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Preprint: Change and continuity in Australian doctoral education: PhD completion rates and times (2005-2018)

Australia is following a global trend in doctoral education policy to improve PhD completion times and rates. It is widely believed that accurate data on PhD completion are needed to assess the success of reforms and drive changes in doctoral education. In this article, new national completion data (2005-2018) provided by the Australian Department of Education and Training (DET) have been employed to examine changes and continuities in the Australian doctoral education system. The findings demonstrate that Australian completion rates and times have only slightly changed over time, exceed normative expectations and systematically differ by student characteristics, disciplines and institutions. The article suggests that better completion data are needed to guide detailed research into the structural conditions that determine completion. This knowledge would help to base future reforms on evidence rather than normative expectations and to realign expected with actual completion times and rates.

Introduction

Completing a PhD has always been a matter of concern, but the focus of the discourse has changed over time. Early debates raised the question of whether the completion of a PhD should be a necessary requirement to obtain academic positions (James, 1903; Parsons & Platt, 1968, p. 500). Since the late 1980s, high attrition rates and concerns that many students start but never complete their PhD dominated the discourse (Bourke *et al.*, 2004; Lovitts, 2001). Today the question is how long it takes and should take to complete a PhD. It has been argued that low completion rates and long completion times are detrimental to student's self-esteem, employability and career progress (Lovitts & Nelson, 2000). It is further argued that poor completion rates and times may damage the reputation of institutions and their capacity to attract promising students as well as funding. PhD students who take longer than expected may occupy free slots, and overload unpaid supervisors or coursework capacities (Horta *et al.*, 2019). For funding agencies and governments low completion rates and long completion times are simply an 'unacceptable wastage of private and public resources' that undermines the expectation to gain 'reasonable return on their investments' (Kemp, 1999, pp. 2, 18). As a result of these concerns, PhD completion developed from an individual intellectual challenge to an abstract indicator of institutional, organisational or systemic levels of success. Although the reliability and validity of this indicator is contested, information on completion rates and times is highly sought after and has been widely used to allocate funding, compare and restructure doctoral programs within and

across national doctoral education systems (Geven *et al.*, 2018; Hall *et al.*, 2006; Palmer, 2016; Spronken-Smith *et al.*, 2018). This international trend towards a data driven 'governance by numbers' (Heintz, 2008) heavily relies on a 'trust in numbers' (Porter, 1995). For this reason, higher education policies around the globe aim to create and use more trustworthy data sets to drive change and improve PhD completion in doctoral education systems.

In Australia, concerns about PhD completion can be traced back to the 1960s (Rodwell & Neumann, 2008) culminating in the Dawkins reforms in the late 1980s. Given the late introduction of Australian PhD degrees, with the first not awarded until 1948, early reforms primarily aimed to increase PhD numbers by creating specific postgraduate pathways, training programs and funding opportunities to encourage students to undertake doctoral studies in Australia rather than overseas (Torka, 2019). Dawkins' reforms explicitly focused on monitoring completion: 'The Government has recently asked institutions to develop action plans to improve the present low rates of course completion in postgraduate study. The Government will monitor the implementation and effectiveness of these plans' (Dawkins, 1987, p. 71). Since then, completion numbers have become a significant performance indicator. They contribute 50 per cent to the formula which determines the allocation of Australia's national postgraduate funding scheme (known as the Research Training Scheme to 2017 and the Research Training Program after) (Kemp, 1999, p. 19). Institutional reforms emerged to further drive timely PhD completion by reducing expected candidature time from traditionally four towards three full-time years, introducing new preparatory pathways such as the master's by research degree (MRES), mandatory coursework, supervisor training as well as annual progress reviews (Torka, 2019) and creating a 'completion mindset' (Green & Bowden, 2012) to '"speed up" candidature' (Kiley, 2017, p. 82). While some international studies show that such reforms can improve actual PhD completion times and rates (Geven *et al.*, 2018; Kyvik & Olsen, 2014; Skopek *et al.*, 2020), evidence for Australia is largely missing. This is why the Australian Council of Learned Academies' (ACOLA) most recent review of Australia's research training system demands better completion data to 'assess' impacts of these organisational reforms, 'drive performance improvements in the system', help 'students to make informed choices' about the best available Australian PhD programs and enable 'international benchmarking of HDR [higher degree by research] training' (ACOLA, 2016, p. ix). Subsequently, the study of completion times and rates has become a priority in current Australian doctoral education policy. A working group established to implement the ACOLA report recommendations is currently exploring how existing DET completion data and methodologies can be used to that end (DET 2018b, p. 16). A recent report focuses on completion rates of all HDR students including those graduating with doctorates and master's by research (Department of Education, 2020).

To better differentiate between these two very different degree trajectories, in this study the focus is on PhD completion rates and times using a subset of existing DET data. The first section describes the dataset and critically assesses its quality. The second section compares the development of median completion times (MCT) and cumulative completion rates (CCR) over time to investigate factors that may speed up or slow down completion. The data indicate slightly improved completion rates and times, a mismatch between expected and actual completion times as well as remaining differences between research field, institution and cohort specific completion rates. These outcomes contradict the common notion of a radically 'Changing PhD' (Group of Eight, 2013). The conclusion section therefore includes presentations on both changes and continuities in Australian doctoral education and outlines implications of the results for future research and reforms.

Data, methods and definitions

When analysing PhD completion and assessing the quality of the underlying dataset we need to know how the completion process has been constructed, defined and measured. This study draws on national DET completion data from 2005 to 2018, covering all PhD students, granting institutions and fields of study in Australia. It only takes 'Doctorates by Research' into account and excludes MRES students (1,584 in 2018) as well as the small number of 'Doctorates by Coursework' (119) and 'Higher Doctorates' (11) compared to 8,647 'Doctorates by Research' in 2018 (Department of Education, 2019), thereby focusing on the internationally most common Doctor of Philosophy (PhD). Previous research about Australian PhD completion has relied on single university case studies and selective disciplines due to a lack of published national data (ACOLA, 2016, p. 73; Bourke *et al.*, 2004; Hall *et al.*, 2006; Jiranek, 2010; Martin, 2001; Neumann & Rodwell, 2009; Palmer, 2016; Pitchforth *et al.*, 2012; Rodwell & Neumann, 2008; Snyder & Forgasz, 2008). National completion data allow for comparisons between and generalisations beyond these (at times) more detailed single case studies. DET uses student IDs and Commonwealth Higher Education Student Support Number (CHESSN) to track the time elapsed between commencing and completing a PhD course for each student even if they move between Australian institutions. This measurement is commonly known as 'elapsed' (ETD) as opposed to 'total' (TTD)' and 'registered' (RTD) time to degree (Bowen & Rudenstine, 1992, p. 113). DET data links ETD to a range of student characteristics (sex, age, indigenous origin, domestic/international, full/part-time) and institutional factors (field of study, type of university, funding) that are likely to influence completion (Bourke *et al.*, 2004; Latona & Browne, 2001). This enables comparative research into the conditions that shape the completion process.

ETD is a widely used, readily available but also an imprecise measure due to common definitional, tracking and reporting difficulties. DET measures ETD in years rather than months and ETD does not

accurately account for previous studies, the time students took off or the dynamics that may occur during candidature (Bourke *et al.*, 2004, p. 3). While counting periods of leave is likely to increase the measured time to degree, the institutional strategy of transferring elements of the PhD process to preparatory studies may reduce it. Some programs such as the 'Macquarie Model' expect students to find supervisors, design and carry out some parts of a larger PhD project during the MRES. Not only is the start of a PhD difficult to define and measure consistently, but so is the completion. According to DET, 'course completion is recorded when a student has completed all the requirements of the course. This is not a prescriptive definition and may be interpreted differently by different higher education providers' (private communication, 11 June 2019). They may report any date from thesis submission, receipt of examiner reports to the final conferral of the title (Palmer, 2016, p. 114). Furthermore, DET data do not accurately track the dynamics of the PhD journey such as changes between full-time and part-time roles or between fields of study because, according to the Department, types of attendance are only recorded at the beginning or at the end of candidature. This means for example that a student might start in a 'Sciences' degree full-time but may switch to a part-time 'Arts' degree later. Several studies also found that enrolment status does not predict how much students actually work on the PhD leading to the counterintuitive result that part-time students are actually faster in equivalent-time terms (Bourke *et al.*, 2004; Neumann & Rodwell, 2009; Rodwell & Neumann, 2008). A last difficulty is that, so far, DET data are only available in aggregated rather than at a student-level format. This means that inter-relationships between variables are difficult to observe (Department of Education and Training, 2018a). Differences in the completion rates and times by institution, for example, may be due to a myriad of underlying factors such as funding, research culture and environment or the capacity to attract usually faster international or high achieving students. A precise explanation would require access to more fine-grained information to break down and analyse compound factors.

