DISCIPLINE ATTRIBUTES AND BUSINESS ADMINISTRATION GRADUATE STUDENTS SCIENTIFIC PUBLISHING

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ABSTRACT

This study identifies discipline attributes in Business Administration graduate programs that impact student's publishing rate. Faculty member's academic studies abroad, scientific productivity and teaching experience, as well as class structure and quality items, such as demanding a final paper, the number of students per class, and dedication to the discipline are used as independent variables in a multiple linear regression analysis to predict student's scientific publishing rate. Results indicate that: i) the quality of each lesson has a positive and significant effect; ii) there is no statistical evidence of the effect that faculty member's productivity has on students; iii) disciplines requiring a final paper have a positive and expressive impact; iv) the amount of students in classrooms has a negative effect.

Keywords: *Student Performance, Scientific Productivity, Class Quality, Graduate School*

1 INTRODUCTION

Brazil has been experiencing significant growth in the number of Higher Education Institutions (HEIs) offering graduate and undergraduate programs, providing more positions to a larger amount of students (Sampaio, 2014). As a result of this expansion, the importance of evaluating each program, especially in graduate schools, has increased. The Coordination for the Improvement of Higher Level Personnel (Capes) is responsible for classifying graduate programs in the country.

Due to the increasing competition between HEIs, a quest for better positions in higher education rankings is taking place (Huang, Chen, & Chien, 2014). CAPES' evaluation criteria are the main mechanisms used to classify Brazilian programs, hence the constant search among HE Is to fulfill them. Setting up evaluation criteria demands a better understanding of the factors that affect each criterion (Dill & Soo, 2005). Therefore, it is important to understand the factors and practices that engender positive outcomes in each one of them (Hughes, 2013).

A large part of HEIs' reputation comes from the publishing rates and students' curricular activity during the program (McCormick & Bernick, 1982). However, the research in this area has not been very effective with graduate students, mainly because finding data is an obstacle (Pinheiro et al., 2012). Based on this argument, the present study seeks to identify attributes of the disciplines that influence graduate students' publications. Introducing several factors to be used as independent variables in a linear regression to predict student publishing rate, such as faculty member's curriculum, studies taken abroad, scientific productivity, the demand for students to write a final paper, lesson content quality, the amount of students per classroom and also the dedication of groups to each discipline.

Studying student productivity is relevant when considering its effects on students themselves and HEIs. An example is the fact that recent graduates' position in the labor market is directly related to their academic

productivity. In that sense, there is further encouragement to publish their work (Marinetto, 2013). Recent graduates with significant scientific production have a competitive advantage to fill positions in an aggressive academic market (Pinheiro, Melkers, & Youtie, 2012).

However, in spite of numerous reasons students and scholars have to publish, there is scarce published work in most countries worldwide. As faculty members do not publish as much as they could, it is not surprising the low productivity among graduate students (Pan & Lee, 2011). Accordingly, understanding and listing the factors that increase graduate students publishing rates is of great importance not only to students and HEIs, but also to society.

2 THEORETICAL BASIS

Several studies have analyzed higher education quality in the past decades. According to Peña (1997), as early as in 1967 the International Conference on the World Education Crisis considered this issue. During the 1990s, as a consequence of the growing importance given to the quality of higher education, experimental programs were developed by several European countries. Riportella, Cousté, & Torres (2001) attest that these measures actually improved the quality of education in these countries.

In Brazil, CAPES and the Ministry of Education (MEC) are in charge of evaluating HEIs and their programs to create quality standards that fit into current social demands. Following the American model, Brazilian HEIs have their own methodology to rank programs and education quality. One tool used to rank HEIs is making students answer program quality evaluation questionnaires.

2.1 Brazilian Higher Education and ranking system

Since 1976CAPES has been developing Brazilian graduate programs and scientific research through two approaches: the evaluation of existing and future graduate programs (CAPES, 2011). They both have the same guidelines and together form a single ranking system. The ranking criteria are divided in three different groups: analysis of the HEI's physical structure, faculty members and students. In the present study we focus on student's performance in terms of published scientific works.

2.2 Student performance

There are plentiful methods of accounting academic performance. The approach validated by Gu, Lin, Vogel, & Tian (2010) stands for a unidimensional academic performance concept, directly linked to certain tasks and their results, a key element to evaluate PhD students. On the other hand, Kuncel, Hezlett, and Ones, (2001) say that a graduate student's performance is multifaceted, with scores as the commonest aspect in extant research. The same authors also present research productivity - the amount of published works or presentations in conferences - as a relevant part of graduate programs.

