Should first-year doctoral students be supervised collectively or individually? Effects on thesis completion and time to completion

Hans Agné & Ulf Mörkenstam

Published online: 22 Mar 2018.

Submit your article to this journal ⤤

Article views: 738

View related articles ⤤

View Crossmark data ⤤

Routledge
Taylor & Francis Group

Should first-year doctoral students be supervised collectively or individually? Effects on thesis completion and time to completion

Hans Agné and Ulf Mörkenstam

Department of Political Science, Stockholm University, Stockholm, Sweden

ABSTRACT

Whether supervision of doctoral students is best pursued individually or collectively is a recurring but unresolved question in debates on higher education. The rarity of longitudinal data and the common usage of qualitative methods to analyse a limited number of cases have left the effectiveness of either model largely untested. To assist with overcoming these problems, this paper reports on a study of 145 individuals admitted to a specific doctoral programme between 1991 and 2014. It analyses the effects of either individual or collective supervision during the first year of the programme on the probability of thesis completion and the time to thesis completion. Group means, Cox regressions, Kaplan–Meir curves and Ordinary Least Square regressions are calculated on the basis of the number of months spent by each doctoral student in the programme without defending a thesis. Studied in these ways, it appears that collective supervision in the first year significantly increases the probability of thesis completion and decreases the time to thesis completion. Collective supervision may have this effect as it enhances peer learning, creates a wider academic learning context, allows doctoral students to gradually acquire the values and behaviours of a research practice community and reduces the risk of premature selection of permanent supervisors.

Introduction

Supervision of independent research projects is a key practice at universities worldwide. This is used to transfer knowledge among individuals, encourage the development of new ideas and create a common understanding within groups or academic disciplines, as well as for a range of other purposes. That said, there has been little systematic research into which kinds of supervision are more effective than others at attaining any given set of objectives. Research has devoted much time to describing a variety of ideals, problems and practices in supervision (e.g., Agu & Odimegwu, 2014; Dysthe, 2002; Gurr, 2001; Norden-toft, Thomsen, & Wichmann-Hansen, 2013; Robertson, 2017; Samara, 2006) while not

CONTACT Hans Agné ✉ Hans.agne@statsvet.su.se 🖃 Department of Political Science, Stockholm University, Sweden

testing the effects of the differences observed. Individual and collective supervision is one of several critical but yet untested distinctions.

Individual supervision consists of discussions between, on the one hand, a supervisor or group of supervisors, and, on the other hand, an individual student who is carrying out a research project (Dysthe, Samara, & Westrheim, 2006; Robertson, 2017; see Nordentoft et al., 2013 for a listing of the many handbooks that concentrate on this kind of supervision). The person or a group of persons who are more experienced in research, the supervisor or supervisors, communicate with a single less-experienced person, the supervisee, on matters of relevance to his or her research. This situation defines what in this article we refer to as *individual* supervision. It is commonly seen as the traditional and most frequently used supervision model.

In recent decades and in many parts of the world, however, individual supervision appears to have lost ground to supervision models in which several students working on related but different research projects are supervised at the same time by one or several supervisors. This latter situation defines what we and other scholars refer to as *collective* supervision (Enyedy et al., 2003; Hutchings, 2017; Nordentoft et al., 2013; Robertson, 2017; Samara, 2006; Wisker, Robinson, & Shacham, 2007). An important species of collective supervision is cohort supervision, which consists of collective supervision of students who have been admitted to a teaching program at the same time and which are expected to follow a similar planned development (e.g., de Lange, Pillay, & Chikoko, 2011).

This paper analyses the effects of individual and collective supervision on the probability of doctoral thesis completion and the time to thesis completion (TTC). We use new longitudinal data on cohort supervision to test arguments in the literature on this matter as well as arguments in the broader literature on collective supervision. Unless motivated by specific claims in our discussion, we use the generic term 'collective supervision' to name our object of study.

There are three reasons for conducting the analysis. Firstly, an unduly long TTC (or worse, no completion at all) may be detrimental to doctoral students' overall life situation – causing stress, unpaid work and a loss of valuable time to advance their careers. Secondly, excessive TTC will lead universities to lose financial resources invested in supervision, teaching, etc., as well as the potential scientific contributions by doctoral students (van de Schoot, Yerkes, Mouw, & Sonneveld, 2013). Thirdly, and most critically for the purpose of sound theory development, earlier research on collective supervision yield competing but as yet empirically untested expectations with regard to its consequences for TTC and other measures of effective supervision.

For these reasons, we will compare the TTC and completion probability for doctoral students undergoing either individual or collective (cohort) supervision in their first year. The data involves 145 individuals, all of whom were admitted to the same doctoral programme in Political Science at Stockholm University, Sweden, between 1991 and 2014. In 2009, this doctoral programme shifted its teaching model from individual supervision throughout the entire four-year programme to collective supervision in the first year. Hence, by analysing the TTC and completion probability of students admitted before and after 2009, this data makes it possible to test empirically whether the introduction of collective supervision has a positive, a negative or no effect on TTC and the probability of thesis completion.

