A PRODUÇÃO CIENTÍFICA DE PROFESSORES DA PÓS-GRADUAÇÃO EM ENGENHARIA DE PRODUÇÃO NO BRASIL

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Resumo: O objetivo deste estudo é analisar a produção científica de professores universitários que atuam em programas de pós-graduação na área de Engenharia de Produção no Brasil. Para tal, através do software Scriptlattes, coletou-se os dados referentes à produção científica de artigos de 129 professores que atuam em programas de pós-graduação na área de Engenharia de Produção no Brasil. Incluiu-se na amostra os professores que responderam um questionário sociodemográfico enviado via e-mail. Verificou-se que a produção científica desta população destina a maioria de seus artigos em periódicos com estratos B3, B4, B5 e não identificado. Não obstante, observou-se que a produção científica de bolsistas de produtividade foi significativamente superior à produção de não bolsistas. Tal cenário de prevalência da produtividade de um grupo sob o outro não se replicou na análise por gênero, por tempo de atuação e por instituição.
Palavras-chave: Engenharia de Produção; Qualis; Docentes universitários.

THE SCIENTIFIC PRODUCTION OF PROFESSORS WHO WORKS IN THE GRADUATE OF PRODUCTION ENGINEERING IN BRAZIL

Abstract: The main intent of this study is analyzing the scientific production of professors who works in graduate programs in the Production Engineering field of Brazil from 2013 to 2015. Data on scientific production (publications in periodicals) were collected from 129 teachers who works in the graduate programs of Production Engineering field of Brazil, through the free software ScriptLattes. It was verified the scientific production of professors of Production Engineering is destined, almost all, to periodicals of strata B3, B4 and B5 of the Qualis. Nevertheless, it was observed that the scientific production of researcher grant of productivity was statistically superior to the production of the group of non-grant. The scenario of prevalence of productivity of one group under the other was not replicated in the analysis by gender, by time of performance and by institution.
Keywords:

1. Introduction

The Brazilian science it is in constant expansion, with a percentage representation of 2.69 the scientific production in the world (PETHERICK, 2010). In this sense, Vasconselos et al. (2015) observed the country need of funding and management for building a world-class scientific, besides other factors. For this to occur, it is undeniable in the expansion of the Brazilian scientific production the participation of graduate programs, which are governed by the Coordination of Improvement of Higher Education Personnel (Capes)[1] linked to the Ministry of Education[2] (CASTRO, 2005).

In this context, CAPES, through its evaluation board, has several areas of knowledge governed by its standards, and Engineering III is one of these fields. This is composed of Mechanical Engineering, Production Engineering, Aerospace Engineering, Naval and Oceanic Engineering and in 2015 counted on 123 graduate programs (GEOCAPES, 2016).

[1] Coordenação de Aperfeiçoamento de Pessoal de Nível Superior
2 Ministério da Educação

Taking into account the Production Engineering field, the focus of this study, it is prudent to highlight that relates to the implementation, operation, improvement and maintenance of integrated production systems of goods and services through human action or materials, technology and energy, taking advantage of specialized concepts in the mathematics, physics and the humanities and social sciences field (ABREPRO, 1998). According to data GeoCapes (2016), only Production Engineering totaled 49 graduate programs in 2015, or 39.84% of the total.

It is evident, based on the assumption above, that the Production Engineering field is broad and includes professionals with different backgrounds. Nevertheless, it is worth mentioning that Capes, in order to evaluate the graduate programs in Engineering III, which Production Engineering is part of, uses in its evaluation criteria the University, the Student Body (theses and dissertations) and intellectual production, in which scientific articles have greater score (CAPES, 2013).

The evaluation of the scientific articles is done through the Qualis Capes stratum of journal, considered important to evaluate the results and development of scientific research in Brazil (LINS; PESSÔA, 2010; CAPES, 2013). As for Qualis, Capes provides the following strata: A1, A2, B1, B2, B3, B4, B5 and C, where A1 is the largest stratum and C is the smallest stratum (CAPES 2013).

