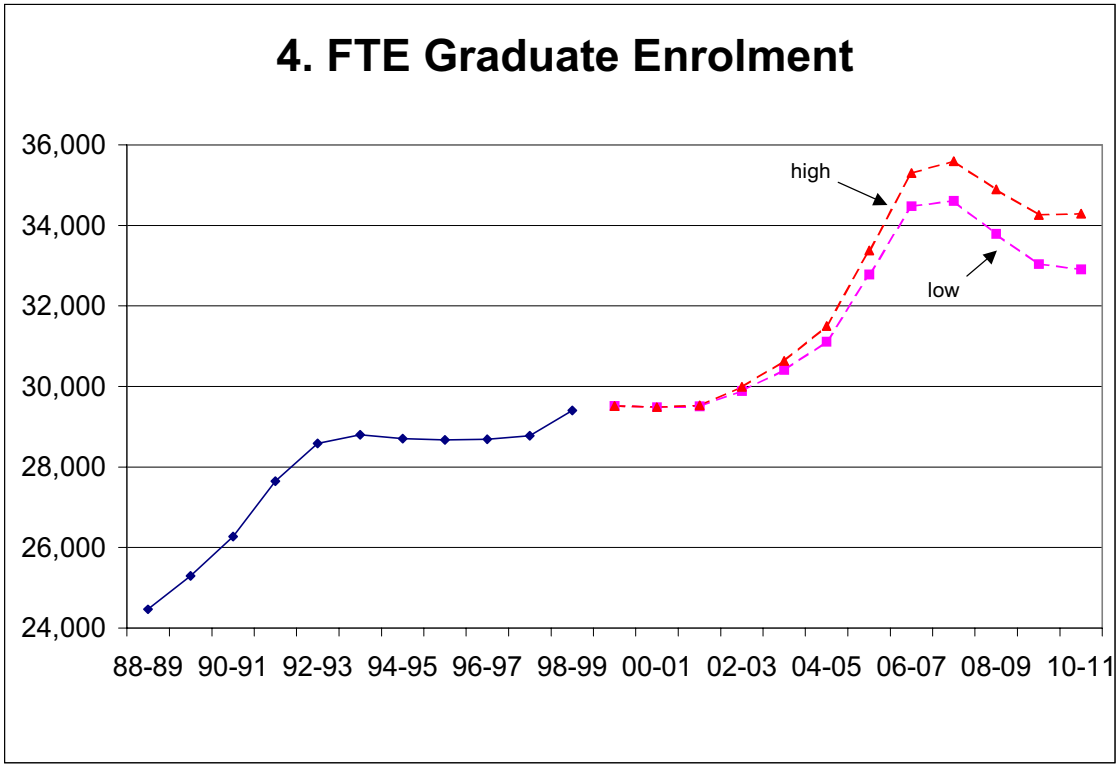


Source: Calculations for 1988-89 to 1998-99 based on special tabulations from Statistics Canada; projections based on model of enrolment.

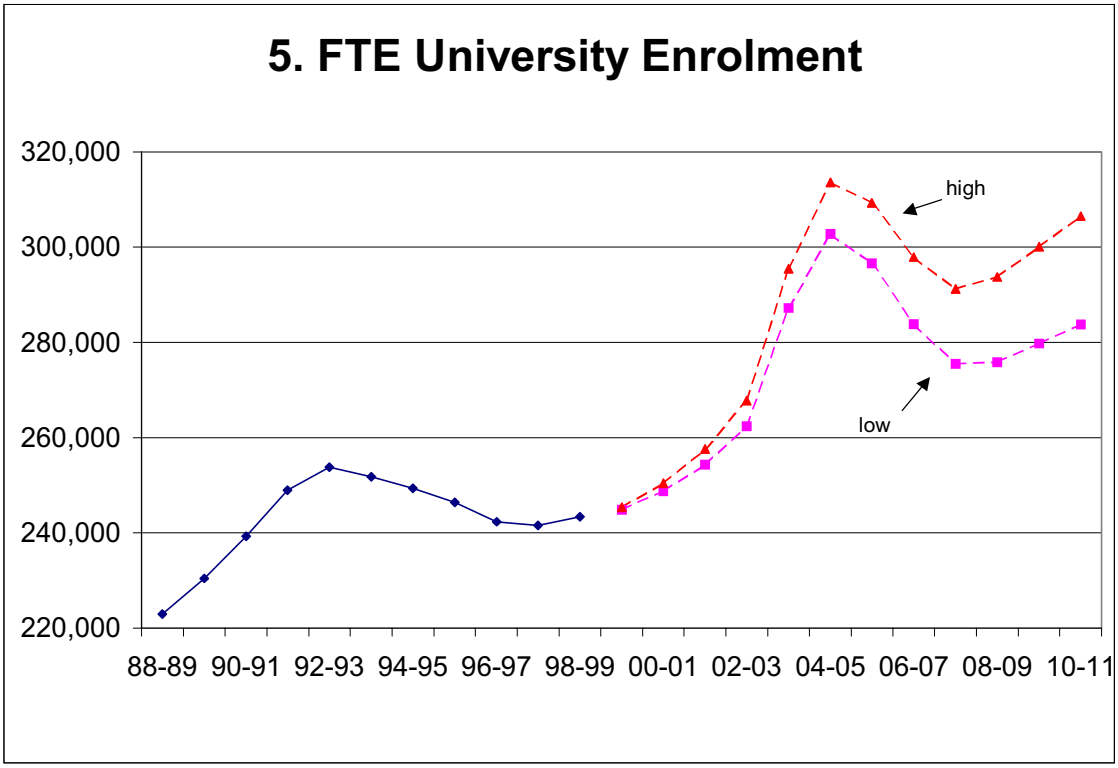
Note: The fraction of the population that enrols is centred on 19- (and then 18-) year-olds; the double cohort is phased in between 2000-01 and 2006-07. In the "low" projection that fraction is held constant; in the "high" projection, it increases by about one-tenth.