While these limitations apply to all PhD students, granting institutions and disciplinary fields equally, they also restrict the analysis methods we can use and the way in which we should look at completion data. All completion data should be used with caution and in context, particularly if we aim to compare the completion process across different cohorts, disciplines, institutions or even doctoral education systems (Hall *et al.*, 2006). The review of existing research will show mixed results in almost every dimension of the complex completion process and this is mostly due to specific definitions, data, methods and doctoral education systems. In order to deal with always incomplete, imprecise and context specific information on completion, Palmer recommends using completion time and rate data as 'raw' and 'crude' indicators to understand the completion processes rather than precise measures of quality or success. Accordingly, the interpretation of such data needs to be informed by additional information about the context in which doctoral education takes place (Palmer, 2016). The analysis here follows a 'pragmatic approach' (Rodwell & Neumann, 2008) using two

descriptive completion measures to shed light on contextual factors that influence completion times and rates. The results of these analyses can be used to inform further investigations and the creation of evidence-based institutional support systems.

The first measure is the length of candidature for exiting cohorts (2005-2017). These data are useful to calculate and compare median completion times (MCT) over time. The second is the study of completion rate, measured as the percentage of students of a commencing cohort that has completed the PhD in each year since commencement. The study uses a nine-year scale to account for usually longer completion times and lower completion rates among part-time students. Completion rates and times are examined simultaneously by calculating so-called cumulative completion rates (CCR) (Bowen & Rudenstine, 1992, p. 119). Although CCR is actually a summation of rates rather than a rate itself, the article will follow the convention in completion studies to refer to cumulative completions as a rate. CCR curves show a general pattern that is useful to compare different completion processes by discipline, institution type and student characteristics. In Australia, completion rates tend to leap up rapidly after four to six elapsed years before levelling off towards the ultimate completion rate (see Figures 1-9). Differences in the pattern indicate specific conditions that may speed up or slow down completion. The comparison of completion rates over time focuses on 2005 (first available data), 2009 (last year covering the entire nine-year scale) and 2013 that includes the fifth candidature year (2018 last year covered) in which most Australian students complete their PhD.

Findings

The typical pathway to doctoral studies in Australia is to complete either a traditional one-year Honours or internationally better known master's degree following at least three years of undergraduate studies. Australian doctoral education policy traditionally expects students to complete a PhD within four equivalent full-time years. The aim is currently to further reduce completion time to 3.5 or even three years (ACOLA, 2016, p. xiii; Group of Eight, 2013, p. 41). Postgraduate funding mechanisms (RTS / RTP) that cover up to 4 years' tuition fees and 3 to 3.5 years' living allowance stipends reflect this normative expectation. How long it actually takes to complete a PhD in Australia is not reflected in policies and funding schemes. This analysis will explore Australian PhD completion times and rates in three steps. First, the development of median completion times between 2005 and 2017 will investigate the relation between expected and real completion patterns. Second, the comparison of CCRs by discipline, institution type and funding availability aims to reveal structural conditions that drive or slow down completion. Finally, the comparison of CCRs by different student characteristics investigates how social conditions contribute to completion.

Median candidature length of exiting PhD cohorts (2005-2017)

The median candidature length of exiting cohorts provides a first overview of how long it usually takes to complete a PhD in Australia. Table 1 shows the distribution of students who completed their PhD in 2005, 2010 and 2017 within a set period of time (1-9 years).

Table 1: Candidature length for PhDs awarded in 2005, 2010 and 2017

	2005						2010						2017					
	All		Domestic		Overseas		All		Domestic		Overseas		All		Domestic		Overseas	
	n=5244	%	n=4250	%	n=994	%	n=6053	%	n=4456	%	n=1597	%	n=9054	%	n=5525	%	n=3529	%
2 years & less	99	2%	79	2%	20	2%	123	2%	83	2%	40	3%	154	2%	110	2%	44	1%
3 years	242	5%	166	4%	76	8%	297	5%	167	4%	130	8%	291	3%	170	3%	121	3%
4 years	936	18%	688	16%	248	25%	1191	18%	732	16%	459	29%	1586	18%	808	15%	778	22%
5 years	1422	27%	1,042	25%	380	38%	1849	28%	1,259	28%	590	37%	3310	37%	1,737	31%	1,573	45%
6 years	937	18%	807	19%	130	13%	1027	16%	797	18%	230	14%	1782	20%	1,087	20%	695	20%
7 years	593	11%	513	12%	80	8%	551	8%	475	11%	76	5%	795	9%	609	11%	186	5%
8 years	369	7%	342	8%	27	3%	376	6%	337	8%	39	2%	397	4%	327	6%	70	2%
9 years & more	646	12%	613	14%	33	3%	639	10%	606	14%	33	2%	739	8%	677	12%	62	2%
Median	**5.0**		**5.2**		**4.4**		**4.8**		**5.0**		**4.3**		**4.8**		**5.0**		**4.5**	

Source: DET completion data, author's calculations

Most students complete their PhD in the fifth year. The median completion time (MCT) for all students is consistently around five years with a slight decrease by 0.2 since 2010. Overseas students are significantly faster than domestic students with a MCT between 4.3 and 4.5 years. While the percentage of early completions (three and less years) tend to equalise over time at a low level (4-5 per cent), completion times differentiate between domestic and overseas students in the following years. The percentage of overseas students completing in year four and five is significantly higher and late completions (7 and more years) are rare compared to domestic students. This pattern indicates that the rising proportion of PhDs awarded to faster overseas students (from 19 per cent in 2005 to 39 per cent in 2017, see Figure 7) is a main driver in reducing Australian overall completion times. Faster completions among overseas students may be due to a range of factors such as visa restrictions, the threat of high tuition fees or differences in the overall career situation of overseas students (see Figure 8).

While Table 1 does not account for contextual factors that may drive completion, it can be used to address the question of whether the focus of doctoral education policy on completion has enhanced actual completion times. This is only partly the case. The data show a consistent mismatch between the expected three to four years and actual MCTs for all students. The percentage of students who completed their PhD after four or fewer years has even fallen from 25 per cent in 2005 and 2010 to 23

per cent in 2017. What has changed is that more overseas as well as domestic students complete after five to six years and fewer of them in the following years resulting in a slight overall decrease of MCTs from 5.0 in 2005 to 4.8 years in 2010 and 2017. This is certainly due to the higher intake of faster overseas students but also to doctoral education policies for timely completion that apply to all students. Domestic students seem to catch up, as the difference between domestic and overseas students' median completion times fell steadily from 9.6 months in 2005, to 8.4 months in 2009 and 6 months in 2013. This preliminary result needs to be further examined as the data do not account for differences between full-and part-time roles or other student characteristics and only applies to exiting rather than commencing cohorts.

Overall completion rates of PhD students commencing in 2005, 2010 and 2013

Comparisons between commencing cohorts are more reliable than between exiting cohorts because students start the PhD under similar institutional conditions. Cumulative completion rates (CCRs) of commencing PhD student cohorts are useful to investigate how structural factors and student characteristics influence the completion process. CCRs show the percentage of each entering cohort that earned a PhD against the number of years since commencement. It is the nature of CCRs that they grow from year to year but their patterns and pace of growth may differ due to the conditions under which students pursue a PhD. As mentioned before, Australian CCRs display a general pattern. Completion rates tend to leap up rapidly between the fourth and sixth years before levelling off towards the ultimate completion rate. Figure 1 shows the CCR of all Australian PhD students commencing in 2005, 2009 and 2013.