What we find is that collective supervision has a negative effect on TTC (and a positive effect on completion probability). The effect is statistically significant and robust when applying controls for alternative explanations, such as funding opportunities, while holding other relevant factors constant, such as the academic discipline. Hence, shifting to collective supervision in the first year should allow organisers of doctoral studies to *reduce* the TTC and *increase* the probability of completion of doctoral theses. The results constitute a strong argument for further collection and analysis of similar data in different contexts, but they also yield new support for general assumptions about collective supervision during early teaching phases, such that it strengthens opportunities for self-learning among doctoral students. We argue, therefore, that collective supervision in the first year of doctoral studies is more effective than individual supervision as a factor in reducing TTC and increasing completion probability.

The remainder of the paper is split into four sections. Firstly, we provide a brief account of previous research and the expected effects of collective supervision in the first year of doctoral studies. Secondly, we describe the data and empirical measures used in the study. Thirdly, we present the results of the empirical analysis. Fourthly, we conclude by discussing possible reforms of doctoral study programmes, alternative interpretations of the results and future research options.

Previous research, theoretical and practitioner expectations

Much attention in research into supervision in master's and doctoral studies is devoted to conceptualising, observing and discussing different styles and pedagogical assumptions relating to supervision. Models of supervision have been evaluated empirically by researchers, supervisors and supervisees who make qualitative observations of supervision practices in a limited number of cases (e.g., Agu & Odimegwu, 2014; Gurr, 2001; Holbrook, Bourke, & Cantwell, 2006; Nordentoft et al., 2013; Samara, 2006; see Delany, 2008 for a review). Important as they are, such studies tell us little about the effects of supervision on matters beyond the supervision and learning context itself, such as the quality of the end product or the time it took to produce it. That said, research concerned explicitly with collective (either group or cohort) supervision suggests plenty of reasons to anticipate significant effects on TTC and completion probability.

Collective supervision is supposed to reduce the TTC in the first place because it enhances peer learning; that is, 'teaching and learning strategies in which students learn with and from each other without the immediate intervention of the teacher' (Boud, Cohen, & Sampson, 1999, pp. 413–414). Collective supervision provides doctoral students with feedback on their own work from the perspective of multiple theories, methods and empirical observations by peers, allowing them to learn from the experiences of other students (e.g., Carter, Enyedy, Goodyear, Arcinue, & Nijhawan Puri, 2009; Stracke, 2010; Wichmann-Hansen, Thomsen, & Nordentoft, 2015; Wisker et al., 2007). Peer learning is helpful in respect of doctoral supervision as the skills needed to create something as complex as a doctoral thesis are sometimes communicated more effectively by peers than by senior colleagues for whom solutions may be obvious, resulting in a failure to clearly identify problems in the first place (cf. Nicol & Macfarlane-Dick, 2006). Moreover, where collective supervision is based on cohorts (i.e., where the group consists of students from one intake), '[t]he fact that all the students are at the same stage of their research journey and are grappling

with similar issues, encourages reflection on the critique offered, allowing them to weigh up the value and importance of the critique' (de Lange et al., 2011, pp. 24–25). Furthermore, it has been noted that students perceive peer learning as creative and reflexive (Hutchings, 2017), more so than with individual forms of supervision (Fenge, 2012). What is more, the formalisation of peer learning makes it easier for doctoral students to engage outside planned formal teaching in terms of research (Wisker et al., 2007), thereby counteracting the oft-cited experiences of social and academic isolation among doctoral students (see, e.g., de Lange et al., 2011; Fenge, 2012; Hutchings, 2017; Samara, 2006).

Peer learning is related to, but distinct from, a second factor which is stimulated by collective supervision and expected to reduce TTC, namely the broadening of the academic learning context (Fenge, 2012). This factor is important specifically when collective supervision includes more than one supervisor (de Lange et al., 2011; Samara, 2006). Knowledge in the broadest sense is a key but scarce resource for any doctoral student writing a thesis. Interaction with many researchers who are experts in different fields, rather than a small number of researchers, thus provides students with greater opportunities to acquire what they need (Samara, 2006). These opportunities for learning as provided by collective supervision can be enhanced further by selecting supervisors to suit the specific needs of the students admitted in a particular year (cohort).

With implications for TTC, collective supervision has also been argued to facilitate enculturation, that is, the process through which doctoral students are allowed to gradually acquire the values and behaviours of a research practice community (de Lange et al., 2011; Fenge, 2012; Hutchings, 2017; Wisker et al., 2007). These social dimensions of supervision include 'acculturation into the institution, the community of the discipline, the country/civilisation and epistemological access' (Lee, 2008, p. 272). Doctoral students need access to knowledge on methodological and theoretical issues (Dysthe et al., 2006), as well as on practical matters such as how to write an article and how to create a research network (Pearson & Brew, 2002). Put more generally, collective supervision 'enables the students' gradual full and legitimate participation in the discipline' (Samara, 2006, p. 126), which we expect will reduce the TTC.

