

The impact of the student-to-supervisor ratio on research proficiency in postgraduate Economics

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ABSTRACT

In 2007, the Higher Education Qualification Framework (HEQF) prescribed that all Bachelor degrees and Bachelor Honours degrees at National Qualification Level (NQF) level 8 include a research component worth 30 credits. The purpose of the research component is to prepare students to conduct independent and authentic field-specific research at an Honours-level with emphasis on discipline-specific research methodologies, data analysis and rigorous interpretation of results.

Institutions have opted to present this research component in different ways depending on the discipline. In the discipline of Economics, the Honours research component is usually presented as a separate research module over one academic year and involves conducting and reporting research under supervision. The research module includes 10 two-hour research methodology lectures in the first semester so that students are provided with guidance on how to conduct independent research.

The research proficiency of an Honours student in Economics is not only dependent on their own knowledge and ability, but also on the knowledge, ability and supervision capacity of their supervisor. Since universities usually have different student intakes, they are very likely to have different student-to-supervisor ratios. The aim of this study is to contribute to the emerging research on postgraduate supervision pedagogy in South Africa. The study does this by investigating whether the students' research proficiency in Honours-level Economics (measured by the final grade of the module) at the University of Pretoria and at the University of Johannesburg is influenced by the Honours student-to-supervisor ratio of their supervisor. After controlling for a range of factors, preliminary empirical findings suggest that the Honours student-to-supervisor ratio has no significant impact on research proficiency of an Honours student in postgraduate Economics. These findings are a signal that there are many other factors that need to be considered when modelling the research proficiency of postgraduate students in Economics.

INTRODUCTION

The purpose of postgraduate education is manifold. Development for the labour market (employment), the production of research, contribution to discipline-specific scholarship and the personal development of an individual are but some of the major purposes of postgraduate education (Burgess, Band and Pole, 1998). The South African Department of Higher Education and Training (DHET) recognised the importance of postgraduate education and implemented additional research requirements into all Bachelor Honours Degrees as part of its re-curriculation process in 2012 in order to “deepen the student’s expertise in a particular discipline, and to develop research capacity in the methodology and techniques of that discipline” (Council on Higher Education, 2013). The Honours year is a critical year in

postgraduate education because it is the point where students transition from knowledge acquisition to knowledge creation (Kiley et al., 2011). In the South African context, the Honours year is typically a student's fourth year of study.

Research student supervision is one of the most important roles in postgraduate education. It is important because supervision can be seen as a "mutual, interactive process aimed at improving the supervisor's ability to be sensitive to the student's competence and ability" (Severinsson, 2012, p.215). In addition, "[supervisors] socialize students into disciplinary research cultures, provide emotional support, and assist with broader career development" (Pearson and Brew, 2000). Without adequate supervision, the aims and objectives of postgraduate education cannot be met.

In this study, research proficiency is defined as meeting the research outcomes stipulated for a Bachelor Honours Degree. These outcomes were stipulated by the South African Higher Education Qualifications Sub Framework (HEQSF) as "preparing students for research-based postgraduate study" by "conducting and reporting research under supervision, worth at least 30 credits, in the form of a discrete research component that is appropriate to the discipline or field of study" (Council on Higher Education, 2013, p.30).

The Honours research component in South Africa for Bachelor degrees and Bachelor Honours degrees is unique because it is usually delivered in different ways across institutions and disciplines with the aim of achieving the same outcome which is conducting and reporting research under supervision. For example, some disciplines offer mandatory research methodology training before each student undertakes research while other disciplines offer optional training as the student undertakes their research. At many South African universities, the Honours research component in Economics is usually presented as a separate research module over one academic year and involves conducting and reporting research under supervision. The research module includes 10 two-hour research methodology lectures in the first semester so that students are provided with guidance on how to conduct independent research. These comprehensive research methodology lectures cover a wide spectrum of topics from drafting your introduction, conclusion and literature review to identifying and executing qualitative and quantitative methodologies. Upon completion of the module, registered students are required to submit a research essay for grading to prove their research proficiency at the Honours level.