It is interesting to note each stratum of Qualis presents a different score proposed by Capes in each area of evaluation. In the case of Engineering III, stratum A1 has score 100, stratum A2 has score 85, stratum B1 is 70, stratum B2 corresponds to 50 points, stratum B3 has score 20, stratum B4 corresponds to 10 points, Stratum B5 has score 5 and stratum C has score 0 (CAPES, 2013).

It should be mentioned some studies discuss the Production Engineering field in relation to the methodological questions used in their research, as well as in relation to the scientific production of their professors who works in graduate studies (MIGUEL, 2007; PICININ et al. 2016). Specifically, regarding scientific production, other academic fields have recently been investigated, mainly regarding the production of their productivity grants, such as Speech-Language Pathology, Finance, Pediatrics and Psychology (WEBER, 2015; LEAL, 2013; GONÇALVES, 2014).

Thus, it is evident the analyzes of scientific production of the researchers is a subject in evidence in academic environment in several fields. In addition, the field of Brazilian's scientific production was asked about show an increase quantitative scientific production, but not qualitative one. Thus, in the case of Production Engineering, this study makes it possible to understand the quantitative and qualitative trends of the teaching scientific production inserted in the graduate course, as well as to draw the existing characteristics in the scientific production of this field.

In this context, the objective of the present study is to analyze the scientific production of professors who works in graduate programs in the Production Engineering field of Brazil from 2013 to 2015.

2. Materials and Methods

In the rupture stage, the investigative process was centered on a literature review related to scientific production of Brazil. The construction phase occurred through the data collection pertinent to scientific production of the professors who works in the graduate course in Production Engineering of Brazil. In this sense, the sample of this study was obtained through the method of non-probability sampling by accessibility.

With the name of the University members of graduate in Production Engineering of Brazil, 129 professors were randomly selected to participate in the subsequent stage of the research. In the sequence, the Lattes curriculum was collected from the professors who works in the graduate course of Production Engineering field, through the Lattes Platform, in the curriculum search item. In a second moment, the data collection was carried out through the ScriptLattes software. Subsequently, the manual counting of publications of graduation professors' articles was carried out, considering the Qualis stratum of the journal.

In order to obtain the list of professors in Production Engineering field of Brazil, the following procedures were used: (i) data collection (names and e-mail contacts) Sucupira, for the year 2015, by means of the following steps: On the Capes website, we selected the recommended programs item, later the Engineering III was selected and, lastly, only the professors of Production Engineering; (ii) e-mails not found on the Sucupira platform were searched on the electronic pages of each graduate program in Production Engineering field; (iii), in cases where the e-mail was not found, the questionnaire was sent via Currículo Lattes, through the item "contact", (iv) three contacts were sent via e-mail, First week of three weeks, to request their participation in the present study.

The demographic data of the studied population, which made possible an exact comparison between different groups of the same sample, were obtained through the application of a questionnaire with this purpose together with the request of participation of the teachers. Of the 738 professors who is working in Production Engineering program of Brazil (population), 129 professors opted to participate in the study, totaling the sample of this study (17.48%).

Finally, the data collected through the ScriptLattes software and manual counting of scientific publications were analyzed with software Statistical Package for the Social Sciences - IBM SPSS Statistics for Windows, version 23.0. In order to obtain greater depth in the proposed discussion, it was decided to segregate the analysis into four distinct groups, including articles published in journals following the Qualis classification according to Table 1:

Table 1 – Groups for statistics analysis

Groups	**Qualis Extract**
Group 1	A1 e A2
Group 2	B1 e B2
Group3	B3, B4 e B5
Group 4	C or do not identify

Source: Authors (2016)

This division is permeated by the score of the stratum evaluation proposed by Capes (2013), which provides score 100 for papers A1, score 85 for papers A2, score 70 for papers B1, score 50 for papers B2, score 20 for papers B3, score 10 for papers B4, score five for papers B5 and zero score for papers C.

According to Capes (2013), the strata B2, B3, B4 and B5 have saturation, being three publications per researcher in the triennium.