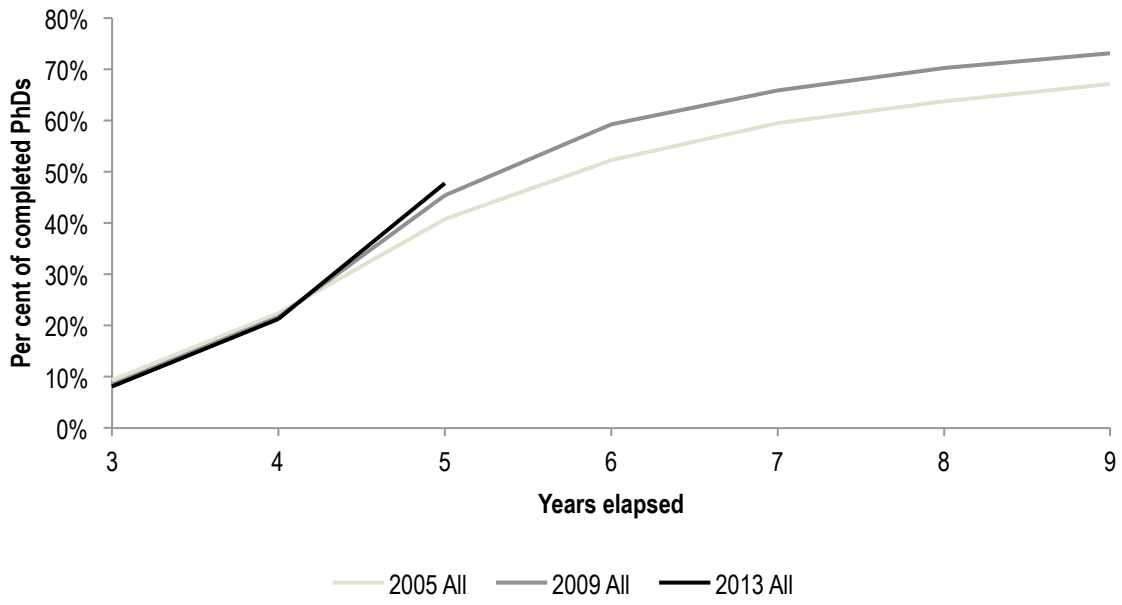

Figure 1: CCR of all PhD students commencing in 2005, 2009 and 2015

Overall completion rates have slightly increased between 2005 and 2009. While both cohorts show similar completion rates until the end of year four, they differentiate in years five and six as the 2009 cohort is 4 to 7 per cent above 2005 completion rate levels. Thereafter the rates per year are roughly equal, as evidenced by the two curves being parallel from year 6 onwards. This trend may continue as the 2013 cohort completion rate is again 3 per cent above 2009 levels in the fifth year. The steady slow rise of completion rates is due to a range of factors including policies that focus on timely completion. The pattern indicates that pressures for timely completion manifest after the expected maximum of four years candidature. To further detail factors that drive or slow down completion, the next sections compare the overall CCR with structural conditions (disciplines, institutions and funding) and a number of student characteristics.

Disciplinary Differences

Most international studies (Abedi & Benkin, 1987; Booth & Satchell, 1995; Groenvynck *et al.*, 2013; Jiranek, 2010; Rent & Anderson, 1996; Rodwell & Neumann, 2008; Spronken-Smith *et al.*, 2018; van de Schoot *et al.*, 2013; Visser *et al.*, 2007; Wright & Cochrane, 2000) show that 'completion rates and time-to-degree vary more significantly with field of study than with any other variable' (Bowen & Rudenstine, 1992, p. 123). Figures 2 and 3, contrasted with other factors in further figures, demonstrate that this pattern is also valid in the Australian context. Figure 2 shows the 2009 CCRs for all broad fields of education distinguished in DET data, while Figure 3 focuses on selected fields to investigate the development of CCRs from 2005 to 2013.

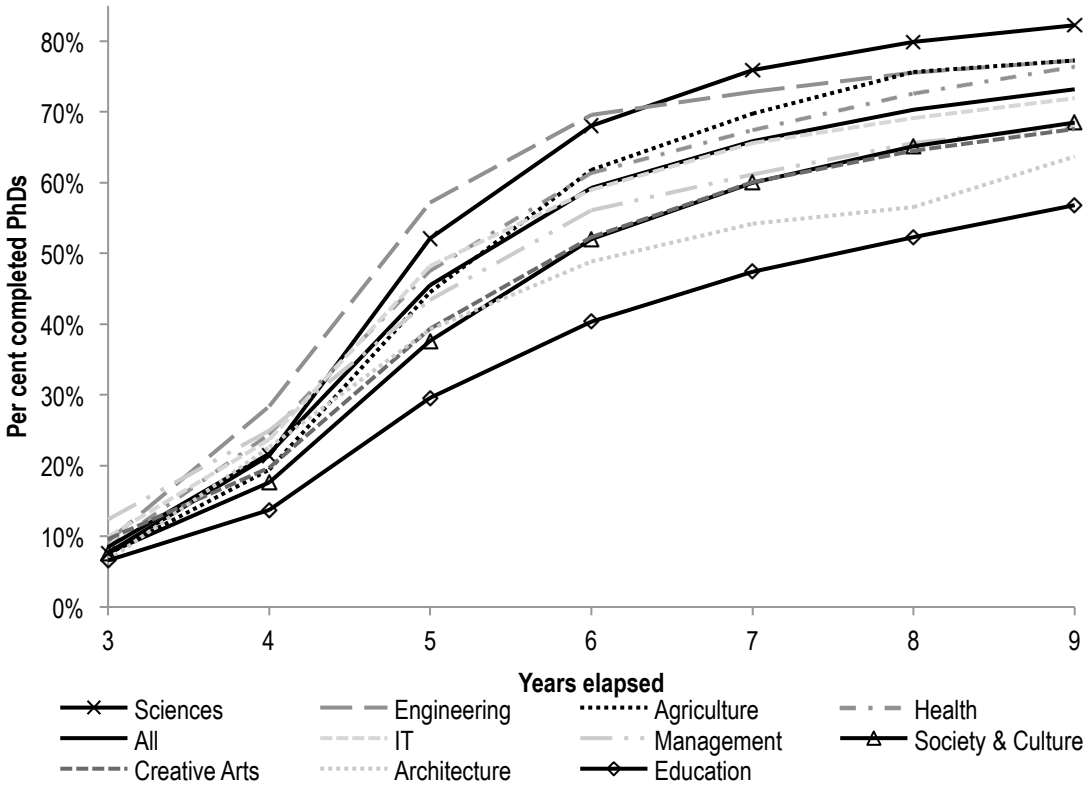

Figure 2: CCR 2009 all Broad Fields of Education

While Natural and Physical Sciences (hereafter 'Sciences'), Engineering, Agriculture, Health and Information Technology are above or at the level of average completion rates, all other fields are below with Education as an obvious outlier. This pattern is similar in other doctoral training systems (National Science Foundation, 2019, p. 10) and suggests that differences in the completion process are attributable to field-specific socio-epistemic conditions (Torka, 2018) and related ways of pursuing a PhD (Bowen & Rudenstine, 1992, pp. 123-141). Students in science-related fields, for instance, typically undertake a PhD within highly structured research environments. They are often part of a research team, usually contributing to ongoing research and developing their thesis generally within consolidated intellectual frameworks or projects at times predefined by supervisors (van Rooij *et al.*, 2019). By contrast, PhD students in the multi-paradigmatic social sciences and humanities often work alone and are expected to develop individualised PhD projects that may or may not align with the research of supervisors (Manathunga, 2005; Seagram *et al.*, 1998). In addition, PhDs in other research fields such as Engineering, Information Technology, Health or Education have a much more applied character and often contribute to professional work environments beyond academia. Such different settings influence the PhD process and create characteristic completion rate patterns.

