

THE GENDER PROFILE OF THE SOUTH AFRICAN ACTUARIAL PROFESSION

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ABSTRACT

The aim of this paper is to contextualise the gender status of the South African actuarial profession, both historically and relative to elsewhere in the world, as well as to establish the current level of representation of women in the profession. The authors have investigated the extent to which women are represented in different age groups and at various stages of the qualification process. They find that 85% of Fellow members of the Actuarial Society in 2010 are male but that women represent at least 30% of student members and younger cohorts. Given that people enter the profession primarily from undergraduate degrees in actuarial science, the authors have analysed the relative performance of female students enrolling for an Actuarial Science degree at the University of Cape Town. They find that the proportion of entrants who are female has increased over time but that persistency rates for female students are lower than for male students. They identify the need for further research to establish the underlying reasons for the gender differentials in entrants to university programmes and persistency, and conclude that universities, actuarial employers and the profession have a role to play in improving the perception of the profession and the experiences of women in the classroom and workplace.

KEYWORDS

Actuarial science; exemption rates; gender diversity; persistency

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1. INTRODUCTION

1.1 The actuarial profession in South Africa is relatively small with 910 Fellow members and 1305 Student members.¹ The South African profession is male dominated as evidenced by the fact that in 2010 only 15% of Fellow members were female. The Australian actuarial profession, similarly reported a 17% female membership in 2002,² and the comparable figure for the UK profession in 2006 was 19%.³ By comparison 37% of all managers and professionals in South Africa are female.⁴ However, it should be noted that ‘professionals’ includes nurses and teachers, both of which typically are characterised as female professions typically.

1.2 Women have had a relatively short history in the South African actuarial profession. The first woman to qualify as an actuary in South Africa was Mrs Pat Potgieter (née Wood) in 1955.⁵ At the same time women made up 1% of the UK profession (Bellis, 1996). The Society of Actuaries in North America admitted its first female member in 1894, whilst the first Fellow of the Institute of Actuaries qualified in 1923.⁶ The first black African South African woman, Ms Ndivhuwo Ravele, qualified as an actuary in 2005.⁷

1.3 The aim of this research was to provide a starting point for research efforts to improve the gender diversity of the South African actuarial profession. The authors set out to establish the current level of participation of women in the actuarial profession and to contextualise the gender diversity status of the profession. The main objectives were to contextualise the gender status of the South African actuarial profession, both historically and relative to elsewhere in the world; to identify factors affecting women entering the profession; to examine the relative performance of female students during the university years; and to analyse the proportion of persons entering the profession who are female.

1.4 Both Slattery (unpublished) and Naidoo (unpublished) have commented on the need for the actuarial profession to become more diverse, and to become more representative of South African society. It is clear that the representation of women in the profession has increased over time. However, at the more senior levels of the profession

1 Actuarial Society of South Africa database. Actuarial Society of South Africa, Cape Town, 2010

2 M Howes. Editorial. *Actuary Australia*, 73 (September 2002), 2

3 M de Valois. Actuarielle. *The Actuary*, September 2007

4 Statistics South Africa. Quarterly Labour Force Survey Quarter 2 2011. Statistics South Africa, Pretoria, 2011

5 W Els. Women of the Actuarial Society. Poster, Actuarial Society of South Africa, Cape Town, 2009

6 De Valois, supra

7 Els, supra

and in the structures of the profession, this representation is still poor. It is therefore important for the profession to consider possible actions that can be employed to counter the prevailing bias.

1.5 Actuarial employers face the demands of employment-equity legislation as well as specific targets for the participation of black women in the financial services industry as set out by the Financial Sector Charter,⁸ which defines ‘black people’ as “all Africans, Coloureds and Indians who are South African citizens” on page 2. There is a global trend towards quotas for women’s representation on boards of directors⁹ and increasing evidence that gender diversity has a positive impact on corporate performance (Desvaux et al., 2010).

1.6 The UK profession appointed its first female president, Jane Curtis, in June 2011.¹⁰ In that respect the South African profession has been slightly ahead in that the first woman President of the Actuarial Society, Ms Janina Slawski, held office from 2003 to 2005.

1.7 The public profile and structures of the South African actuarial profession reflect the male-dominated nature of the profession. Only two of the 13 Actuarial Society Council members in 2011 were women. There are four operational boards that report to Council and the chair of each of these boards is male. Since its inception in 1972,¹¹ the Murray Medal, the profession’s most prestigious award, has only ever had male recipients.