To calculate the individual score of each professor inserted in the graduate program in Production Engineering field, we used Equation 1:

$$=A1+A2*0,85+B1*0,7+B2*0,5+MIN(B3*0,2;0,6)+MIN((MAX(B3-3;0)+B4)*0,1;0,3)+MIN((MAX(B3+B4-6;B4-3;0)+B5)*0,05;0,15) \quad (1)$$

Equation 1: Individual score of professors enrolled in a graduate program in Production Engineering
Source: Authors (2016), adapt from Capes (2013)

Equation 1 predicts saturation for the individual score of papers published in periodicals of strata B2, B3, B4 and B5 of Qualis.

In order to verify if there were significant differences in the scientific production of articles in the comparison by stratum and between the groups by gender (male and female), by productivity (researcher grant and non-grant), by institution (federal, state and private) and (Between 1 to 7 years, between 8 to 15 years and over 16 years), the Kolmogorov-Smirnov data normality test ($p < 0.05$) was used, followed by the hypothesis test Mann-Whitney, to verify the difference between the means of the groups. Significant differences were considered in the averages when $p < 0.05$. The correlation of the number of publications between each stratum, as well as the correlation of the number of publications with the weight of articles was calculated through the Spearman correlation.

3. Results and Discussion

The present study investigated the scientific production of 129 professors in Production Engineering field of Brazil. Thus, 33 (25.58%) are of the female gender and 96 (74.42%) are of the masculine gender. Regarding the linking of the professors investigated, 69 (53.48%) work in federal public higher education institutions (IES), 26 (20.16%) work in state public institutions and, 34 (26.36%) professors work in private educational institutions.

Regarding the time of graduation, 58 (44.96%) professors are in the range of one to seven years of professional practice, 32 (24.81%) have between eight to 15 years of professional practice. Therefore, 39 (30.23%) professors have been in graduate school for more than 16 years. It was also verified 41 (31.78%) professors retain a productivity grant and 88 (68.22%) professors did not achieve a productivity grant.

It should be noted, based on the above values, that the majority of professors who works in Production Engineering of Brazil are male, work predominantly in public HEIs in higher education and have experience of up to seven years teaching. It should be noted that most of these do not have productivity grants.

Still in relation to the sample of the present study, Figure 1 presents the map of geolocation of professors who works in Production Engineering field they had their publications analyzed. The Figure 2 shows a geographic distribution of the Masters and PhD Engineering III's programs (Mechanical Engineering, Production Engineering, Astronautical Engineering and Naval and Oceanic Engineering).

Figure 1 – Sample of the geographical distribution of professors who works in the Production Engineering graduate programs
Source: Field Research (2016)

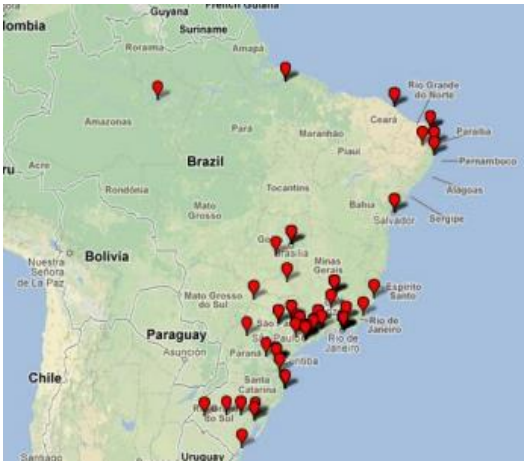
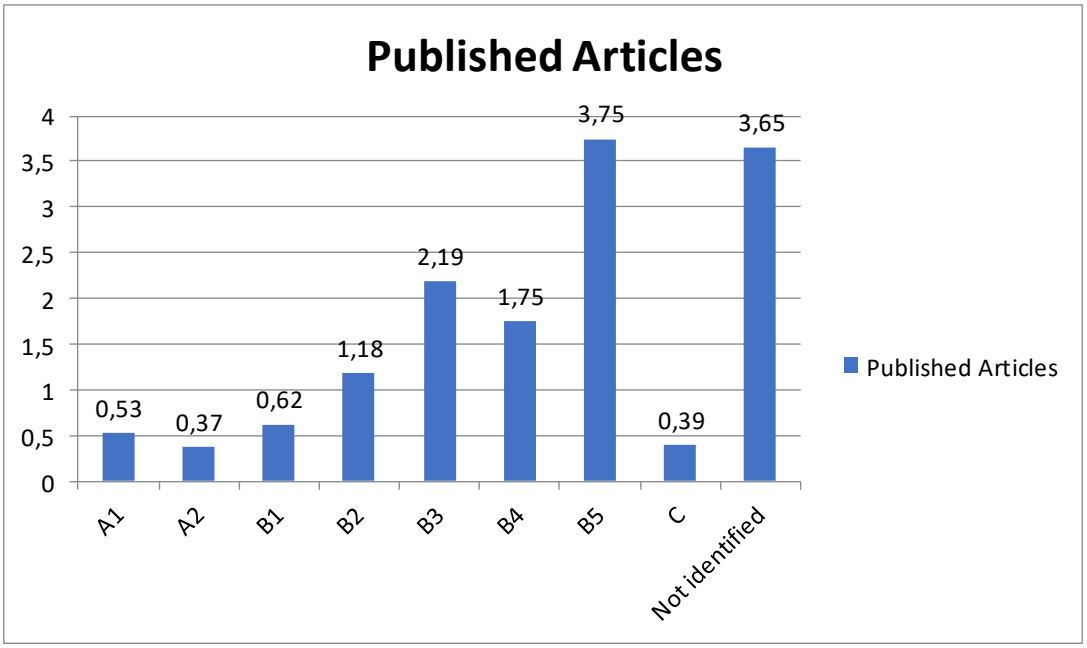


