The Effectiveness of an External QA Process on Doctoral Programs in a Regional System of Universities, 1990-2003

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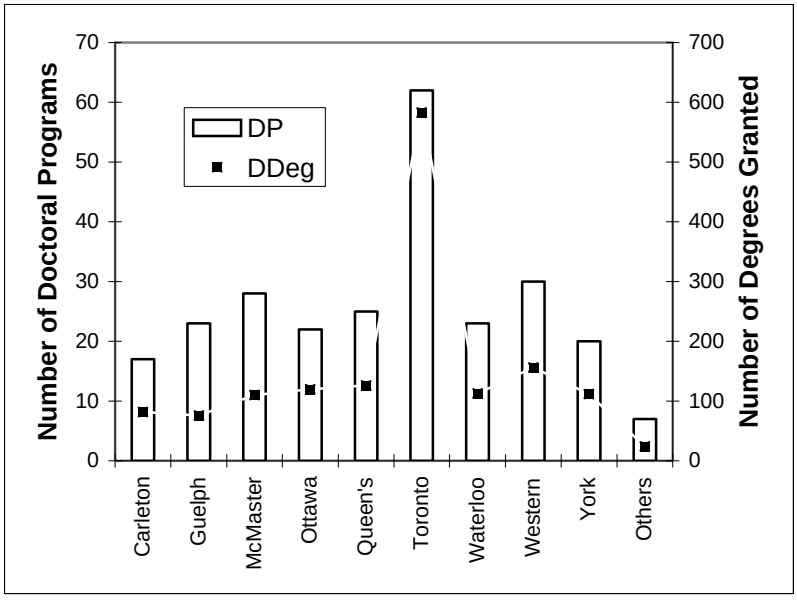
Context

The now 19 universities in Ontario (Canada) have been blessed with a self-regulated program-oriented quality assurance process since 1982 (Leyton-Brown, 2004), which has been described and discussed in detail elsewhere (Filteau, 2003). In brief, the process requires that each graduate program present a common-content self-study every seven years to an Appraisals Committee (a committee of 'peers') of the Ontario Council on Graduate Studies. This committee then recommends (to OCGS), on the basis of external consultant site visit reports, and their own reading of the self-study, whether a program should continue, and, if necessary, what might be done to improve its quality. Follow-up reports are often required. If OCGS agrees, on the basis of the Committee's recommendation, that a program not be approved to continue, the University involved has to discontinue the program.

Given that in 2002/3 there were 254 doctoral programs in the provincial system (an increase from 205 in 1990/91), and many more masters programs, this external QA process is an extensive exercise. The University of Toronto (Figure 1) plays a prominent

Figure 1. Doctoral Programs and Degrees Granted in Ontario Universities, 2002/3



role in the doctoral degree process – its 62 doctoral programs provided 583, or 39%, of the doctoral degrees granted in the Province in 2002/3 (of which 120 degrees awarded were in Education). This share has not changed since 1990/01.

Times-to-completion (the length of time it takes for a doctoral candidate to complete the degree), and graduation rates (the proportion of an incoming cohort who complete the degree) became two big issues at OCGS in the early 1990s. In particular, times-to-completion in humanities and social sciences programs appeared rather long, and graduation rates low (Filteau, 1992; Yeates, 1993). The physical sciences and engineering, and life sciences (including medicine), appeared less inflicted. Information from other studies (Nerad and Cerny, 1991; Tuckman, et al., 1990) revealed similar indicators in various U.S. universities, and pointed to similar reasons and possible remedies (Table 1) – which still prevail (Lovitts, 2001).