These assumptions of collective supervision were all part of the motivation for the reform towards collective supervision undertaken in the doctoral programme analysed empirically in this article (Boréus, 2016; Mörkenstam, 2016). However, the reform was also motivated by two further considerations. Firstly, collective supervision was introduced in order to reduce the disagreements sometimes emerging among individual supervisors and teachers responsible for courses taught in the first year of the programme. As conflicting advices offered by superiors constitute an additional and essentially unnecessary burden for doctoral students to carry (Seagram, Gould, & Pyke, 1998), facilitating the resolution of collegial disagreements through joint supervision should allow doctoral students to progress more quickly. Secondly, collective supervision in the first year would allow doctoral students more space to freely consider alternative research topics before finalising their research plans and selecting permanent supervisors. Thus, there may be less of a risk of having to change supervisor and thesis topic later on in the process, which previous research indicates has a significant delaying effect (Seagram et al., 1998; van de Schoot et al., 2013).

Overall, these arguments generate an expectation that shifting to collective supervision in the first year should reduce the TTC and increase the probability of doctoral thesis

completion. However, there are also recurring critiques of collective supervision which would lead us to expect collective supervision to have no effect or the opposite effect. Firstly, the preconditions for collective supervision are important (see, for example, Carter et al., 2009; de Lange et al., 2011; Samara, 2006; Stracke, 2010). If there is no group atmosphere whereby doctoral students can feel secure and trust one another, the desirable suggested effects of collective supervision may not emerge at all, or it may even produce the opposite effect. Specifically, Enyedi et al. (2003, p. 314) suggest that effectiveness in collective supervision may be impeded by 'between-member problems', 'problems with supervisors' and 'supervisee anxiety and other perceived negative effects'. In a similar vein, Fenge (2012) notes that some doctoral students are uncomfortable with being supervised by their peers, in public, or by comparisons with other students.

Secondly, collective supervision is sometimes criticised on the ground that it forces doctoral students to engage with less specialised reactions to their work than are provided by selected field specialists (Enyedi et al., 2003). In this respect, individual supervision gives students the maximum amount of time possible to learn from, and together with, the one supervisor (or group of supervisors) who has more knowledge and experience than all alternative supervisors of relevance to the research project at hand. Collective supervision could also leave doctoral students frustrated as they feel that their individual projects are not the focal point of discussions and that their most topical questions are not answered due to 'poor group time management' (Enyedi et al., 2003, p. 314). On this ground, doctoral students supervised collectively are expected to advance more slowly than students supervised individually.

So to sum up, previous research generates plenty of reasons to expect a negative causal relationship between collective supervision and TTC (i.e., collective supervision will reduce the TTC), but there are also some reasons to expect a positive relationship. The theoretical considerations thus provide very strong justification for testing the competing expectations against empirical evidence. Looking briefly to the extensive literature on TTC without limitation to different supervision models, we see that quantitative methods have been used quite frequently (see, e.g., Baird, 1990; de Valero, 2001; Seagram et al., 1998; Sheridan & Pyke, 1994). So far, however, research on TTC has not tested the effects of individual and collective supervision respectively.

Context, data and methods

Doctoral studies in Sweden have several unique characteristics relevant to TTC which are regulated by law (SFS, 1993, p. 100). Until 1997, doctoral students could apply to and be admitted to doctoral programmes without funding for their doctoral studies while competing for funding with other doctoral students later on in the programme. From 1998 onwards, however, the law of Sweden requires all doctoral students admitted to be funded fully for 48 months from their first day. University departments have been funding doctoral studies through their own research budgets or external funding since 1998. When admitted to a doctoral programme, students have a legal right to decide upon their own topic of research, to change the topic as their studies progress and to change supervisors at any time. The organising institution has no right to unilaterally terminate a student's doctoral studies, even if students de facto leave their studies for

employment outside the university. Students can only be removed from the programme if they decide to leave on their own account. However, the university can withdraw funding and supervision if students fail significantly to comply with their own individual study plan, a signed contract established in the first year and then revised regularly.

The doctoral programme in our study is organised by the Department of Political Science under the Faculty of Social Sciences at Stockholm University.[1] In this programme, the full-time 48 months of funding includes 15–18 months of coursework (depending on the year of admittance to the doctoral programme) and 30–33 months devoted to thesis writing. There are two main sources of funding during studies: the faculty budget (often referred to as internal funding) and research councils (often referred to as external funding). Doctoral students are allowed to work on tasks other than their research and coursework for up to 20% of their full-time hours (this mainly involves teaching or administrative duties), thereby prolonging the 48 funded months for the doctoral studies by the same amount of time. In practice, most doctoral students plan to defend their doctoral theses between 48 and 60 months after commencing the programme. All students, no matter what their source of funding, have to apply to the doctoral programme in competition with other applicants following a public call for applications. They apply by submitting a brief plan for their research projects, although this plan is often amended during the early stage of the programme. Between 1991 and 2014, the department admitted two to eight doctoral students on one or two occasions each year.

To test the main hypothesis elaborated in the previous section, that collective supervision in the first year reduces the TTC and increases the probability of students completing their theses at any particular point in time, we collected data on 145 doctoral students admitted to the doctoral programme between 1991 and 2014.[2] The period for observing thesis completion continues until 31 December 2016.[3] Included in this group is a significant number of individuals who appear to have little or no intention of ever submitting a thesis while not formally leaving the programme (and as noted, the department cannot force them to leave). Most of these individuals were admitted to the programme before 1995 when the department made fewer and less systematic efforts to secure funding for all its students.