Picciano (2002), building on the work of Kuncel et. al. (2001), confronts us with a large number of definitions of student academic performance, such as grades, the time left to complete the program, skill development and acquired ability. According to Picciano, multiple variables can impact a student's workflow, such as: studying habits, previous expertise on the chosen discipline, communication skills, time dedicated to studies and others.

Furnham, Chamorro-Premuzic and McDougall (2003) measure the impact of personality, cognition and faith in intellect on British students' academic performance. The authors divide the analysis into grades in general, student's behavior in classrooms and attendance (Furnham, Chamorro-Premuzic, & McDougall, 2002).

Having settled the main objective of this study, we choose the number of published works in conferences and journalsas the definition of academic performance (Brewer et al., 1999; Gu et al., 2010; Kuncel et al., 2001).

2.3 Academic productivity

Over the past decades the productivity of academic research has become an important topic with three research streams. The first one focuses on the impact that academic publishing has on scholars, the second one analyzes main academic journals' recognition and the third one considers how productive the HEIs are, as well as the units that constitute each institution and its faculty members individually (Treviño, Mixon Jr., Funk, & Inkpen, 2010).

Pan and Lee (2011), in an innovative research, investigate how academic publishing and graduate students' employability relate in Business schools in Taiwan. From their perspective, written articles and essays are among the most important tasks a student has throughout an academic career as well as valid indicators of academic achievement. What they label as academic publication are articles presented in conferences and/or in scientific journals. It is undeniable that after having presented an article in a conference it is easier for a student to publish his work.

Pinheiro, Melkers and Youtie (2012) also concentrate on graduate students publishing, more specifically PhD candidates in Science and Technology, as an indicator of how productive they can be before finishing their studies and a sign of future success. These scholars argue there are no academic productivity guidelines for graduate students. There is, nonetheless, an increasing demand for published works and one of the major goals of most graduate programs is to provide the necessary conditions for students to publish. The authors also mention that students have published more over the years and that co-authorship between students and advisors is a positive move as well as having a number of works published before finishing the PhD program.

We corroborate the innovative aspect of this study by reviewing its scientific literature. As far as it was possible to inquire, no research has been made establishing a logical connection between student publishing productivity and attributes of the disciplines in the programs they are enrolled in. The studies that relate the most to the present work are the ones previously mentioned.

2.4 Which factors improve academic performance?

There are several aspects of the individual, the institution itself or even from the advisor that may influence a graduate student's performance (Gu et al., 2010). High standards of academic regulation, education, teaching methods, an appealing syllabus and welcoming environment provide a better performance (Klem & Connell, 2004).

Dundar & Lewis (1998) study the determining factors of research productivity on PhD programs in the United States. They point out individual and institutional aspects that affect research. The individual aspect includes personality, gender, age, as well as the atmosphere and the quality of the education provided. Institutional variables are: the extent of the program, the premises and budgetary availability.

In that sense, Lizzio, Wilson, & Simons (2002) find evidence of the positive effect that the awareness of a good learning atmosphere has on students' academic achievement, as well as in learning qualitative results. To the authors, the recognition of the quality of the education provided by an institution and the evaluation system are what counts the most to a student's performance. Following that line of thought, Crawford, Gordon, & Prosser (2006) state that the perception of the erudition acquired during the program has a positive impact on the students' results.

In addition to the above mentioned aspects, Kukla-Acevedo (2009) points out the correlation between the erudition and skill of a faculty member and student performance. Skillful professors work more efficiently and make students learn more easily. Scholars with a strong academic activity tend to choose better teaching topics bringing relevant and avant-garde items to class. Monk (1994), in much the same way, stands out the fact that when faculty members are well prepared, their students tend to achieve better results.

Another relevant item studied by scholars in the field is the number of students per classroom. According to Johnson (2010), that correlation was one of the first to be empirically tested by scholars with focus on higher education. Even so, until the present moment, there is no consensus on the impact that the amount of students gathered as a group in classrooms has on each individual's performance. Bandiera, Larcinesi and Rasul (2010) agree that past studies were inconclusive, pointing out that the size of a class is not something observed with clarity in higher education in spite of being a key element for students and professors.