Figure 2 – Geographical distribution of Engineering III graduate programs
Source: Capes (2013)

It can be noticed professors who composes the present sample they are concentrated, in the states of Rio Grande do Sul and Paraná (southern), and in the states of São Paulo and Rio de Janeiro (southeast). Nevertheless, as can be seen in Figure 1, the publications of professors from the Northeast, North and Central-West were analyzed, accompanying the distribution of Brazilian postgraduate programs. It is worth mentioning that the map presented in Figure 1 is similar to that provided by Capes (2013), Figure 2, which refers to the geographic distribution of the graduate programs in Engineering III, and shows a higher incidence of courses in the South and Southeast and Fewer cases in the other regions. In this sense, the sample of the present study is adequate with the places where there is the operation of courses in the area of Engineering III.

The results returned for the three-year period from 2013 to 2015, 1704 articles published by the 129 professors who works in graduate programs of Production Engineering of Brazil listed in this discussion. Initially, evaluating the group of professors as a whole, Graph 1 presents the averages of periodical articles published in each stratum of Qualis.



Graph 1 - Average of articles published in periodicals in the triennium 2013-2015 of the professors who works in Production Engineering (by the Qualis)
Source: Authors (2016).

In addition, when calculating the Capes score by means of Equation 1 of each professor, it was verified the average obtained by the group of professors reached 2.24 points. It was also observed that the strata with the highest number of publications were strata B5 (3.75), unidentified (3.65), B3 (2,19) and B4 (1,75). Antagonistically, the strata with the lowest number of publications were A2 (0.37), C (0.39), A1 (0.53) and B1 (1.18).

According to Capes (2013), for the opening of Masters program, it is necessary professors present publications of stratum B1, A2 or A1 in Engineering III, and for the opening of PhD programs the requirement depends on papers A2 or A1. Nevertheless, the document emphasizes scientific publications influence 35% of graduate program concept, being considered the average in the triennium of publications in journals A and B, and it is suggested that most articles should be published in higher strata (A1, A2 and B1), including a saturation of an average publication per professor per year in strata B2, B3, B4 and B5.

Although professors are aware of this assumption, the publications have been concentrated in lower strata, in which there is saturation of the publications in the evaluation of the triennium. In this sense Picinin et al. (2016) found that the publication averages are smaller in strata A1, A2 and B1 in relation to strata B2, B3, B4 and B5, both in the group of researcher grant and in the group of non-grant.

However, this is not a reality of all areas of knowledge. In Psychology field, Weber et al. (2015) presents a contrast, since in its analyzes on the scientific production of researcher grant in the triennium of 2009-2011 identified a higher incidence of publications of this public in articles of higher stratum. Similarly, in the Pediatrics field, Gonçalves et al. (2014) reported that 76% of the area's researchers published their papers in A1, A2, B1 or B2 journals in the 2010-2012 triennium.