In our analysis, doctoral students admitted up to 2008 are coded as having received individual supervision throughout their entire time in the programme. The students who joined the programme in the autumn of 2009 and later have been coded as having received collective supervision throughout their first year in the programme (i.e., cohort supervision). This coding of doctoral students does of course capture some of their supervision experience, but not all of it. Certainly, there were elements of collective supervision in the programme before 2009, but in an informal sense most frequently initiated by a supervisor gathering together several doctoral students for supervision at the same time. The key difference made by the 2009 reform, which is embodied by the *Collective Supervision* variable, is that since then the department has not assigned individual supervisors to doctoral students in the first year, but required all of them to participate in collective supervision involving two to four supervisors. This arrangement has not prevented individual doctoral students contacting and interacting informally with researchers outside the collective supervision group.

The TTC for all doctoral students was measured by the number of months from admission to public defence of their doctoral theses, while students remain in the study

population as long as they have not defended their theses. This measurement is based on *gross* time. The time devoted by doctoral students to activities other than their doctoral research (such as teaching at the department, but also parental or sick leave, leaving the programme for other employment without formally leaving the programme or part-time studies) has *not* been subtracted from the number of months used to estimate the TTC. Future studies may include more refined measures which correspond approximately to the net time, but for the time being the gross time is the best available measure. This has the advantage of being relatively simple to measure, which should invite replication of this study in the context of other doctoral programmes.

To assess the effects of collective supervision more precisely, the study has collected data on two variables that are constitutive of the doctoral programme with anticipated effects on TTC. The first of these variables is *Early Funding Start*. This distinguishes between doctoral students with no funding from the department at all (0), students with funding commencing later than the first day (1) and students receiving full funding from the first day (2). Previous research has found that funding opportunities are key to explaining the TTC (Seagram et al., 1998; van de Schoot et al., 2013). The other variable constitutive of the doctoral programme included in the study is *Research Group Integration*. The important distinction here is between doctoral students admitted for the purposes of conducting research within their own formulated project, either with no funding at all (0) or with funding from the department (1); and doctoral students funded by a particular research project consisting of other researchers as well, and in which doctoral students may develop their own doctoral theses in relation to the project's general research plan (2). The idea here is to measure the extent to which doctoral students can draw upon an existing research agenda and research environment in their selection of topics, methods, etc., which is expected to lead them to an early start and facilitate completion within specific time frames.

The analysis will also assess the effects of three specific structural variables: *Sex*, *Citizenship* and *Admission Year*. *Sex* (male, female) and *Citizenship* (national, other) are standard variables for controlling the effects of structural discrimination. It is important to include *Admission Year* as a control variable in this particular case. The variable of main theoretical interest – *Collective Supervision* – was introduced relatively late, namely in 2009. To perceive the independent effect of this variable, we should cancel out the confounding effect of students receiving individual supervision spending more time in the programme simply because they were admitted at an earlier point in time. The logic, then, is that all doctoral students receiving individual supervision in their first year were admitted to the programme at a point in time that allowed them to 'waste' more time in comparison with all students receiving collective supervision – and inclusion of *Admission Year* as a control variable aims to eliminate this theoretically irrelevant circumstance.

Empirical analysis and results

When we analysed the mean number of months from admission of doctoral students to defence of their doctoral theses, the results were unambiguous: students who were supervised collectively in their first year spent a much lower number of months in the programme than students supervised individually in the first year. As displayed in Figure 1, students with the experience of collective supervision averaged 57 months in the programme, while students receiving individual supervision in the first year as well averaged
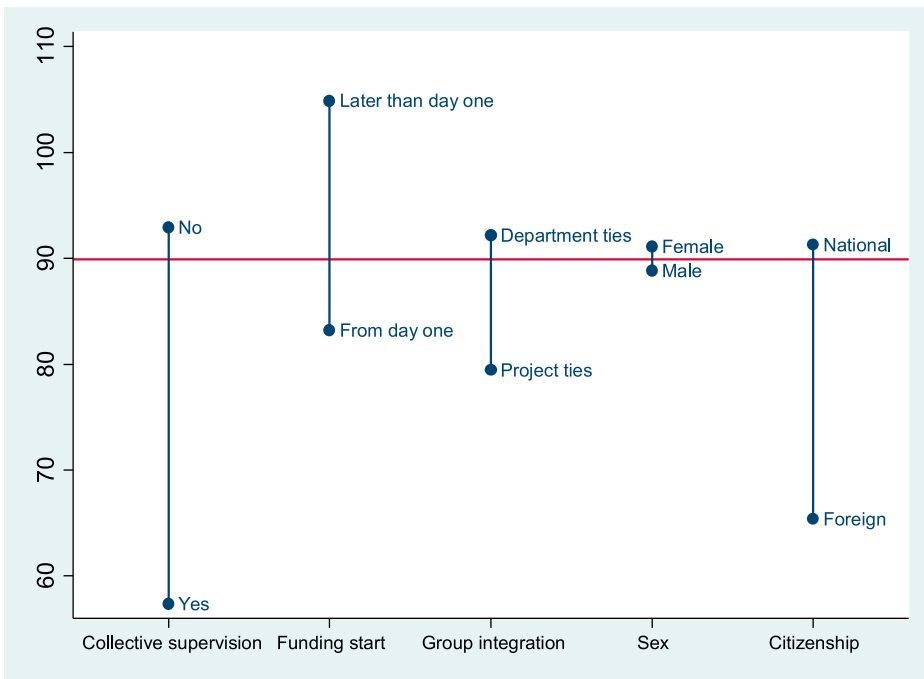
Figure 1. Mean TTC for groups of students admitted between 1991 and 2014 and with theses defended on or before 31 December 2016.

