

Predicting Timely Doctoral Completions: An Institutional Case Study of 2000-2005 Doctoral Graduates

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Abstract

Federal government changes to the funding of doctoral students have focussed the attention of university management on their completion rates. The aims are to inform the allocation of institutional resources in a manner that improves the likelihood of timely doctoral completions and to highlight a process that can also be used for analyses of other key indicators of progression and attrition. The analyses and model development used national data readily available to all universities, which is collected in a standard approach through the Graduate Destinations Survey (GDS). The findings show that the most important variable for timely completion was attendance (full- versus part-time), where in terms of full-time equivalent (FTE) years of study, part-time students were far more likely to complete quickly than full-time students. For the full-time students the key predictors of timely completion were residency, field of study and English-speaking background (ESB). The timeliness of part-time students was predicted by field of study and ESB. This study confirms that there is considerable variation by discipline for timely doctoral completions. The pragmatic application and prospective test of the derived models present a variety of opportunities for research student administrators. For example, those full-time students scoring highly represented a concentration of timely graduates more than 7.5 times higher than the lowest-scoring group – almost an order of magnitude of difference. In short, university management could gain tremendous value from more widely using the data available.

Introduction

Doctoral completion rates and times are long standing concerns of national governments. In Australia, this concern can be traced back to the 1960s (Martin, 1964; West, 1998; Kemp, 1999) and government concerns have grown as the number of doctoral students has quadrupled from 9,298 in 1990 to 37,685 in 2004 (DETYA, 1999; DEST 2006). In an effort to force universities to focus more closely on timely completions the research White Paper (Kemp, 1999) announced the far-reaching decision to include research student completions as a key measure in calculating the institutional research block grant and Research Training Scheme (RTS).

University priorities, plans and policies have subsequently focused their attention on trying to manage attrition rates, completion rates, time to completion and the quality of doctoral supervision (Latona & Browne, 2001; McCormack, 2004). The key indicator of completion times implicitly reflects the rate of attrition of students and explicitly considers the time-to-completion for those students that do complete. Further, the financial and personal costs of either not completing or delayed completion represent substantial costs to the individual candidates (Bourke *et al.*, 2004) as well as to universities. Thus, since the introduction of the RTS many universities have tightened their student selection processes as a way of improving completion rates (Lovitts, 2001; Neumann, 2003), processes that almost represent a risk analysis approach to student selection (Neumann, 2003; Manathunga, 2005).

This paper presents a set of analyses that aim for a more supportive risk management approach focussing on the time-to-degree of doctoral students. The interpretation and application of the results will emphasise the development of customised support systems and seek to avoid the “selective admissions myth.” The selective admissions myth proposes that graduate schools and faculty believe “that the admission process identifies the best students and that attrition is minimal and based on the student’s *choice* not to continue” (Lovitts, 2001, p. 21, emphasis in original). That is, the selective admissions myth places the burden of responsibility on the student – not the university and faculty, even though the graduate school and dynamics of graduate study may be more at the heart of the completions problem. This project had two

aims. The first was to develop key indicators of timely doctoral completions through the analysis of existing data that is readily available to universities and that is collected in a standard format. The second aim was to develop a model to inform the placement of institutional resources for improving the likelihood of timely completion of the doctorate and to highlight a process that can also be used for other key indicators of HDR progress including attrition. This is achieved through analyses of Graduate Destinations Survey (GDS) data for doctoral graduates 2000-2005 in a medium sized Australian research intensive university. The collected data are cost effective and all universities have ready access to the database allowing them to undertake institutional, cross-institutional and cross discipline analyses. We are however not aware of any published research on such institutional analyses.

Prospective Variables

Throughout this paper the emphasis is on a pragmatic prospective approach to the analysis of predictors of timely completion for doctorates. The intention is to use existing data readily available to universities to assist them in understanding and improving doctoral completions. The results of these analyses can be used to establish institutional support systems and prompt further investigations. In seeking to inform the creation of these support systems, only those issues that are known about the student at the time of their enrolment can be used, thereby simulating the amount of information known at the earliest possible time in the student's enrolment. Other issues that may be important in predicting more of the variance of target variables, such as time to completion, may not be known in advance and are more appropriately addressed by adaptive candidature support systems and ongoing monitoring.