Most of the 9,884 students commencing a PhD in 2009 were enrolled in Society and Culture ('Arts') (2,244) and Sciences (2,070), followed by Engineering (1,390), Health (1,310), Management (857), Education (669), Agriculture (427), Creative Arts (386), IT (363) and a small number of 168 PhD students in Architecture (Department of Education and Training, 2014). CCRs in the Sciences grow

consistently and reach the highest levels in year seven (76), eight (80) and nine (82 per cent). A reason for this pattern might be that PhD students often depend on a specific lab, cannot leave before completion and they need the title to find a job as a postdoc or in commercial labs. In engineering we find a slightly different pattern. CCRs in Engineering reach the highest levels until year six and level off rapidly afterwards. Engineers seem to either complete in a timely fashion or late. The high proportion of usually fast overseas PhD students in Engineering (32.1 per cent in 2009, see Dobson, 2012, p. 99) and difficulties in combining PhD work with work commitments in Engineering industries after funding has expired are the most likely contributors to this pattern. Management shows a similar completion pattern and shares some characteristics with Engineering. Management had the highest proportion of overseas students in 2009 (33.2 per cent, Dobson, 2012) and prepares students for professional careers that may not allow to complete a PhD while working. After seven years, CCRs in Management level off and merge with Society and Culture and Creative Arts patterns that are consistently about five per cent below average. The CCR pattern in Architecture is inconsistent most likely due to small PhD student numbers and Education consistently shows the lowest completion rates. A possible explanation could be that students in Education pursue a PhD as a side project, while already working in the education sector. This means more distraction but also more independence from funding systems and the restrictions that come with them. Most students (≥50 per cent) in Education complete their PhD after eight compared to five years in Sciences and Engineering or six years in most other fields. Although CCRs vary considerable between fields, a mismatch between actual and expected completion times applies to all. To explore whether field-specific patterns have changed over time, we consider Figure 3 which compares the development of CCRs in three contrasting fields. The fields with most PhD students, Sciences and Society & Culture, represent a ‘fast’ and ‘below average’ and Education an exceptional ‘slow’ completion process. All following figures use line tones to indicate commencement years (2013 black, 2009 dark grey and 2005 light grey) and dash types for different groupings.

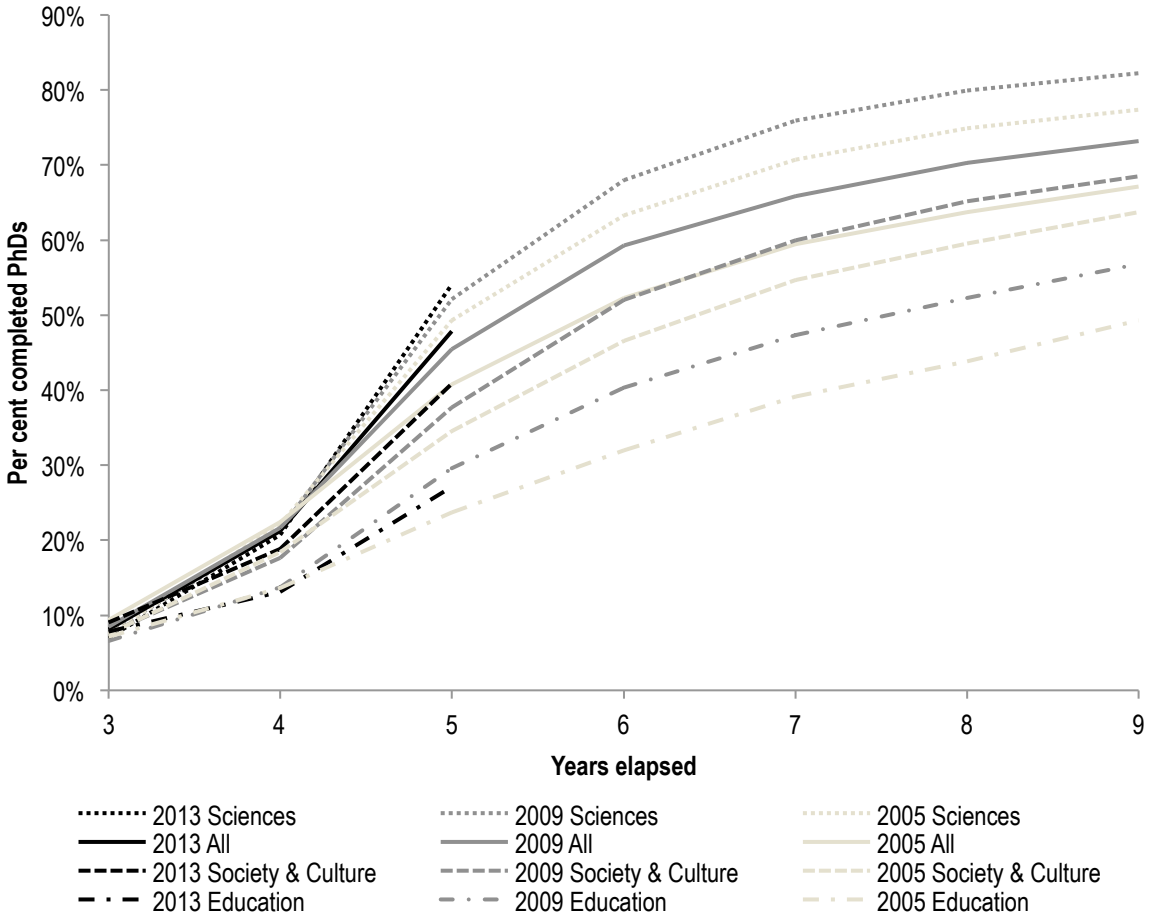

Figure 3: CCR by selected Broad Fields of Education 2005, 2009 and 2013

Figure 3 shows that the general pattern of 'fast', 'below average' and 'slow' completion persists from 2005 to 2013, despite increasing enrolment numbers (Total +46) in Sciences (+47), Society & Culture (+25) and Education (+6 per cent) in all and growing completion rates in most fields. In Education, the rise of completion rates is inconsistent. After a strong increase of about 8 per cent between 2005 and 2009, completion rates tend to fall in the 2013 cohort. These ups and downs might be an effect of smaller PhD numbers or of specific ways how students pursue a PhD in Education as described before. The overall pattern demonstrates an 'elevator effect' (Beck, 2007, p. 687) in which disciplinary differences remain within overall improved completion rates and times. Improvements occur across disciplines and must be due to changes in the general environment in which students pursue their PhD, including policies for timely completion. As differences between fields persist, these policies have not affected the field-specific conditions that may drive or slow down completion. Conversely, Australian doctoral education policies and funding mechanisms do not differentiate by disciplines although the field of study explains most variations in empirical completion times and rates.

Institutional Differences

Figure 4 shows the CCRs of different university types. Although Dawkins (1987) introduced a unified university system in the late 1980s, differences between large research-intensive Group of Eight (GO8) and other universities remain. The proportion of PhDs awarded by non-GO8 universities increased steadily since Dawkins reforms (Dobson, 2012, p. 99) and reached 51% in 2018. This means that the eight GO8 universities are still the largest PhD producers but other universities are catching up in size as well as completion rates and times.