Faculty members' experience in their own profession, measured by years of work, also has great impact on what kind of class will be taught, didactic methods and general aspects of interaction with students (Umbach & Wawrzynski, 2005), consequently affecting their performance. The quality of the work of the faculty member is also relevant when it comes to funding a research project. Research grants directly related to scholars' productivity count as another important issue included in higher education quality rankings. (Dill & Soo, 2005). Studies abroad are also considered an indication of academic distinction, especially due to the disparity between HEIs in developing countries, like Brazil, and top schools from developed countries.

The last aspect is the motivation, a fundamental aspect for a student's academic career. It depends on teaching methods, professors' feedback; understanding of eventualities; interaction in class; the ability of making discussed topics interesting to students; looking through a student's perspective and getting the best each has to offer (Trigwell, Prosser, & Waterhouse, 1999). It goes without saying that human perception changes with time, therefore, a student's opinion on a professor or class is likely to change as time goes by (Chieffo & Griffiths, 2004).

3 HYPOTHESIS DEVELOPMENT

Based on what we identified during the literature review, four different hypotheses were developed about the factors that affect graduate students' performance.

The results of acquired knowledge are very different, their manifestations can reflect on competence and skills developed by a student, as well as how prepared the person is for the labor market ahead, his scientific productivity, and the satisfaction regarding the final score of the program (López-Pérez, Pérez-López, & Rodríguez-Ariza, 2011).

On the other hand, unlike high school and undergraduate programs, in which a student's performance is measured by the scores in the disciplines he enrolled, in graduate programs, the main indicator of achievement is the volume and the quality of his scientific production. In Brazil, the scientific work made by students is classified under criteria established by CAPES or the HEI itself, adding different values to publishing in certain journals and presentations in conferences.

In research-oriented institutions, like the one we analyzed, the criteria become more tangible since students are instructed from the start as to how undertake research that might become publishing material.

Lizzio, Wilson, & Simons (2002) analyze the connection between how students see the academic environment and their performance. There is statistical evidence of a positive learning atmosphere in a student's performance as well as in qualitative results of the erudition students acquired. In their conclusion, the authors point out that the quality of the education and how students realize it, along with the grade system are the most influential indicators.

Accordingly, Crawford, Gordon, & Prosser (2006) relate in a positive manner the opinion on the education given by the HEI from a student's point of view with the results his academic performance has during the program. Based on the assumption that graduate students' scientific production is a result of what they have learned throughout the program, the following hypothesis was developed:

> Hypothesis H1: The excellence noticed by a student in a determined discipline in a graduate program has a direct and positive effect on the student's scientific productivity, represented by the amount of works published and presented by students in conferences related to the discipline in question.

According to Bailey, Gupta, & Schrader (2001); Ghoshal (2005); McPherson, Jewell, & Kim (2009); Seiler, Seiler, & Chiang (1999), there are several aspects of a class that may influence a student's opinion on it that do not necessarily relate to his academic achievement. On the other hand, Kukla-Acevedo (2009), says that faculty members' erudition counts as an important factor when it comes to measuring the impact that professors have on a student's academic activity. The education and work as a researcher allow faculty members to designate better topics to be discussed in class, which can directly impact the interest and relevance of the works developed by students in the discipline's topic.

Monk (1994) in a similar study associated faculty member preparation with the results of his students' work. He later identified a positive connection between student achievement and how well prepared for teaching scholars were. However, the significance this effect has can vary according to the importance and relevance attributed to the content of the discipline.

Scholars that often publish their research are constantly looking for updates in their own area, therefore becoming more productive. The amount of published work is measured by CAPES mainly through scientific journals (CAPES, 2013). The Qualis score in the present work is a scholar's scientific productivity through the 2010-2012 triennial as a result of the criteria established by the HEI based on CAPES' rules. The Qualis system categorizes journals according to aspects settled by CAPES based on impact and relevance factors of each journal to the academic field in matter. The ranking of the journals goes from "C" - Irrelevant (score zero) to "A1" - Highly relevant (score 100).

Accordingly, scholars with higher productivity tend to transmit knowledge that is up-to-date and relevant to their students, increasing the possibilities of having topics selected to be discussed in class become scientific works published in a journal or presented at a conference. Based on the above mentioned features, another hypothesis is developed.

> Hypothesis H2: The scientific achievement of a scholar that teaches a determined discipline has a direct impact on the amount of incoming articles from the discipline itself that students publish in journals or present in conferences.

The format and structure of the discipline are also important to the learning process. The evaluation method demanded by professors, for instance, has great influence on students' dedication and how knowledge is earned. Almeida (1997) states that the assessment can be understood through different meanings that come from conceptions such as analysis, value determination, control and distribution.