92 months. A total of eight doctoral students have completed their theses after collective supervision and 86 after individual supervision in the first year.[4]

Figure 1 also confirms that *Early Funding Start* is a relevant factor in explaining TTC. Students funded from admission took, on average, 83 months to defend their theses, while the mean number of months from admittance to thesis defence is 105 for students receiving funding from a later point (usually one year later). No doctoral student has defended a thesis while receiving no funding at all. Furthermore, Figure 1 suggests that *Research Group Integration* is an important factor in explaining TTC. The average number of months is 79 for students linked with a pre-existing research project, while the average time is 92 months for students not pursuing their research as part of a pre-existing project. We draw attention to these details to clarify a methodological point implemented below: to analyse the effects of collective supervision on TTC, it is necessary to account for the effects of funding and research group integration as well. Finally, observation of TTC in Figure 1 provides *no indication of structural discrimination* based on sex. The mean is 91 months for females and 89 months for males. Neither is there any indication of structural discrimination against students with foreign citizenship. The mean TTC for national citizens to the public defence of their doctoral theses is 91, while citizens of other countries average 65 months. The shorter TTC of students with foreign citizenship confirms the findings of existing research (e.g., Aslanbeigui & Montecinos, 1998).

All of the above observations reflect the experiences of individuals who have completed their theses. However, of equal interest to any department choosing between individual and collective supervision is the experience of the doctoral students who have not
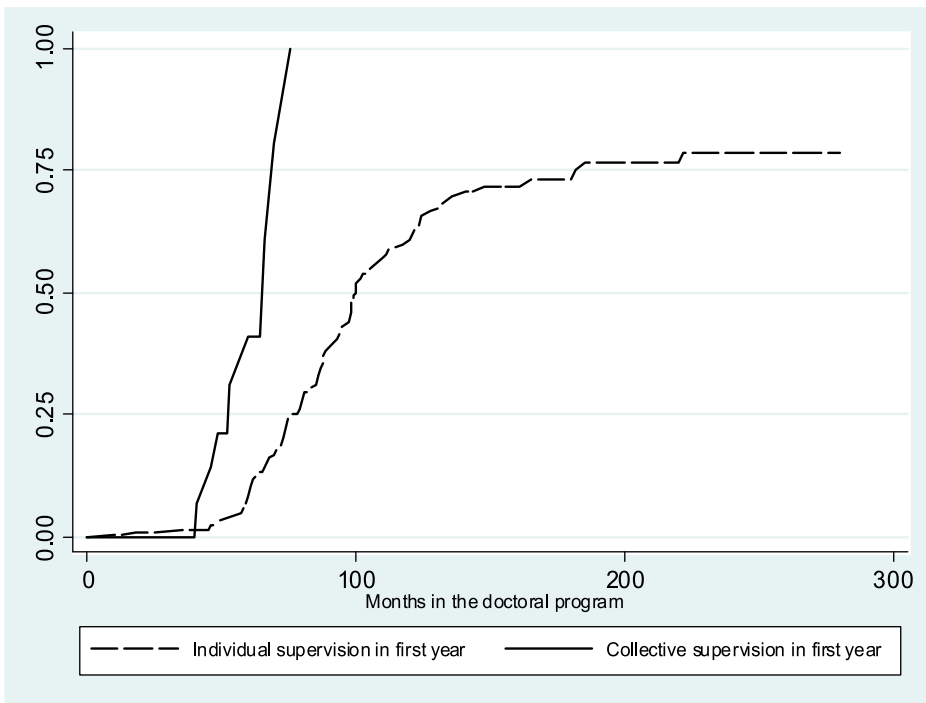
Figure 2. Kaplan–Meir 'failure' estimates (thesis defence probabilities) across Collective and Individual Supervision in the first year.

completed a thesis at all. Hence, it is relevant to look at the *probability* of doctoral students defending their theses across groups that have received individual or collective supervision in the first year. Figure 2 provides a first glimpse of this matter (yet with no control for alternative explanations).

The curves describe the varying probability of having completed a thesis at particular points in time, measured according to the number of months after admission. There is almost no difference between the two groups of doctoral students as regards the probability of defending their doctoral theses in approximately the first 45 months of the programme, which comes as no surprise as the expected TTC is 48 months. After that time, however, we see different trajectories for individuals receiving collective supervision (for whom the probability of defending a thesis increases much more sharply) and individuals receiving individual supervision in the first year (for whom the probability of defending a thesis increases much less sharply). Hence, the difference in TTC between students supervised individually and collectively observed earlier (in Figure 1) indeed translates into an equivalent difference in terms of the abstract but more relevant concept of completion probability (in Figure 2).

