Factors associated with scientific production of professors working at a private university in Peru: An analytical cross-sectional study [version 1; peer review: 3 approved]

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Abstract
Objective: To estimate the association between the academic, personal, and work characteristics and scientific production of professors at a private university of Lima, Peru, in 2021. Methods: We undertook an observational, analytical, and cross-sectional study. The sample included 322 professors through simple random sampling. Two questionnaires were administered. The first gathered personal, academic, and work characteristics; while the second evaluated scientific production. The chi-squared test was used, with a significance level of p<0.05, to evaluate the association between the different characteristics and scientific production. A multiple logistic regression was analyzed through the Stepwise method to evaluate the relationship between the variables of exposure and scientific production. We calculated prevalence ratios (PRs) with their respective 95% confidence intervals (95% CI). Results: We analyzed 322 professors, 59.6% were male. Scientific production was associated with being registered in Renacyt (PR = 5.52; 95% CI: 2.14 to 4.23; p = <0.001), having a doctoral degree (PR = 2.45; 95% CI: 1.60 to 3.85; p = <0.001), having being a thesis advisor (PR = 3.83; 95% CI: 1.45 to 5.66; p = <0.001), having facilities to conduct research at the workplace (PR = 1.58; 95% CI: 1.12 to 2.47; p = 0.006), and having received training by the university (PR = 1.99; 95% CI: 1.55 to 2.56; p = 0.001). Conclusions: Scientific production was associated with being registered in Renacyt, having a doctoral degree, having been a thesis advisor, having facilities to conduct research at the workplace, and having being trained in research by the university. Hence, evaluation systems and the monitoring of university quality standards should be strengthened. In addition, it is necessary to undertake wider scope
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Introduction

Scientific production is one of the most important indicators of scientific and technological development. It is closely related to the economic and social development of a country or region, as it helps researchers disseminate knowledge through the publication of scientific articles in indexed journals. The countries that lead the scientific output rankings are the United States, China, and Great Britain; while in Latin America, Brazil, Mexico, and Argentina are in the top of the lists. In Peru, the efforts to reach scientific and technological development through the investment in education and research projects with a great impact are scarce. Thus, this country is in the 73rd place in terms of scientific production at a world level and in the eighth in Latin America.

In the world, universities constitute the ideal environment for the generation of evidence through scientific research. They have a fundamental role in scientific production by promoting and producing new knowledge that help the countries’ development.

Among the diverse strategies to promote research among professors and students, training, attracting, and retaining young researchers with aptitudes for research stand out, in addition to didactic techniques such as flipped classroom. Thus, universities seek to train future researchers during the undergraduate programs, where research is one of the most important pillars in the education of future professionals, particularly in the human medicine programs, and health sciences in general. This is intended to be replicated with greater demand and quality in the different postgraduate programs.

However, in developing countries and especially in Peru, universities do not fully comply with the function of training quality researchers. This is manifested through the low level of medicine scientific production, compared to medical scientific production of countries such as the United States or European countries. This could be explained by the limited available economic or human resources for research, a low level of research culture and deficient research training during the under- and postgraduate programs.

This situation leads research and scientific production to be a matter of interest and concern within the Peruvian scientific community and the Government. Thus, in 2014, the Peruvian University Law 30220 was passed, which states that students should conduct research projects such as a thesis or a scientific article and this should be sustained and approved as a condition sine qua non to obtain their professional degree and finish satisfactorily the different postgraduate programs. This, in addition, is a basic condition of quality for the licensing of the different professional schools.

The courses that include research activity have a clear objective: to guide students in their scientific education. This situation requires that responsible professors have sufficient research experience expressed in a significant number of publications in indexed journals that certify scientific suitability and novelty. Currently, there exists little available evidence that explores the scientific production of professors in Peru. In addition, this lack of evidence also includes scarce studies on factors associated with, particularly, the area of health sciences which reflects the current condition of the compliance of universities in terms of their scientific and training function, and offers truthful and pertinent information to implement programs and strategies that promote the scientific development of the country.

Taking into account what we stated above, this research’s objective was to estimate the association between professor’s academic, personal and work characteristics and their scientific production at the Universidad Norbert Wiener, Lima, Peru, in 2021, as a first step to identify those factors that contribute or limit the development of scientific production in a higher education institution in the capital of the country.

Methods

Design and population of the study

We undertook an observational, analytical, cross-sectional study. The population was made up of 663 professors of the Universidad Norbert Wiener during the first term of 2021, in Lima, Peru. We included both male and female professors that worked at the Universidad Norbert Wiener during the period of the study. Professors that did not want to participate or were not available to fill in the questionnaires during the period of the study were excluded.

The research instruments were developed by the researchers and were applied using the Google Forms (Google, 2022) tool, for which the link to the survey was sent by e-mail to the study participants. The data provided by the participants were collected in Google drive (Google, 2022).

Sampling type and size

A sample size was determined by proportional allocation according to the size of the school of origin, resulting in a total of 332 university teachers, after applying the statistical formulas. The sampling was simple random probabilistic, since there was a list of all the university teachers.
Procedures
The information on the included participants in this study was collected through two questionnaires. The first was oriented towards the identification of academic, work, and personal characteristics. The second gathered information about the scientific production of the evaluated professors. Data collection was carried out via email, using the drive tool between the months of September and December 2020.

The data collection instruments were developed by the research team and validated through the Aiken’s V coefficient with the participation of ten expert methodologists and experts on the subject, who assessed clarity, objectivity, being up-to-date, organization, sufficiency, adequacy, coherence, methodology, and pertinence of the instruments’ content.

The reliability of the instrument was evaluated through a pilot test that included 30 professors from Norbert Wiener University, who were randomly selected and did not enter the study. The instruments were sent by email using Google drive (Google), then both instruments were subjected to the Cronbach's alpha and KR-20 reliability tests according to the type of variable evaluated. We obtained a Cronbach's alpha coefficient of 0.85 for the instrument that evaluates scientific production and 0.88 for academic factors. In addition, we obtained a KR-20 coefficient of 0.82 for personal factors and 0.90 for work factors. For which the SPSS version 25.0 (IBM Corp, 2017) (RRID:SCR_016479) was used, whose license is from Norbert Wiener University.

Reliability was assessed through a pilot test that included 30 professors of the Universidad Norbert Wiener. Both instruments were subjected to the Cronbach’s alpha and KR-20 tests according to the type of variable evaluated. We obtained a Cronbach’s alpha coefficient of 0.85 for the instrument that assesses scientific production and 0.88 for the one about academic factors. In addition, we obtained a KR-20 coefficient of 0.82 for the personal factors and 0.90 for the work factors the results of the instrument reliability test were adequate; therefore, no changes were made to the instruments. Data from the pilot study cannot be shared in this study, as they are being used for another study that will analyze the psychometric properties of the instruments.

Bias
This study included professors of the Universidad Privada Norbert Wiener with socioeconomic characteristics that differ from the population of university teachers in Peru. However, this study is one of the first to evaluate professor’s scientific production and the possible associated factors, and it will serve as baseline for future studies with a wider scope.

Scientific production can be assessed in different ways that include journal type, H-index, language of publication, level of inter-institutional collaboration at a national as well as international level.

Variables
Outcome variable: Scientific production

Professors’ scientific production was assessed as a dependent or outcome variable. This was defined as the number of publications (original article, review article, clinical case reports, books) in journals indexed in Scopus, Web of Science (WoS), Scielo, Latindex. In addition, the impact of publication through the H-index was reported. This information was obtained through the research instrument.

Variables of exposure: Personal, academic and work characteristics

Professors’ personal, academic, and work characteristics were evaluated as well as the postgraduate programs studied, the level of English comprehension, database management, reference management, statistical software management, subscription to scientific journals, memberships in scientific societies or groups, research competencies, or thesis advising.

