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Drivers of academic performance in a Brazilian university under a government-restructuring program

José Alexandre F. Diniz-Filho [a,c,*], Maria Clorinda S. Fioravanti [b], Luis Mauricio Bini [c], Thiago Fernando Rangel [c]

[a] Pró-Reitoria de Pós-Graduação, Universidade Federal de Goiás (UFG), Prédio da Reitoria, C.P. 131, 74001-970 Goiânia, GO, Brazil
[b] Pesquisa e Inovação, Escola de Veterinária e Zootecnia, UFG, Goiânia, Brazil
[c] Departamento de Ecologia, Instituto de Ciências Biológicas, UFG, Goiânia, Brazil

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ABSTRACT

The search for correlates of scientific production is an important step toward the formulation of decision-making guidelines on academic and funding policy under a competitive system with continuously reduced budgets. Our goal here is to identify drivers of the scientific production of researchers working at the "Universidade Federal de Goiás" (UFG), a medium-to-large public Brazilian University, focusing on the effects of teaching load and supervision of graduate and undergraduate students on scientific production of faculty members. We analyzed data for 1487 faculty members of UFG, including the total number of papers published between 2011–2013, a weighted-index of scientific production and the number of publications in high-ranked journals (according to a Brazilian system of journal ranking in different areas). These variables were regressed on gender, teaching load at undergraduate and graduate levels, number of supervised undergraduate, Master and Doctoral students, self-declared amount of time dedicated to research and outreach, year of doctoral graduation, year of hiring and the scientific production before doctoral graduation. Several regression models were used to model scientific production, including ordinary least-square regression and Hurdle negative binomial models. Although there are some differences among research areas, the most important explanatory variable was the publication record of the researcher before doctoral graduation, reinforcing the role of a solid academic formation in terms of research experience. Undergraduate and graduate teaching loads were negatively and positively correlated with scientific production, respectively. However, the strength of the relationship was much higher for the second than for the first relationship. These correlates of scientific production provide guidelines for policy and management in universities, including criteria for balancing research and teaching loads, awarding fellowships and research grants, designing new policy for future hiring and creation of new graduate programs.

* Corresponding author at: Universidade Federal de Goiás (UFG), Pró-Reitoria de Pós-Graduação, Prédio da Reitoria, C.P. 131, 74001-970 Goiania, GO, Brazil. Tel.: +55 62 3512 14 80.
E-mail address: diniz@ufg.br (J.A.F. Diniz-Filho).

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1. Introduction

Assessing the correlates of scientific research activity at several organizational levels, ranging from individual researchers up to institutes and universities, is a key goal of scientometric analysis (Carayol & Matt, 2006). However, there is an intense debate about the most appropriate metrics for evaluating research merit (e.g., Vieira & Gomes, 2010; Abramo, D'Angelo, & Di Costa, 2011a; Abramo, D'Angelo, & Solazzi, 2011b; Abramo, Cicero, & D'Angelo, 2011c; Franceschet & Costantini, 2011; McNutt, 2014; Abramo & D'Angelo, 2011; Hicks, Wouters, Waltman, de Rijcke, & Rafols, 2015) and how to take into account inherent differences among research areas (Abramo, Cicero, & D'Angelo, 2013a; Ruocco & Daraio, 2013). Even so, under the current scenario of strong competition for limited funds, scientometric analyses have been proven to be an important tool to find correlates of scientific productivity, providing guidelines for decision-making in, for instance, faculty hiring, affirmative actions and funding (e.g., Abramo & D'Angelo, 2011; Akhmat, Zaman, Shukui, Javed, & Khan, 2014). According to these analyses, factors at individual level (e.g., age, gender, seniority, job stability, involvement in collaborative networks, and working conditions) are important predictors of variation in scientific production among researchers (e.g., Carayol & Matt, 2006; Rice, Venables, & Patacchini, 2006; Gonzalez-Brambila & Veloso, 2007; De Witte & Rogge, 2010; Cruz-Castro & Sanz-Menéndez, 2010; Perianes-Rodríguez, Chinchilla-Rodríguez, Vargas-Quesada, Gómez, & Moya-Anegón, 2009; Abramo, D'Angelo, & Di Costa, 2009; Abramo et al., 2011a, 2011b; Abramo, D'Angelo, & Rosati, 2014; Pachi, Yamamoto, Costa, & Lopez, 2012; McCarty, Jawitz, Hopkins, & Goldman, 2013; Bauer, Schui, Eye, & Krampen, 2013; Miller, Coble, & Lusk, 2013; Torrisi, 2013; Çokgezen, 2013; Silaghi-Dumitrescu & Sabau, 2014; Baccini, Barabesi, Cioni, & Pisani, 2014). However, the relative importance of these potential correlates varies from study to study, and the underlying reasons for the importance of these correlates are also open to debate (see Baccini et al., 2014 for a recent review). It is clear, therefore, that more empirical studies in different systems and in countries with different research traditions are needed to better understand the generality and relative roles of drivers of scientific production.

