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Academics' motivation to research: a study on public universities in Panama

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This article shows an analysis of the factors that motivate and demotivate Panamanian academics (professors and researchers) to carry out scientific research. A descriptive quantitative analysis based on data collected through the ENACT survey is presented. The study gathered data using an online self-administered questionnaire, employing a non-probabilistic and voluntary sampling design. A total of 921 academics from four public universities in Panama provided their consent to participate in the study. Multivariate interdependence methods such as the chi-square test and exploratory factor analysis (EFA) were used to determine relationships between variables. The results showed that within the academics' occupational landscape, the utilization of new technology, intellectual stimulation, academics' contributions to society, science through problem-solving, and helping humanity are the key drivers of research motivation. Labor-related aspects, including class schedules and timetables, institutional bureaucracy, wages, lack of opportunities, and job stability, were identified as major demotivating influences. It is recommended that more specific policies need to be developed with an emphasis on the value of research sustainability as an educational model and tool that benefits both the nation's current and future generations.

KEYWORDS

motivation, demotivation, research, academic profile, higher education

1 Introduction

Academic and scientific research is a fundamental pillar of university work, serving not only as a competitive factor between universities but also as a crucial element in developing a critical mindset among professors, generating new knowledge, and developing new models of thought. Institutional quality is observed in the cohesion between academic research, innovative scientific production, and the reputation acquired by the institution.

In Latin America, public education institutions play an outstanding role in promoting research, and it is in these institutions where researchers exclusively do research (Feyen, 2021). This fact emphasizes that the majority of researchers work in universities (75%), surpassing non-academic private institutions in terms of research utilization, the consideration and hiring of researchers (Svenson and de Gracia, 2016), despite the limited investment in research.

In the case of Panama, Lasso (2018) and Cuero (2018) argue that scientific production has been poor and that it is imperative to continue forming researchers with the support of the State to contribute to the country's scientific productivity. Research projects, dissemination, and transmission are limited. The budgetary constraints experienced by the system,

particularly within public universities, have emerged as a substantial challenge to the sustainability of research activities. The pursuit of recurrence in research, aimed at enhancing administrative resource management, could serve as a crucial element in addressing this issue (Lasso, 2018). Moreover, there is an ongoing need to enhance the competencies and conditions that are essential for facilitating optimal development in research (Flores Nessi et al., 2020). The lack of policies, motivation, and money are the three most important factors that affect the progress of research, according to Cortez Rojas et al. (2020).

In contrast, five social perception and technology surveys have been carried out in Panama during the years 2001–2017, administered by the National Secretariat of Science, Technology, and Innovation (Senacyt). The analysis of the aforementioned surveys revealed significant results regarding the Panamanian population and the faith that people have in science and technology. It was also revealed that people have faith in the future advantages offered by scientific-technological advances, where medicine and health are the topics that the vast majority consider much or sufficient to keep them informed, followed by the issues of environment, ecology, science, and technology (Cedeño-Vega et al., 2020).

In general, all efforts to support research combine factors that promote its execution as well as some other factors that hinder and limit its proper development, and therefore, more efforts are needed to achieve them (Carrillo et al., 2009). It is important to note that the perception of research by society generates tension in the general population. Although 40% of society believes that the development of science and technology is the solution to the country's problems, a higher percentage disagrees or simply rejects the idea (Secretaría Nacional de Ciencia, Tecnología e Innovación – SENACYT, 2019). These thoughts could be due to the belief that science accelerates the changes in their way of life, produces an artificial lifestyle, or leaves faith aside, among other things (Ayala et al., 2022; Saldarriaga et al., 2021).

An important mission of the universities of our century is to generate scientific and technological knowledge that generates products and services at the service of communities to improve the quality of life and, therefore, raise the development of the country, which is directly linked to the issues of education, science, and technology (Martínez Madrigal et al., 2022).