Although the studies of Weber et al. (2015) and Gonçalves et al. (2014) include stock exchanges of productivity, the tendency has not been confirmed that all fields present the same scenario regarding the analysis of their scientific productions. Regarding the Production Engineering, the scenario portrayed by Picinin et al. (2016) for the triennium 2007-2009 does not seem to have changed in the analysis carried out by the present study, referring to the triennium of 2013-2015.

Some hypotheses may be advanced to justify such a scenario. At first, according to Capes (2013), in Engineering III is composed of Production Engineering, Mechanics, Aeronautics, Ocean and Naval. In this way, interdisciplinary tends to make it difficult for researchers to find high impact journals compatible with their research. Leal (2013), for example, justified the lack of research in the area of finance in high impact journals due to the low innovation in the area. In the case of Production Engineering, although there is constant innovation, there may be a preference to disseminate new knowledge through Patents, limiting the incidence of high impact articles.

In order to verify the correlation between the papers score per stratum and the number of publications, the Spearman correlation.

The value returned in the Spearman correlation calculation was p = -0.952. This value, according to Dancey and Reidy (2006), indicates a strong and inversely proportional correlation between the variables. In this way, it is inferred that as the weight of papers per stratum proposed by Capes (2013) increases, the number of publications in stratum decreases. These results reinforce the tendency of a lower incidence of publications in higher strata and, in this sense, reinforces the requirements of publications in such strata.

To evaluate the variance between Groups (specified in Table 1, page 2), Table 1 shows the p-values of the Mann-Whitney U test in relation to the mean of published articles.

Table 1 - Analysis of the difference between the averages of papers published by Production Engineering's professors from Brazil, by groups in the triennium 2013-2015

Groups	**Mean**	**p-value**	**Hypothesis**	**Conclusion**
Group 1 and Group 2	Group 1=0,45 Group 2=0,90	p=0,001	H0: The Mean group 1 and group 2 are similar. H1: The Mean group 1 and group 2 are different.	Rejected H0
Group 1 and Group 3	Group 1=0,45 Group 3=2,57	p=0,001	H0: The Mean group 1 and group 3 are similar. H1: The Mean group 1 and group 3 are different.	Rejected H0
Group 1 and Group 4	Group 1=0,45 Group 4=2,00	p=0,001	H0: The Mean group 1 and group 4 are similar. H1: The Mean group 1 and group 4 are different.	Rejected H0
Group 2 and Group 3	Group 2=0,90 Group 3=2,57	p=0,001	H0: The Mean group 2 and group 3 are similar. H1: The Mean group 2 and group 3 are different.	Rejected H0
Group 2 and Group 4	Group 2=0,90 Group 4=2,00	p=0,001	H0: The Mean group 2 and group 4 are similar. H1: The Mean group 2 and group 4 are different.	Rejected H0
Group 3 and Group 4	Group 3=2,57 Group 4=2,00	p=0,163	H0: The Mean group 3 and group 4 are similar. H1: The Mean group 3 and group 4 are different.	Accepted H0

Source: Authors (2016).

A statistically significant difference was observed between the number of publications from Group 1 (A1 and A2) compared to Group 2 (B1 and B2), Group 3 (B3, B4, B5) and Group 4 (C and unidentified). Nevertheless, there is a smaller and significant number of publications in Group 2 (B1 and B2) in relation to Group 3 (B3, B4, B5), as well as a smaller and significant number of publications in Group 2 (B1 and B2) In relation to Group 4 (C and unidentified). However, there are not significantly more publications in Group 3 publications (B3, B4, B5) than Group 4 (C and unidentified).

Based on the observed results, it is evident the tendency of the higher strata groups to have fewer publications compared to the lower stratum groups, as discussed previously.

Table 2 presents the Spearman correlation calculation for the number of articles per Qualis stratum.

Table 2 – Correlation of the scientific productions of the professors who works in Brazilian Production Engineering, by Qualis atrata.