Grounlund (1979) argues that a ranking's primary role is to enhance methods, strategies and materials, seeking not only better comprehension by students, but also an improvement of scholars' teaching skills. In graduate programs, especially in Business Administration, students are usually graded as they participate in class debates, seminars, Q&A's, final exams and final papers.

Although the first ways to classify might be effective to grade students throughout the program, they have very little to do with a student's ability to elaborate scientific work. On the other hand, the final paper can offer an evaluation of how capable of synthesizing information students are. If the content of a semester of classes on a determined subject is shaped like a scientific article that has publishing potential by the end of the academic year, the student's skills are definitely noticeable.

Once the student has invested time in planning and writing a scientific article, it is likely that he will be motivated, or even demanded, to pursue the project in the future, not just over means of being graded. Having published work as a graduate student is certainly of great value to a future scholar's curriculum. Another hypothesis can take part of this discussion based on the different topics listed above:

> Hypothesis H3: Disciplines on graduate programs that demand a final paper will generate more published articles and conference presentations.

Klem and Connel (2004) say that there is consensus among researchers about the conditions that contribute to a student's success, for instance the high standards of learning and academic conduct, pedagogic methods and relevant curriculum, not to mention an atmosphere suitable for learning. Students also claim for a certain engagement by faculty members, if they have interpersonal connections with the professors then they will be consequently more involved in academic activities. Hence, the advantage of every professor having a small group of students to advise. With fewer students to follow up, it is easier to develop a stronger relationship with each one of them.

Johnson (2010) focuses mainly on the impact that the number of students per class has on a student's academic performance and states that it was one of the first matters to be analyzed by those who did empirical research on higher education. The author, however, indicates that the results have not been conclusive. Term grades, scores of standard tests and the general evaluation of the discipline are used as an index on student achievement.

In most cases, larger classrooms are scored through multiple-choice tests and smaller groups of students through final papers and oral presentations. A student in a small class has to interact more because this type of environment requires active participants, contrastingly classrooms filled with a great number of students usually display less involved students (Johnson, 2010). Johnson's research results show that the size of a class has a significant impact on students' final grades.

Bandiera, Larcinesi and Rasul (2010) have also dedicated their work to the effects of the number of students per class on the scores of students, agreeing with Johnson (2010) on the inconclusive aspect of previous studies. For them, the actual impact that the number of students per class has on higher education is still an unknown fact. The extent of a class is one of the biggest concerns scholars and students have, the proportions between students and professors are relevant for the HEI as an indicator of quality in teaching all over the world. The results show that classes with a larger amount of students on average tend to lower a student's performance. (Bandiera, Larcinese, & Rasul, 2010). Another hypothesis comes up based on the latest discussion:

> Hypothesis H4: Students will publish more and will attend more conferences if they enroll in disciplines with fewer people.

4 METHODOLOGY

This study is based on research through a quantitative approach (Richardson, 1989). This choice in methodology can be explained by the research seeking the common points between variables that can be quantified and the possibility of collecting and transforming data.

4.1 Universe and Sample

The research universe were the master's and PhD students of Business Administration at the Brazilian School of Public and Business Administration (EBAPE), a school that belongs to Fundação Getulio Vargas (FGV), that

were enrolled in disciplines from January 2008 until July 2012. During that period of time, 152 classes in which 220 students were randomly enrolled (153 master's and 67 PhD students) formed the research universe.

The random sample criterion was defined with surveys distributed to the universe of the research, resulting in 110 valid responses from a total of 220 students enrolled in that specific period of time, which represents a 50% feedback rate. The responses correspond to 97 different classes from a total of 152, an amount that represents 63,8% of the total of disciplines available for review in the institution.

4.2 Data Gathering

The research method applied in this process was based in data from three different sources: a SET survey from files of the analyzed HEI, a survey in the format of a poll that was given to students enrolled in graduate programs at FGV from 2008 to 2012 and, lastly, an inquiry at the institution's faculty members Lattes curriculum. The Lattes platform is part of the National Council for Scientific and Technological Development's (CNPq) database and is the main reference when it comes to curriculum information in the Brazilian academic community (Plataforma Lattes, 2013).

Student's evaluation of the disciplines they signed up for was collected through secondary information made available by the institution itself. The students were able to express their opinion by means of SET survey questionnaires filled out electronically at the term of each discipline between 2008 and 2012.