Solis (Solís, 2010) argues that the key pillars for the positive evolution of the research and knowledge generation system will always be active professors and researchers, especially those who participate in educational environments, technological transfer mechanisms, and the investment of the public and private sectors that can maintain a healthy research system. This overlaps professors and researchers and their professional improvement as the critical mass held by the research system. It is then the integration of research into the pedagogical process at a higher level, a topic of high interest as part of the training and preparation of future professionals, that contributes significantly to development while potentializing students' minds and their evolution as future professionals, dynamics, and entrepreneurs in any branch of science (Carvajal Tapia and Carvajal Rodríguez, 2019).

Research is of great importance, as we have proposed, and in turn, it is very relevant to academic institutions, business sectors, and society in general. That is why university professors and researchers are motivated to develop their projects, train new researchers, and receive the necessary institutional support to carry out these activities. This article describes the factors that

motivate them to carry out research, as well as external barriers and factors that cause demotivation. The objective of this study is to describe the results of the surveys conducted with university professors and researchers in Panama and propose possible changes that contribute to the progress and promotion of research among them.

1.1 Motivation and demotivation toward research

According to Astráin-Ezcurra (2018), there are times when the motivational and emotional support exercised by the institution toward professors and researchers is non-existent. In this sense, the analysis of job satisfaction can be determined by various aspects, such as mood, salary rank, social changes, autonomy at work, promotion opportunities, and non-monetary incentives, which are supported by various theorists such as Abraham Maslow, Frederick Herzberg, Edward Lawler, Victor Vroom, and Donald McGregor (Cavazos, 2003; Fernández et al., 2018).

Research as an activity considered within the academic work of university professors is also affected by motivating and demotivating factors during the development of the same, which could be associated with the job satisfaction or personal improvement that a professor can feel (Victor and Babatunde, 2014). Labor motivation is described within the psychological and specifically social psychology of work as the study and understanding of the factors that encourage a person to work to achieve a particular goal or result (Vargas Téllez, 2014). Motivation and labor performance determine the degree of labor activation, intensity, and persistence at work. These have to do directly with performance and indirectly with satisfaction as well as the quality of working life (Erez et al., 2001; Mitchell and Daniels, 2003). Therefore, within the university context, what drives us to be motivated in our workplace and academia for the development of research projects is very relevant.

Cavazos (2003) describes motivation as “a force that drives to act in a certain way,” where it is intrinsic in the individual, increasing its probability levels of staying motivated and therefore achieving its goals, and where there may be psychological and/or physical phenomena that can influence it. López-Arellano et al. (2017) and Robbins and Coulter (2018) argue that motivation is a complex process that directs energy and influences the persistence and achievement of goals and interests.

Daumiller et al. (2020) define the motivation of university professors as the general processes that give rise to the members of the faculty who initiate, maintain, and regulate the behaviors led by objectives. With respect to the professor, motivation is imperative to achieve the necessary job satisfaction, show the progress of pedagogical procedures (Franco et al., 2015), and help boost additional skills (Astráin-Ezcurra, 2018; González Torres, 2003). In their study, Basha et al. (2021) and Buberwa (2015) agree that working conditions, economic compensation, and promotion possibilities are determining factors in the motivation of university professors.

According to Daumiller et al. (2020), the number of studies on the motivation of academics to date is limited compared to research on elementary students and professors, indicating that the motivation of academics maintains great differences depending on the context of the country.

In the case of research, motivation is visualized as an incentive for work done where the individual expects the satisfaction of basic needs, either personally or socially. These needs may encompass solving a problem, seeking your interest in receiving better income, improving social relationships, or receiving some recognition. From another point of view and in this same direction, the components that influence the motivation of an individual are diverse. Franco (2021) argues that influential factors can be both intrinsic and extrinsic, with the extrinsic having a greater influence on the quality of learning activities. Thus, we can assert that professors and researchers seek to highlight their image and/or social value (Lambovska and Todorova, 2021), development opportunity, improvement of their abilities, economic position, or domain of the subject (Cortez Rojas et al., 2020).

According to Hermann et al. (2019), there are other factors related to infrastructure and institutional organization that influence the capacity of researchers to achieve the proposed objectives, such as language management, institutional time management mechanisms, the dedication of exclusive time to research, affiliation with research centers that facilitate collaboration with other professionals, and the institutional offer of continuous training.