There is a reason against this background to undertake an explanatory statistical analysis which seeks to isolate the effects of having received individual or collective supervision in the first year. Table 1 does so by reporting the results of a Cox regression analysis.

The coefficient of 1.40 for the independent variable *Collective Supervision* in Table 1 suggests that a doctoral student is 140% more likely to defend a thesis in a particular month if collective supervision was provided in the first year, compared with doctoral

Table 1. Cox regression.

Independent variables	Coefficients	Significance levels
Collective Supervision	1.40	0.009
Early Funding Start	0.82	0.011
Research Group Integration	0.55	0.043
Female	−0.30	0.141
Admission year	−0.02	0.533

Note: Determinants of the probability of a doctoral student defending a thesis in a given month (dependent variable).

Table 2. Ordinary Least Square regression.

Independent variables	Coefficients	Significance levels
Collective Supervision	−28	0.018
Early Funding Start	−17	0.011
Research Group Integration	−6	0.043
Female	−3	0.141

Note: Determinants of TTC (dependent variable).

students receiving individual supervision in that time.[5] Hence, there is considerable support for the theoretical argument made earlier that collective supervision increases the probability of defending a thesis in any one month. In contrast to our earlier and preparatory interpretations of Figures 1 and 2, Table 1 supports this conclusion while accounting for the alternative explanations of TTC and completion probability discussed earlier.[6]

Looking just briefly at the estimated effects of the other variables as well, we can see in Table 1 that receiving full funding from day one appears to increase the probability of being able to defend a thesis by about 82%, compared with doctoral students belonging to the other groups.[7] Also in the expected direction, being linked with a research project increases the probability of completing a thesis on any given day by 55%, compared with doctoral students not linked with an existing research project.[8]

The main weakness of the Cox regression technique is that its results are difficult to interpret in concrete terms, such as the number of months that collective supervision may save for a doctoral student. Statisticians yet have to find a transparent solution to this problem. To gain some traction with the issue at this point, however, Table 2 estimates the same model as that presented in Table 1, but with an OLS regression limited to the 94 of the 145 doctoral students who have actually completed their theses. While truncating the sample and reducing the relevant information, this analytical move has the advantage of shifting the dependent variable from the probability of completing a thesis (in the Cox regression) to the actual number of months it takes to complete a thesis (in the OLS).

As shown in Table 2, *Collective Supervision* is estimated to reduce the TTC by 28 months, *Early Funding Start* by 17 months and *Research Group Integration* by 6 months. The effect of *Sex* is not statistically significant, while the negative coefficient suggests that being female reduces the TTC. The direction of this effect is contrary to the effect of *Sex* in the Cox regression, suggesting that among students who complete their theses (the only ones included in the OLS regression), the estimated TTC is shorter for female students (unlike Figure 1 which describes TTC differently, Table 2 controls for alternative explanations). More generally, our study confirms earlier findings that the effect of sex on TTC is conditional and context-dependent (van de Schoot et al., 2013).

Conclusion

How to organise and conduct supervision of research is an often-debated issue. So far, however, few studies have been designed in a way that allows researchers to analyse the effects of alternative supervision models. To gain some traction in this regard, we collected data on 145 doctoral students receiving either individual or collective supervision in their first year and statistically analysed the TTC and the probability of them completing their theses. We found that collective supervision had a significant negative effect on TTC and a significant positive effect on thesis completion probability. Hence, collective supervision reduces the TTC while increasing the probability of thesis completion. Plausible explanations for this inferred effect, we suggest, include the potential of collective supervision to (i) enhance peer learning, (ii) broaden the academic learning context and common pool of knowledge, (iii) facilitate acquisition of the values and behaviours of a research practice community, (iv) reduce the risk of linking doctoral students with a single supervisor before topic selection has been finalised and (v) resolve disagreements among senior staff responsible for providing supervision.

According to our study, institutions experiencing problems with TTC or thesis completion may then seek to make their supervision more collective, at least in the first year of the doctoral programme. As a minimum, this involves supervision of more than one research project at the same time. At the department studied, the number of students and supervisors has varied since 2009; from three to seven students and two to four supervisors. Throughout the entire period of doctoral studies, collective supervision should be viewed as a supplement to individual supervision (cf. de Lange et al., 2011; Fenge, 2012; Hutchings, 2017; Samara, 2006); but as our analysis shows, collective supervision could replace individual supervision entirely throughout the first year. Our results also indicate that collective supervision in parallel with individual supervision may provide doctoral students with support throughout the doctoral programme. Collective supervision sessions could be organised for doctoral students within a specific research field or at a specific stage in the research process (such as analysing large data sets, quantitatively or qualitatively) and thus need not be cohort-based. Such collective supervision may include the supervisors responsible for the individual supervision of doctoral students (thereby reducing the risk of different researchers/teachers offering conflicting advice to doctoral students), and it may be limited to a few meetings per year.