Data referring to students' scientific publishing and the connection with the courses taken by these students was gathered via survey; a questionnaire was handed out to students and former students of the master's and PhD programs from the classes within the 2008-2012 period (primary data). In a similar way, the complete list of students enrolled in all the disciplines from 2008 to 2012 was provided by FGV. All faculty members' Lattes curriculum was a source of information about their careers, academic background and scientific productivity.

4.2.1 The SET survey

Secondary information obtained at FGV's database comes from evaluation polls in which EBAPE/FGV graduate students filled out 489 questionnaires similar to the ones chosen by Seiler et al. (1999) and Silva et al. (2011), designated to score teaching skills from their professors and the quality of the classes between 2008 and 2012. These questionnaires correspond to 152 different classes.

The student evaluation of teaching (SET) questionnaires measure the quality of classes from the student's perspective and were used as an important mechanism in this research. According to Riportella et al. (2001), SET surveys are used as means to rank education in most of the HEIs in the United States and has been growing as a method in Brazil over the past years.

The SET survey provided by EBAPE/FGV was divided in two different segments: content and development of the discipline as well as self-evaluation from students' performance.

On the first segment the following data is collected: the main focus and content of disciplines, the importance of the course, connecting points within the discipline in matter and the others among the program, teaching techniques, punctuality, enthusiasm in teaching, proposed activities, availability for meetings and evaluation criteria. The second segment considers every student's self-evaluation, previous academic interest in the discipline, an increase on the existing curiosity throughout the course and dedication to activities requested by professors.

4.2.2 Students and alumni Questionnaire

On the second stage of data gathering, questionnaires shaped like surveys were given to students and former students of the master's and PhD programs from 2008 to 2012, demanding information about their own publications and the connection with the courses they took in the programs The survey was handed out via e-mail directly to 220 students and alumni. The results were 110 responses that generated 97 disciplines with none or more published works.

The questionnaire comprised three blocks with 24 questions in total. The first one had 5 questions requesting demographic information, as well as the kind of institution in which the student went for his undergraduate studies (public or private), the number of articles submitted to journals and conferences with the total of accepted articles.

In case the respondent had no accepted articles, the survey would be terminated. If the person did have published work, he would be moved on to the second block of questions, that gathered information about the title of the

article, the number of authors and the type of publication (journal or conference), if the student was enrolled in the master's or PhD program when the work was submitted, the author's line of research, the name of the student's advisor, as well as his part in the published work and, lastly, if the article in question had been related to any course in the institution. If the published work was inspired by a discipline or related to one in any way, then the respondent would move on to the third part of the questionnaire.

The third block of questions demanded responses on what disciplines related to the published work, the faculty member who taught the class, the class and the methodology applied to develop the article. Other information that was requested was if the student had to present a final paper, and the ranking on a likert scale (Likert, 1932) from 1 to 5 about their interest and previous understanding (before taking the course) of the article's main subject. The second and third parts of the questionnaire were repeated to every article the student had.

Some respondents claimed to have published articles that were linked to disciplines that were not ranked in quality, therefore comments on these articles were disregarded. The result by means of the crossing of information amounted to 80 valid remarks on disciplines with zero or more published works that included complete information. Information corresponding to the faculty member who taught the discipline was added to each one of these remarks.

4.2.3 Faculty members' Lattes curriculum

Gathering information - published work during the triennial, time of teaching, research grants and academic history abroad - about scholars was a process that consisted in looking directly into their individual files on the Lattes database.

4.3 Data Preparation

After crossing the information gathered by our survey with the data from the SET survey, we extracted information on the type and quantity of published articles that were related to each discipline and the demand of a final paper.

In order to settle the rate of published works yielded by the discipline, due to a higher degree of difficulty in publishing in journals, an arbitrary value that consists on a level of difficulty twice as large as the one given to articles presented in conferences was given to such work.

The index of productivity of the discipline was conceived through the sum of the number of works published, multiplied by their hierarchical level of importance (x or 2x) and divided by the total of students enrolled in the discipline, creating a table of published works per enrolled student, entitled 'publications'.

Equation 1- Publications

$$Publications = \frac{((PUB_{Journal} * 2) + PRES_{Conferences})}{N_{Students}}$$

Based on the analysis of the faculty members' Lattes database information we were able to recover information about the years of teaching and their academic experience abroad. The data on the Qualis score of professors and the presence of grants and related research projects were found via FGV's own database.

The quality of each discipline is a latent variable, and due to that fact it was measured by the indicators from the SET survey.