Demotivation or lack of satisfaction expressed by professors regarding their involvement in or carrying out research can result in several issues, including:

- Dissatisfaction due to the difficulties in achieving research goals and dealing with institutional bureaucracy (Šorgo and Heric, 2020),
- A lack of personal incentives such as time availability or sharing with family (Ventura, 2020; Ghenghesh, 2013),
- Institutional and/or financial issues where a positive contribution to psychological growth is not reflected (Munyengabe et al., 2017; Martínez Madrigal et al., 2022),
- Shortage of economic resources applied to the cost of research,
- Inadequate training in the research process leads to incompetence in conducting scientific research, or
- A lack of diligence among academics, which may stem from immaturity or a lack of passion for research (Ghenghesh, 2013).

On that note, Heric (2019) adds the incidence of environmental factors, which also play a role as demotivating factors, such as the opinions of institutional and collective managers with respect to research work, as well as the material and social status of the professor. Therefore, if there is a need to achieve a high commitment in the dedication, capacity, and improvement of the professor not only in academic development but also in scientific research, the role of educational institutions at a higher level is significant and relevant in the development of the institution itself and in society (Daumiller et al., 2020). Therefore, the responsible authorities must be aware of the main resource in the development of human talent since every individual needs recognition (Pedraza Melo and González Cisneros, 2021; Ghenghesh, 2013) and valorization in its training (Guzmán et al., 2021).

Taking into account the lack of studies related to the motivation of professors to conduct research, this article presents contributing factors to the motivation of professors to carry out research work, and those factors that demotivate them are explored. For this, a first approach within the university context in Panama is made, and it is

intended to contribute to the aforementioned lack of studies on the subject.

2 Materials and methods

This article presents a descriptive quantitative study based on data collection using the ENACT survey (Mendoza et al., 2024). This survey was designed and distributed using a digital platform for data collection, whose link was shared and disclosed through different formal participating university channels, emails, institutional websites, and even posters, during the period from May to August 2023.

In the study, a non-probabilistic and voluntary sample of professors and researchers from four of the five public universities in Panama¹ participated in all their headquarters nationwide. The questionnaire included, among other components, sociodemographic data, teaching exercise, academic training, and scientific research. These data correspond to a larger study called “Factors that Influence Academic and Scientific Research in Panama: From the Perspective of Professors and Researchers,” which has the guarantee of the University of Panama, the approval of the Bioethics Committee of the University of Panama, and is funded by the National Secretariat of Science, Technology, and Innovation (SENACYT). This is the second article in this project.

For this article, only the answers to the questions related to motivation and demotivation toward academic scientific research were measured on the Likert Scale. These were designed using the five levels of order for amounts, with the purpose of deepening these factors under the precept that it is higher education institutions that promote, to some extent, students to train as researchers, so it is of interest to know what motivates or what demotivates university professors to develop this activity.

As statistical analysis techniques were used, the data were verified using the chi-square test to confirm uniform probability distributions in the responses of the five levels of the scale for each factor evaluated in the categories of motivating and demotivating factors. Applications of multivariate analysis techniques were made, including exploratory factor analysis (EFA), which seeks to determine the existence of structure or underlying associations of factors from a data set (Pizarro Romero and Martínez Mora, 2020).

The sample corresponded to 921 (Table 1) university professors, of whom 55.05% were female and 44.95% were male. The most frequent age was in the range of 50 to 59 years old, with an average of 52.6 ± 11.5 and a medium age of 53 years. According to the years of service, it was observed that a significant percentage was grouped in extreme times of weekly dedication: 22.9% from 1 to 5 years and 36.5% from 20 and more years of age as a professor. It was also reported that just over half of the professors earn wages below \$2000 (58.9%), and only 13.8% have a salary which is greater than 5,000 dollars. A total of 6.5% of the professors were located in the category of attending professors and 50.3% as special professors; that is, a little more than

1 Universidad de Panamá (UP), Universidad Tecnológica de Panamá (UTP), Universidad Especializada de las Américas (UDELAS), Universidad Autónoma de Chiriquí (UNACHI), Universidad Marítima Internacional de Panamá (UMIP). From these, the last university did not participate in the study.