Among the factors influencing the postgraduate research proficiency is the ratio of students-to-supervisors. Little is known about how exactly the student-to-supervisor ratio influences research proficiency at an Honours level in the discipline of Economics in South Africa. The purpose of this paper is to gain meaningful insight into the factors that influence research proficiency at an Honours level in the discipline of Economics in South Africa. The study uses data from 2016 and the sample contains students from two prominent residential universities in the Gauteng province – the University of Johannesburg (UJ) and the University of Pretoria (UP).

LITERATURE REVIEW

Scholarly literature has many themes pertaining to postgraduate supervision at an Honours level. Table 1 below presents the key articles, in the area of Honours research supervision, that are most useful to the framework of this study along with the main claim of each article. The

articles below are also an indication that inquiry into research proficiency at an Honours level within the realm of Economics in the South African context is clearly lacking.

Table 1. Honours supervision literature: state of the art

Study	Main claim
Brydon and Flynn (2014)	In the field of social work, Honours students see their supervisors as “expert companions” but also feel the need to be seen as the drivers of their own work. They consider their relationship with their supervisor as an alliance.
Drew, Subramaniam and Clowes-Doolan (2002)	Bachelor of Business Honours students prefer supervisors to take on a mentoring role and preferred facilitative processes during their studies (as opposed to authoritative interventions).
Laming (n.d)	An effective 3-step recipe is formulated for Honours students across disciplines namely Getting Started with Your Thesis, Writing Up and the Writing Space.
Kiley, Boud, Cantwell and Manathunga (2011)	Explored the multiple meanings of Honours qualifications across disciplines.

Source: Authors’ own adaptation

ANALYTICAL FRAMEWORK

In this section, the analytical framework of the paper is presented. The study makes use of a probability model, in the form of a probability unit (probit) regression, to examine the impact of the Honours student-to-supervisor ratio on an Honours student’s research proficiency.

Let us denote an Honours student’s research proficiency as RP . RP represents a student’s final Honours Research Project (HRP) mark and is used as a proxy for an Honours student’s research proficiency. The final mark is a combination a student’s semester submissions and their exam submission. The semester submissions are usually smaller parts of the project that are developed during the year and scaffolded to form the exam submission. At UJ, the exam submission, and at UP, the final research essay, is the final version of the HRP which comprises of all the revised semester submissions. At UJ, these smaller parts are semester activities namely the introduction (5%), literature review (5%), methodology (5%), results (5%), a first draft (10%) and a final draft (70%). At UP, these smaller parts are semester activities (10%), proposal and examination (15%) and the final research essay (75%).

Because we are interested in the probability of a student being research proficient, the dependent variable is binary. RP takes on the value 1 if a student is research proficient and 0 if a student is not research proficient. Thus, this paper will estimate the probability of being research proficient based on the following latent variables model.

$$RP_i^* = \alpha + \beta SSR_i + \eta X_i + \varepsilon_i \quad (1)$$

$$\begin{cases} RP_i^* = 1 & \text{if } RP_i^* \geq 50 \\ RP_i^* = 0 & \text{if } RP_i^* < 0 \end{cases} \quad (2)$$

where RP_i^* is the binary dependent variable taking a value of 1 if the student's final mark is 50% or more and 0 otherwise; SSR_i refers to the Honours student-to-supervisor ratio for each Honours student and X_i is a set of individual characteristics affecting the respondent's research proficiency. ε_i is the residual term that follows a standard normal distribution; and α , β , η are constant parameters to be estimated. A grade of 50% was used as the cut off for research proficiency because it is the grade used by most universities in South Africa to determine whether a student has passed or reached a basic level of proficiency for a particular subject. It is very unlikely that a student could obtain 50% from semester submissions alone. At UP and UJ, an examination submission is mandatory in order to pass the subject or in this case, to be considered as research proficient. In this study, a binary variable, determined by the 50% threshold, facilitates more accurate measurement of the "pass" or "fail" probability.

Data

For this paper, data from two higher education institutions, UJ and UP, were used. This data was acquired from the research methodology lecturers' faculty class records as well as each institutions planning and enrolment management divisions (the Institutional Planning and Enrolment Management (IPEM) and Data Governance & Management division at UJ and the Division for Institutional Planning (DIP) at UP). The sample contained 185 students (149 from UJ and 36 from UP) of which 148 were active (116 from UJ and 32 from UP). Students were registered for a Bachelor of Commerce Honours in Economics or Econometrics on a part time or full time basis at UJ and for a Bachelor of Commerce Honours in Economics (and Econometrics) on a full time basis at UP.