4.3.1 Measuring the quality of each lesson

We measured the latent variable "quality of class" by means of the indicators extracted from the SET survey. A factor analysis was performed following models of scales previously used by other scholars (Bailey et al., 2001; Ghoshal, 2005; McPherson et al., 2009; Riportella et al., 2001; Seiler et al., 1999). It consisted on grouping indicators in two components: the first was named "QUALI_AULA" ("QUALI_CLASS") and stands for the group of indicators referring to how the class and the professor in matter were scored in a way to obtain a proxy of the opinion students have on the class. The second component was named "FATORES_INTR" ("INTR_FACTORS") and it stands for the intrinsic factors such as students' self-evaluation and previous interest. With the purpose of obtaining all the factors, the varimax axis rotation was used. The results can be viewed on table 1.

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Table 1- Factor analysis components matrix

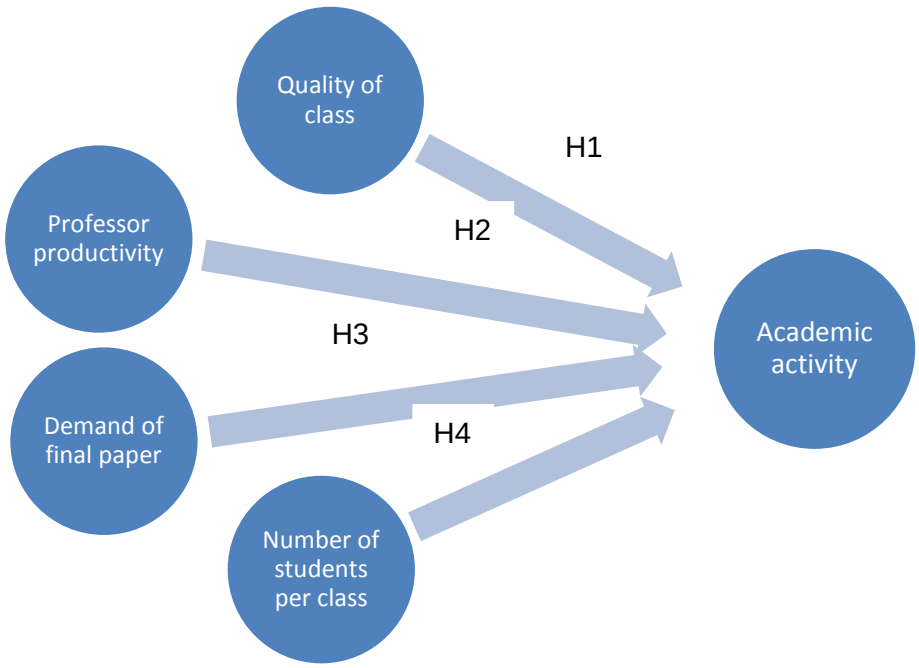
		(1)	(2)
BLOCK 1	Discipline goals	0,926	0,151
	Presented content	0,945	0,143
	Exposition of the theme's relevance	0,927	0,036
	Didacticskills usage	0,826	-0,115
	Punctuality	0,794	-0,016
	Professor's enthusiasm	0,850	-0,028
	Proposed activities	0,891	-0,065
	Professor's availability	0,804	-0,130
	Evaluation criteria	0,892	-0,085
BLOCK 2	Auto-evaluation	0,257	0,838
	Previous interest in the discipline	-0,112	0,973
	Growth in interest	0,326	0,724
	Dedication to proposed assignments	0,288	0,711

The results of the factor analysis match the expected groupings from the adaptation of the chosen scale, having indicators relate to two contrasting blocks, the first consisting of the discipline's content and the approach given by professors, the second block exclusively made of intrinsic factors referring to students.

4.4 Model Development

With the intention of increasing the model's accuracy, the following control variables previously identified in the literature were included: i) scholar's years of teaching; ii) scholar's academic background abroad; iii) scholar's productivity grants (PQ) in the given period of time; iv) student's motivation to take the course (FATORES_INTR), represented by the second factor of the factor analysis; v) the type of discipline according to the program, master's or PhD; vi) elapsed time since the student was enrolled in the discipline (in semesters).

Figure 1 – Hypotheses



In order to test the model, we did multiple linear regressions with the independent variables; we had the student-publishing rate within each discipline as dependent variable (Y) The software used to estimate the statistics was IBM's SPSS. Results of the regressions are on table 2.