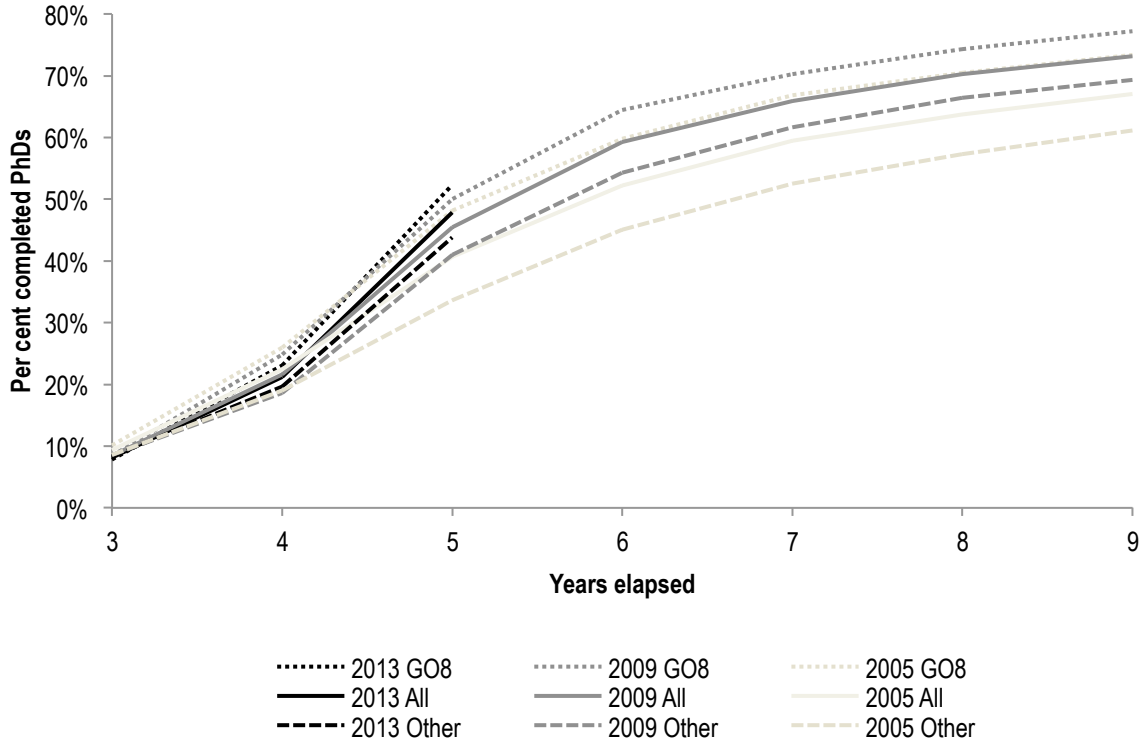

Figure 4: CCR by types of university

In the period 2005 to 2013, completion rates improved at all universities. While GO8 universities improved their completion rates only by about 4 per cent between 2005 and 2009, all other universities increased them by 7 to 9 per cent in the same period. This indicates that differences between 'types of university' are shrinking and may converge in the long run. This development could be a result of doctoral education policies aiming at timely completion or an effect of a range of institutional factors that are difficult to break down on the basis of DET data. International research suggests that the quality of the student intake, of the academic environment, and financial support to students are the three most important institutional factors that drive completion rates (Geven *et al.*, 2018; Skopek *et al.*, 2020; Stricker, 1994). These include for example the ability to select potentially faster high achieving or international students, to create a beneficial research environment with a low student-supervisor ratio and intense research training or to attract and offer enough postgraduate funding. To estimate the influence of funding, enrolment status and a number of student characteristics on the completion process, the next sections compare specific student groups with average CCRs. Differences indicate that contextual factors impact on completion rates.

PhD Funding

The relationship between PhD funding and completion times or rates is complex even if we focus on direct funding for student living expenses rather than implications of general research and higher education funding. Empirical studies have produced mixed results due to a range of interacting factors (Horta *et al.*, 2019, p. 3). Whether PhD funding generally reduces (Abedi & Benkin, 1987) or extends (Stock *et al.*, 2011) the time to complete a PhD may depend on the type (de Valero, 2001; Ehrenberg & Mavros, 1995) and length of funding (Kim & Otts, 2010; Skopek *et al.*, 2020), as well as the research productivity and credentials accumulated during candidature (Horta *et al.*, 2019) to face labour market conditions (Breneman, 1976).

Figure 5 compares the CCRs of domestic students who hold an Australian Postgraduate Award (APA) scholarship with those who are not equipped with any scholarship. Overseas students and other funding opportunities have been excluded to ensure comparability. Overseas students are subject to different conditions such as visa restrictions and high tuition fees (see below) or may have access to international funding schemes not recorded in DET data. Other Australian funding opportunities such as a range of university stipends or supervisors' grants are not considered to control for similar funding conditions. Domestic doctoral students do not pay tuition fees and the APA covers a maximum of 3.5 equivalent full-time years' living allowance that enables them to focus on the PhD rather than other work duties. APA stipend award numbers (and rates) have increased from 1,550 (A$ 18,872) in 2005, 2,584 (A$ 20,427) in 2009 to 3,500 (A$ 24,653) in 2013 (Department of Education and Training, 2016).

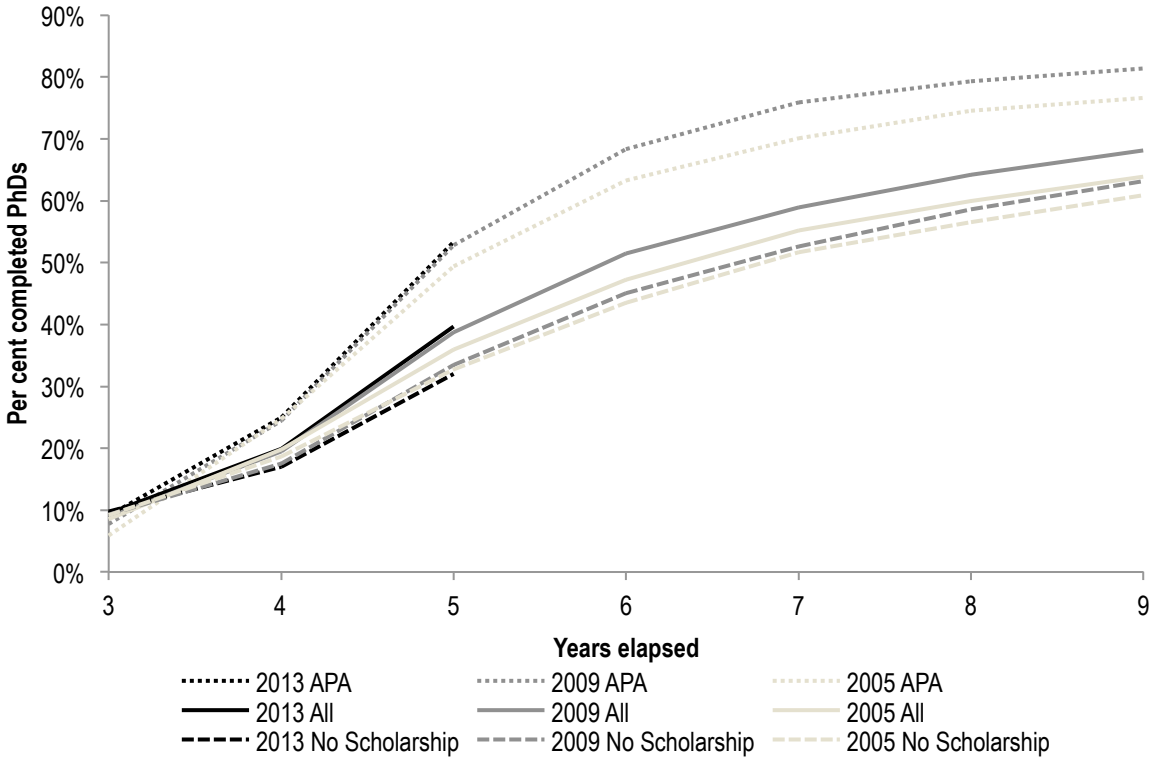

Figure 5: CCRs of domestic students with APA and without scholarship

Domestic CCRs increase significantly if students hold an APA scholarship. Cohorts start to differentiate from three years onwards. In each following year completion rates of scholarship holders are between 16 and 23 per cent higher than those of students without stipends. Although most APA recipients are full-time students and the stipend only lasts until 3.5 years (FTE), the curves keep diverging in the following years. This might be a selection effect as recipients of stipends are often high achieving students or a long-term normative effect of funding as scholarships always come with the expectation to complete in a timely fashion. The difference between students with and without a stipend has slightly increased from 2005 to 2009. In both years, most scholarship holders (≥ 50 per cent) completed the PhD after 5 and non-scholarship recipients after 7 years. While completion rates of scholarship holders increased by 4-6 per cent from 2005 to 2009, those of non-scholarship holders remained unchanged (+1-2 per cent). These differences indicate that scholarship holders can cope better with the expectation to complete in a timely fashion and may be subject to enhanced institutional pressure inscribed in the postgraduate funding mechanisms. Although the formula does not directly account for completion rates or times, the Government compensates institutions only for a maximum of four years tuition fees paid on completion (Kiley, 2017, p. 81). CCRs also indicate that incentives to further reduce completion times are rather weak (King & Dobson, 2003) as completion rates leap up rapidly after four years. As scholarship holders usually have more impressive entry qualifications than most other candidates and are expected to enrol full-time (Bourke *et al.*, 2004), the

impact of enrolment status on completion rates needs to be examined in more detail. DET completion data does not account for undergraduate performance.