1.8 In order to ascertain the extent to which women are represented in the actuarial profession, the authors examined the number of women enrolled to study towards a qualification in actuarial science, the relative performance of male and female students at university and in the professional examinations, and the persistency of female students through the qualification process.

1.9 The scope of the research did not extend to an explanation of the underlying reasons for differentials in attraction, retention and performance but it aimed to stimulate thinking and to provide a snapshot of the current situation and thereby a base for further research. The authors had detailed data from only one university actuarial programme, which is a limitation of the research.

8 Financial Sector Charter, 2004. www.fscharter.co.za, 14/06/2013

9 SA Hewlett. Women on Boards: America Is Falling Behind. Harvard Business Review blog, 2011. http://blogs.hbr.org/hbr/hewlett/2011/05/women_on_boards_america.html, 14/06/2013

10 M Scanlan. Jane Curtis becomes President of the Institute and Faculty of Actuaries. Institute and Faculty of Actuaries press release, 2011. www.actuaries.org.uk/news/press-releases/articles/jane-curtis-becomes-president-institute-and-faculty-actuaries, 14/06/2013

11 Actuarial Society of South Africa. List held by the Actuarial Society of South Africa

1.10 The paper begins, in section 2, by analysing the gender profile of new entrants to the actuarial-science programme at the University of Cape Town (UCT). In section 3 it examines the relative performance of female students in actuarial science at UCT using the rates of persistency and the numbers of exemptions obtained from professional examinations as measures of academic success. In section 4 the relative performance of male and female students in the professional examinations is discussed and the profile of the profession is analysed by age and category of membership. In section 5, opportunities for further research are discussed.

2. ATTRACTING WOMEN INTO THE ACTUARIAL PROFESSION

2.1 FACTORS AFFECTING THE ENTRANCE OF WOMEN INTO THE PROFESSION

2.1.1 The typical route to qualification as an actuary in South Africa involves a first degree in actuarial science (Naidoo, *op. cit.*). Most universities in South Africa offering actuarial programmes are accredited by the Actuarial Society of South Africa to provide exemptions from some of the professional examinations. We can therefore approximate the gender diversity of entrants into the profession by analysing the profile of entrants into university actuarial programmes.

2.1.2 The entrance requirements into actuarial programmes are high.¹² Requirements vary between universities and from year to year, but usually require excellent mathematics scores and high overall performance. Actuarial programmes typically attract the top 5% of school leavers (Bellis, *op. cit.*; Slattery, *op. cit.*).

2.1.3 The gender diversity of entrants into actuarial science will thus depend on gender differences in high school performance and particularly mathematics performance, as well as the usual factors affecting career choice: genuine interest based on intrinsic factors such as intellectual interest, availability of jobs, opportunities for career advancement, earning potential, and the influence of socialisers such as teachers and parents (Dick & Rallis, 1991; Jawitz et al., 2000).

2.1.4 A study of the career choices of young South African women who are high achievers in school mathematics and physical science (Jawitz et al., *op. cit.*) found that parents play a key role in influencing choice. The default choice for women in this group was found to be medicine. At the time the intake into the MBChB at UCT was 65% female. The strengths of the school attended, such as strength in science, also played a role, as did work-shadow experiences and perceived job opportunities.

2.1.5 Martineau (1997) draws attention to the fact that female students tend to receive more moral and financial assistance when they pursue careers that are traditionally female-dominated, such as nursing. She also argues that low enrolment rates and high dropout rates of female university students in South Africa are a consequence of parental expectations.

¹² See, for example: University of Cape Town. Admissions Policy for Undergraduate Admission to the University in 2013, 2012. www.uct.ac.za/downloads/uct.ac.za/about/policies/admissions_policy_2013.pdf, 07/09/2012

2.1.6 Actuarial employment regularly rates amongst the top-ranked jobs across a range of criteria.¹³ We would thus expect it to be positively perceived by school-leaving students and their socialisers. However, as noted by Slattery (op. cit.) there is a low level of awareness of the actuarial profession by the general public.

2.2 HIGH SCHOOL MATHEMATICAL ACHIEVEMENT

2.2.1 Gains over time in the mathematical achievement of girls are indicative of the importance of the environment in the cultivation of both mathematical ability and interest (Hill et al., 2010). Recent research suggests that differences in mathematical ability between sexes are strongly mediated by environmental factors such as the classroom atmosphere, gender role expectations and personal variables such as self-esteem (Hill et al., op. cit.; Lawrence & Charbonneau, 2009; Pomerantz et al., 2002; Ubuz, 2011).