Table 1 Factors Determining Graduation Rates and Median (or Average) Time-to-Completion at UC Berkeley (after Nerad and Cerny, 1991, p.5)

Research Mode	Apprenticeship mode	Individualistic learning
	Team work	Solitariness
	Laboratory	Library
Structure of program	No M.A/M.S required	M.A./M.S. required
	QE includes dissertation prospectus	QE does not include dissertation prospectus
	Annual evaluation	Sporadic evaluation
Dissertation definition	Test of future ability to do research	Major contribution to knowledge (book)
Advising	Faculty monitoring & departmental advising	Absence of faculty monitoring & department advising
Departmental climate	Sense of community	Factions among faculty
	Students treated as colleagues	Students treated as adolescents
Research Money	Many sources	Few sources
Type of Financial Support	Research assistantships	Teaching assistantships
	Fellowships	Loans
	Grants	Own earnings
Campus Facilities		
Housing	Affordable	Expensive
Childcare	Available	Overcrowded
Space (eg. office)	Available	Overcrowded
Transportation	Efficient, affordable	Slow, expensive
Library	Long hours/year round	Short summer hours
Job Market	Many openings	Few openings
Post-doc & academic	Available and well paid	Scarce and not well paid
Industry	Many Openings	Few openings
OUTCOME	**= SHORT TIME LOW ATTRITION**	**= LONG TIME HIGH ATTRITION**

QE = qualifying exam

OCGS, as the custodian of the Provincial graduate QA process, agreed that these issues, and range of possible remedies, would be addressed by the universities, and progress evaluated program-by-program in the periodic program review cycle (which is now in its 4th iteration). Associated with this agreement, and giving some bite to it, the universities agreed in 1992 to implement tuition fee structures basically requiring payment of full fees to completion. As these had to be established independently by each autonomous university, this recommended policy took a number of years to implement, with local variations, across the system.

The doctoral time-to-completion and graduation rate issue did not, however, come to the fore in the public policy arena in Ontario and Canada until recently. The Provincial Government had not been that bothered about these issues because, as far as it was concerned, doctoral 'costs' were under control – a doctoral student is eligible for inclusion in a university's funding base for about 3.5 years. In consequence, many doctoral universities have a significant part of their 'count' ineligible, and if the universities found it advantageous to 'carry' ineligible students, that was their business.

However, in recent years 'productivity' in doctoral programs has become of greater concern because of: (i) projected national faculty requirements (an estimated 40,000 new faculty required by 2010); and, (ii) requirements for more highly qualified researchers consequent to new R&D objectives articulated by the Federal Government, summarized in the call for Canada to rank fifth in the GERD ratio among OECD countries by 2010 (AUCC, 2002; DoI, 2002). This latter objective, which is probably unattainable in the stated time frame given that Canada currently ranks 14th, has been backed with relatively large increases in federal funds for research, scholarships, and chairs, particularly in the sciences.