Dependent variable: Honours Research Proficiency

Since the aim of this paper is to examine research proficiency, particularly for Economics students at a postgraduate level, the dependent variable used here is Honours Research Proficiency which is quantified by an Honours student's final HRP mark. The final mark variable is transformed into a binary variable taking a value of 1 if the student's final mark is 50% or more and 0 otherwise. The final mark is a combination a student's semester submissions and their exam submission. The semester submissions are usually smaller parts of the project that are developed during the year and scaffolded to form the exam submission.

Independent variables:

Student-to-supervisor ratio (SSR_i)

The main independent variable of interest is the Honours student-to-supervisor ratio. This variable was calculated by taking the number of Honours students supervised by each supervisor. This number was then assigned to each student and ranged from 1 to 9. This is our main independent variable of interest because we are interested in how this variable influences the research proficiency of Honours students in Economics.

Control variables (X_i)

The control variables chosen for this study were based on data availability at the respective institutions. Variables that were most preferred were not always available.

Age

The age range was 22 – 45 years old. The study made use of all the students who were registered for the module at both UJ and UP irrespective of their age. The age range would differ from cohort to cohort annually. Age is an important factor to consider because research proficiency could improve with age or maturity.

Marital status

Marital status was represented as a binary variable with 0 being married and 1 unmarried. Divorced or separated was not accounted for in this marital status variable. Marital status is important to consider because unmarried people may have more time to study. However, married people may be better at balancing their work, study and personal commitments.

Racial group

Racial group was also represented as a binary variable with 0 representing European, Indian and Coloured students and 1 representing African students. Other racial groups were not present in this sample and thus, were not accounted for. The sample comprised of predominantly African students which is why the racial group variable was presented as binary. Considering the legacy of apartheid, it would be interesting to see whether there are any noticeable differences between African students and European, Indian and Coloured students.

School quintile

In the South African education system, the quintile system ranks schools from quintiles 1 to 5 – with 1 representing a group of schools catering for the poorest 20% of learners in a particular area and 5 representing the least poor (Van Wyk, 2015: 5). The aim of this quintile system is to categorise schools for government subsidy – schools classified in a lower quintile qualify for more non-personnel, government subsidy per learner. In this study, school quintile is used in an attempt to control for socioeconomic status as income information per student was not available.

Study duration (part-time or full-time)

Students at UJ were offered the choice between part-time study (over two years) and full-time study (over one year) while UP students had the option of full-time study (one year) only. As a control variable, full-time or part-time study matters because it controls for timetable constraints and influences the kind of attention a student can give their research during the year.

RESULTS

Descriptive Statistics

The HRP module was a 28 week year module and carried a 30 credit value at both universities. Module delivery was similar at both institutions. At the beginning of the academic year, a designated lecturer provided the HRP students with a series of lectures on research methodology in Economics. The aim of these lectures was to provide the students with perspective on postgraduate writing, the HRP structure and a clear guideline on methodologies in the discipline of Economics. Parallel to these lectures, students were assigned to supervisors based on their sub-disciplines of interest. Supervisors submit topics or areas of interest and students select their topics or areas of interest. Together with their supervisor, students would then agree on an exact topic so that they could contextualize their topic with the research methodology lectures as they took place.

Because class sizes differed substantially per institution (UJ had an intake of less than 150 while UP had an intake of less than 40), the student-to-supervisor ratio also differed substantially per institution. Table 2 below illustrates this per institution. The supervisor total refers to the total number of supervisors in the department who supervised Honours students in 2016. The student intake refers to the number of students who remained registered up until the examination date. The active students refers to students who submitted their final project for examination. The average student-to-supervisor ratio was calculated by taking the total number of active students and dividing this by number of supervisors.

Table 2. UJ versus UP average student-to-supervisor ratio for the HRP

University of Pretoria		University of Johannesburg	
Supervisor total	10	Supervisor total	31
Student intake	36	Student intake	149
Active students	32	Active students	116
Average student-to-supervisor ratio	3.2	Average student-to-supervisor ratio	3.7

Source: Authors' own calculations

Table 3 depicts the number of students who were in similar size groups per supervisor. Only 7 supervisors had one student each. On average, most supervisors had HRP student groups of between 2 and 6 students. There were 3 supervisors who had HRP student groups that exceeded 6 students.