Furthermore, work characteristics such as access to incentives, institutional support, infrastructure, and research funding were assessed, as well as administrative aspects such as employment category, contract type, and number of teaching and non-teaching hours.

In addition, we evaluated personal characteristics such as bio-social (gender, age, civil status, and children) and professional (profession, professional experience, teaching experience, or institutions where he/she worked) factors.

Statistical analysis
The obtained data were collected in the Excel 2010 (Microsoft, 2010) (RRID:SCR_016137) software and were analyzed with the SPSS program version 25.0. The descriptive results of the categorical variables were shown through
absolute and relative frequencies; while for quantitative variables, we calculated measures of central tendency and dispersion.

For assessing the relationship between each exposure and outcome variables, we used bivariate analysis and the Chi-squared test with their respective p-values. We considered p<0.05 statistically significant. We calculated prevalence ratios (PRs) and their respective confidence interval at 95% for each relationship.

Also, in order to evaluate the relationship between the variables of exposure and scientific production, a multiple logistic regression analysis was performed using the Stepwise method, where step by step we added the indicators that showed a value of p<0.05 to the previous bivariate analysis. All statistical analyzes were performed using SPSS version 25.0 software licensed by Norbert Wiener University.

**Ethical aspects**
This study was carried out following the guidelines of the Declaration of Helsinki of 1964 and its subsequent modifications. In addition, the participants agreed to participate through written informed consent and we ensured the anonymity of the data obtained from each participant, so their integrity was not violated. This study was evaluated and approved by the Institutional Research Ethics Committee of the Norbert Wiener University. The approval number by the ethics committee was Exp. No 158-2020.

**Results**

**Descriptive analysis of the scientific production in the study sample**
The information obtained from a total of 322 professors allowed us to find that 59.6% (n=192) did not have publications in indexed journals and only 9.6% (n=31) had published six or more articles. By evaluating scientific production in different databases, we found that 13.4% (n=43) had a publication in Scopus, and 5.3% (n=17) had five or more. Also, 9.0% (n=29) had a publication in WoS and 3.1% (n=10) had four or more. In addition, 9.3% (n=30) had a publication in Scielo and 7.5% (n=24) had published four or more. We also found that 15.2% (n=49) published one or two papers in Latindex and 5% (n=16) had published five or more. On the other hand, 51.2% (n=165) did not have an H-index and 40.1% (n=129) did not know about this index. Moreover, 91.9% (n=296) had an H-index equal to 0, while 1.9% (n=6) had an H-index equal to or higher than 5 (Table 1).

**Table 1. Professors’ scientific production at the Universidad Norbert Wiener, 2022 (n=322).**

|                                      | n   | %   |
|--------------------------------------|-----|-----|
| Publications in indexed journals     |     |     |
| No                                   | 192 | 59.6|
| Yes                                  | 130 | 40.4|
| Published articles                    |     |     |
| None                                 | 190 | 59.0|
| 1-3                                  | 80  | 24.8|
| 4-5                                  | 21  | 6.5 |
| ≥6                                   | 31  | 9.6 |
| Articles published in Open Access journals |     |     |
| None                                 | 193 | 59.9|
| 1-5                                  | 100 | 31.1|
| ≥6                                   | 29  | 9.0 |
| Articles published in Scopus         |     |     |
| None                                 | 251 | 78.0|
| 1-2                                  | 43  | 13.4|
| 3-4                                  | 11  | 3.4 |
| ≥5                                   | 17  | 5.3 |


Descriptive and bivariate analysis by scientific production in the study sample

Of the 322 professors included in this study, 58.7% (n=189) belonged to the Faculty of Health Sciences; 6.8% (n=22), to Pharmacy and Biochemistry; 11.2% (n=36), to Engineering and Businesses; 9% (n=29), to Law and Political Sciences; and 14.3% (n=43), to the Postgraduate School.

Among the personal characteristics, we found that 59.3% (=191) were male and the median age was 48 (29-72 years old). We found that 16.8% of professors were registered in Renacyt (National Registry of Science, Technology and Technological Innovation), in which the most frequent category was Rostworowski III (3.4% n=11). Of the total, 98.4% stated that they had an interest in research and 50.3% (n=162) mentioned that they felt satisfaction due to research, but 62.7% (n=202) and 59.9% (n=193) indicated that economic aspects and workload, respectively, prevent them from conducting research. Through bivariate analysis, we could find an association between scientific production and belonging to the teaching staff of a postgraduate school (PR=2.05; 95% confidence interval: 1.38 to 3.04; p<0.001), being registered in DINA (PR=5.52; 95% confidence interval: 2.14 to 14.25; p<0.001) or in Renacyt (PR=2.39; 95% confidence interval: 1.92 to 2.98; p<0.001), and having received an award (RP=2.28; 95% confidence interval 1.81 to 2.88; p<0.001) or having being recognized for researching (PR=2.34; 95% confidence interval: 1.55 to 3.01; p<0.001) (Table 2).

Regarding the academic characteristics, we found that 99.4% (n=320) had a postgraduate degree and the most frequent was the master’s degree (81.4% n=262). In addition, 43.8% (n=141) had a basic level of English; while 14.3% (n=46) had an advanced level. According to what was declared by the study participants in the research survey. Likewise, Of the total, 85.7% (n=276) reported that they use a database for doing research. Also, 50.6% (n=163) stated that they used Google Scholar; 47.5% (n=153) used Scopus; 73.3% (n=253) used Scielo; 50.6% (n=163) used Pubmed; and 41.6% (n=134) used Medline. In addition, 54.7% (n=176) reported that they used reference managers; while 68.6% (n=221) used

|                           | n  | %  |
|---------------------------|----|----|
| Articles published in Web of Science (WoS) |    |    |
| None                      | 277| 86.0 |
| 1                         | 29 | 9.0  |
| 2-3                       | 6  | 1.9  |
| ≥4                        | 10 | 3.1  |
| Articles published in Scielo |    |    |
| None                      | 256| 79.5 |
| 1                         | 30 | 9.3  |
| 2-3                       | 12 | 3.7  |
| ≥4                        | 24 | 7.5  |
| Articles published in Latindex |    |    |
| None                      | 245| 76.1 |
| 1-2                       | 49 | 15.2 |
| 3-4                       | 12 | 3.7  |
| ≥5                        | 16 | 5.0  |
| Has an H-index            |    |    |
| No                        | 165| 51.2 |
| Yes                       | 28 | 8.7  |
| Does not know the H-index | 129| 40.1 |
| Number of H-index         |    |    |
| 0                         | 296| 91.9 |
| 1-2                       | 13 | 4.0  |
| 3-4                       | 7  | 2.2  |
| ≥5                        | 6  | 1.9  |

Table 1. Continued

Descriptive and bivariate analysis by scientific production in the study sample
Table 2. Professors’ personal characteristics at the Universidad Norbert Wiener, 2022 (n=322).  