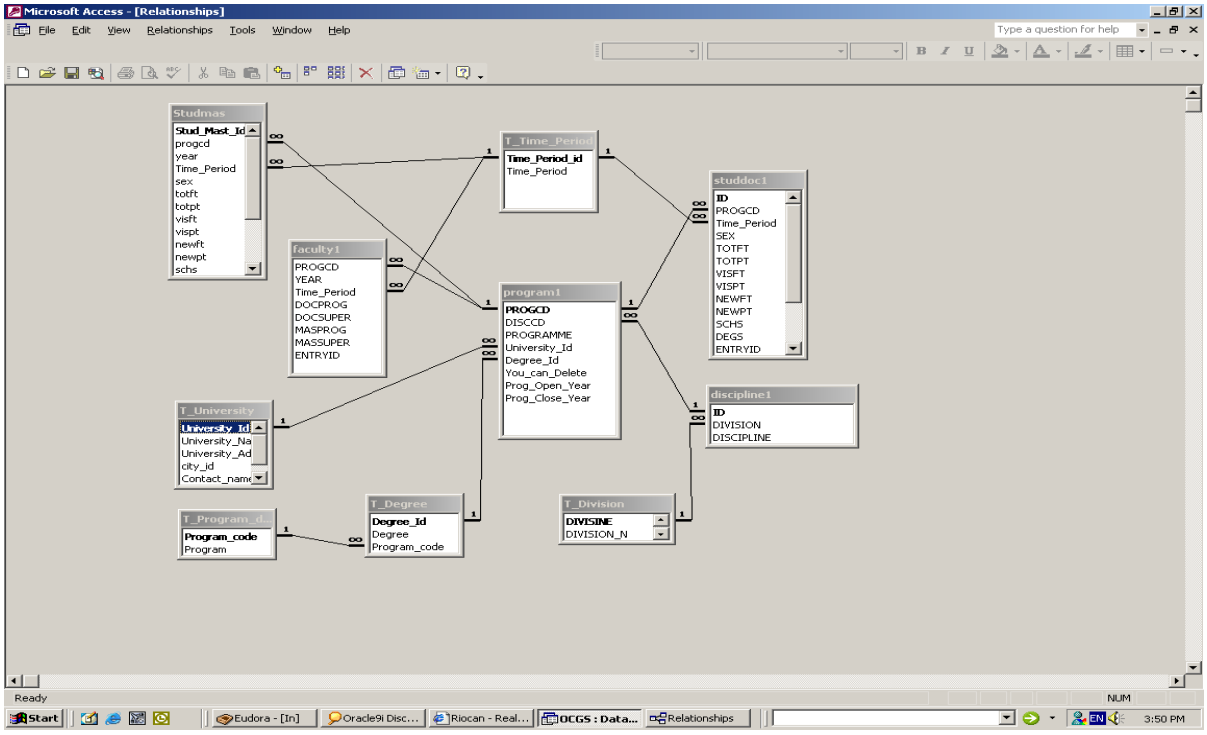
Data and Methodology

Thus, with the OCGS QA process bearing down, and the gradual tightening of tuition fee structures, it would be expected that times-to-completion would decrease, and graduation rates increase, particularly in the humanities and social sciences. The best way of testing these hypotheses would be with system-wide cohort data tracking the progress of each student, but, unfortunately, such information is not as available as it once was (Yeates, 2003).

The next best time-series source is the *Macroindicator Data*, compiled annually by program from *un-audited* data submitted on data collection forms (now electronically) by the universities to OCGS. This source includes (among other elements of information), by program, by calendar year: new doctoral admissions; doctoral graduations; and, median time-to-completion. The use of medians immediately indicates there was no expectation, until recently, that the data would be used for the establishment, and the analysis, of trends in system wide benchmarks – because medians cannot be disaggregated and re-aggregated in the same manner as means. Nevertheless, an attempt is made in this paper to use the *Macroindicator* data as it is all that is available.

The information has recently been recompiled to a relational database structure, and is now easier to use in a time series context than previously (Figure 2). The program data

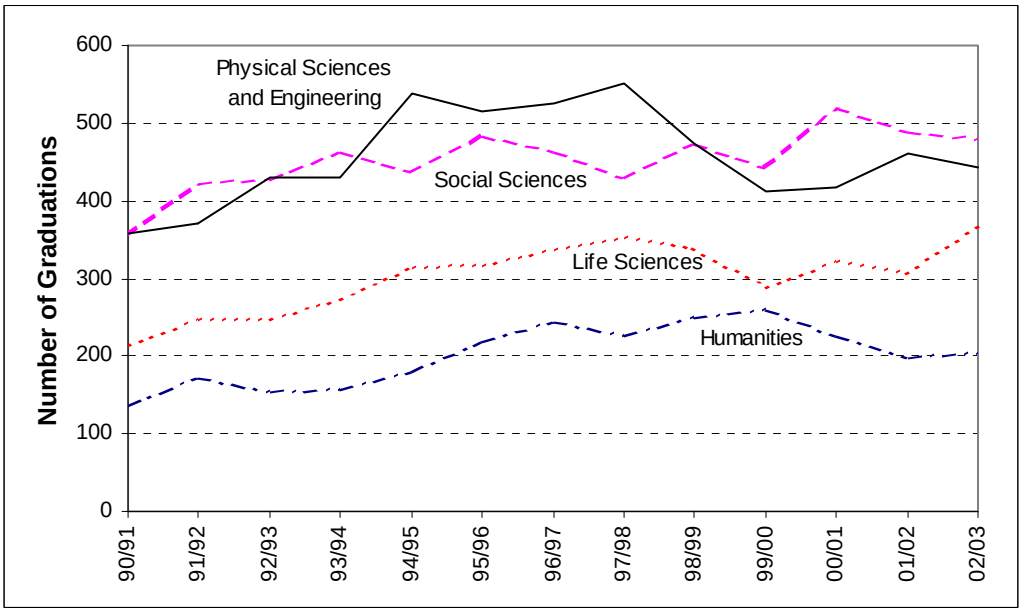
Figure 2. OCGS Macroindicator Data: structure of relational database