A variety of issues have been found to be related to doctoral completion and most of the variables useful for prospective analyses can be grouped into the two categories of being about (a) characteristics of the candidate and (b) characteristics of the candidature. A common third category of variables, regarding supervision - such as satisfaction with supervisor, can only be determined after the student is a substantial distance down the path to study. The variables that are most commonly available at the time of enrolment of a doctoral student, regarding the candidate are: sex, age, ethnicity especially whether from a non-English speaking background, and previous qualification. The known candidature variables are: field of study, attendance, and mode. This study focuses on completion and time to doctoral degree.

Candidate variables

Studies based on large datasets (Solmon & Hughes, 1992; Wright & Cochrane, 2000; Martin *et al.*, 2001) have found unclear or no significant age and gender difference in time to complete for doctoral students. Smaller scale studies (such as Abedi & Benkin, 1987; Moses, 1994; Booth & Satchel, 1995) have found differing completion patterns based on gender. Since large scale studies average-out differences by field of study and differences between institutions and individual supervisors, the implication for university administrators may be that the most useful systems to help HDR students are likely to be institutionally based.

Residency status and whether the student is from a non-English speaking background (NESB; particularly at English-based universities) have received little attention in the doctoral completion literature. The driver of the faster times to completion generally found for international students is typically attributed to the effect of the time constraint of the student visa (Millett & Nettles, 2006), although few studies have simultaneously explored the distinctions and overlap of residency and whether from a NESB.

The level of the previous highest educational qualification for doctoral studies is typically considered as being direct and based on honours studies or indirect and based on postgraduate diploma or masters' level studies. Any connection between previous highest qualification and doctoral completion is also unclear from existing studies (Booth & Satchel, 1995; Wright & Cochrane, 2000).

Candidature Variables

Form of enrolment, whether part-time or full-time, is an important variable in determining time to degree for doctoral students. Better completion rates have been found for full time students (Latona & Browne, 2001; Martin *et al.*, 2001; Bourke *et al.*, 2004). Average completion rates are around 50%-60% although there is

considerable variation in completion rates by discipline and by institution (e.g. Lovitts, 2001; Martin *et al.*, 2001; Elgar, 2003). In English speaking countries the science fields have the best completion rates (Bowen & Rudenstein, 1992; Seagram *et al.*, 1998; Wright & Cochrane, 2000; Martin *et al.*, 2001). Although there are consistent differences in completion times between disciplinary areas, the reasons for these differences are not clear. The most likely explanation would be a set of issues that covaries with discipline including an early start on the dissertation, maintaining the same topic and frequent meetings with supervisors (Seagram *et al.*, 1998).

Time to degree

Completion time for research higher degrees can be calculated in a number of ways. The most direct measure would be to examine the simple elapsed time from enrolment to completion (e.g. see Millett & Nettles, 2006). However, the use of such simple measures could lead to results that need clarification, such as where differences by field of study, effectively act as proxies for attendance (full- vs part-time). Weighting the elapsed time to account for the impact of full- versus part-time attendance, translates the measure into a full-time equivalent (FTE) measure of time-to-degree (TTD). A more accurate measure of the sheer workload that has gone into the degree would be to adjust the FTE measure of TTD by excluding time taken for leave to derive a measure of candidacy time (e.g. see Bourke *et al.*, 2004). This level of detail may not always be available to researchers or in the data available for analysis.

The discussion has focused on the two categories of information readily available to institutions for prospective analyses in relation to characteristics of (a) the candidate and (b) the candidature. The resulting hypothesis in terms of predicting TTD is:

Hypothesis 1: Candidate sex, age, NESB, previous qualification, field of study, attendance and mode will predict timely TTD in doctoral graduates.

The commonly available variables at the time of enrolment of a doctoral student are: sex, age, NESB and previous qualification, while available variables about the candidature are: field of study, attendance and mode. These variables will be analysed to explore their ability to predict a FTE-weighted measure of TTD. The interpretation of the results will emphasise the development of customised support systems.