Table 3. Total student-to-supervisor ratio

HRP supervision student range	Number of students	Supervision groups
1	7	7
2	19	9
3	31	3
4	24	6
5	25	5
6	18	3
7	7	1
8	8	1
9	9	1

Source: Authors' own calculations

Tables 4 to 7 depict the individual characteristics of the sample. More than half the sample are female, single and of African ethnicity. 24% of the sample is 24 years of age with very few students exceeding the age of 35 years.

Table 4. Gender frequency

Gender	Frequency	Percent
Male	83	44.8
Female	102	55.2

Source: Authors' own calculations

Table 5. Age frequency

Age	Frequency	Percent
22	2	1.08
23	35	18.92
24	45	24.32
25	31	16.76
26	23	12.43
27	11	5.95
29	7	3.78
30	7	3.78
31	11	5.95
32	5	2.70
33	2	0.54
35	1	0.54
37	1	0.54
39	1	0.54
41	1	0.54
45	1	0.54

Source: Authors' own calculations

Table 6. Marital status

Marital status	Frequency	Percent
Married	4	2.16
Unmarried	171	92.43
Unknown	10	5.41

Source: Authors' own calculations

Table 7. Race

Race	Frequency	Percent
African	162	87.57
White, Coloured, Indian	23	12.43

Source: Authors' own calculations

In addition to individual characteristics, an important indicator of socioeconomic background is the school quintile for each student. Table 8 below displays the school quintiles for 40.54% of the sample – quintile information was not easily available for all students at UJ and not available at all for students at UP. Nevertheless, 24.86% of students in the sample were from quintile 5 schools.

Table 8. School quintiles

Quintile	Frequency	Percent
1	3	1.62
2	10	5.41
3	5	2.70
4	11	5.95
5	46	24.86
Unknown	110	59.46

Source: Authors' own calculations

Table 9. Study duration (part-time versus full-time)

Full time	Frequency	Percent
0	59	31.89
1	126	68.11

Source: Authors' own calculations

Table 9 above shows that most students in the sample studied a Bachelor of Commerce Honours in Economics or Econometrics at UJ and UP on a full time basis (over one year). Moreover, in this study, research proficiency was measured using the students' final HRP mark. The average final mark for the HRP across both institutions was 49.66% and the highest mark was 88%.

Univariate probit results

The estimation of the baseline univariate probit model includes all the covariates used (age, marital status, gender, race, school quintile and study duration (full time or part-time)) without controlling for endogeneity. While the coefficient for the student-to-supervisor ratio is negative, which is to be expected, it is insignificant at the 10% confidence level. This means that the Honours student-to-supervisor ratio has no significant impact on research proficiency of an Honours student in postgraduate Economics. This is in line with the correlation coefficient between the student-to-supervisor ratio and the final mark of -0.2164 which suggests a weakly correlated and negative relationship.

Discussion

The univariate probit results are an indication that the research proficiency of an Honours student is not simply related to the number of Honours students supervised by an individual student's supervisor. In addition, the variability of marital status and race is limited which might not confirm the hypothesis that married people have other responsibilities and less time. While the probit model controls for many important socioeconomic factors, many other factors need to be considered from a supervisor and student perspective to improve the robustness of the model in future.

In future, we will need to control for a supervisor's overall supervision, lecturing and research workload. While the literature on the student-to-supervisor ratio is sparse, one would expect a similar rationale to the small class debate i.e. smaller class sizes tend to have higher success rates. The workload of the supervisor is bound to have an impact on the research proficiency of the HRP student. The impact could be through the time allocated to the Honours students. Supervisors with a heavier workload may not necessarily be able to allocate enough time to their Honours students. In addition, the study did not control for supervision experience. This variable is important because it could determine the supervision proficiency of a supervisor while controlling for their workload i.e. an experienced supervisor may be able to handle a full supervision, lecturing and research workload. A third variable to consider from a supervision perspective is the supervision style of a supervisor. Some supervisors guide their students through each step of their research while other supervisors prefer to limit their advice to allow the student to learn independently. A fourth variable to consider is the number of senior postgraduate students that a supervisor supervises. Some supervisors may choose to allow senior postgraduate students to mentor Honours research students which could decrease a supervisor's supervision workload, especially at the Honours level.