has been aggregated to four major groups, and seven sub-groups, used by both OCGS and the Provincial Government: the humanities and fine arts; the social sciences (including education); the physical sciences and engineering; and, the life sciences (including PhDs in medicine)[1]. The life sciences, social sciences, and humanities have experienced generally a fluctuating upward drift in graduations, with some divergence since Y2K; while a similar upward drift in social sciences graduations diverges with twin peaks in the mid-1990s (Figure 3). These twin peaks may be related to an increase in graduations following the changes in tuition fee policies previously described.

[1] *Humanities* include: (1) classics; English; French; languages; library science; linguistics; communication; philosophy; religion., history; journalism: comparative literature, drama and film.
Social Sciences etc. include: (2) anthropology; archaeology; area studies; medieval studies; business administration; planning; environmental studies; political science; law; psychology; sociology; public administration; geography; economics; demography/criminology; family studies, and (3) all education.
Physical Sciences and Engineering include: (4) mathematics, computer science; chemistry; geology; material science; meteorology; oceanography; physics; (5) chemical engineering; civil engineering; electrical engineering; mining engineering; metallurgical engineering; engineering science; forestry; mechanical and aeronautical engineering.
Life Sciences include: (6) animal, plant, soil science; botany; biology; food science and nutrition; veterinary medicine; zoology; toxicology; (7) anatomy; biochemistry; biophysics; microbiology, pharmacology; physiology; medical toxicology.

Figure 3. Graduations in Doctoral Programs in Ontario, 1990-2003



A Conceptual Model

Conceptually, the number of graduations (#G) in program *i* in time *t* should be equal to the new enrolment entering the program (NE) in some earlier time-frame *n*, modified by the graduation rate in program *i*. That is: $\#G_i = (NE_{t-n})_i * (GR_{t-n})_i$.

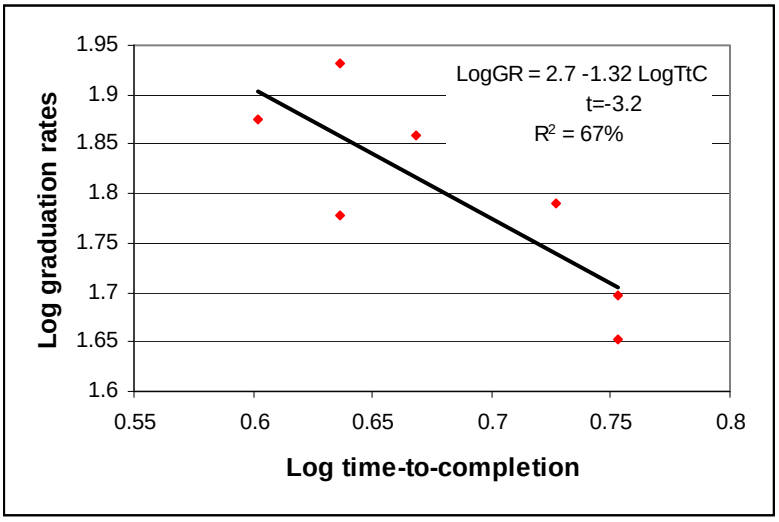
There are two main issues with this simple model. First, there is the issue of defining *n*. In general, it would be expected that graduation rates will increase as *t-n* increases, though there will be a *t-n* when the probability of an additional graduation in a program is extremely low. There is some evidence to suggest that this may be 8 years for all disciplines, less than this for the sciences, and longer for the social sciences and humanities (Yeates, 1993). An alternative method is to define *n* on the basis of an average, or median, time-to-completion of those who graduate. That is the approach used in this paper.