2.2.2 Early studies indicated significant differences between the mathematical ability of male and female students (Benbow & Stanley, 1980) but more recent research indicates that differences persist in some countries and not others (Else-Quest et al., 2010). South Africa exhibited low levels of gender difference in both mathematical performance and mathematical confidence (Else-Quest et al., op. cit.). It is not clear from the published research whether this result holds for high performing students and further work is needed to determine the profile of the pool of school-leaving students who would meet the entrance requirements for actuarial science.

2.3 NEW ENTRANTS INTO ACTUARIAL SCIENCE AT UCT

2.3.1 Detailed data were made available from UCT but not from other universities. Data were requested from the University of the Witwatersrand, Stellenbosch University and the University of Pretoria, as all these universities have actuarial programmes accredited at the highest possible level with the Actuarial Society of South Africa.

2.3.2 The UCT programme is large and long established and the authors would expect it to be representative of other university programmes. The UCT programme has also been the focus of other research, enabling comparisons with prior research such as MacDonald & Dorrington (1994), Dorrington & Vergeest (1988) and Slattery et al. (unpublished).

2.3.3 UCT has offered a programme in actuarial science since 1968. In 1973, UCT became the first university in South Africa to offer courses that allowed students to gain exemption from writing professional examinations once they had graduated. At present, students can obtain a maximum of ten exemptions during the course of their undergraduate actuarial-science degree, from a total of 15 professional examinations.

2.3.4 The majority of UCT students graduate with a Bachelor of Business Science degree in Actuarial Science. This is a fixed-curriculum degree covering actuarial,

13 A Strieber. Jobs Rated 2011: Ranking 200 Jobs From Best to Worst. www.careercast.com/jobs-rated/2011-ranking-200-jobs-best-worst, 26/08/2011

finance and general business courses (Slattery et al., op. cit.) and is accredited by both the Actuarial Society of South Africa and the Institute and Faculty of Actuaries in the United Kingdom. The Actuarial Science division at UCT offers a range of other degrees, including a Bachelor of Business Science in Quantitative Finance, introduced in 2000, and a Bachelor of Commerce degree in Actuarial Science, introduced in 2010. A Bachelor of Science in Actuarial Science was offered up to 2009 but has been discontinued.

2.3.5 For the purposes of this study, an ‘actuarial-science student’ was taken to be any undergraduate student who had registered for the Introduction to Actuarial Science’ course while registered for a degree at UCT. Entrance to this course is restricted to actuarial-science students. The number of entrants into the UCT actuarial programme has increased steadily over time, despite increased competition from other universities offering actuarial programmes. It should be noted that these figures do not include those who switch majors and deregister from Introduction to Actuarial Science during their first year. Table 1 illustrates the average number of entrants into the programme as well as the proportion of entrants who are female.

Table 1. Number of entrants and proportion of entrants who are female by year of entry

| Year of entry | Average number of entrants | Proportion female |
|---------------|----------------------------|-------------------|
| 1995–1999 | 70,4 | 24,1% |
| 2000–2004 | 102,6 | 31,4% |
| 2005–2009 | 117,8 | 33,6% |
| 2010–2011 | 121,5 | 36,6% |

2.3.6 The proportion of entrants into actuarial science who are female has risen steadily over time. The figures are broadly in line with previous research (Slattery, op. cit.), which indicated that roughly two-thirds of entrants were male and with high-level figures obtained from the University of the Witwatersrand and Stellenbosch University. The extent to which it is possible for the proportion of students who are female to rise further will depend on the gender profile of the pool of eligible school leavers.

2.3.7 We now consider the persistency of women students through the undergraduate process and the relative performance of male and female students.

3. RELATIVE PERFORMANCE OF FEMALE STUDENTS

3.1 FACTORS AFFECTING STUDENT PERFORMANCE

3.1.1 The dominant theory regarding the relative under-performance of female students in fields where negative stereotypes exist is deemed ‘stereotype threat’, which Steele (1997: 616) formally defines as “the event of a negative stereotype about a group to which one belongs becoming self-relevant, usually as a plausible interpretation for something one is doing, for an experience one is having or for a situation one is in that has relevance to one’s self-definition”. Given the male-dominated nature of the actuarial profession and the stereotypes that persist regarding the mathematical ability of women,

it may be expected that women in the actuarial profession are vulnerable to stereotype threat.