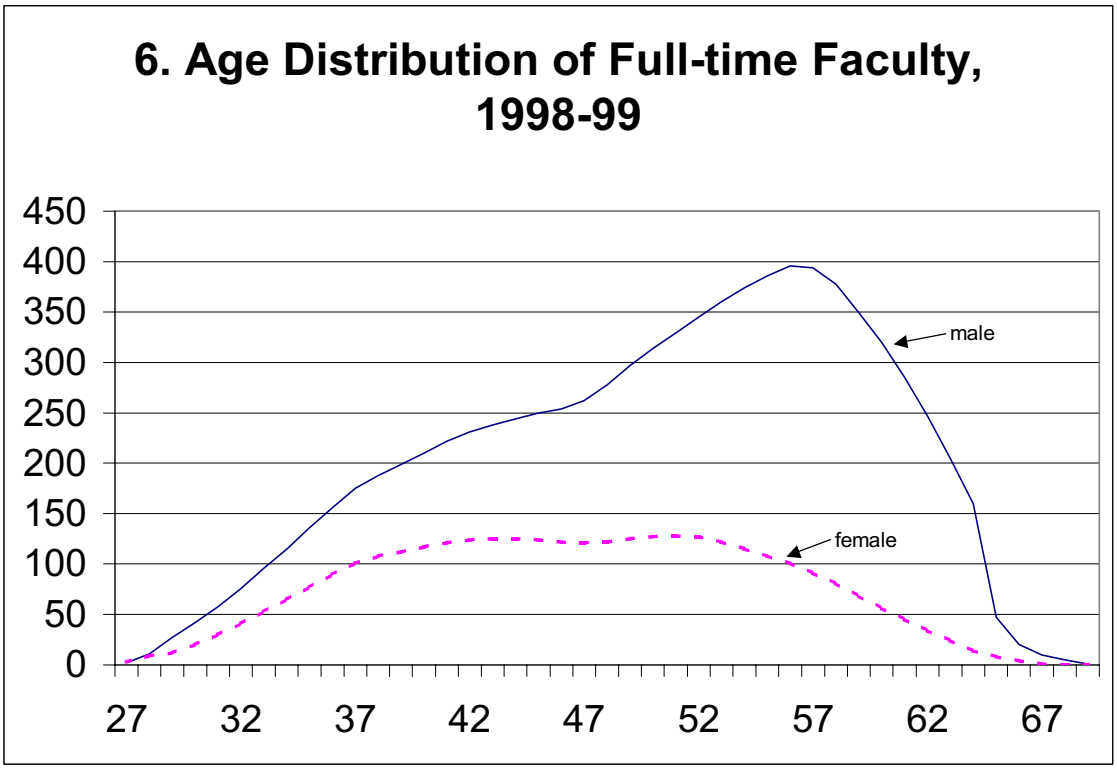
Source: See Figure 2.



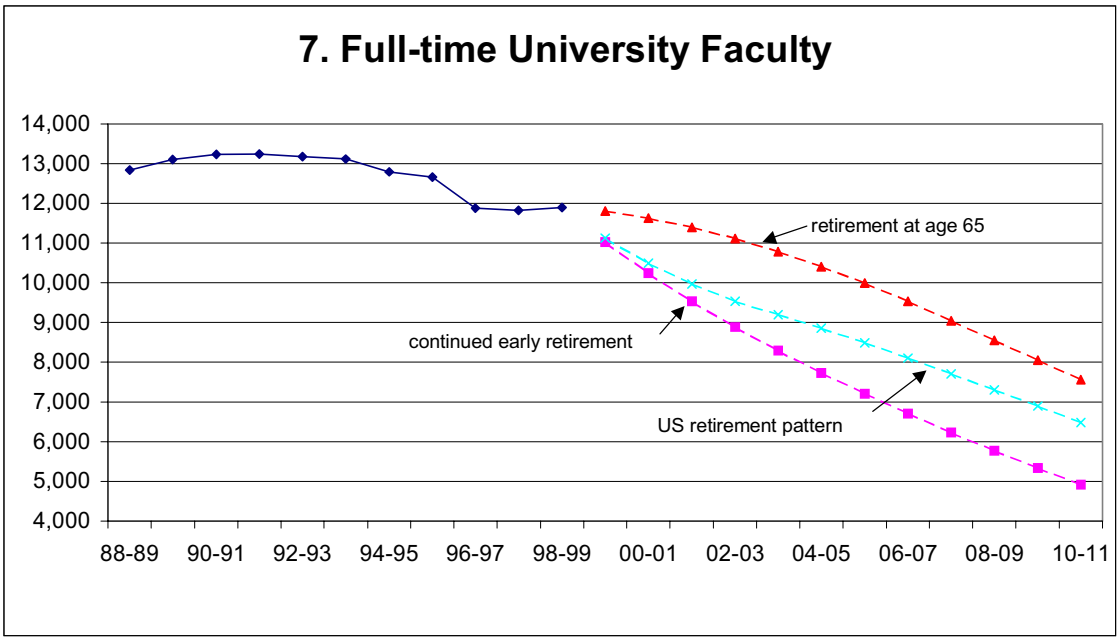
Source: See Figure 2.