Second, in Ontario there is a problem with respect to the estimation of new admissions to doctoral programs. During the past twenty years, there has crept into individual programs, mostly in the sciences, informal procedures for direct admission of certain students into doctoral programs, commonly following completion of part of masters level requirements. In consequence, in many doctoral science programs, the number of graduations for a number of sequential years is greater than new admissions for the respective *n*.

An additional interesting notion, assumed in the Berkeley model, and in most other studies (Golde, 2000; Elgar, 2003), but not actually tested, is that graduation rates (the tautological obverse of withdrawal rates) and times-to-completion are negatively related.

Figure 4 provides some information supporting this contention[2] for disciplines aggregated to the seven sub-groups identified within the four major discipline groups defined in footnote 1 – though the measure of elasticity, which suggests (for example) that a ten percent increase in time-to-completion is related to a 13.2% decrease in graduation rates, is only just significantly different from zero (.01 level, one-tailed test).

Figure 4. The Relationship Between Graduation Rates and Times-to-Completion



Trends in Times-to-Completion

Times-to-completion are, therefore, useful measures related to those who have graduated, and also indicators of potential graduation rates (and hence withdrawal rates) for incoming cohorts to a doctoral program. With the OCGS *Macroindicators* providing median time-to-completion for the graduates of each program in each year, along with the number of graduates, it is possible to **estimate** weighted 'means' for each division, if one accepts the heroic assumption that the medians are close to the means – encouragingly, these estimated weighted 'means' are extremely close to the median of the program medians.

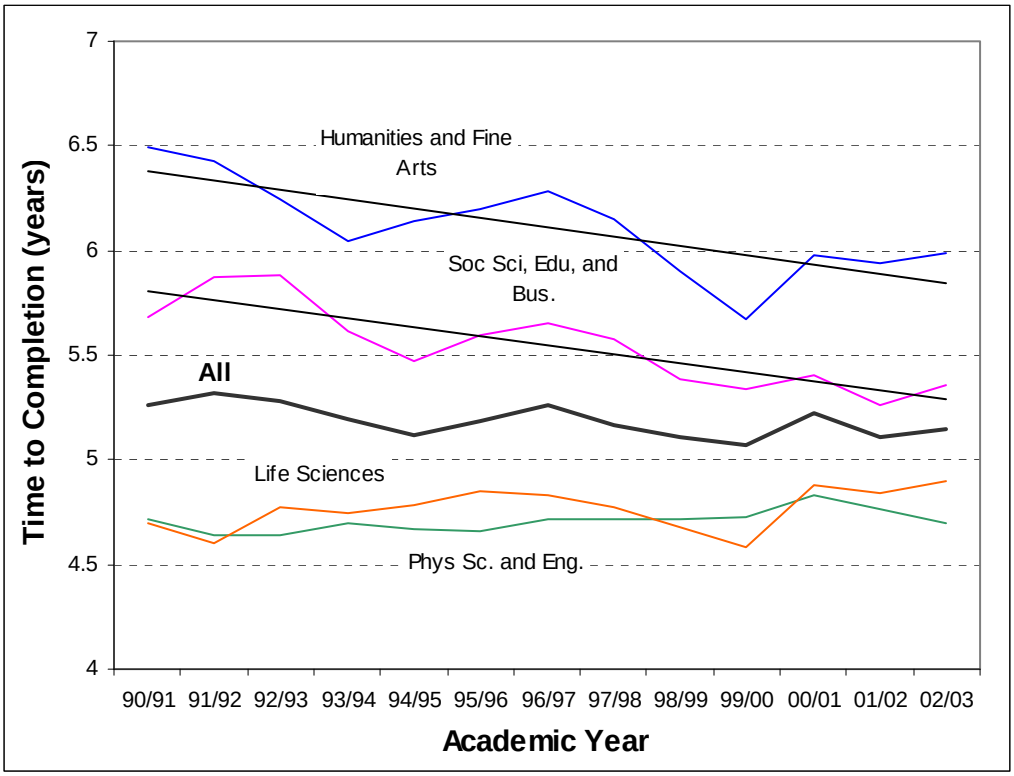
Fortunately, the results are not counterintuitive. The data suggest that though the aggregate times-to-completion for all programs have decreased only slightly since the early 1990s to a little over 5 years in 2003/3, the greatest decreases have been in the humanities and social sciences (Figure 5). The sciences have remained remarkably constant at about 4.75 years.