3.1.2 The literature does not argue that individuals who are exposed to stereotypes will internalise them and therefore come to believe that they are inferior, but asserts that these individuals will be aware of these negative stereotypes and that the knowledge of their existence may induce fears of fulfilling them (Steele, *op. cit.*). An individual does not have to believe that a stereotype is true or that they personally verify the stereotype in order to experience stereotype threat (Bell et al., 2003).

3.1.3 Stereotype threat experienced by women in male-dominated spheres appears to have a negative effect on their performance (Cadinu et al., 2005). Females who find themselves in situations in which a negative stereotype could be associated with them had the tendency to entertain negative thoughts, which had an adverse effect on their performance. Lawrence & Charbonneau (*op. cit.*) also showed that undergraduate female students who believed that their performance in a test would convey information about their ability had a higher propensity to produce poor results.

3.1.4 Stereotype threat appears to affect the upper echelon of academic achievers, those who possess enough skills and self-belief to have identified with the domain to begin with, more than the average student (Bell et al., *op. cit.*). Students who gain entrance, either into an actuarial-science undergraduate degree or directly into the profession, are those who have excelled academically at high school. It is therefore reasonable to assume that these students are invested in their academic pursuits and are therefore identified with the academic domain.

3.1.5 It follows that female actuarial-science students will experience stereotype threat, which may impair their academic performance. The findings of Bell et al. (*op. cit.*) are disconcerting as they suggest that the best female students are at greater risk of experiencing stereotype threat and becoming disengaged, which may ultimately lead to their dropping out of an actuarial-science programme.

3.1.6 Steele (*op. cit.*) suggests that prolonged stereotype threat may diminish motivation and may ultimately lead to an individual's disengagement from the domain. This is particularly relevant for actuarial science, where motivation and perseverance are important. Fisher & Margolis (2002) observed that women frequently cited a lack of interest as the reason for withdrawing from a programme, but that this drop in interest was preceded by a drop in confidence.

3.1.7 Fisher & Margolis (*op. cit.*) document the transformation of a computer-science department in the United States, where they increased the proportion of entrants who were female and reduced differentials between male and female persistency. As with actuarial science, the programme in question is highly competitive. They found that the academic culture perpetuated the barriers experienced by female students. In their particular case they found an academic culture that was male orientated, that promulgated expectations of male success and resulted in continual questioning of the abilities of female students. Their interventions ranged from changes in the curriculum to the training of tutors and the introduction of a series of cohesion-building events for female students.

3.1.8 They found that the motivation for choosing the field of study was different for male and female students, women being more motivated by the broader applications of the field. In order to improve the motivation levels of women students they made efforts to teach in a social context by situating early teaching in realistic settings and exploiting the connections between their discipline and other disciplines.

3.1.9 Seymour and Hewitt (1997: 271) highlight the importance for female students of positive relationships with academic staff:

To be faced with the prospect of four years of isolation and male hostility on the one hand, and the abrupt withdrawal of familiar sources of praise, encouragement and reassurance by faculty on the other is, in our view, the most common reason for the loss of confidence that makes women particularly vulnerable to switching.

3.1.10 Employers of actuaries may also have a role to play in supporting female students: Bellis (op.cit.) notes that, in Australia in the 1970s, women were unlikely to receive scholarships from employers in their first year of study, but only in their second or third year once they had proved themselves. Ms Heather McLeod was the first woman to receive an actuarial bursary in South Africa when she studied at UCT from 1979 to 1982. In 1992 she also became the first woman to serve on the Council of the Actuarial Society.

3.2 RELATIVE PERSISTENCY OF MALE AND FEMALE STUDENTS

3.2.1 Research by Slattery et al. (op. cit.) on the South African actuarial profession found that the persistency of female actuarial-science undergraduate students and the proportion graduating at UCT remained low.

3.2.2 Data on student performance from 1995 to 2010 at UCT were obtained from the Institutional Planning Department at UCT. Earlier figures are drawn from Slattery et al. (op. cit.).

3.2.3 For the purposes of this paper, 'persistency' is defined as the proportion of students entering into an actuarial programme who ultimately graduate from that programme. As with Slattery et al. (op. cit.) the authors find that male persistency rates are higher than female persistency rates in all three periods considered, as shown in Table 2. The persistency rates vary from period to period and there has been no discernible trend over time. It should be noted that the 2006 figure is slightly understated as there are students who began in that year and who are still in the system. It is not possible to analyse more recent periods as many of the students in those cohorts were still in the system.