TABLE 1 Demographic characteristics of professors and researchers participating in the ENACT (2023).

Demographic characteristics		No.	Percentage
Total sample		921	100.0
Gender	Men	414	45.0
	Women	507	55.1
Age	25–34	72	7.8
	35–39	54	5.9
	40–49	116	25.2
	50–59	271	29.4
	60–69	239	26.0
	70–75	53	5.8
Service years as professor	de 1 a 5	211	22.9
	de 6 a 10	154	16.7
	de 11 a 15	128	13.9
	de 16 a 20	87	9.5
	20+	336	36.5
	Non-declared	5	0.5
Salary range (in dollars)	Less than 1,000	265	28.8
	1,000 a 1999	277	30.1
	2000 a 2,999	118	12.8
	3,000 a 3,999	60	6.5
	4,000 a 4,999	64	7.0
	Más de 5,000	127	13.8
	Non-declared	10	1.1
Professor category	Assistant professor	60	6.5
	Special professor	463	50.3
	Regular professor	352	38.2
	Researcher only	42	4.6
	Non-declared	4	0.4

half of the university professors of the four public universities participating in this study still do not have a university chair, which is the highest level to be obtained in Panamanian universities.

With respect to the participants' ages, the greatest proportion of university professors are concentrated at approximately 50 years of age, but, in addition, it can be seen that the entry of young people to university teaching is much lower than the participation of those who are older or greater than 60 years old.

Considering that this study sought to give a voice to public university professors and researchers, it must be mentioned that the non-probabilistic sampling was planned for convenience to capture as many participants as possible in the absence of prior research on the topic and a prior sampling frame for the purposes of this study. However, the study had limitations in terms of participation and participants' willingness to share their experiences, even though the study was conducted in complete anonymity.

In addition, not all public universities were able to participate due to the time required to obtain the necessary approval for participation

in accordance with the schedule established and approved by the authorities; however, the majority was achieved with the participation of four out of a total of five universities.

3 Results

The findings of this study on the motivation and demotivation of professors and researchers are based on descriptive analysis, an exploratory factor analysis, and the academic discipline and faculty devotion variables as follows.

3.1 Descriptive analysis

The most significant motivational factors, whose levels of motivation are positioned in categories showing greater percentages than 50%, are helping humanity (54.4%), having intellectually stimulating work (52.9%), discovering or inventing new things (52.6%), and, in fifth place, working with new technologies (50.2%). On the other hand, the factors that motivate the investigation are fame (24.9%), salary (12.8%), and increasing reputation among colleagues (10.8%; Table 2).

Regarding the factors that demotivate the investigation mainly, the institutional bureaucracy is identified with 46.4% of the responses at a level of "very much." However, in the opposite, 57.0% indicated that doing research at all demotivates since it is not boring. Of the listed factors, five of them showed quite similar proportions in the levels of responses, so no significant statistical differences were determined. These are job stability; continuing to study; need to master another language; other types of work pay better; colleagues do not let you emerge; or professional jealousy. That is, these five factors are not decisive in demotivation, according to the opinions of university professors. It is important to highlight that, in addition to the institutional bureaucracy, the hourly load or time of dedication to research (36.6%) and salaries (31.2%) are factors that demotivate university professors to do scientific research (Table 3).

Regarding the dedication to academic and scientific research, the results showed that 18.0% indicated not researching, 9.2% did not respond, and 72.8% indicated spending time on research.

The exploratory factor analysis (EFA) reported through its indicators that the data collected regarding the factors on motivation and demotivation toward research are suitable for the analysis.

3.2 Factor analysis on motivation

The exploratory factor analysis of the items defined in the dimension of motivation toward the study presented a value of KMO of 0.854, with a statistical significance of $p < 0.001$, according to Bartlett's sphericity test (Table 4). Both indicators show that the data from these items allow us to continue with this factorial analysis.