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Table 2 – Regressions standard beta results

	Articles arising from discipline N=99			
	(1)	(2)	(3)	(4)
Time of teaching	-0,157	-0,202**	-0,164	-,0139
Research Grant (PQ)	-0,237**	0,298***	0,369***	0,378***
Studies abroad	0,113	0,037	0,015	0,032
Students' intrinsic factors	0,160	0,188*	0,174*	0,162
PhD	0,267**	0,262**	0,202**	0,219**
Elapsed time since discipline	-0,071	-0,015	-0,032	-0,002
Quality of class	-	0,337***	0,309***	0,280***
Professor productivity	-	-	-0,115	-0,155
Article as term paper	-	-	0,305***	0,337***
Number of students	-	-	-	-0,199**
Adjusted R^2	0,175	0,271	0,345	0,376
F rate	3,794	5,197	5,633	5,76

* corresponding to 10%, ** corresponding to 5%, *** corresponding to 1%

In the multicollinearity analysis, a trial with the VIF connections between variables was pursued. All the associations show us low VIF scores (less than 2); pointing out that there is no evidence of multicollinearity in the adopted model.

5 RESULTS

From a factor analysis with data gathered in the SET survey, followed by multiple linear regression on the factors and the other data, the results suggests:

i) The model we present explains 37, 6% of the variation in student publishing rate, $R^2 = 0,376$;
ii) Hypothesis H1 was confirmed, so that the opinion students have on their classes has a significant and positive effect on the publishing rate (Std. Beta = 0,280).
iii) Hypothesis H2 was not confirmed. There is no statistical evidence of the effect faculty member productivity has - represented by its Qualis - score on student publishing rate in the triennial.
iv) Hypothesis H3 was confirmed, in a way that the demand for a final paper has a significant and positive effect on the student publishing rate (Std. Beta = 0,337).
v) Hypothesis H4 was confirmed, thus the number of students per classroom has a negative and significant effect on the publishing rate (Std. Beta = -0,199).

6 DISCUSSION

Predicting students' academic performance is a widely studied matter; however, the most commonly used approach relates achievement to grades in tests and the behavior in class (Furnham et al., 2002). Our approach brings a new matter to the ongoing debate by focusing mainly in the factors coming from inside the academic environment that may influence graduate students to publish their work.

Other works with innovative perspectives also contribute to the development of this discussion. Pan and Lee (2011), for instance, take academic publishing as an indicator of graduate student performance, and, much like the present work, define academic publishing as the presentation of articles in conferences as well as the publication in journals. They also argue that going to conferences to present articles is a good way to start publishing.

As indicated in the literature and in the making of this research, the academic environment has been experiencing remarkable growth in the need for more published works. Other authors employed PhD students' publishing as an index of productivity before graduating, as well as an indicator of future academic success (Pinheiro et al., 2012). Our work went ahead by including master's students in the samples. We can argue that when a student has work published during a graduate program it is likely that he will be academically successful.

One of the results of learning is the student's scientific productivity, something that depends on the skills and knowledge acquired by the student (López-Pérez et al., 2011). This work was able to identify approximately 37%

of the causes that lead graduate students to publish articles based on what they learned in specific disciplines. Each hypothesis will be discussed in detail in the following paragraphs.

6.1 Hypothesis 1

The confirmation of H1 indicates that the opinion a student has on a class and the quality he notices in the learning process will definitely impact his scientific productivity, a result that matches the ones of the existing literature. Lizzio, Wilson, and Simons (2002) found statistical evidence of the positive influence that noticing a positive learning atmosphere has, stating that this perspective and the quality of teaching will not only directly impact the students' academic performance, but also the qualitative results of the learning process.

On the other hand, Crawford, Gordon, and Prosser (2006) point out a positive connection between the awareness of having received education throughout the program and the real goals achieved by students. The present study considers the development of scientific work as the result of the learning process by master's and PhD students.

The results of the research also corroborate prior work that value the quality of the education passed on to students, agreeing with what Riportella, Cousté, and Torres (2001) said. In that way, the importance of ranking methods to HEIs is essential because significantly influences students' academic achievement.

6.2 Hypothesis 2

The not confirmation of H2 indicates that a scholar's scientific productivity cannot influence his students' performance, showing different results when compared to the literature on the subject. Kukla-Acevedo (2009) claims that a professor's skill and erudition are important for the student's performance, whereas the content is passed on in a very efficient way and the discussion topics become more interesting. The results of our research do not corroborate this perspective.