3.2.4 A chi-squared test was used to determine whether the difference between the two proportions shown in Table 2 over the period 1995 to 2006 is significant. The difference was found to be significant at the 1% level.

3.2.5 A stricter definition of 'persistency' would be the proportion of those entering who graduate within the minimum recommended duration of the degree. This analysis was done for the Business Science degree, as this is the degree with which the majority (79,3%) of actuarial graduates exit. It is evident from Table 3 that the percentage of students who graduate within the minimum recommended duration of the degree is

low for both male and female students in each cohort. Using the chi-squared test for the cohorts 1995 to 2006, the difference between the proportions graduating was found to be statistically significant at the 5% level.

Table 2. Persistency by sex and year of entry

| Year of entry | Female persistency | Male persistency | Number of female graduates from cohort | Number of male graduates from cohort |
|---------------|--------------------|------------------|--|--------------------------------------|
| 1995–1999 | 34,1% | 40,8% | 29 | 109 |
| 2000–2004 | 36,6% | 48,3% | 59 | 170 |
| 2005–2006 | 31,8% | 43,1% | 21 | 72 |
| 1995–2006 | 34,9% | 44,7% | 109 | 351 |

Table 3. Proportion of Business Science students graduating in four years by sex and year of entry

| Year of entry | Average number of entrants | Average number of graduates in four years | Proportion of female entrants graduating in four years | Proportion of male entrants graduating in four years |
|---------------|----------------------------|---|--|--|
| 1995–1999 | 58,0 | 15,0 | 26,0% | 25,8% |
| 2000–2004 | 84,8 | 25,4 | 21,4% | 33,6% |
| 2005–2006 | 88,0 | 25,0 | 24,5% | 29,9% |
| 1995–2006 | 74,2 | 21,0 | 23,4% | 30,2% |

3.2.6 From the data available it is only possible to differentiate between students transferring to other degrees at UCT, those withdrawing from UCT voluntarily (not because of academic exclusion), and those who were academically excluded. Students transferring to other academic programmes may do so because they have failed to meet the academic requirements to progress with actuarial science or may do so voluntarily. As shown in Table 4, the majority of students who withdraw from actuarial science do so by transferring to another academic programme.

Table 4. Forms of withdrawal by sex (year of entry 1995 to 2006)

| | Number of female students who withdraw | Number of male students who withdraw | Proportion of female students who withdraw | Proportion of male students who withdraw |
|--------------------|--|--------------------------------------|--|--|
| Transfers | 166 | 325 | 81,8% | 74,7% |
| Voluntary drop-out | 22 | 55 | 10,8% | 12,6% |
| Academic exclusion | 15 | 55 | 7,4% | 12,6% |
| Total withdrawals | 203 | 435 | 100,0% | 100,0% |
| Total graduates | 109 | 351 | | |
| Total entrants | 312 | 786 | | |

3.2.7 As shown in Figure 1, a higher proportion of female students than male students withdraw in each year. This is determined in terms of initial withdrawal rates calculated as the number of students withdrawing in each year as a percentage of the number of students enrolled at the beginning of that year. The detailed data indicating when in a year a student withdrew were not available and it was therefore not possible to calculate central withdrawal rates.

3.2.8 Although the differential between male and female students is fairly consistent across the years, because of the smaller number of students in the later years, the chi-squared test indicates that only the difference in the first year is statistically significant at the 5% level. For both sexes the proportion withdrawing at the end of year one is likely to be understated as a proportion of students will exit early during their first academic year and thus not appear in the starting cohort at all.

3.2.9 As expected, female students are less likely to persist with actuarial science than male students. Given that the majority of students transfer to other academic programmes it is important that further work be done to identify the proportion of transfers that occur voluntarily. An understanding of the underlying reasons for voluntary transfers may help in designing strategies to improve the retention of talented students.