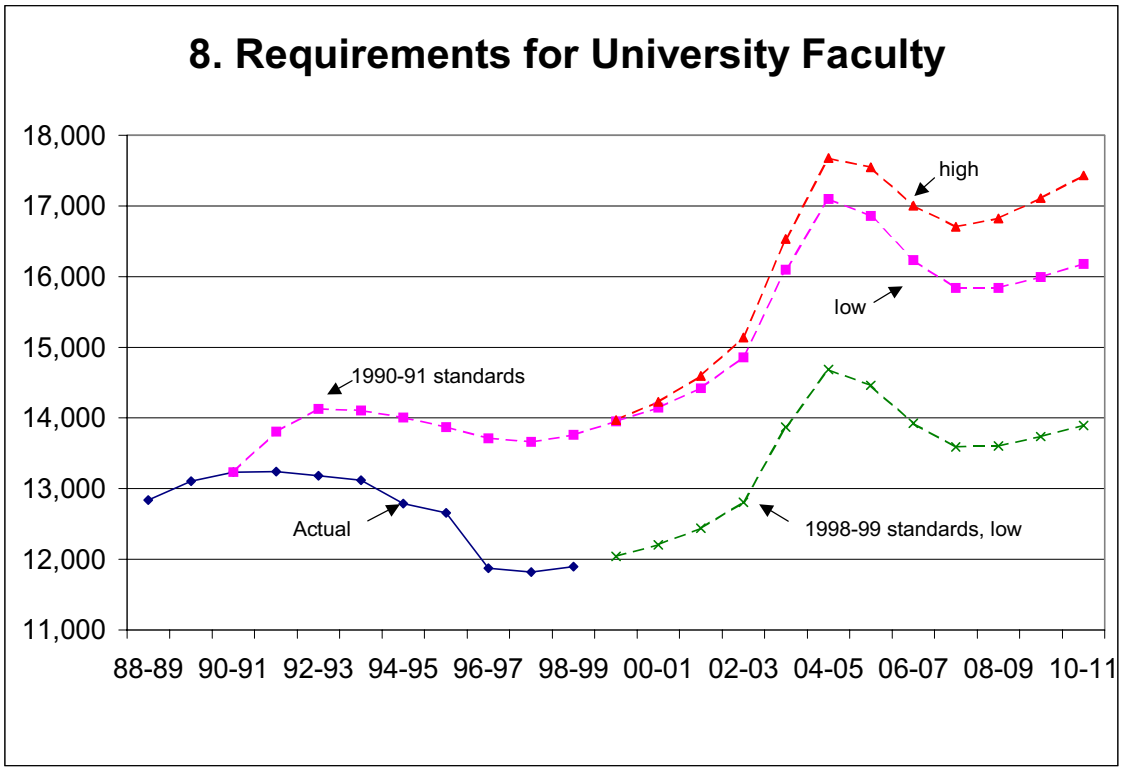
Source: See Figure 2.



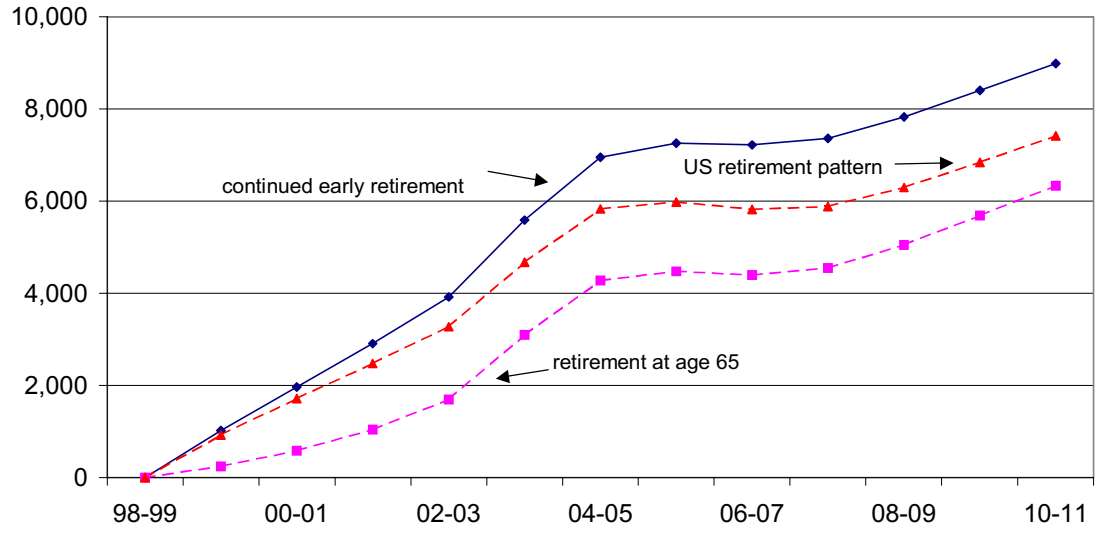
Source: Based on special tabulation from Statistics Canada.



Source: Figures for 1988 to 1998 based on special tabulation from Statistics Canada; figures for 1999 to 2010 based on a model of retirement. "Continued early retirement" assumes that age-specific retirement rates observed during the 1993-98 period apply thereafter; "retirement at age 65" assumes that no one retires before age 65; "US retirement pattern" assumes a phase-in of US retirement rates by 2003-04.