Regarding the communalities of the items about the motivation in the extraction, they show values greater than 0.5, except for the items: interesting environment to work, earning money or salaries, traveling to other countries, and getting out of the routine and schedules. Of these items, interesting environments to work and get out of the routine have communalities lower than 0.4. Thus, it was decided to extract them from the analysis.

TABLE 2 Percentage distribution of professors and researchers from public universities in Panama, according to motivational factors toward research (2023).

Motivation	Level				
	Very much	Somewhat	Not much	Little	Not at all
Interesting work atmosphere	25.9	32.1	25.5	11.6	4.9
Increased reputation between colleagues	19.5	29.4	27.7	12.6	10.8
Progress in the professional career	49.7	33.8	10.9	3.5	2.0
Be able to solve problems	57.2	33.4	7.7	0.5	1.2
Discover or invent new things	52.6	31.5	12.6	2.0	1.3
Have an intellectually stimulating job	52.9	34.5	9.1	2.0	1.5
Fame	5.7	11.1	33.4	24.9	24.9
Money/salaries	16.5	20.8	35.5	14.5	12.8
Help humanity	54.4	31.8	10.2	1.5	2.0
Travel to other countries	23.2	25.5	31.7	12.6	7.0
Work with new technologies	50.2	35.1	10.9	2.5	1.3
Change the routine	33.6	29.0	21.6	9.1	6.7

All factors showed statistical significance in their answers ($p < 0.05$).

TABLE 3 Percentage distribution of professors and researchers from public universities in Panama, according to factors that demotivate to research (2023).

Demotivation	Level				
	Very much	Somewhat	Not much	Little	Not at all
Schedules/dedication time (*)	36.6	25.0	24.8	8.6	5.0
Wages (*)	31.2	22.1	28.8	11.4	6.5
Difficulty to excel (*)	12.6	16.1	32.3	20.3	18.8
Lack of job opportunities	24.1	23.1	26.8	13.7	12.2
Employment stability	22.6	21.3	24.5	15.2	16.4
Keep studying	15.6	19.8	26.5	17.8	20.4
Need to travel (*)	6.9	11.9	32.0	25.5	23.8
Need to master another language	15.7	20.9	26.6	17.9	18.8
Other types of job pay better	20.6	19.9	23.8	16.9	18.8
It's boring (*)	1.8	1.8	12.8	26.5	57.0
It's difficult (*)	5.0	8.7	29.2	23.7	33.4
Research is subject to economic objectives (*)	17.1	21.3	31.7	15.9	13.9
Institutional bureaucracy (*)	46.4	27.1	20.1	3.4	3.0
Colleagues do not let you emerge/ professional jealousy	25.5	18.8	25.5	15.8	14.4

All factors showed statistical significance in their answers ($p < 0.05$).

With the new result, the KMO results in 0.838, and Bartlett's sphericity test equally significantly indicates that the factor analysis can be continued without these two items. The communalities are superior to 0.5 except for schedules with a communality of 0.416. It was decided to keep these items from the analysis and run the model again.

Finally, an analysis is achieved whose communalities are superior to 0.5, and the factors clearly define a motivational aspect (Table 5). The KMO indicators of 0.836 and Bartlett's sphericity test, both

equally statistically significant, confirmed that the factor analysis could be continued.

For these items, three aspects were determined with a total explained variance of 66.8% (Table 6). The first factor responds mainly to solving problems. It contains items that identify the motivation toward research such as discovering or inventing new things, being able to solve problems, helping humanity, working with new technologies, having an intellectually stimulating job, and progressing in a professional career. This factor explains 40.5% of the

TABLE 4 Indicators of KMO and Bartlett’s tests for motivation.

KMO and Bartlett’s test		
Kaiser–Meyer–Olkin measurement of sampling adequacy		0.854
Bartlett’s sphericity test	Aprox. chi-squared	2847.60
	Gf	105
	Sig.	0.000

TABLE 5 Communalities of items on the motivation toward research.