3.3 RELATIVE PERFORMANCE OF MALE AND FEMALE STUDENTS

3.3.1 In order to analyse the relative academic performance of male and female students the authors used the number of exemptions gained as a measure of academic success. The number of exemptions gained has previously been found to be a

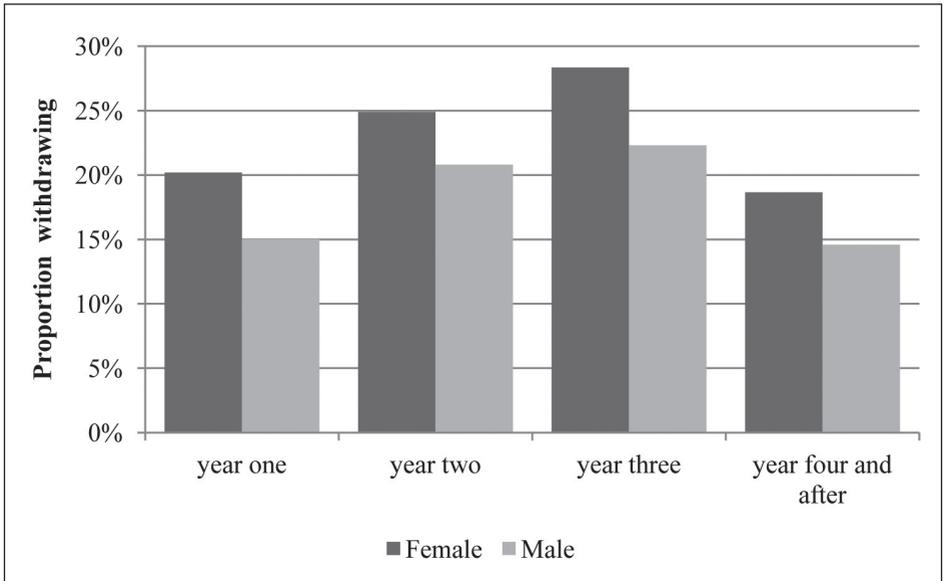


Figure 1. Proportion of students withdrawing at the end of each academic year of those registered at the beginning of the year for years of entry 1995 to 2006

reasonable indicator of qualification success and the time to qualification: over 70% of graduates who enter the profession with an above-average number of exemptions can be expected to qualify, and most of these in less than five years (Slattery et al., op. cit.) .

3.3.2 Exemption data were analysed for the six entry-year cohorts from 2000 to 2005 inclusive for students graduating with the Business Science degree in Actuarial Science. Students graduating before 2005 had a total of nine exemptions available to them, whilst those graduating from 2005 onward had ten exemptions available to them. The average number of exemptions obtained by female students was 6,40 over the period, compared with an average of 6,35 for male students. The proportion of students obtaining seven or more exemptions, i.e. more than the average, was calculated and it was found that for both male and female students this proportion was approximately 50%.

3.3.3 This result indicates that there is no statistically significant difference in the academic success of male and female students who do persist and graduate with an actuarial-science degree from UCT. It would thus be expected that graduating students of both sexes would be equally likely to ultimately qualify as actuaries if there are no differences in their subsequent performance in the professional examinations. To ascertain whether this is the case we consider the relative performance in professional examinations and the gender diversity amongst different age groups and categories of membership.

4. WOMEN IN THE SOUTH AFRICAN ACTUARIAL PROFESSION

4.1 RELATIVE PERFORMANCE IN THE PROFESSIONAL EXAMINATIONS

4.1.1 An analysis of performance in the professional examinations by Diedericks (unpublished) found differences in performance between male and female students in individual subjects and is shown in Table 5. In the most recent period analysed—2005 to 2008—male students performed better on CT1, CT2 and CT3 whilst female students performed better on CT5 and CT7. There was almost no difference in performance across the full set of early, more technical subjects, either before or after the major curriculum review in 2005. As part of this review the 100-series became the CT-series. Female students outperformed male students in the later subjects, which deal with more applied concepts, both before and after the review. Although the difference in performance was consistently observed it was found not to be statistically significant.

Table 5. Performance of male and female students in professional examinations

| Subject set | Description | Time period | Male aggregate pass rate | Female aggregate pass rate |
|--|--------------------|-------------|--------------------------|----------------------------|
| CT series | earlier, technical | 2005–2008 | 47% | 48% |
| CA1, CA3, ST and UK-SA series | later, applied | 2005–2008 | 31% | 34% |
| CT/100 series | earlier, technical | 1998–2008 | 45% | 46% |
| CA3/201 and ST/300 series and UK-SA/400 series | later, applied | 1998–2008 | 30% | 34% |

Source: Diedericks (op. cit.)

4.2 MEMBERSHIP PROFILE

4.2.1 A comprehensive report on women in the science, technology, engineering and mathematics (STEM) professions in the United States reported a growing number of women in these professions, but continued under-representation particularly at the graduate level and in the workplace (Hill et al., op. cit.).