Enrolment status

'Completion rates can be strongly skewed by differences in enrolment patterns' (Hall *et al.*, 2006, p. 5). For this reason, it is necessary to estimate the effect of the enrolment status on completion. DET data only track students' enrolment status at the beginning or end of their doctoral studies. Changes between full- and part-time status during candidatures as well as actual time spent in employment are not recorded. DET assumes that part-time students work only 50% although research has shown that they spend much more time on their PhD and actually complete earlier (Bourke *et al.*, 2004; Neumann & Rodwell, 2009; Rodwell & Neumann, 2008). However, Figure 6 demonstrates that the entry enrolment status strongly influences completion rates and times.

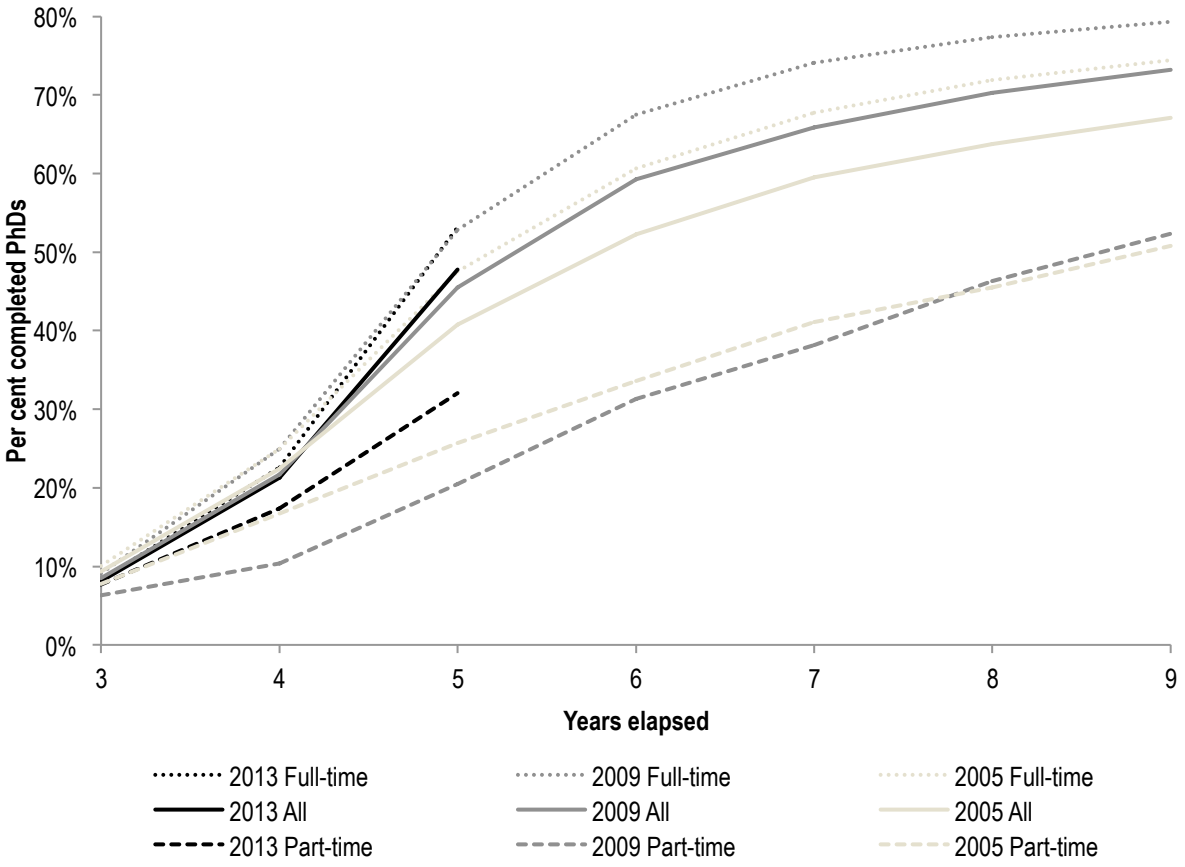

Figure 6: CCRs full- and part-time students

In 2005 and 2009, only about 50 per cent of part-time and 73 to 79 per cent of full-time students completed the PhD after nine years' candidature. In the period 2005 to 2013, completion rates of full-

time students increased steadily, while CCR patterns of part-time students show ups and downs. Completion rates of part-time students fell from 26 to 20 per cent between 2005 and 2009 and jumped to 32 per cent in 2013 at the five year mark but tended to level off afterwards most likely due to a high proportion of late completers. While CCRs of full-time students are S-shaped with a clear rush hour between years four and six, part-timers show constant rates of completion. Most (≥ 50 per cent) part-time students completed the PhD after nine years, while the majority of full-time students finish after five years. This is consistent with the finding that timely completion policies tend to manifest after four years candidature, with the expectation that part-time students may take twice as long as full-timers as they are meant to work about 50 per cent on their PhD and with the result of previous research that part-timers are actually faster than full-time students in equivalent-time terms. About a third of the part-time students even complete after four to six years like most full-timers do. The comparison of the 2005 and 2009 indicates that timely completion policies may impact on student cohorts differently. While the CCRs of full-time students have improved consistently, part-time students' completion rates merge over time.

To analyse social conditions that may drive or impede completion rates and times, CCRs of specific student groups will be examined. The analysis is restricted to full-time students to account for enrolment status effects. Changes in the composition of the Australian PhD student population may influence overall completion rates and times. Figure 7 shows overall Australian PhD numbers (left) and how the proportion of female, indigenous, mature and overseas students developed from 2004 to 2017 (right axis). Indigenous figures are plotted as ten times the real figure to visualise changes despite very small numbers.