9. Shortfall of Full-time University Faculty, 1998-99 Standards and "Low" Student Enrolment



10. Shortfall of Full-time University Faculty, 1998-99 Standards and "High" Student Enrolment

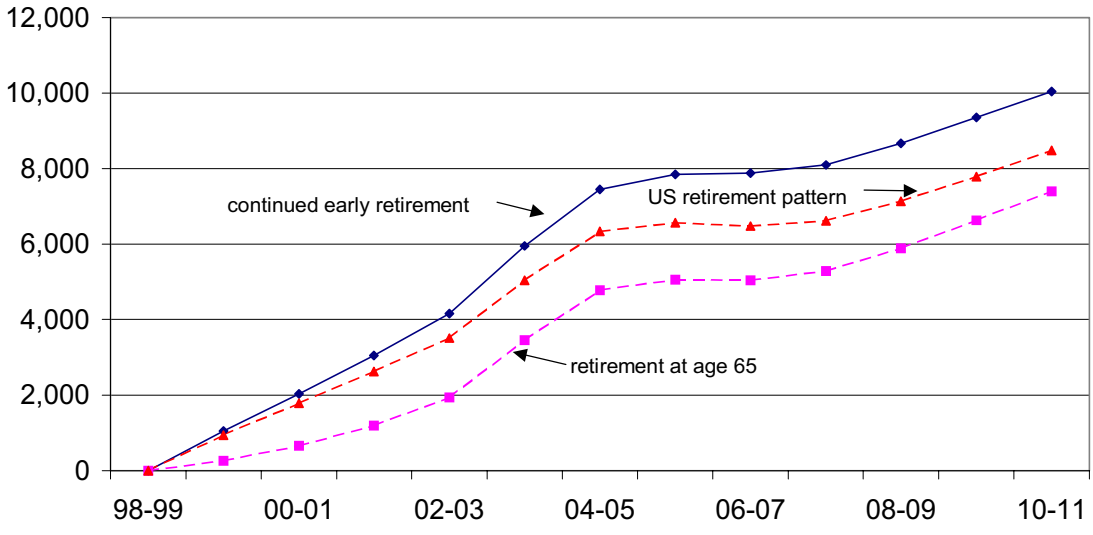


Table 1: Shortfall of Ontario Full-time University Faculty, 1990/91 to 2010/11

Enrolment	Retirement	Shortfall of Faculty		
		1998-99	2004-05	2010-11
	Target is to maintain 1998-99 standards			
"low"	Early retirement	--	6,952	8,982
	US retirement pattern		5,834	7,419
	Retirement only at age 65	--	4,278	6,328
"high"	Early retirement	--	7,448	10,043
	US retirement pattern		6,330	8,480
	Retirement only at age 65	--	4,775	7,389
	Target is to return to 1990-91 standards			
"low"	Early retirement	1,870	9,364	11,267
	US retirement pattern	1,870	8,246	9,704
	Retirement only at age 65	1,870	6,691	8,613
"high"	Early retirement	1,870	9,947	12,519
	US retirement pattern	1,870	8,829	10,956
	Retirement only at age 65	1,870	7,274	9,865

Appendix A: Description of the Projection Model of Student Enrolment and Faculty Aging

Student Enrolment:

Enrolment is modelled separately at the undergraduate and graduate levels, and for both full-time and part-time studies. In the case of full-time undergraduate studies, first year is distinguished from other years. A category "all other" (which includes diploma and certificate programs, non-university programs at universities, and other) is included for both full-time and part-time studies. At the graduate level, masters and doctoral studies are treated separately, as is a third category, "all other" (which includes certificate, diploma, and other programs). The enrolment counts include *all* enrolment in *all* Ontario universities. (In particular, the counts here include those enrolled in professional schools; schools of medicine and dentistry, among others, are often omitted in such counts. The institutions included are listed below.)

The projection system is as follows.

Undergraduate Level

First-year full-time enrolment is projected by the equation

(1) $UF1(t) = e(UF1,t)*[w(18,t)*N(18,t) + ... + w(21,t)*N(21,t)]$ $(t = 99/00, ..., 09/10)$

where: UF1 indicates full-time first-year enrolment

e indicates the enrolment ratio (the ratio of first-year enrolment to the population of 19-year-olds)

w is an age-specific weight (the assumed weights are shown in the text)

N is the age-specific population

t is the academic year (1999-2000, 2000-01, etc.)

Full-time enrolment in the second year and beyond (UF2) is related to first-year enrolment in the preceding three years. The estimated equation, with the year weights determined by a grid search using ordinary least squares over the data period 1988-89 to 1998-99, is

(2) $UF2(t) = 1.347 * (UF1(t-1) + 0.6*UF1(t-2) + 0.2*UF1(t-3))$ (t = 99/00, ..., 09/10)
(0.003)
R-bar squared = 0.702

Enrolment in "other" full-time undergraduate programs (UFO) was 5,437 in 1988-89, declined to 4,550 two years later and has fluctuated subsequently within a fairly narrow range. In the projections it is held constant at its latest (1998-99) level.

(3) $UFO(t) = 4,403$ (t = 99/00, ..., 09/10)

Part-time enrolment in standard degree programs (UP12) increased by almost 10,000 between 1988-89 and 1992-93 before decreasing fairly steadily by more than 20,000 to a level of just over 40,000 by 1998-99. In the projections the decline is assumed to continue until 2004/05 in equal annual

decrements, reaching 33,000 and then stabilizing.