4.2.2 The 2010 member database was obtained direct from the Actuarial Society of South Africa's Cape Town office.¹⁴ It is possible that this database is not accurate, particularly with regard to age and race data. It is also important to note that people educated in South Africa and working elsewhere in the world would not be reflected in the data if their membership of the local profession had lapsed by 2010. Additional information was drawn from the Society's webpage and a series of posters produced by the Society. Lists of new academic qualifiers were obtained from email communication sent out by the Society.

4.2.3 As shown in Table 6, the proportion of Fellow actuaries in South Africa who are women has increased dramatically over time from 2% in the mid-1980s to 5% in the mid-1990s and 15% in 2010.

4.2.4 The proportion of Fellow members who are female varies across race groups. Of concern is the low proportion of black African Fellow members who are female (6%). Given the low absolute number of black African women actuaries the results are very sensitive to data error. There are ten times as many women classified as unknown as there are classified as black African. For all race groups the proportion of Student members who are female is higher than the proportion of Fellow members who are female. This is similar to the UK where in 2006, 19% of UK Fellows were female whilst 32% of UK Student members were female.¹⁵ Similarly, 35% of 'affiliates'—mostly students—in the Australian profession were female in 2002, as compared to 17% of Fellows.¹⁶ There were only 40 Associate members in South Africa in 2010, of which 60% are female.

Table 6. Proportion of members who are female in each race group (2010)

| Race group | Number of Fellow members who are female | Number of Student members who are female | Proportion of Fellow members who are female | Proportion of Student members who are female |
|--------------------------|---|--|---|--|
| Black African | 2 | 57 | 6% | 27% |
| Coloured/Indian/oriental | 10 | 76 | 26% | 37% |
| White | 105 | 213 | 16% | 32% |
| Unknown | 20 | 60 | 12% | 27% |
| Total | 137 | 406 | 15% | 31% |

14 Actuarial Society of South Africa database, supra

15 De Valois, supra

16 Howes, supra

4.2.5 As discussed by Howes (unpublished) it is possible that the differential between female representation amongst Students and Fellows may be explained by the relatively recent attraction of women into the profession, but may also indicate that women are more likely to cease studies and not progress toward the final qualification. Given the long qualification time (Slattery, *op. cit.*), it is reasonable to expect the proportion of Fellow members who are female to lag the proportion of Student members who are female, but further research also needs to consider the relationship between the long qualification process and prime child-bearing years.¹⁷

4.2.6 In order to get a sense of whether the reason for the differential between Student members and Fellow members is that women do not persist with their studies, the age profile of both the Student and Fellow members of the profession was analysed. For this purpose the ASSA membership data were used. It should be noted that, in more recent years, categorisation as a Fellow member requires completion of academic requirements as well as three years of work experience. Changes in the education system over time mean that women qualifying at different times had a different set of criteria to meet. No adjustment was made for changes in criteria over time and the authors report on membership status as recorded by the professional body. Age data were missing for 13,77% of student members and 6,71% of Fellow members. The age data that were available are reflected in Table 7.

Table 7. Proportion of members who are female in each age category (2010)

| Age category | Number of Fellow members | | Number of Student members | | % of Fellow members who are female | % of Student members who are female |
|--------------|--------------------------|------|---------------------------|------|------------------------------------|-------------------------------------|
| | female | male | female | male | | |
| Under 30 | 30 | 81 | 294 | 568 | 27% | 34% |
| 31–35 | 48 | 153 | 53 | 126 | 24% | 30% |
| 36–40 | 25 | 160 | 9 | 44 | 14% | 17% |
| 41–50 | 20 | 134 | 8 | 36 | 13% | 18% |
| Over 50 | 1 | 113 | 1 | 7 | 1% | 13% |
| Unknown | 13 | 130 | 41 | 110 | 9% | 27% |
| Total | 137 | 771 | 406 | 891 | 15% | 31% |

4.2.7 For both categories of members the representation of female members is higher in younger age categories. Furthermore, of the 53 students completing the academic requirements for the Fellowship qualification in 2011, 34% were female. This, together with the profile of the student membership, indicates that the proportion of female actuaries is likely to increase over time, albeit slowly because of the current heavy weighting towards males.