Similarly, Monk (1994) mentioned a positive cause and effect when comparing scholars preparation and their students' results. Productive scholars tend to make sure students learn well and understand the subject better, hence the use of class content to publish articles. Pan and Lee's (2011) suggestion that staying in touch with more experienced researchers would be positive for students is not corroborated by the results.

The not confirmation of the hypothesis can be explained by the seemingly analogue scientific productivity of professors at FGV, who have Qualis score above the average demanded by CAPES. Consequently, when the productivity reaches very high levels, increasing them may stop bringing positive outcomes.

6.3 Hypothesis 3

By confirming H3, we see that disciplines demanding the development of a final paper increase student's productivity, a statement in agreement with the literature. The format and structure of the discipline count considerably for the learning process. Just as the evaluation method influence students' dedication and the way they deal with administrating time.

Almeida (1997) says that the ranking can have different meanings to students, the fact that disciplines demanding a final paper affect students' scientific productivity in a positive way indicates that writing an article has an important role in boosting scientific productivity. The final paper provides a better source of evaluation on the student's work and his ability to synthesize knowledge.

By means of speculation, we can assume that once the student has invested time developing an academic article during the graduate program, he will most likely be motivated, even required, to pursue the project, taking a step forward that goes beyond being graded on the discipline, looking to improve his curriculum through a published work.

6.4 Hypothesis 4

By confirming H4, it is possible to say that fewer students per class have a direct impact on their academic achievement. The studies on this matter are not conclusive (Bandiera et al., 2010; Johnson, 2010), presenting us with a wide range of results. Klem and Connel (2004) claim that students need to realize their professors' commitment, something more noticeable with small groups of students per class.

The results of our research connect classes with fewer students to an increasing academic productivity. Johnson (2010), nonetheless, points out several ways to rank, according to the size of the classes. For the author, classes with more students can be ranked through multiple-choice tests, whereas smaller groups are scored through term projects and oral presentations.

7 CONCLUSION

The results of this research have implications for those in charge of HEIs as well as scholars. The world's main HEIs - Brazil's included - seek to provide conditions for graduate students to publish their academic work. We collaborate with this goal by listing the factors on each discipline that increase students' publishing rate.

It is important for students that the content of each class is up to their standards, because not only does that aspect of the program makes them more satisfied, but also because well-taught lessons are capable of increasing the scientific productivity of the student body. Our results show that in situations like that both student body and HEI benefit from the consequences of quality education.
Disciplines demanding a final paper stimulate students to publish their work, so there should have more that apply that method of grading. Research-oriented institutions must guide their faculty members towards that direction; however, it is important to consider that an overload of academic activity might also set students back quality wise, reducing the possibilities of future published scientific works.

Going beyond the results of the research, students' main interests should be the same as the institutions', so it is up to the HEI to guide students and provide resources for them to develop their work. An example of how that could work is by having students read the professor's comments and suggestions after their article has been graded.

It goes without saying that attendance to conferences and the presentation of works to the academic community are a fundamental step in a student's career, major moves to develop articles with publishing potential in journals. Meanwhile, the HEI must provide financial support through all of these steps in the student's career.

7.1 Suggestions for future research and limitations

Ideally, graduate students' scientific production would be measured according to the same criteria utilized for their professors, by measuring the amount of published works and its quality.

Due to the time it takes for an article to go through all the required steps before it gets published, it is not a valid option to measure graduate students' productivity via these criteria, especially for students in the first years of the programs. Consequently, in this study we decided to measure students' scientific production through their presentations in conferences and published works in academic journals - giving greater attention to published works because they have a greater difficulty level.

Future studies must try to estimate the students' scientific production in terms of articles that have been submitted to scientific magazines, classifying them according to the score criteria established by CAPES.

As a result of the limited amount of time and the difficulties to develop the present work,it was not possible to identify the effects of the criterion that makes student select the disciplines themselves. Thus it would be relevant to consider that there is a change in the effort put into mandatory and elective disciplines by students, we can only say that the discipline in matter was mandatory for a certain group of students, but perhaps it was not mandatory for all of those who were enrolled in that period of time.

The present research has enough potential to be expanded to other HEIs; however, for that to occur, there has to be an extensive research to find out if on other fields of knowledge the same student-professor connections can be established. The link between the professors' attributes and students' productivity applies to a numerous amount of fields. On that same line of thought, quantitative research benefits from growth in data. It is also possible to add a qualitative approach to it, interviews with graduate students might add great value to this debate.

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