(4) $UP12(t) = 40{,}386 - 7{,}386 * ((t-98/99)/6)$ $(t = 99/00, ..., 03/04)$

$UP12(t) = 33{,}000$ $(t = 04/05, ..., 09/10)$

Other part-time enrolment declined from 34,000 in 1988-89 to 20,000 a decade later. However, the decline has been much slower in the last two years. In the projection it is assumed to remain at its 1998-99 level.

(5) $UPO(t) = 20{,}074$ $(t = 99/00, ..., 09/10)$

Graduate Level

Full-time enrolment at the masters level (GFM) increased fairly steadily from less than 11,700 in 1988-89 to more than 15,300 a decade later. Regression analysis suggests that enrolment in programs at this level has been equal to 5.3 percent of full-time undergraduate enrolment beyond the first year in the previous two years. The projections draw on that ratio, but also allow for students coming from out of province and for continued growth beyond that experienced in undergraduate studies. Firm figures are hard to come by, but an educated guess suggests that about two-thirds of Ontario graduate students are drawn from undergraduate programs in Ontario universities[12]. In the

[12] I am grateful to John A. Scime, Graduate Registrar and Secretary of the School of Graduate Studies, McMaster University, for discussions on this matter.

projections a weight of two-thirds is assigned to undergraduate enrolment in the previous two years and a weight of one-third to other sources of enrolment, with an allowance for continued growth in the latter component of 1 percent per year.

(6) $GFM(t) = 0.053 * 2/3 * (UF2(t-1) + UF2(t-2)) + 1/3 * GFM(98/99) * 1.01^{t-98/99}$ (t = 99/00, ..., 09/10)
(0.0006)
R-bar squared = 0.663

Full-time enrolment at the PhD level is related to enrolment at the Masters level in the previous two years. The estimated relationship is shown in equation (7); the weights were the result of a grid search using ordinary least squares.

(7) $GFD(t) = 0.380 * (GFM(t-1) + 0.6\ GFM(t-2))$ (t = 99/00, ..., 09/10)
(0.005)
R-bar squared = 0.510

Full-time enrolment in other graduate programs (GFO) has changed little over the last decade. In the projections it is assumed to remain constant at its latest level.

(8) $GFO(t) = 3{,}554$ (t = 99/00, ..., 09/10)

Enrolment in part-time Masters programs increased slightly before 1990-91, but has declined fairly steadily since then, not only in absolute numbers but also relative to full-time enrolment at this level. In the projections a linear decline in that ratio is assumed to continue until 2001-02, and then to cease. Specifically,

(9) GPM(98/99) = 0.436 * GFM(98/99)

...

GPM(01/02) = 0.400 * GFM(01/02)

GPM(t) = 0.400 * GFM(t) (t = 02/03, ..., 09/10)

Enrolment in part-time PhD programs has also declined, both in absolute numbers and relative to full-time programs. In the projections the relative decline is assumed to continue until 2004-05, and then to cease.

(10) GPD(t) = 0.0764 - 0.0164 * ((t-98/99)/6) * GFD(t) (t = 99/00, ..., 03/04)

GPD(t) = 0.0600 * GFD(t) (t = 04/05, ..., 09/10)

All other enrolment in graduate studies (GPO) is related to full-time Masters enrolment with the proportion held constant at its 1998-99 level.

(11) GPO(t) = 0.048 * GFM(t) (t = 99/00, ..., 09/10)

Faculty Demand

The demand for faculty (or "faculty requirements") at the aggregate level is related to student enrolment by equation (12).

(12) $FD(t) = SUM(i)\ (\ w(i) * E(i,t)\ )$ $(t = 99/00, ..., 09/10)$

where FD indicates faculty demand

w indicates an enrolment-group-specific weight

i indicates the enrolment group (UF1, UF2, etc.)

E indicates enrolment level

The weights, w(i), are the ratio of full-time faculty associated with the i^{th} enrolment group, F(i), to enrolment at that level, E(i). That ratio is not directly observable, but it can be re-written as

(13) $w(i) = F(i)/E(i) = (F/E(i)) * (F(i)/F)$ $(t = 99/00, ..., 09/10)$

The first part, F/E(i), is the ratio of all full-time faculty to enrolment in the i^{th} group, and is directly observable from the data. The second part, F(i)/F, is the fraction of faculty teaching resources devoted to the i^{th} enrolment group. That portion is not directly observable, but can be approximated by the fraction of total faculty teaching time allocated to each group, and that is what is done. More specifically, OCUFA provided estimates of how faculty teaching time is allocated across the various groups, and those estimates were adjusted slightly to reflect the groups identified in the projections shown here. The allocations are shown below; some of the implied student-faculty ratios are reported in the text.

Enrolment Group	OCUFA-specified Fraction of Faculty Instructional Time (base period)	Adjusted Allocation
UF1	0.1954	0.1954
UF2	0.5473	0.5301
UFO		0.0172
UP12	0.0663	0.0443
UP0		0.0220
GFM	0.0685	0.0595
GFD	0.1095	0.0951
GFO		0.0234
GPM		0.0108
GPD	0.0130	0.0010
GPO		0.0012
Total	1.0000	1.0000

Projection of Continuing Supply

Statistics Canada provided unpublished counts of the number of full-time faculty in Ontario by age group (under 30, 30-34, 35-39, ..., 60-64, and 65 and older), separately for each sex, for 1988-89, 1993-94, and 1998-99. The faculty counts relate to the same set of institutions as do the student enrolment counts.