	Communalities	
	Initial	Extraction
Increase reputation between colleagues	1.000	0.575
Progress in a professional career	1.000	0.511
Be able to solve problems	1.000	0.721
Discover or invent new things	1.000	0.719
Have an intellectually stimulating job	1.000	0.559
Fame	1.000	0.759
Ear money/salaries	1.000	0.528
Help humanity	1.000	0.646
Travel to other countries	1.000	0.508
Work with new technologies	1.000	0.595
Help the country’s development	1.000	0.884
Contribute to the advancement of knowledge	1.000	0.889
Extraction method: Main component analysis.		

total variability. The second factor, with an explained variance of 14.6%, is associated with personal rewards and remuneration such as fame, increasing reputation among colleagues, earning money or salaries, and traveling to other countries. The third factor labeled as a contribution to the country, with an explained variance of 10.6%, included items such as helping the development of the country and contributing to the progress of knowledge.

At this point, a parenthesis is made to understand the salary factor in the context of universities, since it could be controversial, as it is for some professors a motivational factor and at the same time demotivating for others. In some cases, the salary represents a raise category as a university professor and researcher since conducting research becomes one of the many activities that constitute points to ascend and obtain a better salary. On the other hand, there are professors who decide to continue conducting research despite already having job stability and belonging to a higher category on the university ladder. That is, with a motivation beyond salary as a professor, other realities are faced, aspects that this study tries to decipher and show.

TABLE 6 Rotated factor matrix for motivation items.

Factors	Factorial loads
1-Resolve problems	
Discover or invent new things	0.834
Be able to solve problems	0.821
Help humanity	0.775
Work with new technologies	0.733
Have an intellectually stimulating job	0.690
Progress in your professional career	0.545
2-Recompensas/remuneration	
Fame	0.865
Increase reputation between colleagues	0.728
Ear money/salaries	0.690
Travel to other countries	0.617
3-Contribution to the country	
Help the country’s development	0.909
Contribute to the advancement of knowledge	0.906
Extraction method: Main component analysis.	
Rotation method: Varimax with Kaiser standardization.	

3.3 Factor analysis on demotivation

For the exploration of demotivation toward research, a first analysis with this technique is carried out on the items defined as demotivating to do research. Table 7 presents the Kaiser–Meyer–Olkin (KMO) coefficient and Bartlett test, which will determine whether the data are fit for the purpose of factor analysis.

The first indicates a value of 0.864, corroborating the adequacy of the sample to perform the analysis through this technique. The second indicator shows the significance of the Bartlett’s test with a level ($p < 0.001$), confirming that the correlation matrix is different from the identity matrix. Both indicators show that the sample is adequate to continue with the factorial analysis.

In relation to communalities (Table 8), it was observed that the items mostly exceed a value of 0.5, with the exception of the item on the schedules/dedication time that was determined at 0.252.

The rotated matrix groups the items into three factors that explain 58.1% of the total variance (Table 9). The first factor, which refers to labor, grouped six items totaling a variability of 37.45%, which are salaries, lack of job opportunities, job stability, difficulty excelling, other types of work pay better, and schedules/dedication time.

A second demotivating factor was labeled as attributions and includes items such as the need to travel; it is difficult and needs to master another language; it is boring and continuing to study. These define powers derived from research that together explain 12.1% of the total variability. Finally, institutional structure gathers items such as institutional bureaucracy, economic objectives, and professional jealousy among colleagues and explains 8.5% of the variability.

TABLE 7 KMO and Bartlett’s test results.

KMO and Bartlett’s test		
Kaiser–Meyer–Olkin measurement of sampling adequacy		0.864
Bartlett’s sphericity test	Aprox. chi-squared	3202.115
	Gf	91
	Sig.	0.000

TABLE 8 Communalities of items related to demotivation toward research.

	Communalities	
	Initial	Extraction
Schedules/dedication time	1.000	0.252
Wages	1.000	0.659
Difficulty to excel	1.000	0.531
Lack of job opportunities	1.000	0.709
Employment stability	1.000	0.667
Keep studying	1.000	0.629
Need to travel	1.000	0.651
Need to master another language	1.000	0.519
Other types of job pay better	1.000	0.582
It’s boring	1.000	0.532
It’s difficult	1.000	0.634
Research is subject to economic objectives	1.000	0.557
Institutional bureaucracy	1.000	0.696
Colleagues do not let you emerge/professional jealousy	1.000	0.514

Extraction method: Main component analysis.