| Personal characteristics          | n   | %     | Scientific production | Prevalence ratio [CI] | p-value* |
|-----------------------------------|-----|-------|------------------------|-----------------------|----------|
|                                   | n   | %     | No (n=192)              | Yes (n=130)            |          |
| Gender                           |     |       |                        |                       |          |
| Male                             | 191 | 59.3  | 117 (60.9)             | 74 (56.9)             | 1.00     |
| Female                           | 131 | 40.7  | 75 (39.1)              | 56 (43.1)             | 1.10 [0.84-1.44] | 0.470 |
| Civil status                      |     |       |                        |                       |          |
| Single                           | 76  | 23.6  | 44 (22.9)              | 32 (24.6)             | 1.00     |
| Married                          | 198 | 61.5  | 118 (61.5)             | 80 (61.5)             | 0.96 [0.70-1.31] | 0.797 |
| Domestic partner                 | 21  | 6.5   | 15 (7.8)               | 6 (4.6)               | 0.68 [0.33-1.40] | 0.296 |
| Divorced                         | 19  | 5.9   | 11 (5.7)               | 8 (6.1)               | 1.00 [0.55-1.80] | 1.000 |
| Widowed                          | 8   | 2.5   | 4 (2.1)                | 4 (3.1)               | 1.19 [0.57-2.50] | 0.650 |
| Has children                     |     |       |                        |                       |          |
| No                               | 78  | 24.2  | 41 (21.4)              | 37 (28.5)             | 1.00     |
| Yes                              | 244 | 75.8  | 151 (78.6)             | 93 (71.5)             | 0.80 [0.60-1.07] | 0.130 |
| Profession                       |     |       |                        |                       |          |
| Non-related to Health Sciences   | 130 | 40.4  | 82 (42.7)              | 48 (36.9)             | 1.00     |
| Health Sciences                  | 192 | 59.6  | 110 (57.3)             | 82 (63.1)             | 1.16 [0.88-1.53] | 0.306 |
| Number of institutions you are working for | | | | | |
| 1                                | 67  | 20.8  | 42 (21.9)              | 25 (19.2)             | 1.00     |
| 2 or more                        | 255 | 79.2  | 150 (78.1)             | 105 (80.8)            | 1.10 [0.78-1.56] | 0.574 |
| Time working at UNW**            |     |       |                        |                       |          |
| ≤2 years                         | 65  | 20.2  | 44 (22.9)              | 21 (16.1)             | 1.00     |
| >2 years                         | 112 | 34.8  | 75 (39.1)              | 37 (28.5)             | 1.02 [0.66-1.59] | 0.921 |
| Does not respond                 | 145 | 45.0  | 73 (38.0)              | 72 (55.4)             | 1.54 [1.04-2.27] | 0.030 |
| School in which you teach        |     |       |                        |                       |          |
| Non-related to Health Sciences   | 91  | 28.3  | 64 (33.3)              | 27 (20.8)             | 1.00     |
| Health Sciences                  | 185 | 57.4  | 110 (57.3)             | 75 (57.7)             | 1.37 [0.95-1.96] | 0.091 |
| Postgraduate                     | 46  | 14.3  | 18 (9.4)               | 28 (21.5)             | 2.05 [1.38-3.04] | <0.001 |
| Registered in DINA†              |     |       |                        |                       |          |
| No                               | 48  | 14.9  | 44 (22.9)              | 4 (3.1)               | 1.00     |
| Yes                              | 274 | 85.1  | 148 (77.1)             | 126 (96.9)            | 5.52 [2.14-14.25] | <0.001 |
| Registered in Renacyt‡           |     |       |                        |                       |          |
| No                               | 273 | 84.8  | 182 (94.8)             | 91 (70.0)             | 1.00     |
| Yes                              | 49  | 15.2  | 10 (5.2)               | 39 (30.0)             | 2.39 [1.92-2.98] | <0.001 |
| Category                         |     |       |                        |                       |          |
| Not registered in Renacyt        | 273 | 84.8  | 182 (94.8)             | 91 (70.0)             | 1.00     |
| María Rostworowski               | 26  | 8.1   | 4 (2.1)                | 22 (16.9)             | 2.54 [2.01-3.21] | <0.001 |
| Carlos Monge                     | 23  | 7.1   | 6 (3.1)                | 17 (13.1)             | 2.22 [1.65-2.98] | <0.001 |
| Motivated to do research         |     |       |                        |                       |          |
| No                               | 10  | 3.1   | 8 (4.2)                | 2 (1.5)               | 1.00     |
| Yes                              | 312 | 96.9  | 184 (95.8)             | 128 (98.5)            | 2.05 [0.59-7.15] | 0.259 |
Bivariate analysis showed that having a master’s degree was associated with not having scientific production (PR=0.65; 95% confidence interval: 1.49 to 0.85; p=0.002). Furthermore, scientific production was associated with having a doctoral degree (PR=2.14; 95% confidence interval: 1.60 to 2.85; p<0.001), having an intermediate level of English (PR=1.35; 95% confidence interval: 1.01 to 1.82; p=0.045), having knowledge of bibliographic search in databases (PR=2.93; 95% confidence interval: 1.46 to 5.87; p=0.002), and knowing how to use any statistical software (PR=2.05; 95% confidence interval: 1.39 to 3.03; p<0.001). In addition, belonging to a scientific society (PR=2.05; 95% confidence interval: 1.75 to 2.88; p<0.001) or to a research group (PR=3.67; 95% confidence interval: 2.66 to 5.07; p<0.001), and being a thesis advisor in a master’s program (PR=1.91; 95% confidence interval: 1.39 to 3.03; p<0.001) or in a doctoral program (PR=1.95; 95% confidence interval: 1.49 to 2.55; p<0.001) were also associated with a better level of scientific production (Table 3).

In regard to work characteristics, only 5.9% (n=19) were professors with a permanent appointment and 76.7% (n=247) did not have a regulated teaching category. Also, 73.3% (n=236) indicated that the university did not grant them time for research and only 11.5% (n=37) dedicated 10 or more hours a week to research-related activities. In addition, 87.9% (n=283) had not received any funding for conducting research; 90.7% (n=292) had not received an incentive to publish; and 727% (n=234) had not received any support in the management of research projects. Bivariate analysis showed that

### Table 2. Continued

| Personal characteristics | n   | %    | Scientific production | Prevalence ratio [CI] | p-value* |
|--------------------------|-----|------|-----------------------|-----------------------|----------|
|                          | No  | Yes  | No (n=192)            | Yes (n=130)           |          |
|                          | n (%)| n (%)| n (%)                 | n (%)                 |          |
| How do you like to work when researching? |     |      |                       |                       |          |
| In teams                 | 234 | 72.7 | 130 (67.7)            | 104 (80.0)            | 1        |
| By myself                | 26  | 8.1  | 21 (10.9)             | 5 (3.8)               | 0.43 [0.19-0.96] | 0.041    |
| Indifferent              | 62  | 19.2 | 41 (21.4)             | 21 (16.2)             | 0.76 [0.52-1.11] | 0.158    |
| Role in the research team|     |      |                       |                       |          |
| Leader of the project    | 116 | 36.0 | 55 (28.7)             | 61 (46.9)             | 1        |
| Member of the technical team | 162 | 50.3 | 104 (54.2)            | 58 (44.6)             | 0.68 [0.52-0.89] | 0.005    |
| Other                    | 44  | 13.7 | 33 (17.2)             | 11 (8.5)              | 0.48 [0.28-0.82] | 0.007    |
| Received a research award|     |      |                       |                       |          |
| No                       | 258 | 80.1 | 175 (91.1)            | 83 (63.9)             | 1        |
| Yes                      | 64  | 19.9 | 17 (8.9)              | 47 (36.1)             | 2.28 [1.81-2.88] | <0.001    |
| Was recognized for researching |     |      |                       |                       |          |
| No                       | 217 | 67.4 | 156 (81.2)            | 61 (46.9)             | 1        |
| Yes                      | 105 | 32.6 | 36 (18.8)             | 69 (53.1)             | 2.34 [1.81-3.01] | <0.001    |
| Is satisfied with research |     |      |                       |                       |          |
| No                       | 160 | 49.7 | 121 (63.0)            | 39 (30.0)             | 1        |
| Yes                      | 162 | 50.3 | 71 (37.0)             | 91 (70.0)             | 2.30 [1.70-3.13] | <0.001    |
| The economic situation prevents me from researching |     |      |                       |                       |          |
| No                       | 120 | 37.3 | 69 (35.9)             | 51 (39.2)             | 1        |
| Yes                      | 202 | 62.7 | 123 (64.1)            | 79 (60.8)             | 0.92 [0.70-1.21] | 0.547    |
| Family load prevents me from researching |     |      |                       |                       |          |
| No                       | 223 | 69.2 | 133 (69.3)            | 90 (69.2)             | 1        |
| Yes                      | 99  | 30.8 | 59 (30.7)             | 40 (30.8)             | 1.00 [0.75-1.34] | 0.994    |
| Work load prevents me from research |     |      |                       |                       |          |
| No                       | 129 | 40.1 | 78 (40.6)             | 51 (39.2)             | 1        |
| Yes                      | 193 | 59.9 | 114 (59.4)            | 79 (60.8)             | 1.04 [0.79-1.36] | 0.803    |