Estimates of faculty numbers by single years of age, separately for each sex, were derived by the application of Sprague multipliers to the grouped data. The resulting numbers for the latest year are displayed in Figure 6.

Retention ratios were derived for those age 50 and older by taking the ratio of those age *x+5* in 1998-99 to those five years younger (age *x*) five years earlier, and expressed on an annualized basis. In this age range the ratio would show the proportion surviving (and in full-time employment) at each age. (Some would have retired and others would have died. Such ratios could exceed 1.0 if gains through recruitment exceeded losses through attrition. However, there was very little hiring in this age group in that period, and the few ratios that exceeded 1.0 were set to 1.0.)

Equation (14) is then used to project the count of continuing full-time faculty, FS, at each age.

(14) $FS(a+1,t+1) = FS(a,t) * r(a+1)$ $(a = 50, ..., 68; t = 99/00, ..., 09/10)$

where r is the annual retention rate

In the case of "retirement at age 65", as shown in Figure 7, the retention ratio is set to 1.0 at ages below 65.

Appendix B: Institutions Included in the Enrolment and Full-time Faculty Counts

Algoma College

Atkinson College

Brock University

Carleton University

University of Guelph

Collège de Hearst

Glendon College

Huron College

King's College

Lakehead University

Laurentian University

McMaster University

Nipissing University

University of Ottawa

Queen's University

Ryerson Polytechnic University

University of Toronto

Trent University

University of Waterloo

The University of Western Ontario

Wilfrid Laurier University

The University of Windsor

York University

Appendix C: Historical and Projected Enrolment and Full-time Faculty Numbers

Table C1: Undergraduate and Graduate Enrolment, Ontario University System, 1988-89 to 2010-11, Alternative Projections

Year	Undergraduate Programs					Graduate Programs					
	Full-time			Part-time		Full-time			Part-time		
	Year 1	Years 2+	Other	Degree	Other	Masters	PhD	Other	Masters	PhD	Other
1988-89	53,231	115,302	5,437	51,840	34,006	11,666	6,312	3,621	7,929	971	1,123
1989-90	54,539	121,115	4,806	53,866	32,621	11,923	6,711	3,645	8,138	968	1,449
1990-91	55,839	127,157	4,550	55,922	33,154	12,267	7,258	3,639	8,242	1,075	1,554
1991-92	57,037	133,226	4,608	59,227	33,304	13,183	7,761	3,642	8,195	1,081	1,456
1992-93	57,200	137,076	4,622	61,009	31,136	13,787	8,169	3,671	7,935	1,006	1,385
1993-94	56,127	138,038	4,865	55,302	28,579	13,951	8,418	3,610	7,695	942	1,215
1994-95	56,781	136,723	4,456	52,718	26,750	14,024	8,501	3,578	7,174	993	938
1995-96	55,444	135,976	4,339	49,646	27,362	13,986	8,540	3,602	7,125	893	882
1996-97	55,059	135,301	4,236	44,487	22,209	14,107	8,475	3,737	6,757	766	756
1997-98	55,435	134,957	4,304	42,962	20,408	14,589	8,262	3,618	6,632	677	756
1998-99	56,838	135,409	4,403	40,386	20,074	15,336	8,219	3,554	6,680	628	735
Low Projection											
1999-00	57,880	136,156	4,403	39,155	20,074	14,649	9,166	3,554	6,152	678	702
2000-01	59,489	138,793	4,403	37,924	20,074	14,742	9,075	3,554	6,044	653	707
2001-02	61,975	142,180	4,403	36,693	20,074	14,913	8,954	3,554	5,965	618	715
2002-03	65,126	147,108	4,403	35,462	20,074	15,177	9,040	3,554	6,071	597	727
2003-04	83,121	153,794	4,403	34,231	20,074	15,522	9,179	3,554	6,209	578	744
2004-05	70,843	181,241	4,403	33,000	20,074	15,983	9,371	3,554	6,393	562	766
2005-06	64,212	180,096	4,403	33,000	20,074	17,235	9,625	3,554	6,894	578	826
2006-07	63,697	166,093	4,403	33,000	20,074	18,213	10,207	3,554	7,285	612	873
2007-08	64,576	156,735	4,403	33,000	20,074	17,737	10,864	3,554	7,095	652	850
2008-09	66,814	155,717	4,403	33,000	20,074	16,973	10,906	3,554	6,789	654	813
2009-10	67,861	159,301	4,403	33,000	20,074	16,665	10,507	3,554	6,666	630	799
2010-11	68,566	162,756	4,403	33,000	20,074	16,812	10,216	3,554	6,725	613	806

Table C1: concluded

Year	Undergraduate Programs					Graduate Programs					
	Full-time			Part-time		Full-time			Part-time		
	Year 1	Years 2+	Other	Degree	Other	Masters	PhD	Other	Masters	PhD	Other
High Projection											
1999-00	58,369	136,156	4,403	39,155	20,074	14,649	9,166	3,554	6,152	678	702
2000-01	60,497	139,453	4,403	37,924	20,074	14,742	9,075	3,554	6,044	653	707
2001-02	63,549	143,932	4,403	36,693	20,074	14,936	8,954	3,554	5,975	618	716
2002-03	67,331	150,174	4,403	35,462	20,074	15,262	9,049	3,554	6,105	597	731
2003-04	86,639	158,306	4,403	34,231	20,074	15,691	9,217	3,554	6,276	581	752
2004-05	74,442	188,185	4,403	33,000	20,074	16,249	9,455	3,554	6,500	567	779
2005-06	68,017	188,378	4,403	33,000	20,074	17,637	9,765	3,554	7,055	586	845
2006-07	68,011	175,071	4,403	33,000	20,074	18,747	10,420	3,554	7,499	625	898
2007-08	69,496	166,587	4,403	33,000	20,074	18,342	11,159	3,554	7,337	670	879
2008-09	72,470	166,852	4,403	33,000	20,074	17,634	11,259	3,554	7,053	676	845
2009-10	74,180	172,054	4,403	33,000	20,074	17,402	10,897	3,554	6,961	654	834
2010-11	75,531	177,160	4,403	33,000	20,074	17,651	10,647	3,554	7,060	639	846