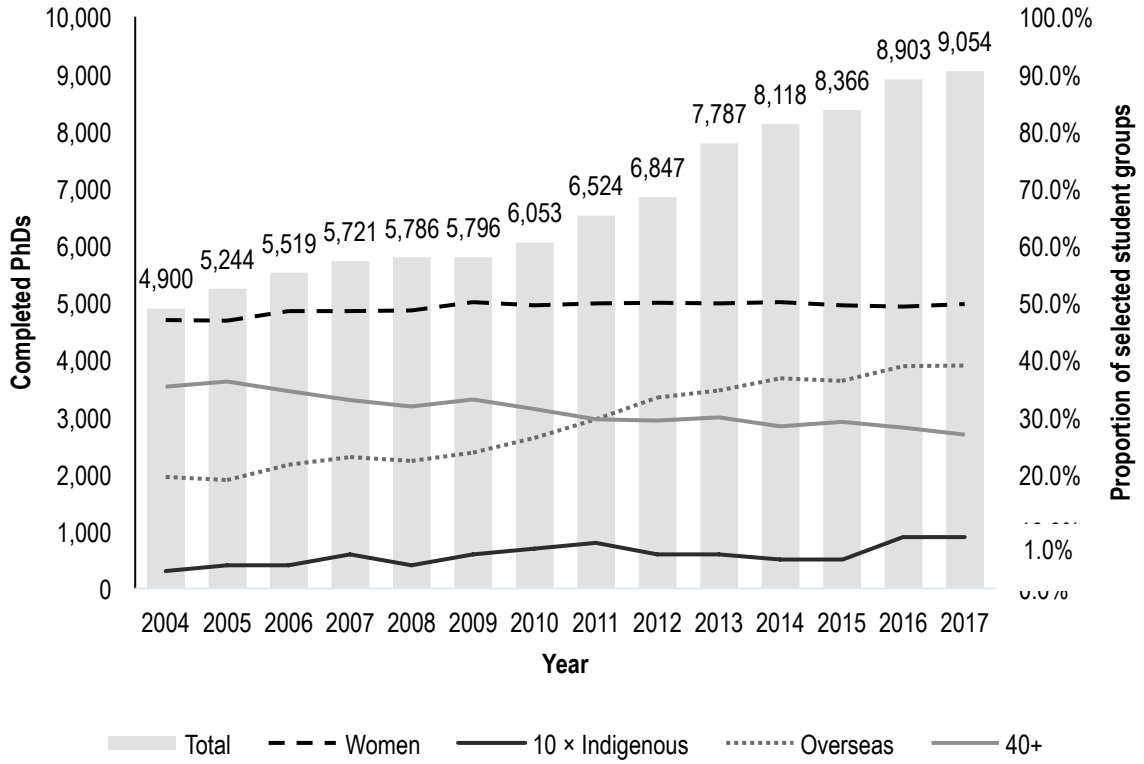

Figure 7: PhDs awarded by student groups

The proportion of female PhD students is consistently high at around 50 per cent and their completion rates and times only marginally differ from average CCRs (see Figure 9). This indicates that gender does not affect Australian completion rates in the observed period of time. Indigenous PhD students are underrepresented in Australia. Only 0.4 to 0.9 per cent of all domestic PhD students are indigenous Australians, although they represent 3.3 per cent of the Australian population. With some sizable uncertainty, due to the statistically small numbers involved, Figure 7 shows that the Indigenous proportion of the PhD student population doubled over the 13 year period. A high proportion of mature age PhD students (40+ years at commencement) is characteristic of the Australian doctoral training system because 'Contrary to past experience, in many disciplines it is now unusual in Australia for PhD students to move directly from an undergraduate degree to postgraduate training' (Group of Eight, 2013, p. 15). The proportion of students who are mature age students decreased from 36.1 in 2004 to 26.9 per cent in 2017 but is still relevant because completion rates and times of mature age PhD students differ considerably from other students (see Figure 9). The strong intake of overseas students is likely to have the strongest impact on overall completion rates and times. Their proportion increased rapidly from 19 per cent in 2004 to 39 per cent in 2017 and overseas students usually complete the PhD faster than domestic students (see Table 1).

Domestic and overseas students

The analysis of median candidature lengths of exiting cohorts has already established that overseas students complete faster than domestic students, although the gap shrank steadily from 9.6 months in 2005, to 8.4 months in 2009 and 6.0 months in 2013. International research shows that doing a PhD abroad improves completion times and rates in most disciplines (Council of Graduate Schools, 2008; Jiranek, 2010; Lin & Chiu, 2014; Palmer, 2016; Spronken-Smith *et al.*, 2018; Stock *et al.*, 2011). The comparison of full-time domestic and overseas PhD students CCRs in Figure 8 confirms this pattern.

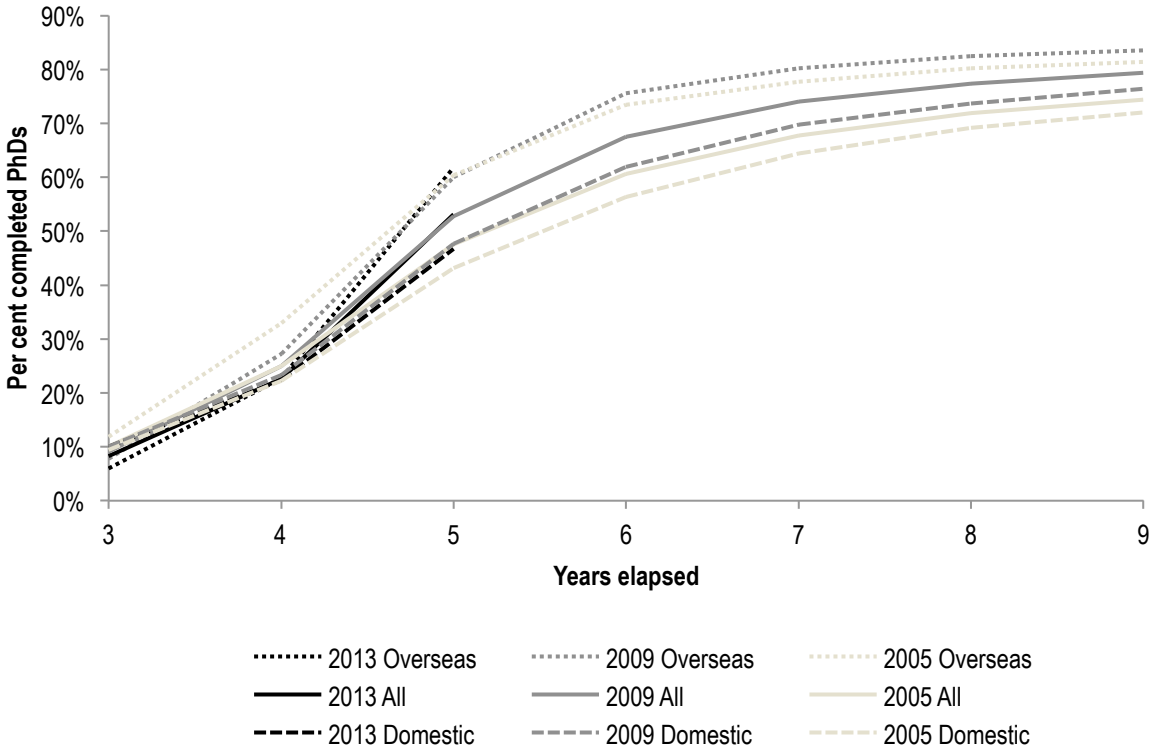

Figure 8: Full-time domestic and overseas students

Domestic and overseas student CCRs have steadily increased over time. Domestic student CCRs are consistently below overseas student CCRs. The difference becomes more pronounced in year five and six before levelling off in the following years. This pattern demonstrates that overseas students elevate overall CCRs and domestic students follow this trend although both groups pursue the PhD under very different conditions. Overseas students face a range of socio-cultural and linguistic challenges (Yu & Wright, 2016) that are likely to slow down completion. Research has also shown that the overall situation of studying abroad drives timely completion (Lin & Chiu, 2014) including high tuition fees, specific visa and funding conditions that expect overseas students to work full-time on the PhD and leave Australia after completion or enhance their career prospects (Harman, 2003).

In the period 2005 to 2009, domestic completion rates and times have improved by four to six per cent at a lower level but faster than those of overseas students. This is most likely due to timely completion policies. Universities currently try to adjust the conditions of domestic to overseas PhD students by implementing strict submission deadlines, closing existing loopholes (e.g. withdrawal and re-enrolment) and considering financial penalties for domestic PhD students or even supervisors.

Student characteristics

Figure 9 shows the CCRs of female, mature age and indigenous PhD students who are likely to pursue the PhD under different social conditions.