*P-value estimated through Chi-squared test, with a level of significance of p<0.05.
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†National Directory of Researchers and Innovators.
‡National Registry of Science, Technology and Technological Innovation.

statistical software. Bivariate analysis showed that having a master’s degree was associated with not having scientific production (PR=0.65; 95% confidence interval: 1.49 to 0.85; p=0.002). Furthermore, scientific production was associated with having a doctoral degree (PR=2.14; 95% confidence interval: 1.60 to 2.85; p<0.001), having an intermediate level of English (PR=1.35; 95% confidence interval: 1.01 to 1.82; p=0.045), having knowledge of bibliographic search in databases (PR=2.93; 95% confidence interval: 1.46 to 5.87; p=0.002), and knowing how to use any statistical software (PR=2.05; 95% confidence interval: 1.39 to 3.03; p<0.001). In addition, belonging to a scientific society (PR=2.05; 95% confidence interval: 1.75 to 2.88; p<0.001) or to a research group (PR=3.67; 95% confidence interval: 2.66 to 5.07; p<0.001), and being a thesis advisor in a master’s program (PR=1.91; 95% confidence interval: 1.48 to 2.47; p<0.001) or in a doctoral program (PR=1.95; 95% confidence interval: 1.49 to 2.55; p<0.001) were also associated with a better level of scientific production (Table 3).
Table 3. Professors’ academic characteristics and scientific production of the Universidad Norbert Wiener, 2022 (n=322).

| Academic characteristics | n   | %   | Scientific production | Prevalence ratio [CI] | p-value* |
|---------------------------|-----|-----|-----------------------|-----------------------|----------|
|                           |     |     | No (n=192) n (%) | Yes (n=130) n (%)     |          |
| Has specialty studies     |     |     |                       |                       |          |
| No                        | 196 | 60.9| 124 (64.6)           | 72 (55.4)            | 1        |
| Yes                       | 126 | 39.1| 68 (35.4)            | 58 (44.6)            | 1.25 [0.96-1.63] 0.094 |
| Has a Master’s degree     |     |     |                       |                       |          |
| No                        | 60  | 18.6| 26 (13.5)            | 34 (26.1)            | 1        |
| Yes                       | 262 | 81.4| 166 (86.5)           | 96 (73.9)            | 0.65 [0.49-0.85] 0.002 |
| Has a Doctorate degree    |     |     |                       |                       |          |
| No                        | 171 | 53.1| 126 (65.6)           | 45 (34.6)            | 1        |
| Yes                       | 151 | 46.9| 66 (34.4)            | 85 (65.4)            | 2.14 [1.60-2.85] <0.001 |
| Level of English comprehension |   |     |                       |                       |          |
| Basic                     | 141 | 43.8| 93 (48.4)            | 48 (36.9)            | 1        |
| Intermediate              | 128 | 39.8| 69 (35.9)            | 59 (45.4)            | 1.35 [1.01-1.82] 0.045 |
| Advanced                  | 46  | 14.3| 27 (14.1)            | 19 (14.6)            | 1.21 [0.80-1.84] 0.361 |
| None                      | 7   | 2.2 | 3 (1.6)              | 4 (3.1)              | 1.68 [0.85-3.32] 0.137 |
| Bibliographic search in databases | |     |                       |                       |          |
| No                        | 46  | 14.3| 39 (20.3)            | 7 (5.4)              | 1        |
| Yes                       | 276 | 85.7| 153 (79.7)           | 123 (94.6)           | 2.93 [1.46-5.87] 0.002 |
| Bibliographic search in Google Scholar | |     |                       |                       |          |
| No                        | 159 | 49.4| 87 (45.3)            | 72 (55.4)            | 1        |
| Yes                       | 163 | 50.6| 105 (54.7)           | 58 (44.6)            | 0.79 [0.60-1.03] 0.078 |
| Uses Scopus               |     |     |                       |                       |          |
| No                        | 169 | 52.5| 125 (65.1)           | 44 (33.9)            | 1        |
| Yes                       | 153 | 47.5| 67 (34.9)            | 86 (66.1)            | 2.16 [1.61-2.89] <0.001 |
| Uses Scielo               |     |     |                       |                       |          |
| No                        | 86  | 26.7| 55 (28.6)            | 31 (23.8)            | 1        |
| Yes                       | 236 | 73.3| 137 (71.4)           | 99 (76.2)            | 1.16 [0.85-1.60] 0.352 |
| Uses Latindex             |     |     |                       |                       |          |
| No                        | 247 | 76.7| 155 (80.7)           | 92 (70.8)            | 1        |
| Yes                       | 75  | 23.3| 37 (19.3)            | 38 (29.2)            | 1.36 [1.03-1.79] 0.029 |
| Uses EBSCO                |     |     |                       |                       |          |
| No                        | 169 | 52.5| 107 (55.7)           | 62 (47.7)            | 1        |
| Yes                       | 153 | 47.5| 85 (44.3)            | 68 (52.3)            | 1.21 [0.93-1.58] 0.158 |
| Uses Pubmed               |     |     |                       |                       |          |
| No                        | 159 | 49.4| 107 (55.7)           | 52 (40.0)            | 1        |
| Yes                       | 163 | 50.6| 85 (44.3)            | 78 (60.0)            | 1.46 [1.11-1.93] 0.007 |
| Uses Redalyc              |     |     |                       |                       |          |
| No                        | 214 | 66.5| 137 (71.4)           | 77 (59.2)            | 1        |
| Yes                       | 108 | 33.5| 55 (28.6)            | 53 (40.8)            | 1.36 [1.05-1.77] 0.021 |
Table 3. Continued