3.4 Analysis by academic discipline and faculty dedication

A secondary analysis relates factor 1 on “solving problems” as a motivation factor with the disciplines grouped into nine (9) categories² according to the standard normalized education classification (cinema) that include education; arts and humanities; social sciences; journalism and information; business administration and law; natural sciences; mathematics and statistics; information and communication technologies (ICT), engineering, industry, and construction;

² International standard classification of education and training fields 2013 (ISCED-F 2013). <https://www.dane.gov.co/files/sen/normatividad/CINE-Campos-2013-Internacional.pdf>.

TABLE 9 Rotated factor matrix.

Factors	Factor loads
1-Labor aspect	
Wages	0.797
Lack of job opportunities	0.781
Employment stability	0.765
Difficulty to excel	0.641
Other types of work pay better	0.574
Schedules/dedication time	0.490
2-Attributes	
Need to travel	0.712
It’s difficult	0.709
Need to master another language	0.699
It’s boring	0.693
Keep studying	0.668
3-Institutional structure	
Institutional bureaucracy	0.797
Colleagues do not let you emerge/professional jealousy	0.657
Research is subject to economic objectives	0.541

Extraction method: Main component analysis.
Rotation method: Varimax with Kaiser standardization.

agriculture, forestry, fishing, and veterinary; health and wellness; and services.

Factor 1 items were averaged and categorized as high, regular, and low motivation. Subsequently, the percentages of those who punctuated a high level of motivation are plotted. These percentages were calculated according to the total responses by discipline since representativeness by discipline is unbalanced.

The percentages were greater than 90% in all disciplines (Table 10); that is, this factor called “solving problems” generated a high average of motivation toward research in more than 90% of professors. It is also observed that the social sciences, journalism, and information were positioned with the highest percentage, and lastly, agriculture, forestry, fishing, and veterinary.

While it is true to identify professors with a motivating aspect toward researching, it does not imply that research is being done. According to the self-provided information on weekly dedication to research, the study reveals that although most professors identified factor 1 with high motivation, few of them do not conduct research (19%), some do for less than 5 h (27%), almost half of the participants reported researching from 5 to 25 h (46%), and only 8% dedicated more than 25 h per week to research.

Regarding demotivation, among the main demotivational aspects grouped in Factor 1 on the labor factor, salaries and dedication to research/hourly charges are included. In this factor, the averages of the assessment of the scale were obtained, as were the levels of motivation, and the levels were encoded in three categories. Table 11 shows that of the professors who indicated a high level of demotivation in this factor, 44.7% perform 5 to 25 h a week in research, but 22.7% do not do research. It is common to observe that, among university

professors, dedication to weekly research is 5 to 25 h. There are few who dedicate more than 25 h per week.

An analysis using the chi-squared test showed that this demotivation factor is associated with the weekly dedication to the investigation ($p < 0.01$).

Regarding the disciplines, for the labor factor (related to wages and dedication to research/time load), no statistical association was found, and the distributions were shown with few differences between the three levels of the demotivating factor toward the research studied.

Another analysis was carried out to observe the relationship between the weekly dedication to research and the disciplines (Table 12). This analysis determined statistical significance ($p < 0.043$) and revealed that the highest percentage of those who do not carry out research was focused on the disciplines of engineering, industry, and construction (18.7%). This was followed by the arts and humanities

(16.9%), while the highest percentage of those carried out more than 25 h per week was positioned in the social sciences, journalism, and information (20.0%), followed by the natural, mathematical, and statistical sciences (16.7%).

4 Discussion and conclusion

This article shows the findings that reveal that most university professors carry out research and are interested in it, illustrating their vocation as a very relevant motivational factor in the educational field (Franco et al., 2020). Specifically, the motivation and demotivation of these university professors are influenced by several factors that correspond to other studies (Victor and Babatunde, 2014; Donovan, 2002; Mujica and Orellana, 2018). Hence, professors' motivation is influenced by their interest in being able to solve problems, helping humanity, having an intellectually stimulating job, discovering or inventing new things, and working with new technologies. Furthermore, the less motivating factors are fame and an increasing reputation among colleagues.