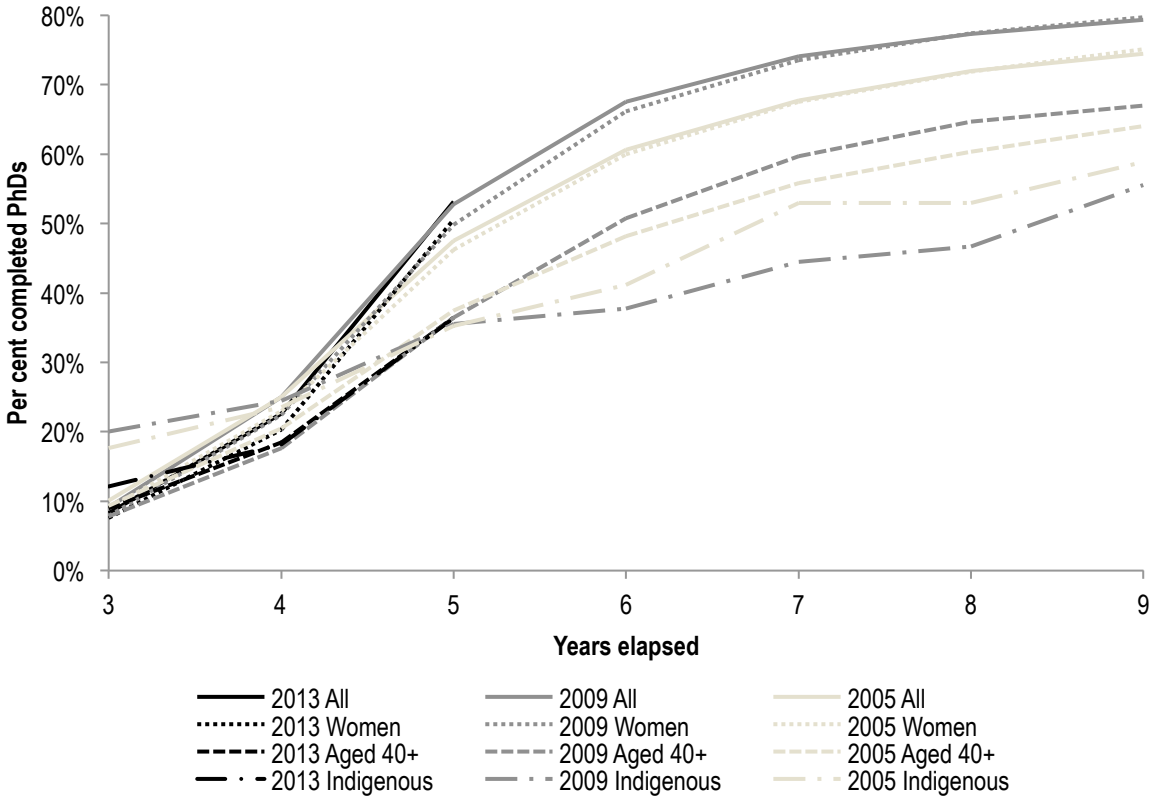

Figure 9: CCRs by full-time student characteristics

The completion rates of women closely align with overall CCRs. Surprisingly, possible gender specific conditions such as more care responsibilities, parental or maternity leaves only marginally influence completion rates and times in Australia. International research on the influence of gender has shown mixed results, with some studies indicating no influence (Bourke *et al.*, 2004; Seagram *et al.*, 1998; Sheridan & Pyke, 1994; Spronken-Smith *et al.*, 2018; Wright & Cochrane, 2000), while others have found that women take longer in all (Booth & Satchell, 1995) or only in some fields such as male dominated or science disciplines (Jiranek, 2010; Stock *et al.*, 2011) but tend to be faster in the Social Sciences and Humanities (Council of Graduate Schools, 2008). The role of having children seems to change since older studies suggested that completion times rise with the number of dependents (Abedi & Benkin, 1987), while more recent research shows no negative effect of children (van de Schoot *et al.*, 2013), if they are born before enrolment (Mastekaasa, 2005).

Figure 6 shows that the CCRs of mature age and domestic indigenous PhD students are far below average for very different reasons. The impact of age on completion times and rates is not linear and best understood as an indicator of a PhD student's specific life circumstances. Some studies found no effects (Spronken-Smith *et al.*, 2018; Wright & Cochrane, 2000), while others distinguish between fast young students who can focus on their studies, slower mature aged, already financially settled or retired students for whom timely completion might be less important and very slow middle aged PhD

students who are subject to often conflicting responsibilities (Department of Education, 2020; Kim & Otts, 2010; Martin, 2001; Rent & Anderson, 1996).

Research on American Native PhD students found that they usually take longer than other domestic PhD students (Council of Graduate Schools, 2008; National Science Foundation, 2019), particularly in the Social Sciences and Humanities (Kim & Otts, 2010). Australian indigenous PhD students seem to face similar cultural barriers and a lack of political or social support. High variations in indigenous CCRs are due to very small numbers (see Figure 7) and should be interpreted carefully. The curves seem to be flatter than others and even better in the years up to year four. A reason might be that a few high achievers can make a big difference in the small group of indigenous PhD students.

Decreasing completion rates from 2005 to 2013 may indicate problems to keep up with the pressure to improve completion. This result supports the call for 'a range of actions to overcome these barriers including better acknowledging Indigenous rights and culture, providing better supervision training, providing greater financial support for Indigenous HDR candidates, and introducing system incentives' such as a higher weighting in the postgraduate funding schemes (ACOLA, 2016, p. xvii).

In a more general perspective, the comparison of CCRs has shown that completion rates and times differ largely due to the structural and social conditions under which students pursue their PhD. Taking these conditions into account would allow to better align normatively expected and real completion rates and times.

Discussion and Conclusion

This article utilised national DET data to analyse the impact of Australian doctoral education policies on actual completion rates and times. These policies emerged in the aftermath of late 1980s Dawkins reforms and primarily focused on regulatory and funding frameworks to '"speed up" candidature' (Kiley, 2017, p. 82). The main finding of this study is that overall completion rates and times can be interpreted as having slightly improved over time, while differences between disciplines, institutions and specific student cohorts largely remain. This means that doctoral education reforms have been partly successful but failed to address the specific structural and social conditions, which drive or slow down completion. The study of national completion data underpins the result of most previous case studies that higher completion rates and faster PhDs can be found in science-based research fields, Group-of-Eight universities, among full-time, younger and particularly overseas students.

International research suggests additional predictors such as social origin, first-generation university students or study results that are not covered by DET data. To identify and analyse the dynamics between often hidden and compound factors that drive completion more precisely, DET data would need to be more detailed and made available in disaggregated format.

The general pattern of policy-driven overall improvements and remaining inequalities can be described as an 'elevator effect' (Beck, 2007). While doctoral education policies expect all students to complete within three to four equivalent full-time years, some cohorts are more likely to keep up with this pace than others due to the conditions under which they pursue their PhD. If policies would address these conditions more specifically, a mismatch between expected and real completion rates and times is likely to persist. Even the CCRs and median completion times of fast overseas (5.2 years) and full-time students exceed the expected three to four-year timeframe by far. Completion rates tend to rise after, rather than before, the fourth year suggesting that current measures such as Australia's funding schemes provide weak incentives (King & Dobson, 2003) to further improve completion rates and times, closing existing loopholes or dealing with the time consuming challenges of doing a PhD. What a divergence between expected and real completion times means is largely unknown. Some theories predict a situation in which patterns of 'cognitive dissonance' (Festinger, 1957) and 'double-bind' (Bateson, 1973) communication emerges. This may trigger the already high prevalence of mental health problems among PhD students (Levecque *et al.*, 2017); discomfort of supervisors, departments, faculties and universities who are held accountable for but cannot guarantee timely completion; statistical tricks of improving outcomes by transferring crucial tasks of the PhD process to earlier preparatory stages or a political climate in which the realities of doctoral training can no longer be addressed.

A re-alignment of expected and real completion rates and times is required, although an ideal strategy is yet out of sight. The current priority is to adjust the PhD process to expected completion times by selecting presumably high-achieving students and 'doable' PhD projects (Neumann, 2007), enforcing research planning and strict deadlines, closing existing loopholes (e.g. periods of leave, suspending, switching to part-time roles) and charging high tuition fees or penalties for students and supervisors who fail to 'manage' timely completion. The results show that this strategy has been partially successful to date but it may come at the expense of crucial elements associated with doctoral education such as the advancement of knowledge, academic freedom, the creation of independent researchers, the overall quality of the PhD experience or social justice. The opposite strategy of adjusting completion rates and times to the real needs of disciplines and students has become almost unthinkable in an increasingly competitive environment. Although structural differences in completion processes are evident and we know that the equal treatment of unequal is unjust, it seems frivolous to ask for more time and therefore money for a PhD in the humanities than in the sciences.

In the absence of a best model, it is reasonable to increase our understanding of why completion rates and times differ. Quantitative studies can be improved by refining available data sets that allow the application of more sophisticated methods to analyse the interacting factors that influence candidature. Moreover, completion rate and time data should be used to guide qualitative research into the realities of doctoral training. Such studies can reveal the different conditions that drive or prevent timely

completion and inform the design of field- and student-specific support structures beyond 'one size fits it all' models that dominate current discourses.

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Abbreviations and definitions

ACOLA	Australian Council of Learned Academies
CCR	Cumulative completion rate
DET	Australian Department of Education and Training (since 2020 Department of Education, Skills and Employment).
Doctorate by Research	Term used in DET data for doctorates most similar to Doctor of Philosophy (Ph.D.)
ETD	Total elapsed time-to-degree measures the time between commencement and completion of a PhD course
FTE	Full-time equivalent
HDR	Higher Degree by Research including master's and doctoral degrees
GO8	Group of Eight is an association of Australia's leading research-intensive universities
MCT	Median completion time
MRES	Master of Research Degree

RTD	Registered time-to-degree excludes the time a student took off
RTS/RTP	Research Training Scheme or since 2017 Research Training Program
TTD	Total time-to-degree measures the time between the BA and PhD completion