Although the results of our quantitative analysis are clear, robust and supported by qualitative observations and arguments in previous research as well as by our own experience, there is still a need for better knowledge on when and how collective supervision has negative (generally desirable) effects on TTC. To gain such knowledge, it would be useful if future research could further isolate the effects of collective supervision. In our study, an alternative explanation of the results can be found in a changing external environment for doctoral studies in Sweden. One factor involves the labour law reforms in the mid-2000s, which limited the time which doctoral students could stay in academia without completing their theses while being employed temporarily as, for instance, teaching staff (AD 2004 No. 58; SFS 1982:80; SOU 2007:98, pp. 285–296). At around the same time, there was a significant increase in competition for research grants, post-doctoral positions and permanent positions in academia (the number of students with completed PhDs in the social sciences in Sweden doubled between 1998 and 2008; see Vetenskapsrådet, 2015).

Another legislative change aimed specifically at doctoral programmes was the above-mentioned radical reform which took place in 1998, making full-time funding from day one obligatory by law for all doctoral students. Viewed collectively, these factors may have altered the incentives for individual doctoral students to complete their theses more quickly and may also have contributed to the emergence of an academic norm whereby prioritisation of rapid progress (short TTC) is important in the face of other aims of doctoral studies, such as research quality and collegiality.

This study cannot rule out the possibility that changes to incentives for doctoral students, or to academic norms, in parallel with or just before the introduction of collective supervision may subsequently have contributed to the observed reduction in TTC. It should be noted, however, that the exogenous sources of these possible shifts in norms and incentives are dated well before 2009, a point in time which heralded collective supervision of first-year doctoral students for the first time as well as a significant reduction in TTC. That said, additional empirical studies are needed in order to consider the alternative explanations more closely. One way forward would be to apply the concepts and design developed for this paper to studies of other doctoral programmes in Sweden that have introduced or abolished collective supervision at various points in time, and then to check whether the effects of collective supervision still persist. Another option would be to apply the design and concepts employed here to analyse doctoral programmes in countries other than Sweden, with academic cultures that are significantly different. Hence, there are considerable opportunities to gain further qualified knowledge on the effects of individual and collective supervision beyond the conclusions of this article. Based on available evidence, however, the best-educated guess is that collective supervision of first-year doctoral students does indeed reduce the TTC and increase the likelihood of them completing their theses.

In light of this conclusion, we would like to end with two caveats on the practical application of our results. Firstly, focusing too closely on TTC may risk placing an unnecessary burden on doctoral students who are already under stress, adversely affecting both their health and their learning. Secondly, this study does not analyse the academic quality or scientific contribution of doctoral programmes or individual theses. We do not know whether such factors are related to TTC, and in what way. So in contexts where most doctoral theses are completed within time limits, the right focus may well be to encourage doctoral students to select more risky, creative and demanding research problems rather than to shorten TTC. Whether collective supervision is more effective than individual supervision as regards attaining those higher aims in doctoral studies is another key problem to be addressed in future HE research.[9]

Notes

1. We rely on public and internal programme documentation available to us in our capacity as directors of the doctoral programme between 2000–2009 and 2013–2017, respectively. All program documentation relevant to this paper is available from the authors upon request.
2. We would like to thank Pasquale Cricenti for collecting most of the data analysed in this article.
3. Ninety-four of the 145 doctoral students had completed their theses by 31 December 2016.
4. To calculate these means, the population has been temporarily delimited to the subgroup of students who have actually completed their theses.

5. The effect is significant below the 0.01 level (with more than 99% certainty the observed pattern is not produced by chance).

6. The explanatory power of the whole model is reasonable. It predicts the direction of the effect in accordance with observations in approximately 70% of cases (Harrell's C). The variables *Early Funding Start* and *Research Group Integration* are defined in this model as explained in an earlier section, that is, as three-step variables at the ordinal level. We have taken this unorthodox step (Cox regressions otherwise assume either categorical or interval level-independent variables) after having tested models with both of these variables restructured into sets of dummy variables. As these complications did not alter the main direction or significance levels, the simpler, more accessible models are presented here. The Proportional Hazard Assumption was tested by analysing the effects of interactions between time and all factors noted in Diagram 1. All factors passed this test except for *Citizenship,* which interacted with time at the 10% security level and was therefore excluded from the statistical analyses.

7. The estimated effect is significant at the 1% security level.

8. This estimate is significant at the 5% security level, but not at the 1% security level.

9. For reactions to earlier versions of this article we want to thank Klara Bolander Laksov, Andreas Duit, Livia Johannesson, Karin Sundström, the editor and anonymous reviewers of HERD, and the participants in two workshops organised at the Department of Political science in Mai 2017 and at the Centre for The Advancements of University Teaching at Stockholm University in November 2016.

Disclosure statement

References

AD [Labour Arbitration Court] 2004 No. 58, Case No. A-129-2003.

Agu, N., & Odimegwu, C. O. (2014). Doctoral dissertation supervision: Identification and evaluation of models. *Education Research International*, *2014*, 9.

Aslanbeigui, N., & Montecinos, V. (1998). Foreign students in US doctoral programs. *Journal of Economic Perspectives*, *12*(3), 171–182.

Baird, L. L. (1990). Disciplines and doctorates: The relationships between program characteristics and the duration of doctoral study. *Research in Higher Education*, *31*(4), 369–385.

Boréus, K. (2016, November 24). [Director of doctoral studies in Political Science at Stockholm University 2009–2013]. E-mail to Hans Agné.