	A1	**A2**	**B1**	**B2**	**B3**	**B4**	**B5**
A1							
A2	0,402*						
B1	0,298*	0,245*					
B2	0,264*	0,200*	0,204**				
B3	0,019	0,090	0,081	0,267			
B4	0,167	-0,101	0,093	0,464*	0,462**		
B5	-0,029	-0,051	0,010	0,345*	0,557*	0,500*	

** The correlation is significant at the 0,01.

* The correlation is significant at the 0,05

Source: Authors (2016)

Based on the assumptions of Dancey and Reidy (2006), there is a moderate and positive correlation between periodicals with strata A1 and A2 (0,402); B2 and B4 (0.464); B3 and B4 (0.462); B3 and B5 (0.557) and B4 and B5 (0.500). In general, there was only a correlation between the number of articles published in upper stratum and the others were found in lower strata.

The data justify the premise there is a tendency for researchers to maintain the same level of publications. Therefore, those publish in lower strata in Qualis tend to remain in strata with lower weight, and who publishes in strata with greater weight tend to maintain qualified publications. This premise remains valid in Production Engineering of Brazil.

Table 3 presents the difference of averages between articles published by postgraduate professors in the area of Production Engineering in Brazil to the stock-holders and non-scholarship holders in the three-year period (Table 2) 2013-2015.

Table 3 - Difference of averages between papers publications for the population of researcher grant and non-grant professors in Brazilian Production Engineering (triennium 2013-2015).

Group	**Mean**	**p-value**	**Hypothesis**	**Conclusion**
Group 1	Productivity fellowship=1,1 No productivity fellowship=0,16	p=0,001	H0: The mean productivity fellowship group is similar of the productivity fellowship mean H1: The mean productivity fellowship group is different of the productivity fellowship mean.	Rejected H0
Group 2	Productivity fellowship=1,61 No productivity	p=0,001	H0: The mean productivity fellowship group is similar of the productivity fellowship mean H1: The mean productivity fellowship group is	Rejected H0

	fellowship=0,58		different of the productivity fellowship mean.	
Group 3	Productivity fellowship=3,42 No productivity fellowship=2,18	p=0,011	H0: The mean productivity fellowship group is similar of the productivity fellowship mean H1: The mean productivity fellowship group is different of the productivity fellowship mean.	Rejected H0
Group 4	Productivity fellowship=2,87 No productivity fellowship=1,60	p=0,002	H0: The mean productivity fellowship group is similar of the productivity fellowship mean H1: The mean productivity fellowship group is different of the productivity fellowship mean.	Rejected H0
Score Capes*	Productivity fellowship=4,17 No productivity fellowship=1,37	p=0,001	H0: The mean productivity fellowship group is similar of the productivity fellowship mean H1: The mean productivity fellowship group is different of the productivity fellowship mean.	Rejected H0

* The Score Capes was realized by means of the distribution weighted for the papers publications, presented in Equation 1.

Source: Author (2016).

In all Groups, the researcher grant presented an average of paper publications in periodicals significantly superior to the group of non-grant. In addition, the scenario replicates when observed the Capes score, which considers scores for the publications of each paper and scores in the lower strata. In this regard, the group of researcher grant presented an average significantly higher than the group of non-grant.

A higher academic researcher grant compared to non-grant was identified in previous studies in Production Engineering in the triennium 2009-2012 (PICININ et al., 2016), and it does not appear to be an abnormality. This scenario is justified by the requirements for the individual to hold a productivity grant, which provides for a minimum limit of articles indexed in the Scielo, Scopus, MedLine, Lilacs, Embase, Eric or ISI database (CNPq, 2010). The purpose of the productivity grant should be "aimed at researchers who stand out among their peers, valuing their scientific production according to normative criteria established by CNPq and specific by CNPq Advisory Committees" (CNPQ, 2006, p. 11). In Administration field, it was also observed a predominance of the publications of researcher grant in periodicals A1 and A2 (PICININ, 2014).

According to Shigaki and Pratus (2012), since 1988 a quantitative evaluation was introduced in graduate course. As evidenced, the tendency towards objectivism and quantitative evaluation continues to predominate in graduate evaluation system, with evaluated teachers (in this case, researcher grant and other professors) striving to publish in the better conceptualization of Qualis, since they offer benefits in evaluation. In the view of Nascimento (2010), the professors adapt easily to the models of evaluation of the publishing in periodicals that offer greater benefit.