From a student's perspective, there are also additional control variables that require consideration or modification in the future. For instance, access to a writing tutor was not controlled for. Students who have access to a writing tutor may become more research

proficient than those who do not have access to a writing tutor. Secondly, the school quintile variable had many missing observations for the UJ cohort of the sample and was just not available for the UP cohort of the sample. This means that socioeconomic status was partially-controlled for in the entire sample which could definitely impact the reliability of the results. Thirdly, the final mark was calculated differently for UJ and UP. At UJ, the final mark is calculated by weighting the semester mark as 30% of the final mark and the examination mark as 70% of the final mark whereas at UP, the final mark is calculated by weighting the semester mark as 50% of the final mark and the examination mark as 50% of the final mark. This could result in a slight difference in final mark calculated which could in turn influence the results. Furthermore, attendance to the methodology lectures was not controlled for which could have influenced a student's access to information and subsequently, their research proficiency. In addition, the intensity of a student's timetable was not considered. A busier timetable could mean less time for research especially if the other modules have regular formative and summative assessments. In addition, the binary dependent variable could also be analysed in its continuous form to better understand the impact of the student-to-supervisor ratio on a student's overall grade as opposed to whether they simply "pass" or "fail". Lastly, most students at UP who submitted, passed their final submission which is different to UJ where not everyone who submitted passed. The reasons behind this should be controlled for in the future.

A more serious empirical issue that needs to be addressed relates to the problem of endogeneity in the probit regression. With reference to the analytical framework section, the parameter of interest in (1) is β . As shown in Wooldridge (2002, p.477), a standard probit estimation of (1) will produce consistent estimates of β only when the variable *SSR* is exogenous. When *SSR* is endogenous, a simple probit regression (1) will deliver invalid estimates of β . The student-to-staff ratio variable may be endogenous in situations where *SSR* is correlated to the error term in (1) or when there is reversal causality between research proficiency and the student-to-staff ratio. Going forward, the next step is to test for endogeneity and control for it if it is present.

CONCLUSION

The aim of this study was to investigate the impact of the Honours student-to-supervisor ratio on an Honours student's research proficiency. The study was undertaken using 2016 data from the University of Johannesburg and the University of Pretoria. To the best of the authors' knowledge, this is the first study in South Africa that uses a probability unit (probit) model to investigate the impact of the Honours staff-to-student ratio on an Honours student's research proficiency.

After controlling for a range of factors, preliminary empirical findings suggest that the Honours student-to-supervisor ratio has no significant impact on research proficiency of an Honours student in postgraduate Economics. These findings are a signal that there are many other factors, related to both the supervisor and the student, that need to be considered when modelling the research proficiency of postgraduate students in Economics.

The study also highlights a range of factors that need to be considered going forward, both from a supervisor and student perspective in order for accurate policy recommendations to be made. University data repositories and enrolment management systems need to include more holistic student information to make data analysis and analysis of context-specific problems, such as this one, easier without the hassle of distributing multiple surveys to university students. Furthermore, to measure the impact of curriculum amendments, universities need to

invest in rigorous cohort studies which requires more detailed and continuous collection of data every year.

Because this is the first academic paper of its kind in South Africa, areas related to HRP supervision require further investigation. For example, it would be interesting to see how a supervisor's workload and supervision experience influences research proficiency for Honours students in Economics. It would also be interesting to measure the efficiency of the research module in its current form.

In addition, this paper opens the door for more investigations from an econometric analysis perspective. A probit that includes more appropriate control variables and controls for endogeneity will provide more robust and meaningful results. Also, future investigations can include more institutions and potentially after a few years, more of a time-series analysis.

The findings from this paper could help programme managers in the discipline of Economics to understand the kinds of curriculum amendments needed to assist Honours students from a timetable perspective and from a research methods perspective. Furthermore, the results could also help school or department heads to offer additional support to supervisors involved in Honours-level supervision.

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