Method

Sample

The sample used in this study are the respondents to the Graduate Destination Survey (GDS) for those students graduating with a PhD from a mid-sized (approx. 20,000 students) comprehensive university on the east coast of Australia for the years 2000 to 2005 inclusive. The target university is typical of comprehensive universities with an annual enrolment of 1300-1800 research students. The majority (approximately 75%) of enrolled research students are PhD students and in the period 2000-2005 there were around 100 annual PhD completions. The annual PhD completion numbers are also typical of similar universities. A single university was chosen to highlight the process of the analyses and to control for university-specific factors, which have been found to explain a significant proportion of the variation in doctoral completion rates (Martin *et al.*, 2001). Similarly, a mid-sized, comprehensive, non-elite university was chosen so as to avoid critiques that students at an elite research university may constrain the variance of some variables (see Baker, 1998 on Ehrenberg & Mavros, 1995).

The GDS has been conducted annually by the Graduate Careers Council of Australia (GCCA) since 1972. All students completing the requirements for award of a relevant degree in a calendar year are surveyed within four months of graduating. Follow-up surveys of non-respondents are conducted three months after the end of the first survey month. Full details of the GDS process are documented in the relevant manuals, such as GCCA (2006). The GDS is a voluntary survey and the national response rate at the graduate research student level varies between 20-75%. This university averaged around 50% in most years.

Measures

Candidate information is collected on previous qualification, gender, age and residency. Candidature information covers year of commencement, type of attendance, mode of study and details on credit or advanced standing for previous study. The year of graduation was coded based on the survey completed. The target variable, FTE time to degree (TTD) was calculated as (year of graduation – year of commencement) multiplied by 0.5 if attendance mainly or wholly part-time, or unadjusted if attendance was mainly or wholly full-time. Field of study codes were applied from the lists of fields created by the federal Department of Education Science and Training (i.e. ASCED codes, see GCCA, 2006). All of the analyses had five sets of Field of Study in common: Humanities and Law (consisting of Humanities, Visual/Performing Arts and Law), Social Sciences (Social Sciences, Psychology, Business Studies, Economics, Education – Initial), Languages (Languages), Hard Sciences (Electrical Engineering, Computer Science, Mathematics, Chemistry, Physical Science and Geology), and Life Sciences (Life Sciences and Agriculture).

Results

The initial analyses highlighted the substantial differences by type of attendance on the FTE-weighted graduation times, as shown in Table 1. The differences were substantial enough to warrant analysing the two groups of students separately; otherwise any analyses on the differences between timely and untimely completions would effectively be analysing differences between full- and part-time students. Subsequently, all of the inferential analyses below are based on the full- and part-time students separately.

Similarly, the graduates that had studied in an external mode had an unusual pattern of completion times by attendance and were often surprisingly fast in their completions (in sharp contrast to Martin *et al.*, 2001). Follow-up investigations appear to confirm that the very successful external students may have been the result of unmeasured systemic issues. Examples of these systemic issues that could be biasing the data for the external students include: full-time staff enrolling externally to reduce student fees, students who were staff at another university, students transferring with their supervisor – a new staff member to the university, or possibly some other factor (Dean of HDR, 2006, pers. comm.). These issues could bias the results and are subsequently excluded from the analyses below. Further, 15 cases given credit for prior studies were excluded because the nature and extent of that credit was unknown and two cases that had a FTE TTD of less than one year were also excluded because they could also bias the results of the analyses.

Table 1. The numbers and proportions of graduating students by attendance and timeliness category

Graduation in FTE years			
Type of Attendance	>4	<=4	Sum
Mainly Full-time	136	33	169
% of full-time	80.5%	19.5%	100%
Mainly part-time	49	129	178
% of part-time	27.5%	72.5%	100%
Overall	185	162	347
% of overall	53.3%	46.7%	100%

In the main analyses below the split of FTE TTD is based on median TTD for the respective attendance groups. For the full-time students the reasonable expected completion time, as per the RTS, allowing for extra time due to delays with examiners and delays between full completion and graduation due to the scheduling of graduation ceremonies throughout the year, gives a median TTD challenge target of five FTE years. For the part-time students the data seems to support the idea that part-time students work at slightly faster than half the speed of full-time students (for at least those who graduate) and subsequently the most appropriate target to use for the part-time students appears to be 3.25 FTE years, based on a median TTD cut-off point.