| Academic characteristics | n  | %   | Scientific production | Prevalence ratio [CI] | p-value* |
|--------------------------|----|-----|-----------------------|-----------------------|----------|
|                         | n (%) | n (%) | No (n=192) | Yes (n=130) |            |           |
| Uses Medline             |     |     |           |           |            |           |
| No                       | 188 | 58.4 | 127 (66.2) | 61 (46.9)  | 1.59 [1.22-2.07] | 0.001     |
| Yes                      | 134 | 41.6 | 65 (33.8)  | 69 (53.1)  |            |           |
| Uses reference managers  |     |     |           |           |            |           |
| No                       | 81  | 25.2 | 57 (29.7)  | 24 (18.5)  | 1.80 [1.25-2.59] | 0.001     |
| Yes                      | 176 | 54.7 | 82 (42.7)  | 94 (72.3)  |            |           |
| Does not know them       | 65  | 20.2 | 53 (27.6)  | 12 (9.2)   | 0.62 [0.34-1.15] | 0.130     |
| Uses Mendeley            |     |     |           |           |            |           |
| No                       | 199 | 61.8 | 141 (73.4) | 58 (44.6)  | 1         |           |
| Yes                      | 123 | 38.2 | 51 (26.6)  | 72 (55.4)  | 2.01 [1.54-2.61] | <0.001   |
| Uses Zotero              |     |     |           |           |            |           |
| No                       | 258 | 80.1 | 165 (85.9) | 93 (71.5)  | 1         |           |
| Yes                      | 64  | 19.9 | 82 (42.7)  | 37 (28.5)  | 1.60 [1.23-2.09] | <0.001   |
| Uses EndNote             |     |     |           |           |            |           |
| No                       | 300 | 93.2 | 183 (95.3) | 117 (90.0) | 1         |           |
| Yes                      | 22  | 6.8  | 9 (4.7)    | 13 (10.0)  | 1.52 [1.04-2.21] | 0.030     |
| Uses other reference manager |   |     |           |           |            |           |
| No                       | 280 | 87.0 | 164 (85.4) | 116 (89.2) | 1         |           |
| Yes                      | 42  | 13.0 | 28 (14.6)  | 14 (10.8)  | 0.80 [0.51-1.26] | 0.344     |
| Manages any statistical software | | | | | | |
| No                       | 94  | 29.2 | 72 (37.5)  | 22 (16.9)  | 1         |           |
| Yes                      | 221 | 70.8 | 115 (59.9) | 106 (81.5) | 2.05 [1.39-3.03] | <0.001   |
| Does not know them       | 7   | 2.2  | 5 (2.6)    | 2 (1.5)    | 1.22 [0.36-4.17] | 0.750     |
| Uses Stata               |     |     |           |           |            |           |
| No                       | 280 | 87.0 | 178 (92.7) | 102 (78.5) | 1         |           |
| Yes                      | 42  | 13.0 | 14 (7.3)   | 28 (21.5)  | 1.83 [1.40-2.38] | <0.001   |
| Uses SPSS                |     |     |           |           |            |           |
| No                       | 54  | 16.8 | 37 (19.3)  | 17 (13.1)  | 1         |           |
| Yes                      | 268 | 83.2 | 155 (80.7) | 113 (86.9) | 1.34 [0.88-2.04] | 0.171     |
| Uses Atlas ti            |     |     |           |           |            |           |
| No                       | 290 | 90.1 | 181 (94.3) | 109 (83.9) | 1         |           |
| Yes                      | 32  | 9.9  | 11 (5.7)   | 21 (16.1)  | 1.75 [1.30-2.34] | <0.001   |
| Uses Minitab             |     |     |           |           |            |           |
| No                       | 299 | 92.9 | 179 (93.2) | 120 (92.3) | 1         |           |
| Yes                      | 23  | 7.1  | 13 (6.8)   | 10 (7.7)   | 1.08 [0.67-1.76] | 0.747     |
| Uses other software      |     |     |           |           |            |           |
| No                       | 252 | 78.3 | 153 (79.7) | 99 (76.2)  | 1         |           |
| Yes                      | 70  | 21.7 | 39 (20.3)  | 31 (23.8)  | 1.13 [0.83-1.53] | 0.441     |
| Who performs the statistical analysis? | | | | | | |
| You do it                | 131 | 40.7 | 65 (33.8)  | 66 (50.8)  | 1         |           |
| Another researcher       | 110 | 34.2 | 61 (31.8)  | 49 (37.7)  | 0.88 [0.67-1.16] | 0.370     |
| Others, by hiring them   | 81  | 25.2 | 66 (34.4)  | 15 (11.5)  | 0.37 [0.23-0.60] | <0.001   |
Table 3. Continued

| Academic characteristics                                                                 | n     | %    | Scientific production | Prevalence ratio [CI] | p-value* |
|------------------------------------------------------------------------------------------|-------|------|------------------------|-----------------------|----------|
|                                                                                         |       |      | No (n=192) n (%)        | Yes (n=130) n (%)      |          |
| Subscribed to any scientific journal                                                     |       |      |                        |                       |          |
| No                                                                                      | 247   | 76.7 | 170 (88.5)             | 77 (59.2)             | 1        |
| Yes                                                                                     | 75    | 23.3 | 22 (11.5)              | 53 (40.8)             | 2.27 [1.79-2.87] <0.001 |
| Member of any Scientific Society                                                        |       |      |                        |                       |          |
| No                                                                                      | 227   | 70.5 | 160 (83.3)             | 67 (51.5)             | 1        |
| Yes                                                                                     | 95    | 29.5 | 32 (16.7)              | 63 (48.5)             | 2.25 [1.75-2.88] <0.001 |
| Society you belong to                                                                   |       |      |                        |                       |          |
| None                                                                                     | 227   | 70.5 | 160 (83.3)             | 67 (51.5)             | 1        |
| Medicine and specialties                                                                 | 25    | 7.8  | 10 (5.2)               | 15 (11.5)             | 2.03 [1.39-2.97] <0.001 |
| Society/association of stomatology or dentistry                                         | 21    | 6.5  | 10 (5.2)               | 11 (8.5)              | 1.77 [1.13-2.80] 0.014 |
| Related to science, technology or environment                                            | 14    | 4.3  | 1 (0.5)                | 13 (10.0)             | 3.15 [2.45-4.03] <0.001 |
| Others                                                                                  | 35    | 10.9 | 11 (5.7)               | 24 (18.5)             | 2.32 [1.72-3.14] <0.001 |
| Belongs to any research group                                                           |       |      |                        |                       |          |
| No                                                                                      | 182   | 56.5 | 148 (77.1)             | 34 (26.2)             | 1        |
| Yes                                                                                     | 140   | 43.5 | 44 (22.9)              | 96 (73.9)             | 3.67 [2.66-5.07] <0.001 |
| Leader of any research group                                                           |       |      |                        |                       |          |
| No                                                                                      | 253   | 78.6 | 176 (91.7)             | 77 (59.2)             | 1        |
| Yes                                                                                     | 69    | 21.4 | 16 (8.3)               | 53 (40.8)             | 2.52 [2.01-3.17] <0.001 |
| Participated in research in the last year                                               |       |      |                        |                       |          |
| No                                                                                      | 134   | 41.6 | 114 (59.4)             | 20 (15.4)             | 1        |
| Yes                                                                                     | 188   | 58.4 | 78 (40.6)              | 110 (84.6)            | 3.92 [2.57-5.98] <0.001 |
| Number of research studies in which you have participated                               |       |      |                        |                       |          |
| None                                                                                     | 133   | 41.3 | 115 (59.9)             | 18 (13.9)             | 1        |
| 1                                                                                       | 75    | 23.3 | 48 (25.0)              | 27 (20.8)             | 2.66 [1.57-4.50] <0.001 |
| 2                                                                                       | 58    | 18.1 | 18 (9.4)               | 40 (30.8)             | 5.10 [3.21-8.10] <0.001 |
| 3                                                                                       | 26    | 8.1  | 6 (3.1)                | 20 (15.4)             | 5.68 [3.52-9.18] <0.001 |
| 4 or more                                                                                | 30    | 9.3  | 5 (2.6)                | 25 (19.2)             | 6.16 [3.89-9.74] <0.001 |
| Attended methodology training sessions                                                   |       |      |                        |                       |          |
| No                                                                                      | 54    | 16.8 | 41 (21.4)              | 13 (10.0)             | 1        |
| Yes                                                                                     | 268   | 83.2 | 151 (78.6)             | 117 (90.0)            | 1.81 [1.11-2.97] 0.018 |
| Has been a thesis advisor                                                               |       |      |                        |                       |          |
| No                                                                                      | 75    | 23.3 | 60 (31.2)              | 15 (11.5)             | 1        |
| Yes                                                                                     | 247   | 76.7 | 132 (68.8)             | 115 (88.5)            | 2.33 [1.45-3.73] <0.001 |
| Bachelor's advisor                                                                      |       |      |                        |                       |          |
| No                                                                                      | 151   | 46.9 | 85 (44.3)              | 66 (50.8)             | 1        |
| Yes                                                                                     | 171   | 53.1 | 107 (55.7)             | 64 (49.2)             | 0.86 [0.66-1.12] 0.252 |
| Second specialty advisor                                                                |       |      |                        |                       |          |
| No                                                                                      | 255   | 79.2 | 153 (79.7)             | 102 (78.5)            | 1        |
| Yes                                                                                     | 67    | 20.8 | 39 (20.3)              | 28 (21.5)             | 1.05 [0.76-1.44] 0.789 |
scientific production was associated with having facilities to conduct research (PR=1.12 to 1.97; p=0.006) or having been trained in research (PR=1.55; 95% confidence interval: 1.12 to 2.13; p=0.008); and having received funding (PR=1.99; 95% confidence interval: 1.55 to 2.56; p<0.001) or a research incentive (PR=1.98; 95% confidence interval: 1.52 to 2.58; p<0.001) (Table 4).