The science/non-science gap seems to have narrowed by six months, with humanities and fine arts doctorates taking generally six years to complete, and the social sciences 5.25 years. The numbers for the most recent time-periods are quite similar to those presented by Crago (2003) for the twelve universities with the largest doctoral enrolments in

[2] From Yeates (2003), Table 1, p.94.

Canada, which includes six institutions in Ontario. The slight increase in times-to-completion around 1996/7 is possibly related to the change in tuition fee structures which would have begun to bite around that year – students who had been in the system for some time (possibly in a 'lapsed' state) suddenly realized their fees were or would be increasing and either withdrew or completed.

Figure 5. Trends in Weighted Doctoral Time-to-Completion 'Means' in Major Discipline Groups: Ontario, 1990-2003



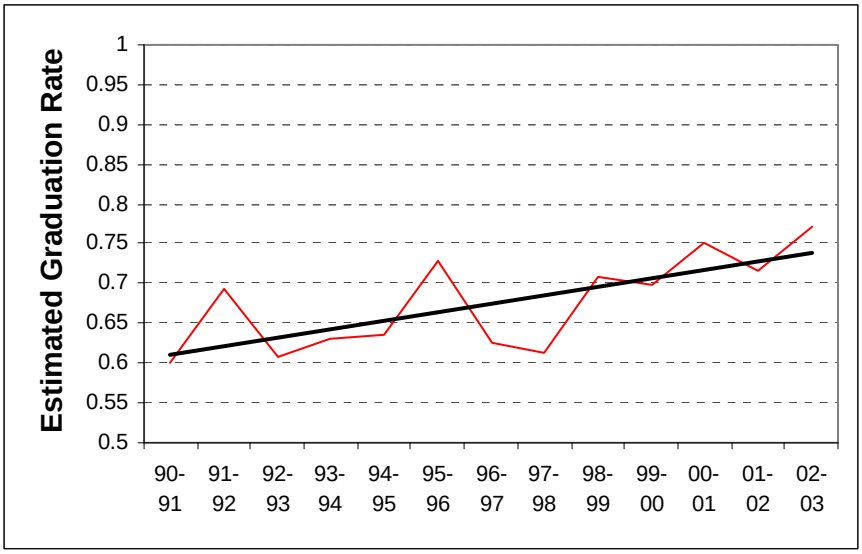
The Trend in Graduation Rates in the Social Sciences and Humanities

With the graduation rate defined as: $(GR_{t\text{-}n})_i = \#G_i / (NE_{t\text{-}n})_i$; and *n* defined as the weighted time-to-completion 'means' for each major discipline group, it should be possible to estimate graduation rates for each discipline, sub-group, and major group. Unfortunately, as has been indicated previously, it is not possible to do this for the sciences. However, the pressing concern is the trend in the humanities and social sciences, because times-to-completion in the sciences remain much lower, and, as would be expected (from Figure 4), graduation rates in the sciences in the largest universities are reported as quite high (Crago, 2003).

The information in Figure 6 suggests that, for the humanities and social science disciplines combined, the graduation rate (as defined above) has increased from 62% to about 74%. This level of increase is both consistent with the trend in Figure 5, and the

measure of elasticity estimated in Figure 4. The graduation rate has, however, fluctuated considerably, with, again, a spike occurring in 1995/96 following tuition fee policy changes, and a more consistent improvement occurring since 1997/98.

Figure 6. Trend in Graduation Rates for the Humanities and Social Sciences: Ontario, 1990 – 2003.