Therefore, that researcher grant has a higher scientific output compared to who does not hold a grant. Another point that deserves to be highlighted is the researcher grant is already consolidated in the area of performance, because the present research found 75.60% of the research grant have a time of performance of more than seven years in graduate studies.

Castro (2005) indicates academic productivity is linked to teaching, research and extension activities in graduate studies. Therefore, it is prudent to consider the longer the time spent in the area the greater the possibilities of publications.

Table 4 presents the comparison between groups of published papers and the male and female population.

Table 4- Comparison between groups of published papers and the male and female population in the triennium from 2013 to 2015

Group	Mean	p-value	Hypothesis	Conclusion
Group 1	Male=0,43 Female=0,5	p=0,964	H0: The mean male group is similar of the female group. H1: The mean male group is diferente of the female group.	Accepted H0
Group 2	Male=0,88 Female=0,96	p=0,717	H0: The mean male group is similar of the female group. H1: The mean male group is diferente of the female group.	Accepted H0
Group 3	Male=2,65 Female=2,32	p=0,466	H0: The mean male group is similar of the female group. H1: The mean male group is diferente of the female group.	Accepted H0
Group 4	Male=2,13 Female=1,60	p=0,158	H0: The mean male group is similar of the female group. H1: The mean male group is diferente of the female group.	Accepted H0

Source: Authors (2016)

Table 4 indicates there is a significant difference between the means of the groups in the comparison by gender. The female population had higher averages in relation to the male population in Group 1 (A1 and A2) and in Group 2 (B1 and B2), and the male gender had the highest averages in comparison to the female population in the Group 3 (B3, B4 B5) and Group 4 (C and unidentified), however, this difference was not statistically significant.

Proposing a discussion about the participation of women in Brazilian scientific production, Leta (2003) and Mascarenhas (2003) showed that in mid-2000 women's knowledge production was insipient, even though women were the majorities among women students.

Following this line of reasoning, there was a late inclusion of the female gender in the system of Science and Technology. Nevertheless, motherhood and the difficulty in reconciling scientific careers with family life contribute to women's lack of superior levels of scientific production (LETA, 2003; MASCARENHAS, 2003).

In this sense, based on the literature, it would be natural for women to present a significantly lower average of articles than men. However, the average of the scientific production of women who works in Production Engineering of Brazil was higher in Group 1 and Group 2, that is, more qualified articles.

Table 5 presents a comparison of the Groups of publications by type of institution to which professors in Production Engineering of Brazil.

Table 5 - Comparison by groups of papers published by Federal, State and Individual HEI professors in the triennium from 2013 to 2015.

Group	Mean	p-value	Hypothesis	Conclusion
Group 1	Federal = 0,47 State= 0,57 Private= 0,27	p^1=0,245 p^2=0,692 p^3=0,167	H0: The mean of groups are similar. H1: The mean of groups are different.	1 – Accepted H0 2 – Accepted H0 3 – Accepted H0
Group 2	Federal=0,91 State =0,80 Private=0,97	p^1=0,281 p^2=0,633 p^3=0,196	H0: The mean of groups are similar. H1: The mean of groups are different.	1 – Accepted H0 2 – Accepted H0 3 – Accepted H0
Group 3	Federal=2,72 State=1,10 Private=3,44	p^1=0,007 p^2=0,773 p^3=0,018	H0: The mean of groups are similar. H1: The mean of groups are different.	1 – Rejected H0 2 – Accepted H0 3 – Rejected H0
Group 4	Federal=2,11 State =1,65 Private=2,04	p^1=0,519 p^2=0,542 p^3=0,959	H0: The mean of groups are similar. H1: The mean of groups are different.	1 – Accepted H0 2 – Accepted H0 3 – Accepted H0

p^1 Federal and State comparison result.
p^2 Federal and Private comparison result.
p^3 State and Private comparison result.

Source: Author (2016).