### Table 3. Continued

| Academic characteristics                              | n  | %  | Scientific production | Prevalence ratio [CI] | p-value* |
|-------------------------------------------------------|----|----|------------------------|-----------------------|----------|
| License program advisor                               |    |    |                        |                       |          |
| No                                                    | 163| 50.6| 100 (52.1)             | 63 (48.5)             | 1        |
| Yes                                                   | 159| 49.4| 92 (47.9)              | 67 (51.5)             | 1.09 [0.84-1.42] | 0.524   |
| Master's advisor                                      |    |    |                        |                       |          |
| No                                                    | 209| 64.9| 145 (75.5)             | 64 (49.2)             | 1        |
| Yes                                                   | 113| 35.1| 47 (24.5)              | 66 (50.8)             | 1.91 [1.48-2.47] | <0.001 |
| Doctoral advisor                                      |    |    |                        |                       |          |
| No                                                    | 293| 91.0| 184 (95.8)             | 109 (83.8)            | 1        |
| Yes                                                   | 29 | 9.0 | 8 (4.2)                | 21 (16.2)             | 1.95 [1.49-2.55] | <0.001 |

*P-value estimated through the Chi-squared test, with a level of significance of p<0.05.

### Table 4. Professors’ work characteristics and their scientific production at the Universidad Norbert Wiener, 2022 (n=322).

| Work factors                        | n  | %  | Scientific production | Prevalence ratio [CI] | p-value* |
|-------------------------------------|----|----|------------------------|-----------------------|----------|
|                                     |    |    | No (n=192)              | Yes (n=130)           |          |
| Facilities to conduct research      |    |    | n (%)                  | n (%)                 |          |
| No                                  | 147| 46.6| 100 (52.1)             | 47 (36.2)             | 1        |
| Yes                                 | 175| 54.4| 92 (47.9)              | 83 (63.8)             | 1.48 [1.12-1.97] | 0.006   |
| Has hours a week granted to do research |    |    |                        |                       |          |
| No                                  | 236| 73.3| 144 (75.0)             | 92 (70.8)             | 1        |
| Yes                                 | 86 | 29.7| 48 (25.0)              | 38 (29.2)             | 1.13 [0.85-1.51] | 0.392   |
| Research hours a week               |    |    |                        |                       |          |
| None                                | 176| 54.7| 109 (56.8)             | 67 (51.5)             | 1        |
| 1-4                                 | 60 | 18.6| 41 (21.3)              | 19 (14.6)             | 0.83 [0.55-1.26] | 0.387   |
| 5-9                                 | 49 | 15.2| 22 (11.5)              | 27 (20.8)             | 1.45 [1.06-1.98] | 0.022   |
| ≥10                                 | 37 | 11.5| 20 (10.4)              | 17 (13.1)             | 1.21 [0.81-1.80] | 0.354   |
| Chief encourages you to do research |    |    |                        |                       |          |
| No                                  | 137| 42.6| 95 (49.5)              | 42 (32.3)             | 1        |
| Yes                                 | 185| 57.4| 97 (50.5)              | 88 (67.7)             | 1.55 [1.16-2.08] | 0.003   |
| Over the last year, have you received training? |    |    |                        |                       |          |
| No                                  | 111| 34.5| 78 (40.6)              | 33 (25.4)             | 1        |
| Yes                                 | 211| 65.5| 114 (59.4)             | 97 (74.6)             | 1.55 [1.12-2.13] | 0.008   |
| Received research funding           |    |    |                        |                       |          |
| No                                  | 283| 87.9| 181 (94.3)             | 102 (78.5)            | 1        |
| Yes                                 | 39 | 12.1| 11 (5.7)               | 28 (24.5)             | 1.99 [1.55-2.56] | <0.001 |
| Work factors                                      | n  | %   | Scientific production (n=192) | Prevalence ratio [CI] | p-value* |
|--------------------------------------------------|----|-----|------------------------------|-----------------------|----------|
|                                                  |    |     | No (n=192)                  | Yes (n=130)            |          |
|                                                  |    |     | n (%)                       | n (%)                 |          |
| Received an incentive to publish                 |    |     | 292 90.7                    | 184 (95.8)            | 1        |
|                                                  |    |     | 30 9.3                      | 8 (4.2)               | 1.98 [1.52-2.58] | <0.001   |
| Has a physical infrastructure                    |    |     | 70 21.7                     | 41 (21.4)             | 1        |
|                                                  |    |     | 252 78.3                    | 151 (78.7)            | 0.97 [0.70-1.33] | 0.838    |
| Has technological resources                      |    |     | 55 17.1                     | 27 (14.1)             | 1        |
|                                                  |    |     | 267 82.9                    | 165 (85.9)            | 0.75 [0.56-1.01] | 0.062    |
| Has bibliographic resources                      |    |     | 55 17.1                     | 28 (14.6)             | 1        |
|                                                  |    |     | 267 82.9                    | 164 (85.4)            | 0.79 [0.58-1.07] | 0.127    |
| Received support in the management of projects    |    |     | 234 72.7                    | 156 (81.2)            | 1        |
|                                                  |    |     | 88 27.3                     | 36 (18.8)             | 1.77 [1.38-2.28] | <0.001   |
| Facilities for external funding                  |    |     | 286 88.8                    | 181 (94.3)            | 1        |
|                                                  |    |     | 36 11.2                     | 11 (5.7)              | 1.89 [1.45-2.47] | <0.001   |
| Promotes national internships                    |    |     | 210 65.2                    | 132 (68.8)            | 1        |
|                                                  |    |     | 112 34.8                    | 60 (31.2)             | 1.25 [0.96-1.63] | 0.100    |
| Promotes international internships               |    |     | 209 64.9                    | 129 (67.2)            | 1        |
|                                                  |    |     | 113 35.1                    | 63 (32.8)             | 1.16 [0.88-1.51] | 0.292    |
| Provides support with translation of articles     |    |     | 207 64.3                    | 136 (70.8)            | 1        |
|                                                  |    |     | 115 35.7                    | 56 (29.2)             | 1.50 [1.15-1.94] | 0.002    |
| Research studies according to institutional research lines |    |     | 30 9.3                      | 22 (11.5)             | 1        |
|                                                  |    |     | 292 90.7                    | 170 (88.5)            | 1.57 [0.85-2.88] | 0.149    |
| Has an Ethics Committee for research             |    |     | 21 6.5                      | 15 (7.8)              | 1        |
|                                                  |    |     | 301 93.5                    | 177 (92.4)            | 1.44 [0.72-0.88] | 0.299    |
| Professor's category                             |    |     | 247 76.7                    | 149 (77.6)            | 1        |
| Is not categorized                               |    |     | 33 10.2                     | 19 (9.9)              | 1.07 [0.70-1.64] | 0.758    |
| Associate                                        |    |     | 12 3.7                      | 4 (2.1)               | 1.68 [1.09-2.58] | 0.180    |
| Main/Professor                                   |    |     | 30 9.3                      | 20 (10.4)             | 1.84 [0.50-1.43] | 0.519    |
| Assistant                                        |    |     | 19 5.9                      | 9 (4.7)               | 1        |
| Work contract type                               |    |     | 80 24.8                     | 41 (21.3)             | 0.93 [0.57-1.50] | 0.756    |
| Permanent appointment                            |    |     | 223 69.3                    | 142 (74.0)            | 0.69 [0.44-1.10] | 0.115    |
Multivariate analysis by scientific production in the study sample