Note 1: See Appendix B for institutions covered.
Note 2: The "low" and "high" projections are described in the text.
Source: Figures for 1988-89 to 1998-99 are from Statistics Canada, CTCES (Culture, Tourism,and the Centre for Education Statistics); projections by the author.
Definitions: Undergraduate programs--"other" refers to diploma and certificate, non-university programs at university and other.
Graduate programs--"other" refers to certificate, diploma and other.

Table C2: Full-time Equivalent Undergraduate and Graduate Enrolment, Ontario University System, 1988-89 to 2010-11, Alternative Projections

Year	Undergraduate Programs					Graduate Programs					
	Full-time			Part-time		Full-time			Part-time		
	Year 1	Years 2+	Other	Degree	Other	Masters	PhD	Other	Masters	PhD	Other
1988-89	53,231	115,302	5,437	14,811	9,716	11,666	6,312	3,621	2,265	277	321
1989-90	54,539	121,115	4,806	15,390	9,320	11,923	6,711	3,645	2,325	277	414
1990-91	55,839	127,157	4,550	15,978	9,473	12,267	7,258	3,639	2,355	307	444
1991-92	57,037	133,226	4,608	16,922	9,515	13,183	7,761	3,642	2,341	309	416
1992-93	57,200	137,076	4,622	17,431	8,896	13,787	8,169	3,671	2,267	287	396
1993-94	56,127	138,038	4,865	15,801	8,165	13,951	8,418	3,610	2,199	269	347
1994-95	56,781	136,723	4,456	15,062	7,643	14,024	8,501	3,578	2,050	284	268
1995-96	55,444	135,976	4,339	14,185	7,818	13,986	8,540	3,602	2,036	255	252
1996-97	55,059	135,301	4,236	12,711	6,345	14,107	8,475	3,737	1,931	219	216
1997-98	55,435	134,957	4,304	12,275	5,831	14,589	8,262	3,618	1,895	193	216
1998-99	56,838	135,409	4,403	11,539	5,735	15,336	8,219	3,554	1,909	179	210
Low Projection											
1999-00	57,880	136,156	4,403	11,187	5,735	14,649	9,166	3,554	1,758	194	201
2000-01	59,489	138,793	4,403	10,835	5,735	14,742	9,075	3,554	1,727	187	202
2001-02	61,975	142,180	4,403	10,484	5,735	14,913	8,954	3,554	1,704	177	204
2002-03	65,126	147,108	4,403	10,132	5,735	15,177	9,040	3,554	1,735	170	208
2003-04	83,121	153,794	4,403	9,780	5,735	15,522	9,179	3,554	1,774	165	213
2004-05	70,843	181,241	4,403	9,429	5,735	15,983	9,371	3,554	1,827	161	219
2005-06	64,212	180,096	4,403	9,429	5,735	17,235	9,625	3,554	1,970	165	236
2006-07	63,697	166,093	4,403	9,429	5,735	18,213	10,207	3,554	2,081	175	249
2007-08	64,576	156,735	4,403	9,429	5,735	17,737	10,864	3,554	2,027	186	243
2008-09	66,814	155,717	4,403	9,429	5,735	16,973	10,906	3,554	1,940	187	232
2009-10	67,861	159,301	4,403	9,429	5,735	16,665	10,507	3,554	1,905	180	228
2010-11	68,566	162,756	4,403	9,429	5,735	16,812	10,216	3,554	1,921	175	230

Table C2: concluded

Year	Undergraduate Programs					Graduate Programs					
	Full-time			Part-time		Full-time			Part-time		
	Year 1	Years 2+	Other	Degree	Other	Masters	PhD	Other	Masters	PhD	Other
High Projection											
1999-00	58,369	136,156	4,403	11,187	5,735	14,649	9,166	3,554	1,758	194	201
2000-01	60,497	139,453	4,403	10,835	5,735	14,742	9,075	3,554	1,727	187	202
2001-02	63,549	143,932	4,403	10,484	5,735	14,936	8,954	3,554	1,707	177	205
2002-03	67,331	150,174	4,403	10,132	5,735	15,262	9,049	3,554	1,744	171	209
2003-04	86,639	158,306	4,403	9,780	5,735	15,691	9,217	3,554	1,793	166	215
2004-05	74,442	188,185	4,403	9,429	5,735	16,249	9,455	3,554	1,857	162	223
2005-06	68,017	188,378	4,403	9,429	5,735	17,637	9,765	3,554	2,016	167	242
2006-07	68,011	175,071	4,403	9,429	5,735	18,747	10,420	3,554	2,143	179	257
2007-08	69,496	166,587	4,403	9,429	5,735	18,342	11,159	3,554	2,096	191	251
2008-09	72,470	166,852	4,403	9,429	5,735	17,634	11,259	3,554	2,015	193	241
2009-10	74,180	172,054	4,403	9,429	5,735	17,402	10,897	3,554	1,989	187	238
2010-11	75,531	177,160	4,403	9,429	5,735	17,651	10,647	3,554	2,017	183	242

Note: See notes to Table 1. The conversion to full-time equivalence is based on the following ratio: 3.5 part-time students are equivalent to one full-time student.