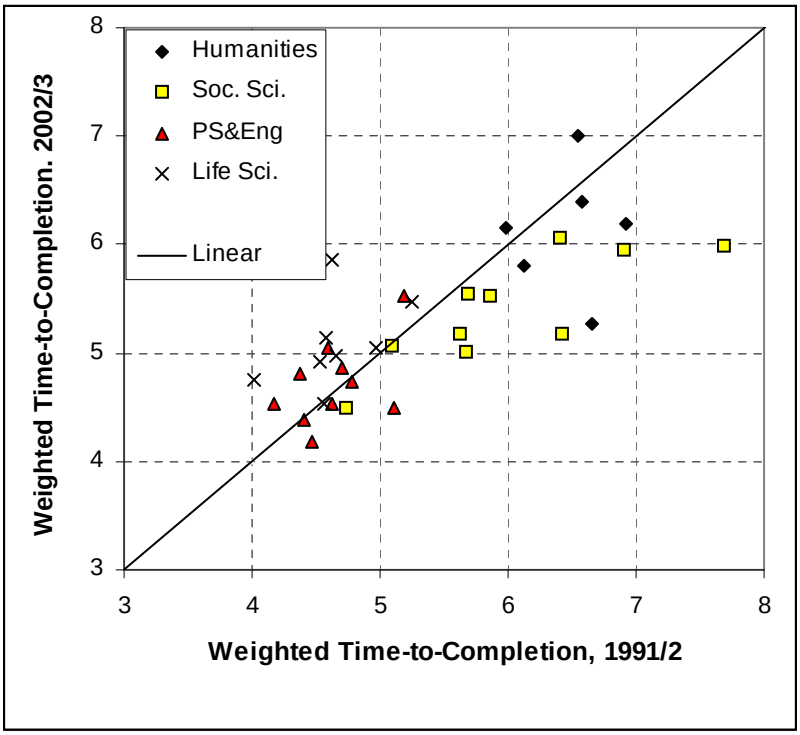
Change in Times-to-Completion by Discipline

With the OCGS QA process being program oriented, it would be useful to compare trends in times-to-completion and graduation rates by individual program. While the OCGS relational database facilitates this, publication of such information without the consent of the university and program concerned would not be appropriate, particularly given the assumptions made with respect to the data. However, publication of aggregated estimates may be less controversial. In this section, therefore, times-to-completion for 02/03 are examined by discipline group, and with respect to change between 91/92 and 02/03.

The data for 91/92 and 02/03 has been aggregated for 34 defined disciplines (Appendix 1) with two or more doctoral programs in Ontario universities. In consequence, not all doctoral graduates are included: in 91/92, 91.2%, and in 02/03, 86.7% are included in the programs comprising the 34 discipline groups. This reduction in percentage reflects an increase in the number of unique and interdisciplinary doctoral programs.

The interesting matter is not so much which disciplines have the longest and which the shortest times-to-completion, but which have changed the most. In general, if the OCGS 'bearing down' had been effective for all disciplines, the data points in Figure 7 would lie to the right, that is beneath, the straight line which indicates no change. Four of the six humanities disciplines have reduced times-to-completion, and, all the social science disciplines; while the sciences exhibit a mixture of change, albeit at a lower register.

Figure 7. Variation in Change in Times-to-Completion by Discipline.



In general, of course, the disciplines which had the lengthiest times-to-completion in 1991/2 have experienced the greatest decrease. Those disciplines that have times-to-completion longer than five years in 02/03, **and** failed to reduce the time between 91/92 and 02/03, include: religious studies, English, geology, electrical engineering, biochemistry, microbiology, biology, and biophysics. Those disciplines that have times-to-completion less than five years in 02/03, **and** reduced the time between 02/03, include: computer science, metallurgical eng., kinesiology, mathematics and statistics, chemical eng., and pharmacology.

Conclusion

So, how effective has the OCGS QA process been in implementing the twin objectives (among many others) of reducing times-to-completion and raising graduation rates in the Ontario university system? On the basis of the evidence provided, one would have to conclude that the process has been reasonably effective in the areas most in need of encouragement – in the humanities and social sciences, 'mean' times-to-completion have decreased by about six months, and graduation rates increased by about twelve percentage points since 1992. Whether such changes are sufficient, or would have occurred in the absence of such a process, or have occurred simply as a result of changes in tuition fee policies, are, of course, moot points.