Through multiple logistic regression analysis, using the Stepwise method, it was found that the main factors associated with scientific production were being registered in Renacyt (adjusted prevalence ratio (aPR)=5.52; 95% confidence interval: 2.14 to 4.23; p<0.001), having a doctoral degree (aPR=2.45; 95% confidence interval: 1.60 to 3.85; p<0.001), and having being a thesis advisor (aPR=3.83; 95% confidence interval: 1.45 to 5.66; p<0.001) (Table 5).

Discussion

This study’s objective was to estimate the association between university teachers’ scientific production and their personal, academic, and work characteristics to give basic data that enable the implementation or modification of strategies that encourage professors to conduct research.

Scientific research is an essential and mandatory activity of universities, which, according to the legal Peruvian university framework,16 “are academic communities oriented towards research and teaching”. In addition to being an indicator for national and international licensing and accreditation processes, scientific production is the best way to measure research competencies in professors.18 This is why, it is indispensable for university teachers to be sufficiently trained, as they are the first contact that students will have with research19 and professors are who encourage them to do research in an adequate way.17

However, this study found that barely 40% of professors have published a scientific article in indexed journals, and only 9.6% had more than six publications in those journals. In addition, 22.1% had, at least, a publication in Scopus and 20.5% in Scielo. These findings are similar to what was reported by previous studies such as the one by Alarcón-Ruiz,20 who found out, in 2018, that 26% of the assessed professors had a publication in Scopus over the last five years, while only 5% had a publication in the same database over the last two years. Chachaima-Mar J’s21 also reported similar percentages as

| Characteristics                        | Adjusted Prevalence ratios (aPR) | Confidence interval (CI) | p-value* |
|----------------------------------------|---------------------------------|--------------------------|----------|
| Being registered in Renacyt**          | 5.52                            | [2.14-4.23]               | <0.001   |
| Having a doctoral degree               | 2.45                            | [1.60-3.85]               | <0.001   |
| Having been a thesis advisor           | 3.83                            | [1.45-5.66]               | <0.001   |
| Having facilities for research activities at work | 1.58                        | [1.12-2.47]               | 0.006    |
| Having received training by the university | 1.99                         | [1.55-2.56]               | <0.001   |

*P-value estimated through multiple logistic regression using the Stepwise method, with a level of significance of p<0.05.

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Table 5. Logistic regression analysis of the professors' personal, academic, and work characteristics and their scientific production at the Universidad Norbert Wiener, 2022 (n=322).

Multivariate analysis by scientific production in the study sample

Through multiple logistic regression analysis, using the Stepwise method, it was found that the main factors associated with scientific production were being registered in Renacyt (adjusted prevalence ratio (aPR)=5.52; 95% confidence interval: 2.14 to 4.23; p<0.001), having a doctoral degree (aPR=2.45; 95% confidence interval: 1.60 to 3.85; p<0.001), and having being a thesis advisor (aPR=3.83; 95% confidence interval: 1.45 to 5.66; p<0.001) (Table 5).
this author found that only 14.6% of the sample had published in Scielo and 5.9%, in Scopus over the last three years, and LILACS was the most commonly used database (34.4%). Despite these similarities, it is possible to note that in our research we found a better percentage of professors with at least one published article in indexed journals. This evidences that this indicator has improved and that, if it continues in the subsequent years, it is possible to reverse the current situation in regard to professors’ scientific production in Peru.

In addition, a factor related to the number of publications is the H-index, which measures the impact of those publications. In this study, we found that only 8.7% of professors had an H-index, which coincides with what was reported in another study. These findings could be the reflection of the low level of culture of publication in the university community, despite the fact that conducting research, many times do not end up in publication due to the little initiative, training or funding, among others.

Definitely, having teaching staff that do not publish indicates that these professors are not trained to teach research, for which it is crucial to study the factors involving the lack of scientific production of university teachers. Thus, this study found that receiving awards, incentives or funding for researching favors scientific production, as reported in other studies. This might be explained by the great economic expenses involving the process of developing a research project, its execution, and publication, which evidence that adequate and well-oriented funding of research activities would greatly contribute to the improvement of publication indexes in professors of Peruvian universities.

However, we have to take into account that, although economic incentives motivate professors and increase publications in universities, it has been demonstrated that they can decrease the quality of the published articles, which increases plagiarism, salami sliced or redundant publications and generates authorship problems. This could be solved if incentives are directed to payment for publications in journals with a high impact factor, and with the implementation of surveillance to guarantee scientific integrity.

In addition, in our study, personal characteristics such as gender or civil status were not associated with scientific production, which coincides with what was reported with evidence. It is important to mention that significant differences have been reported in terms of female and male scientific production, highlighting the low level of representativity of female scientists in the published articles. This contrast could be due to the methodological or sample characteristics’ differences between the present study and the cited studies, although this found difference serves as the basis for questioning why there is still a low level of women’s scientific production. This led us to refocus on the existing gender gaps in the academic and scientific community. However, this is different when comparing women’s scientific production by academic areas as reported by Valdespinto-Aberti, who found female predominance in pediatrics publications, and by Holman et al., who reported the predominance of female authors in nursing and obstetrician areas.

In this study we did not find an association between time working as a professor and scientific production, which is similar to what was reported by another study in 2018. This could be due to the fact that probably professionals’ research practice is, in many cases, related to pre-professional training. Therefore, independently from the time a professional is practicing as a professor, it will be more complicated that they conduct research if they have not been motivated during their university education. In addition, a study found that younger professors were the ones with the most of scientific production. This could probably be due to the fact that this group has a higher level of familiarity with technological resources currently available and which are used for research and by journals, which evidences that the time of teaching practice is not a relevant factor in scientific production.

Moreover, we found that doctoral education is associated with a higher frequency of publications. This finding has already been reported in other studies, in which it was evidenced that the higher academic degree, the higher level of participation in research, which is related to the objective of doctoral education: to produce new knowledge from research. This shows the importance of scientific preparation in university teachers in order to improve indicators of scientific production. To this end, it is crucial to implement programs and strategies for the promotion and the following of research practices in professors.

This study had some limitations: 1) the population included was comprised of professors of the Universidad Norbert Wiener, which could not be representative of the totality of the country in regard to socioeconomic characteristics; 2) Assessing scientific production has multiple nuances, which goes beyond the type of journal in which the professor publishes and the H-index, including also the published language and the level of inter-institutional collaboration nationally as well as intentionally; 3) Due to the fact that the instrument was created specifically for this study, it is not possible to directly compare the results with other studies that used instruments with different structure and content.
Despite these limitations, this study is one of the first to focus the attention on specific population and, because of that, can serve as a basis for subsequent studies with a wider scope and for decision-making in regard to strategies, programs, and policies that seek to promote and strengthen research in university teachers.