¹⁷ *supra*

5. DISCUSSION

5.1 A limitation of this research as regards undergraduate actuarial programmes is that it is based on data from a single university, UCT, and it may well be that there are significant differences between universities. In addition the undergraduate analysis is based only on one university whilst the analysis of progress in the professional exams is based on students from all universities. It would be useful to track the progression of graduates from the UCT to ascertain whether their experience is representative of the broader profession. Further research that reflects data from the other university programmes would also be helpful.

5.2 Whilst the South African actuarial profession is currently male-dominated there are positive indications for future gender diversity. These include:

- a continued increase in the proportion of entrants who are female into an actuarial undergraduate programme;
- higher levels of diversity amongst Student members of the profession, younger Fellow members and new qualifiers; and
- no difference in the average number of exemptions that male and female students graduate with and no statistically significant difference in their relative performance in professional examinations.

5.3 The bottlenecks appear to relate to the undergraduate portion of the qualification process. Whilst there has been an increase in the proportion of entrants who are female, the intake into university programmes is not yet gender-balanced. The levers for increased participation are likely to be work-shadow opportunities, school guest speakers, increased parental awareness of actuarial career opportunities and individual career guidance. The profession can play a role by actively recruiting women into the actuarial profession. This is particularly important for programmes like Actuaries on the Move and the South African Actuarial Development Programme that have access to schoolgoers. Employers have a role to play in the creation of work-shadow opportunities through programmes such as Take a Girl Child to Work, which may serve to increase awareness amongst female schoolgoers. Employers can also use bursary and scholarship programmes to draw female students into actuarial programmes.

5.4 However, as pointed out by Slattery (op.cit.) the profession must be cautious about luring potential students into actuarial science unless they are suited to the arduous qualification process and it must be mindful of the damage that may be done to the high proportion of students who do not persist.

5.5 More than 10 years ago Slattery et al. (op.cit.) pointed to the need to improve the persistency of female students at undergraduate level. It is concerning that persistency rates for female students are significantly lower than for male students, with just over a third of female students who enrol for an actuarial-science degree ultimately graduating

and less than a quarter graduating in the minimum time. There is still considerable work that needs to be done to better understand the reasons for differential persistency between male and female students. Further research would also need to establish the extent to which this varies between university programmes.

5.6 The actuarial profession is susceptible to the effects of stereotype threat. Negative stereotypes about the ability of women to qualify as actuaries can be counteracted by exposing people to female actuarial role models, publicising the increased number of women achieving at higher levels in the profession and pointing out the lack of difference in performance between the sexes in the professional examinations (Hill et al., *op. cit.*). Furthermore, by ensuring a departmental culture within academic institutions that is attractive to more female academics, universities can assist with creating role models and attracting students into the profession.

5.7 There are also pedagogical implications for the way in which actuarial science is taught if the persistency of female students is to improve. Hill et al. (*op. cit.*) suggest developing a classroom environment that emphasises that intellectual skill can be improved with perseverance and effort and argue that students—and academics—should be taught about stereotype threat. Fisher & Margolis (*op. cit.*) found that female students benefit from real-life applications in early courses, contextualised teaching and emphasis of inter-disciplinary connections. This approach is also advocated by Hill et al. (*op. cit.*) who say that the provision of a broader overview of the field in introductory courses can result in large gains in the recruitment of female students.

5.8 Poor results and high failure rates are common in actuarial courses. Hill et al. (*op. cit.*) argue that these two factors create uncertainty, which has a disproportionately negative effect on students who do not have a sense of belonging. Hill et al. (*op. cit.*) identifies both women and black students in this category, however further research is required to determine whether this holds true for South African students, and in particular South African actuarial students. The clarification of expectations helps students to judge their performance more accurately and serves to reduce uncertainty. Fisher & Margolis (*op. cit.*) advocate the promotion of the idea that there are multiple ways to be in a discipline. This can be achieved by presenting diverse problems and teaching styles.

5.9 In 2002, Howes¹⁸ published a call to women actuaries in Australia to put themselves forward to serve on the Australian profession's Council. At that time, only two of the 15 members of the Australian Council were women. Given the similarly low representation on the South African profession's Council, it would be informative to assess the potential impact of efforts to recruit women into such positions.

18 *supra*

5.10 Areas for further research include:

- determination of the profile of the pool of school-leaving students who would meet the entrance requirements for actuarial science;
- identification of the motivation for female students to join and persist in the actuarial profession;
- characterisation of the current academic culture and pedagogical approach in actuarial-science departments in South Africa; and
- establishment of the vulnerability of actuarial students to stereotype threat.

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