Appendix 1. Number of Doctoral Graduates, Number of Programs, 2002/3, Time-to-Completion, and Change in Time-to Completion 91/92 to 02/03 (ΔTtoC), by Discipline, for Universities in Ontario Granting Doctoral Degrees.

Discipline	#G	#Progs	TtoC	ΔTtoC
Religious St.	18	4	7.00	.46
History	40	8	6.39	-.19
Fine Art	13	6	6.19	-.73
English	45	7	6.15	.17
Sociology	38	7	6.07	-.34
Anthropology	17	3	5.98	-1.71
Politics	28	6	5.96	-.95
Biochemistry	39	5	5.86	1.23
Languages	22	6	5.81	-.32
Economics	27	7	5.55	-.13
Psychology	111	10	5.52	-.34
Geology	23	6	5.52	.34
Microbiology	21	5	5.48	.23
Philosophy	39	8	5.27	-1.38
Social Work	13	2	5.18	-1.24
Education	138	7	5.18	-.45
Biology etc.	107	18	5.14	.56
Business	24	7	5.07	-.03
Biophysics	26	2	5.05	.08
Elect. Eng.	69	5	5.04	.45
Geography	31	8	5.02	-.65
Anatomy	3	2	4.97	.31
Physiology	22	5	4.92	.39
Physics, Astr.	40	10	4.87	.17
Mech. Eng.	50	7	4.81	.43
Nutrition	17	3	4.75	.74
Chem. Eng.	27	5	4.74	-.04
Math+Stats	54	13	4.54	-.08
Pharmacology	18	4	4.54	-.03
Civ. Eng.	36	5	4.53	.36
Kinesiology	25	7	4.50	-.23
Computer Sc.	38	5	4.49	-.62
Chemistry	79	8	4.39	-.02
Met. Eng.	8	3	4.19	-.28

References

AUCC (2002) *Trends in Higher Education* (Ottawa: AUCC)

Berkovitz, P. (2003) "The Long Haul" *University Affairs*, Ottawa: AUCC, February, 8-12.

Crago, M. (2003) "The Completion of Graduate Studies in Canadian Universities: Report and Recommendations", Ottawa: CAGS, October.

DoI (2002) *Achieving Excellence* (Ottawa: Department of Industry).

Elgar, F. (2003) *PhD Completion in Canadian Universities* (Halifax NS: Dalhousie University).

Filteau, C. (2003) "Improving Quality by Improving the Process: Making a Quasi-Legal Regional Process More Useful and User Friendly", *INQAAHE Conference Proceedings*, Dublin.

_____. (ed.) (1992) *Graduation Rates and Time-to-Completion: Colloquium Proceedings* (Toronto: OCGS).

Golde, C.M. (2000) "Should I Stay or Should I Go? Student Descriptions of the Doctoral Attrition Process," *The Review of Higher Education*, 23, 2, 199-227.

Leyton-Brown, D. (2004) "Approaches to Quality Assurance," *Communicator*, August/September 37, 7, pp. 3,5,7.

Lovitts, B. (2001) *Leaving the Ivory Tower: The Causes and Consequences of Departure from Doctoral Study* (Lanham, MD: Rowman and Littlefield).

Nerad, M. and J. Cerny (1991) "From Facts to Action: Expanding the Educational Role of the Graduate Division," *Communicator* (Washington DC: CGS).

Tuckman, H.P., S, Coyle, and Y. Bae (1990) *On Time to the Doctorate* (Washington DC: National Academy Press).

Yeates, M. (2003) "Graduate Student Conundrum" *University Affairs*, Feb., 38-39

Yeates, M. (1993) 'Doctoral Graduation Rates and Time-to-Completion in Ontario Universities: A Cohort Analysis" in M. Russell (ed.) *Conference Papers: Selected Proceedings of the 1993 AACRAO Annual Meeting, Washington DC: American Association of Collegiate Registrars and Admission Officers*, 90-105.