Conclusions
To conclude, scientific production is related to being registered in Renacyt, having a doctoral degree, having been a thesis advisor, having facilities to conduct research activities at the workplace, and having been trained in research by the university. These findings are consistent with what was described in the literature and let us know the current situation of professors. Scientific production is low, which has an impact on the educational environment, since professors are not participating in one of the main functions of the university and are not contributing to the development of Peru. Therefore, it is necessary to reinforce the universities’ evaluation systems with respect to university quality standards that allow a better monitoring of professors’ research practice. In addition, wider scope studies should be conducted to know the current situation of professors’ scientific production and its associated factors at a national level. This will enable the implementation of strategies that promote research in professors in order to improve scientific production indicators.

Data availability
Underlying data
Zenodo: Factors associated with scientific production of professors working at a private university in Peru: An analytical cross-sectional study, https://doi.org/10.5281/zenodo.7067303.

This project contains the following underlying data:

- Factors associated with scientific production of professors working at a private university in Peru An analytical cross-sectional study.xlsx (All raw data collected).

Extended data
Data from the pilot study cannot be shared in this study, as they are being used for another study that will analyze the psychometric properties of the instruments.

Zenodo: Instruments-Factors associated with scientific production of professors working at a private university in Peru: An analytical cross-sectional study, https://doi.org/10.5281/zenodo.7091241.

- This project contains the following extended data: Instrument.pdf (Combined questionnaires used in study).

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).

Consent
Written informed consent for publication of the participants details was obtained from the participants. The approval number by the ethics committee was Exp. No 158-2020.

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Boris Salazar
Universidad del Valle, Cali, Colombia

Peer Review of Oriana Rivera-Lozada, ISABEL CRISTINA RIVERA-LOZADA2, and Cesar Antonio Bonilla-Asalde, “Factors associated with scientific production of professors working at a private university in Peru: An analytical cross-sectional study”.

The article under review is an attempt to explore the statistical association between the academic, personal and work characteristics of a sample of 332 university teachers from a private university in Peru, and their scientific production. The authors are adamant about their motivations: they know how far from the world's top-tier scientists' outputs is the Peruvian scientific production—measured by the number of publications in peer-reviewed journals of the sample of teachers under study, and by their H-indexes—and how a huge share of that gap is related to the absence, in Peruvian universities, of serious and well-funded research training programs for young motivated undergraduate students. Would-be or future university teachers that did not learn from early youth the secrets of scientific research will be in no position to contribute to the training of an increasing number of future scientists in their countries.

As the authors avoided the difficulties of causal analysis, they concentrated their efforts in finding the most credible data to measure what they tagged as the “dependent or outcome variable”, that is, the scientific production of the sample of 332 university teachers from the Universidad Norbert Weiner. They had on their side the powerful indexes, processed and provided by different publishing and research organizations, that put into numbers the amount and impact of individual researchers' scientific publications.

What they denominated as “variables of exposure” were divided in two parts: those belonging to the individuals and those related to the institutional, academic, professional, occupational and working arrangements provided by the university and the Peruvian higher educational system. Regrettably the interactions between these two types of variables were not directly addressed by the authors.

In the first part the authors included “the level of English comprehension, database management,
reference management, statistical software management, subscription to scientific journals, memberships in scientific societies or groups, research competencies, or thesis advising (p. 4).“ These characteristics read as the research endowment of every university teacher: his or her capacities, abilities and competencies for conducting research. Are those endowments inherent to each individual, and to his or her decisions, or are they the result of paths forced upon them by forces beyond their control, including the incentives and institutional arrangements of Peruvian universities and university system?

The second part correspond to what they classified as the “work characteristics”: “access to incentives, institutional support, infrastructure, and research funding were assessed, as well as administrative aspects such as employment category, contract type, and number of teaching and non-teaching hours (idem)”. These, of course, reflect the institutional arrangements of both the University of reference and the Peruvian Higher Education system.

A clear correlation between “the economic situation prevents me from research”, “family load prevents me for research”, heavy “work load prevents me from research” and not “receiving any funding for research”, on the one hand, and no scientific production was clearly detected, with “87.9% not having received any funds for conducting research” (p. 8).

They also found the 59.6% of the university teachers under study did not have any publication in indexed journals. This finding goes in line with an even more telling discovery: 40.1% of the teachers surveyed did not even know of the existence of the H-index! It is difficult to find a shaper signal of the separate existence of the university teachers surveyed in two different, unrelated worlds: one in which the H-index gives each one of them a place in a hierarchy, and another one in which that index does not even exist because it does not belong into the real lives of those university teachers.

Regretfully, as I said before, these findings and the interactions between the institutional rules of individual universities and of the Peruvian Higher Education system and the personal traits of the university teachers were not fully exploited in the discussion section of the paper.

There is, however, a logistic regression of the professors' personal academic and work characteristics and their scientific production (p.14) that in some way deals with the interaction issue I raised above. Because they estimated a logistic regression they found what type of characteristics, personal and work related, were probabilistically associated with having a higher scientific production output. It comes as no surprise that the teachers registered in Renacyt, having a doctoral degree, having been a thesis advisor, having facilities for research activities at work and having received training by the universities, are the ones with the highest scientific production in the sample of university teachers from the Norbert Weiner University.

It is pretty obvious that this group of teachers belong into the “fat tail” of the distribution of probability of the scientific production of the sample of reference: they are the few chosen, that with a smaller probability, have a large scientific production and an H-index larger that 6. Most of the remaining teachers in the sample have a large probability of having 0 or a very small scientific production. This is not a strange finding, only related to the Norbert Weiner's teachers. On the contrary, it does reflect the world distribution of probability of the scientific production of university teachers. Only an elite of university teachers concentrates most of the world's scientific production.
My humble recommendation is that the authors give some extra lines to the discussion of the interactions between university teachers' personal and work traits and the institutional arrangements of the Norbert Weiner University and of the Peruvian University at large. A more nuanced discussion of the findings in page 14 will clearly improve the interpretation and discussion powers of the article.

It goes without saying that I recommend this article under review.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Jose Antonio Grandez Urbina
Universidad Continental, Lima, Peru

The article investigates the factors influencing scientific production among professors at Universidad Norbert Wiener in Lima, Peru, in 2021. It discusses the importance of scientific production for the development of universities and countries, particularly in the context of the
Peruvian scientific community's concerns about low scientific output. The study aims to identify factors that contribute to or limit scientific production in higher education institutions. The research employs an observational, analytical, cross-sectional study design with a sample size of 322 university professors. Data collection involved questionnaires addressing academic, personal, and work characteristics, as well as scientific production. Statistical analysis included descriptive analysis, bivariate analysis, and multiple logistic regression.

Key findings include:
- Only 40% of professors had published scientific articles in indexed journals.
- Factors positively associated with scientific production include being registered in Renacyt, holding a doctoral degree, and being a thesis advisor.
- Personal, academic, and work characteristics such as gender, civil status, time working as a professor, and having a master's degree did not significantly influence scientific production.
- Challenges identified include limited funding, lack of incentives, and workload hindering research activities.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Health Sciences and Regenerative Medicine

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.
This is an interesting study that measures the association of scientific production with certain personal, academic, and work characteristics of university professors. The study was carried out with professors from a private university in Lima. The manuscript is well organized and written. However, there are some issues that need to be clarified:

In the Methods section, design and population of the study subsection, it is mentioned that the study was carried out during the first term of 2021. However, in the Procedures subsection, they mention between September and December 2020. Correct the information.

The last two paragraphs of the Procedures section have the same information, that is, they are duplicated. Correct.

About the variable Scientific production. Were editor-letters and editorials not considered publications?

If you have access to the databases, why didn't the researchers collect the scientific production data of the university professors directly from the databases? This form would have helped to reduce some memory bias of the participants when completing the questionnaires on scientific production.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Partly

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.
Reviewer Expertise: Medical education and Public health

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

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