Table C3: Full-time Faculty in the Ontario University System, 1998-99 and Alternative Projections of Continuing Faculty

Year	Age-- <30	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+	total
Male Faculty										
1998-99	40	387	854	1,145	1,341	1,722	1,903	1,217	83	8,692
				Continuing faculty if all retirement at age 65						
1999-00	13	299	770	1,100	1,288	1,645	1,928	1,406	160	8,609
2000-01	2	214	678	1,050	1,248	1,563	1,910	1,579	205	8,449
2001-02	0	140	579	994	1,217	1,480	1,861	1,726	247	8,244
2002-03	0	82	481	928	1,185	1,405	1,794	1,837	285	7,997
2003-04	0	40	387	854	1,145	1,341	1,722	1,903	320	7,712
2004-05	0	13	299	770	1,100	1,288	1,645	1,928	349	7,392
2005-06	0	2	214	678	1,050	1,248	1,563	1,910	378	7,043
2006-07	0	0	140	579	994	1,217	1,480	1,861	394	6,665
2007-08	0	0	82	481	928	1,185	1,405	1,794	396	6,271
2008-09	0	0	40	387	854	1,145	1,341	1,722	386	5,875
2009-10	0	0	13	299	770	1,100	1,288	1,645	374	5,489
2010-11	0	0	2	214	678	1,050	1,248	1,563	360	5,115
				Continuing faculty with sustained early retirement						
1999-00	13	299	770	1,099	1,281	1,609	1,788	945	126	7,930
2000-01	2	214	678	1,048	1,236	1,500	1,663	805	118	7,264
2001-02	0	140	579	992	1,201	1,400	1,539	728	95	6,675
2002-03	0	82	481	926	1,167	1,315	1,428	675	70	6,144
2003-04	0	40	387	852	1,126	1,247	1,335	625	49	5,662
2004-05	0	13	299	768	1,081	1,192	1,247	582	41	5,224
2005-06	0	2	214	676	1,031	1,151	1,163	542	38	4,817
2006-07	0	0	140	578	976	1,119	1,085	505	36	4,438
2007-08	0	0	82	480	911	1,087	1,020	470	33	4,083
2008-09	0	0	40	386	838	1,048	969	438	31	3,750
2009-10	0	0	13	298	755	1,006	928	409	28	3,438
2010-11	0	0	2	213	665	959	897	382	27	3,144

Table C3: concluded

Year	Age-- <30	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+	total
Female Faculty										
1998-99	24	209	488	612	614	619	449	173	13	3,201
				Continuing faculty if all retirement at age 65						
1999-00	12	156	441	599	614	629	496	227	14	3,188
2000-01	3	112	386	582	617	629	537	284	24	3,174
2001-02	0	74	326	559	620	623	573	341	34	3,150
2002-03	0	44	266	528	619	617	600	397	45	3,116
2003-04	0	24	209	488	612	614	619	449	56	3,071
2004-05	0	12	156	441	599	614	629	496	68	3,015
2005-06	0	3	112	386	582	617	629	537	81	2,947
2006-07	0	0	74	326	559	620	623	573	91	2,866
2007-08	0	0	44	266	528	619	617	600	101	2,775
2008-09	0	0	24	209	488	612	614	619	108	2,674
2009-10	0	0	12	156	441	599	614	629	115	2,566
2010-11	0	0	3	112	386	582	617	629	122	2,451
				Continuing faculty with sustained early retirement						
1999-00	12	156	441	599	614	622	466	161	15	3,087
2000-01	3	112	386	582	617	617	481	160	17	2,975
2001-02	0	74	326	559	620	608	495	163	17	2,861
2002-03	0	44	266	528	619	601	505	168	15	2,746
2003-04	0	24	209	488	612	598	513	172	13	2,628
2004-05	0	12	156	441	599	598	514	177	12	2,510
2005-06	0	3	112	386	582	601	510	184	12	2,389
2006-07	0	0	74	326	559	604	502	190	12	2,267
2007-08	0	0	44	266	528	603	496	193	13	2,143
2008-09	0	0	24	209	488	596	495	193	13	2,017
2009-10	0	0	12	156	441	583	495	192	14	1,892
2010-11	0	0	3	112	386	566	498	188	14	1,767

Source: Figures for 1998-99 from Statistics Canada, CTCES; projections by the author.
Note 1: The series relate to all Ontario universities; see Note 1 to Table 1.
Note 2: The alternative projections are described in the text.

Table C4: Ontario Population Ages 18-24: Historical and Projected

	(thousands)
1988	1,146
1989	1,144
1990	1,122
1991	1,095
1992	1,083
1993	1,067
1994	1,059
1995	1,048
1996	1,035
1997	1,037
1998	1,043
1999	1,053
2000	1,061
2001	1,071
2002	1,083
2003	1,100
2004	1,116
2005	1,130
2006	1,142
2007	1,160
2008	1,180
2009	1,199
2010	1,214

Source: Figures for 1988 to 1996 are from Statistics Canada; figures for 1997 to 2010 are from McMaster MEDS projection system (standard projection).

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