Boud, D., Cohen, R., & Sampson, J. (1999). Peer learning and assessment. *Assessment & Evaluation in Higher Education*, *24*(4), 413–426.

Carter, J. W., Enyedy, K. C., Goodyear, R. K., Arcinue, F., & Nijhawan Puri, N. (2009). Concept mapping of the events supervisees find helpful in group supervision. *Training and Education in Professional Psychology*, *3*(1), 1–9.

de Lange, N., Pillay, G., & Chikoko, V. (2011). Doctoral learning: A case for a cohort model of supervision and support. *South African Journal of Education*, *31*, 15–30.

de Valero, Y. F. (2001). Departmental factors affecting time-to-degree and completion rates of doctoral students at one land-grant research institution. *Journal of Higher Education*, *72*(3), 341–367.

Delany, D. (2008). *A review of the literature on effective PhD supervision*. Dublin: Centre for academic practice and student learning, Trinity College.

Dysthe, O. (2002). Professors as mediators of academic text cultures: An interview study with advisors and master's degree students in three disciplines in a Norwegian university. *Written Communication*, *19*(4), 493–544.

Dysthe, O., Samara, A., & Westrheim, K. (2006). Multivoiced supervision of master's students: A case study of alternative supervision practices in higher education. *Studies in Higher Education*, *31*(03), 299–318.

Enyedy, K. C., Arcinue, F., Puri, N. N., Carter, J. W., Goodyear, R. K., & Getzelman, M. A. (2003). Hindering phenomena in group supervision: Implications for practice. *Professional Psychology: Research and Practice*, *34*(3), 312–317.

Fenge, L.-A. (2012). Enhancing the doctoral journey: The role of group supervision in supporting collaborative learning and creativity. *Studies in Higher Education*, *37*(4), 401–414.

Gurr, G. M. (2001). Negotiating the "Rackety Bridge" — A dynamic model for aligning supervisory style with research student development. *Higher Education Research & Development*, *20*(1), 81–92.

Holbrook, A., Bourke, S., & Cantwell, R. (2006). *Using research candidate annual report data to examine supervision effectiveness*. In M. Kiley & G. Mullins (Eds.), *Quality in postgraduate research: Knowledge creation in testing times* (pp. 83–98). Canberra: CEDAM, The Australian National University.

Hutchings, M. (2017). Improving doctoral support through group supervision: Analyzing face-to-face and technology-mediated strategies for nurturing and sustaining scholarship. *Studies in Higher Education*, *42*(3), 533–550.

Lee, A. (2008). How are doctoral students supervised? Concepts of doctoral research supervision. *Studies in Higher Education*, *33*(3), 267–281.

Mörkenstam, U. (2016, December 12). [Director of doctoral studies in Political Science at Stockholm University 2000–2009]. Interviewed by Hans Agné.

Nicol, D. J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in Higher Education*, *31*(2), 199–218.

Nordentoft, H. M., Thomsen, R., & Wichmann-Hansen, G. (2013). Collective academic supervision: A model for participation and learning in higher education. *Higher Education,*, *65*(5), 581–593.

Pearson, M., & Brew, A. (2002). Research training and supervision development. *Studies in Higher Education*, *27*(2), 135–150.

Robertson, M. J. (2017). Team modes and power: Supervision of doctoral students. *Higher Education Research & Development*, *36*(2), 358–71.

Samara, A. (2006). Group supervision in graduate education: A process of supervision skill development and text improvement. *Higher Education Research & Development*, *25*(2), 115–129.

Seagram, B. C., Gould, J., & Pyke, S. W. (1998). An investigation of gender and other variables in time to completion of doctoral degrees. *Research in Higher Education*, *39*(3), 319–335.

SFS (Swedish Code of Statutes) 1982:80 *Lag om anställningsskydd*.

SFS (Swedish Code of Statutes) 1993:100. *Högskoleförordning*.

Sheridan, P. M., & Pyke, S. W. (1994). Predictors of time to completion of graduate degrees. *Canadian Journal of Higher Education*, *24*(2), 68–88.

SOU (Swedish Government Official Reports) 2007:98 *Karriär för kvalitet*.

Stracke, E. (2010). Undertaking the journey together: Peer learning for a successful and enjoyable PhD experience. *Journal of University Teaching & Learning Practice*, *7*(1), 1–10.

van de Schoot, R., Yerkes, M. A., Mouw, J. M., & Sonneveld, H., (2013). What took them so long? Explaining PhD delays among doctoral candidates. *PLoS ONE*, *8*(7), e68839. doi:10.1371/journal.pone.0068839

Vetenskapsrådet [Swedish Research Council]. (2015). *Forskningens framtid! Karriärstruktur och karriärvägar i högskolan*. Stockholm: Vetenskapsrådets rapporter.

Wichmann-Hansen, G., Thomsen, R., & Nordentoft, H. M. (2015). Challenges in collective academic supervision: Supervisor's experiences from a master programme in guidance and counselling. *Higher Education,*, *70*, 19–33.

Wisker, G., Robinson, G., & Shacham, M. (2007). Postgraduate research success: Communities of practice involving cohorts, guardian supervisors and online communities. *Innovations in Education and Teaching International*, *44*(3), 301–320.