The frequencies and initial chi-squared analyses for the median targets are presented in Table 2. The full-time students graduating in more than five years had an average (standard deviation) age of 38.5 (8.46) years, which was not significantly different from those graduating in five years or less (mean = 35.8, SD=9.43), although there was a tendency for an age difference between the two groups ($F(1, 144)=3.423$, $p=.066$). The part-time students graduating in more than 3.25 years had an average (standard deviation) age of 45.2 (9.20) years, which was not significantly ($F(1, 138)=2.695$, $p=.103$) different from those graduating in less than 3.25 FTE years (mean = 42.4, SD=10.53).

Table 2. The frequencies and chi-squared tests for the full-time and part-time students

	Full-time students Years FTE				Part-time students Years FTE			
	> 5	≤ 5	χ^2	p	> 3.75	≤ 3.75	χ^2	p
Field of study								
Humanities & Law	10	16	5.62	NS	17	9	4.19	NS
Social Sciences	21	14			28	23		
Languages	9	7			14	7		
Hard Sciences	19	24			12	8		
Life Sciences	8	16			6	10		
Residency								
Australia	58	55	4.54	< .05	n/a*			
Overseas	10	23						
Previous qualification								
Postgraduate or diploma	36	39	0.02	NS	45	38	0.85	NS
Bachelors (Pass or Honours)	30	34			24	14		
Main language spoken at home								
English	34	29	2.24	NS	16	23	5.63	< .05
Not English	34	48			62	36		
Sex								
Male	32	36	0.01	NS	40	30	0.03	NS
Female	36	42			39	31		

* Note: Residency variable excluded from part-time regression analyses.

Backward stepwise binary logistic regressions were conducted using the prospective candidate and candidature characteristics discussed above for each of the target periods of the full- and part-time groups respectively.

The key predictors for the full-time students

For the regression analyses of the full-time students completing in five years or less the significant predictors are the respective grouped Fields of Study, residency and whether from an ESB or not.

Table 3. The significant predictors of graduation in five years or less for full-time students

	B	S.E.	p	Exp(B)
Grouped Field of Study *			.054	
Social Sciences & Languages	-1.244	.561	.027	.288
Hard Sciences, Humanities & Law	-0.517	.533	.333	.597
Residency	-1.345	.502	.007	.261
ESB	-0.909	.401	.023	.403
Constant	2.252	.738	.002	9.508

Note: * The output of the logistic regressions does not indicate the comparison field. For example, for the grouped field of study variable, the comparison score is Life Sciences, which would receive a default score of zero (i.e. a higher weighting than the other groups of field of study presented here).

The key predictors for the part-time students

The ESB and Field of Study variables are significant for the part-time students. That is, ESB students and students in the life, hard and social sciences were more likely to have completed in less than 3.25 FTE years.