There was a significant difference only in Group 3 (B3, B4, B5), in which the population of professors linked to Federal and Private HEIs obtained a mean of publications

significantly higher than professors linked to State HEI. There was no apparent justification for the data set forth in Table 5.

Table 6 presents a comparison of production groups by time of performance in graduate programs in Production Engineering.

Table 6 - Comparison by Groups of production by time of performance in Production Engineering in the triennium from 2013 to 2015

Group	Mean	p-value	Hypothesis	Conclusion
Group 1	1 to 7 years = 0,36	p^1=0,610	H0: The mean of groups are similar.	1- Accepted H0
	8 to 15 years = 0,46	p^2=0,692	H1: The mean of groups are different..	2- Accepted H0
	16 years and over= 0,57	p^3=0,678		3- Accepted H0
Group 2	1 to 7 years = 0,71	p^1=0,113	H0: The mean of groups are similar.	1- Accepted H0
	8 to 15 years = 0,98	p^2=0,55	H1: The mean of groups are different.	2- Accepted H0
	16 years and over = 1,11	p^3=0,790		3- Accepted H0
Group 3	1 to 7 years = 1,83	p^1=0,090	H0: The mean of groups are similar.	1- Accepted H0
	8 to 15 years = 3,56	p^2=0,867	H1: The mean of groups are different.	2- Accepted H0
	16 years and over = 2,85	p^3=0,126		3- Accepted H0
Group 4	1 to 7 years = 1,62	p^1=0,610	H0: The mean of groups are similar.	1- Accepted H0
	8 to 15 years = 2,5	p^2=0,567	H1: The mean of groups are different.	2- Accepted H0
	16 years and over = 2,14	p^3=0,221		3- Accepted H0

P^1 It is the result of the comparision between 1 to 7 years and 8 to 15 years of service.
P^2 It is the result of the comparision between 1 to 7 years and 16 or more years of service.
P^3 It is the result of the comparision between 8 to 15 years and 16 or more years of service.

Source: Authors (2016)

For all Groups there were no significant differences between the averages of publications by length of service. It is noticeable in the cases of the group with 1 to 7 years of performance in the graduation, the lowest averages of publication were obtained.

In this sense, it is necessary to retake the concepts presented by Castro (2005) in relation to the connection of teaching, research and extension activities in graduate studies with academic grant. Bearing in mind this assumption, it is evident that professors who has been working for a shorter period of time in the graduate course present a lower publication average than the others, given the lower number of completed guidelines and the smaller network, justifying this scenario.

4. Conclusion

In Brazil, scientific production is closely linked to graduation, which is assessed through the standards established by Capes. The present study analyzed the scientific productions of professors who works in Production Engineering of Brazil in the triennium 2013-2015.

It was verified that most of the publications of professors in Production Engineering of Brazil concentrate their publications in periodicals in smaller strata (B3, B4, B5). This was reinforced by Spearman's correlation test, which reinforces the tendency for publications to decrease as stratum weight increases.

Regarding the scientific production, it was evidenced that: (i) the researcher grant presented scientific production significantly superior to the group of non-grant; (ii) there is no gender (male or female) that presents a scientific production significantly superior to its peers; (iii) between Federal, State and Private HEIs, there was a significant difference only in group 3 (B3, B4 and B5), since the federal institutions obtained a significantly higher average than the state HEI teachers, and, in the same way, the HEI teachers Individuals returned significantly higher than the state HEI teachers; (Iv) there was no significant difference in the

scientific production of teachers with different years of graduate enrollment (1 to 7 years, 8 to 15 years and over 16 years).

With regard to the case of the researcher grant and non-grant, this scenario is not an unusual scenario, given that in order to obtain the grant, professor must fulfill a series of requirements regarding their scientific production.

Regarding the comparison by institutions and time of service, more studies are necessary to ascertain pertinent hypotheses the influence of these variables on the scientific production of the professors who works in Production Engineering of Brazil.

This work was not intended to account for scientific publications of another nature, such as books, book chapters, patents and articles in congress, which is a limitation of the present research. In this way, it is suggested for future research, to increase the analysis of the scientific production of the professors from Brazilian Production Engineering, adding the other types of publications not covered in this study.

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