There are now about 6000 universities in Brazil, in different categories (public and private universities), with about 37,500 undergraduate courses and almost 4000 graduate (Master and Doctoral) programs (see http://emec.mec.gov.br/). In general, public (state or federal) universities offer top-ranked undergraduate courses and graduate programs. Starting in 2007–2008, under the auspicious of the Supporting Program for the Restructuring and Expansion of Federal Universities (REUNI, its acronym in Portuguese), the Federal System of Public Universities increased more than two-fold in faculty size and number of graduate students, with 65 federal universities and about 300 campuses now widespread throughout the country. The expansion of the system involved funding for building new infrastructure, a massive hiring of new faculty members, staff, and the admission of an increased number of students. As a consequence, new graduate programs were also created because young, productive doctors were hired and wanted to start their own programs focused in new research lines. Research budgets were also increased to support this growing research and graduate system, within the context of a, at least until up to 2014, favorable economic scenario (see Escobar, 2015) This expansion has been important to increase the proportion of Brazilians with higher education degrees and to foster the scientific production in the country (see Regalado, 2010; Almeida & Guimarães, 2013).

Brazil has two main research funding agencies at the national level. First, the National Counsel of Technological and Scientific Development (CNPq), under the Ministry of Science, Technology and Innovation, mainly funds individual researchers through grants and scholarships. Second, the Coordination for the Improvement of Higher Level Personnel (CAPES), under the Ministry of Education and Culture funds and evaluate graduate programs. Since 2007, the mission of CAPES was expanded to include issues related to formation of teachers at all levels (Myers, 2011). In general, proposal ratings by both CNPq and CAPES are based on peer-reviewing and scientometric-based assessments. However, universities seldom use comparable metrics to evaluate their own faculty members or to promote incentives for scientific publication and innovation. One of the most controversial issues discussed in Brazilian universities is the distribution of teaching load among faculty members, which usually does not take into account other activities related to research. The discussion is how (and if) scientific productivity is constrained by other academic activities, especially teaching and administration. Evidence-based answers to this question would lead to better definition of academic policies. Thus, it is important to identify the underlying drivers of the variation in production, providing criteria to balance teaching load, research and administrative activities.

Our goal here is to identify correlates of scientific production of researchers in Brazil. For this task, we use data obtained from scholars working at the Federal University of Goiás (UFG), as a case study. We hypothesized that variation in scientific production can be explained by a set of predictors related to different academic activities (e.g., teaching load, number of supervised students, outreach and administrative activities) and to some faculty members-specific characteristics (gender, years of doctoral degree and admission).

We are aware that our analysis is restricted to a single university (similarly to the studies of De Witte & Rogge, 2010; Silaghi-Dumitrescu & Sabau, 2014; Baccini et al., 2014) and, beforehand, we suggest that further studies are needed to gain generalization. However, considering the similarities between our results and those from previous studies, we believe that our findings are consistent enough to be generalized to other similar-sized universities in Brazil. This is so because similar statutes, mainly the Law of Directives and Bases of National Education (LDB), regulate all the Federal System of Universities in Brazil. For instance, under LDB, the minimum teaching load in public universities is 8 h/week (Article n. 57). Also, the main Brazilian funding agencies (CNPq and CAPES) have unified criteria at national level, within research areas, to evaluate research proposals, homogenizing to some extent the perception of the level of scientific productivity needed for successful applications.