TABLE 10 Average of motivation toward research according to academic disciplines.

Academic discipline	Average
Social Sciences, Journalism, and Information	99.26
Natural Sciences, Mathematics, and Statistics	97.48
Business Administration and Law	97.32
Education	96.43
Health and Well being	96.03
Information Technology and	95.74
Arts and Humanities	95.33
Engineering, Industry, and Construction	94.12
Agriculture, Forestry, Fisheries, and Veterinary	93.10

TABLE 11 Demotivation level according to the labor factor, according to weekly dedication to research, ENACT 2023.

Weekly dedication	Factor: labor–demotivation			
	Low	Regular	High	Total
Do not conduct research	12.9	13.1	22.7	19.9
Less than 5 h	21.4	32.0	26.2	27.0
From 5 to 25 h	60.0	44.6	44.7	45.9
More than 25 h	5.7	10.3	6.4	7.2
Total	100.0	100.0	100.0	100.0

Highest percentage per weekly dedication segment.

TABLE 12 Professors of public universities participating in the ENACT, for weekly time dedication to research, according to discipline to which it belongs, ENACT 2023.

Discipline	Weekly dedication to research				Total
	Does not conduct research	Less than 5 h per week	From 5 to 25 h per week	More than 25 h per week	
Education	12.0	7.1	9.7	6.7	9.2
Arts and Humanities	16.9	11.1	10.7	13.3	12.2
Social Sciences, Journalism, and Information	12.0	12.9	15.9	20.0	14.6
Business Administration and Law	6.0	13.3	13.8	13.3	12.1
Natural Sciences, Mathematics, and Statistics	14.5	17.3	18.5	16.7	17.3
Information and Communication Technology (ICT)	4.2	4.0	5.0	8.3	4.8
Engineering, Industry, and Construction	18.7	16.0	9.7	6.7	12.9
Agricultural, Silviculture, Fisheries, and Veterinary	1.2	2.7	3.7	6.7	3.1
Health and Wellness	14.5	15.6	13.1	8.3	13.7
Total	100.0	100.0	100.0	100.0	100.0

For the calculation of the percentages, of the total of 921 participants in the study, 87 records without responses on the weekly dedication to the investigation are excluded.

However, the factors that most demotivate them are the schedules or time load, the institutional bureaucracy, the wages, the lack of opportunities, and the job stability. These results were also identified in the work done by Satizabal et al. (2020); Basha et al. (2021); and Buberwa (2015), where they describe the salary situation of professors and remuneration, uncertainty regarding future jobs and progress in their careers, and the flexibility of the labor bond directly influencing professors. These findings show that a lack of institutional support represents a source of external demotivation that has an impact on research practices.

It is true that to be ideal in the construction of higher education and adaptation in the worldwide environment, research professor training must include ongoing training, preparation, and improvement. But since professors are part of a collaborative work in professional training, they need to feel adequate, clear, and precise accompaniment where institutional bureaucracies are minimized and they are constantly and continuously motivated to develop their research. As a result, educational institutions play a major role in both motivating and demotivating professors toward research. For this reason, it is essential to determine the challenges that affect teaching motivation both individually and throughout the institution.

As an exploratory study, this study was intended to lay the groundwork for a more complete and nationwide study in the near future that may include not only public universities in Panama but also private universities.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of the University of Panama (No. CBUP/170/2022 del 1 de junio del 2022). Written informed consent from the participants was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

GB: Conceptualization, Funding acquisition, Investigation, Project administration, Resources, Supervision, Visualization, Writing – original draft, Writing – review & editing. EM: Conceptualization, Data curation, Formal analysis, Methodology,

Software, Validation, Writing – original draft, Writing – review & editing. MA: Data curation, Formal analysis, Investigation, Writing – original draft. MT-C: Investigation, Writing – original draft. CO: Conceptualization, Writing – original draft.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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