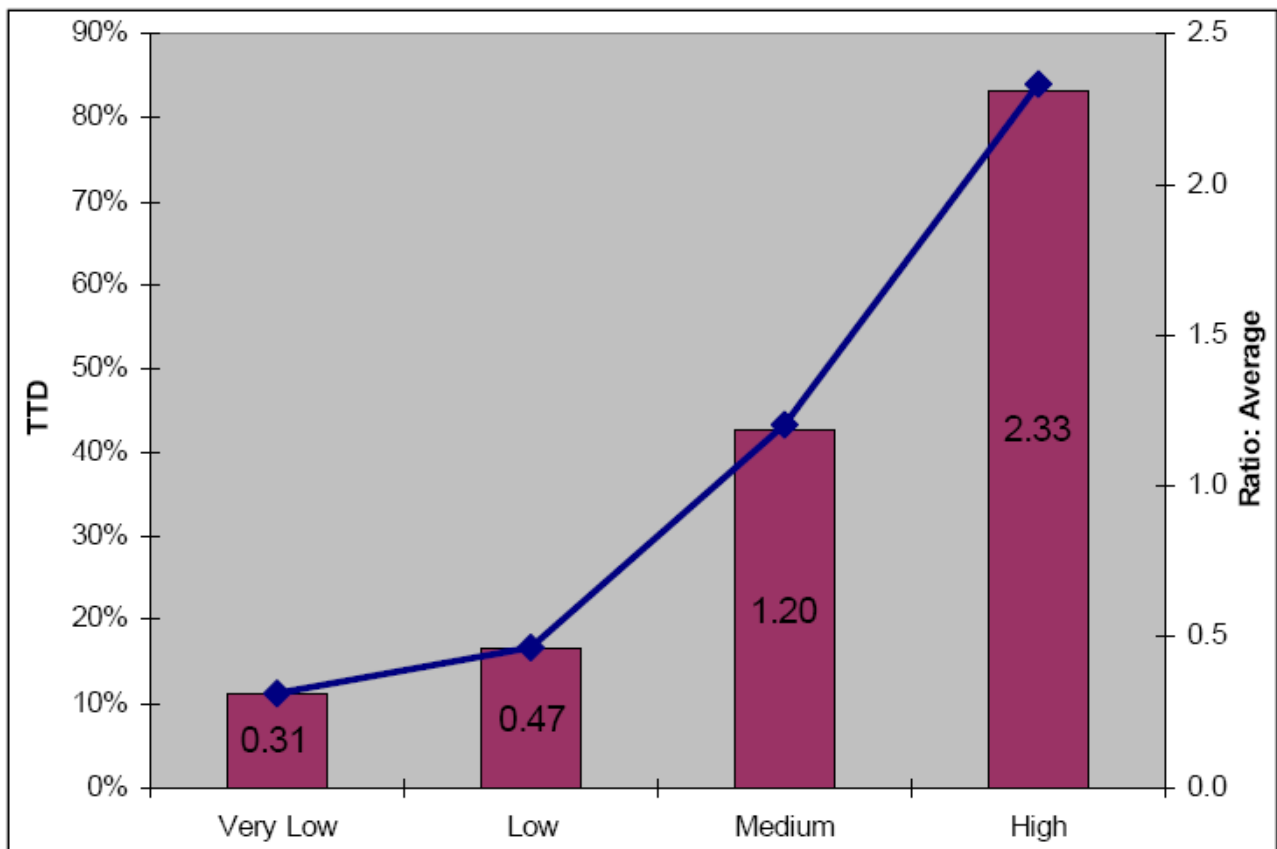
Table 4. The significant predictors of graduation in 3.25 FTE years or less for part-time students

	B	S.E.	Exp(B)	p
Grouped Field of Study				.027
Languages, Humanities & Law	-2.015	.754	.133	.008
Social & Hard Sciences	-1.712	.721	.180	.018
ESB	1.083	.442	2.954	.014
Constant	1.010	.669	2.745	.131

Demonstrating prospective tests using the full-time model

Tests of the prospective utility of these models were conducted for the full-time students. The prospective test for the full-time students was conducted on the 2005 graduates. The 2005 graduates that studied mainly or wholly full-time were scored using the graduation in less than five FTE years model, ranked from the highest to the lowest scores and then grouped by their scores. For each of these groups the proportion of that 2005 group that graduated in less than five FTE years is shown in Figure 1.

Figure 1. The TTD and proportion of full-time students graduating in less than 5 years FTE per scored hold-out group



For each of the groups ordered by their prospective scores a ratio is constructed of the proportion of graduations in less than five FTE years for that group relative to the average proportion of graduations in less than five FTE years for all of the 2005 full-time graduates (35.7%). The resulting ratio gives an idea of the “amplification” or “concentration effect” obtained by the model and is shown on the right-hand vertical axis in Figure 1.

Discussion

The variable found to be the most important for completion analyses was the type of attendance. While completion rates are usually higher for full-time than part-time students (Martin *et al.*, 2001), when the time-to-degree is examined, especially in terms of FTE years, this study found that part-time students were far more likely to complete quickly than full-time students. Indeed, the differences were so large that the analyses had to be conducted for each type of attendance separately.

When the target completion time for full-time students was set to the median of five years, residency, field of study and ESB were the key predictors. Full-time students were more likely to complete in five years or less if they were overseas residents, in the life sciences, or if not life sciences, were in the hard sciences, humanities and law, and did not speak English at home.

These results highlight the need for more research on residency and doctoral completion, especially for full-time students, usually on a student visa. The results of this study appear to support the proposition of Millet and Nettles (2006) that the driver of the faster times to completion generally found for international students is attributable to the effect of the time constraint of the student visa.

For the part-time students with the target time of 3.25 FTE years the key predictors are field of study and ESB. Part-time students were more likely to complete in a timely fashion if they were in the Life Sciences and/or came from an ESB.

This study confirms that there is considerable variation by discipline both for completion rates and TTD. A possible explanation may lie in the clear negative result for the part-time students studying languages, humanities and law. Reasons for this result may be that part-time attendance is not conducive to the relative “immersion” required to gain deep mastery of a particular topic area. Further, timely completion in those fields may require substantially more contact and interaction than current supervision practices provide.

Conversely, the consistently positive finding that PhD candidates in the life sciences completed faster, whether full- or part-time, is probably due to the nature of study in that field. For example, it would be worthwhile for the subject institution to explore the structure of the studies in that area, or other elements that may explain the impact of the field of study. Lessons learnt could then be transferred to other fields of study. This line of investigation is similar to that of Seagram *et al.*, (1998) where the issues that co-vary with field of study, such as making an early start on the dissertation, maintaining the same topic and frequent meetings with supervisors, may explain the differences in completion times. Faculty management and research cultures may also contribute to the differences.

More broadly, one could make the case from the results above that the science fields were more conducive to faster completions than other fields, thereby supporting the findings of Martin *et al.*, (2001), Bowen and Rudenstein (1992), Seagram, Gould and Pyke (1998) and Wright and Cochrane (2000). However, the lead once held by the sciences may have been eroded (see also Bourke *et al.*, 2004) with humanities and law showing an impact on completion time comparable to the hard sciences for full-time students. For part-time students the social sciences may have an impact on TTD comparable to the hard sciences.

When the results for the full- and part-time students are considered together, they present an interesting pattern when examining their FTE TTD. Using the metaphor of the innovation curve (Rogers, 2003) the results appear to indicate that students display different characteristics, which may be analogous with the different stages in the innovation curve. For full time students the analyses of TTD at five years could highlight the differences between the early majority relative to the late majority. Similarly, for the 3.25 FTE year cut-off highlights the differences between the early and late majorities. This staged approach may present an interesting avenue for future research on a larger scale in understanding the drivers or factors leading to timely completion.

Limitations

The data used in this study focused on the TTD of doctoral students who had completed and had also elected to participate in the GDS. Subsequently, the results may be constrained due to the data being right-censored, with many doctoral candidates still studying. This constraint is less of an issue in this study due to its pragmatic approach and focus on TTD rather than attrition. Further, GCA research on non-respondents found no bias at national or institutional levels in GDS survey participants (Coates *et al.*, 2006).

The form and conduct of the GDS were outside the authors’ control and subsequently could represent an unknown source of bias. Further, the questions available in the GDS limited the range and nature of variables that could be tested. Future versions of the GDS may want to include questions on contemporary issues such as the details of any coursework completed, whether the student took leave during their enrolment and how much leave, the month of the submission of the thesis, and/or completion of the program and the month of enrolment. These and other changes could improve the utility of the GDS for research student administrators and managers as well as better reflect the HDR process.

Conclusion

This study used existing national data to examine institutional doctoral completions. By taking a single institutional case the aims were to gain a better understanding of the key indicators of timely completions and to develop a model to inform institutional support for doctoral students and to highlight a process that can be adopted to understand other aspects of progression including attrition. The application of the models derived in this study in a prospective test represents a variety of opportunities for HDR administrators. For example, as shown in Figure 1, for the full-time model, those students scoring highly represented a

concentration of timely graduates more than 7.5 times higher than the lowest-scoring group – almost an order of magnitude of difference.

None of the significant variables found above represent issues that are alterable in the usual direct sense. The main avenue for using the above results is to target institutional support systems for students at different stages and for students meeting different criteria. The application of the results must emphasise the development of customised support systems and seek to avoid the “selective admissions myth” that places the burden of responsibility on the student – not the university and faculty. Both candidate and candidature variables were important in predicting TTD for doctoral students, although a particular candidature characteristic – type of attendance sets the context. Future research may also want to further explore an area that has not received much attention, namely the mechanisms of residency status.

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