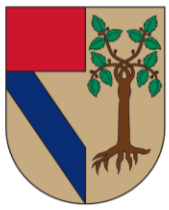

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Study of Factors that Affect the Performance of Researchers in Mexican Private Universities

TESIS

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Authorship statement

I, the undersigned, declare that the material in this paper, which I now submit, is my own work. The work of no other person has been used without due acknowledgement in the main text of the thesis. I make this declaration in the knowledge that failure to comply with the rules relating to the submission of papers may lead to serious consequences. I am aware that the document will not be accepted unless this declaration has been submitted with it.

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Alejandra Núñez Acosta

Abstract

The broad offer of private universities in Mexico increases the pressure for institutions to stand out for their quality. Pursuing national and international accreditations is a strategy frequently used by deans to position their institutions globally. However, reaching the quality standards defined by the accrediting bodies represents a challenge that requires important institutional efforts.

This study focuses on improving institutional research, specifically through policy management. Our main objective is to identify the factors that, from the perspective of researchers, should be considered in the design of a research policy in private universities in Mexico. This is a frequently overlooked topic in research policy design, but highly relevant for decision-makers that want to reach institutional research goals while keeping researchers motivated.

We designed a cross-sectional survey to identify the incentive preferences of researchers. We integrated a sample of 86 researchers of business and engineering areas of 10 private universities in Mexico. We analyzed the results of this survey through statistical methods, such as z-tests for differences in proportions and correlations tests, as well as Analytic Hierarchy Process (AHP) and System Dynamics (SD) methodological frameworks.

Findings suggest that the institutional research strategy should be aligned to the mission and vision of the university. From the survey, we identified that age, rather than salary range and years of experience, influence researchers' preferences of financial incentives over non-financial incentives, and that delay in receiving an incentive plays a relevant role in their preferences and decision-making process. We found that work-life balance, research funding, and institutional support, are the most valued factors in the design of an effective research policy from the perspective of researchers. Finally, based

on the prioritization results, it is concluded that balanced strategies are relevant to improve the performance and well-being of researchers, to ensure the competitiveness of universities and increase their leadership. Simulation scenarios demonstrate how changes in key leadership variables may affect the research capacity. These findings can help to develop more effective policies that consider academic staff, promoting the sustainability of research as one of the pillars of academic excellence.

Resumen

La amplia oferta de universidades privadas en México aumenta la presión para que las instituciones destaquen por su calidad. Buscar acreditaciones nacionales e internacionales es una estrategia frecuentemente utilizada por los decanos para posicionar su institución en un contexto global. Sin embargo, alcanzar los estándares de calidad definidos por los organismos acreditadores representa un reto que requiere de importantes esfuerzos institucionales.

Este estudio se enfoca en mejorar la investigación institucional, específicamente a través de la gestión de políticas. Nuestro principal objetivo es identificar los factores que, desde la perspectiva de los investigadores, deben ser considerados en el diseño de políticas de investigación en universidades privadas en México. Este es un tema constantemente pasado por alto en el diseño de políticas de investigación, pero altamente relevante para los tomadores de decisiones que buscan alcanzar las metas institucionales de investigación mientras mantienen motivados a los investigadores.

Diseñamos una encuesta transversal para identificar las preferencias de incentivos de los investigadores. Integramos una muestra de 86 investigadores de negocios e ingenierías de 10 universidades privadas en

México. Analizamos los resultados de esta encuesta mediante métodos estadísticos, como pruebas z para diferencias de proporciones y pruebas de correlaciones, así como marcos metodológicos de Proceso Analítico Jerárquico (PPA) y Dinámica de Sistemas (DS).

Los hallazgos sugieren que la estrategia de investigación institucional debe estar alineada a la misión y visión de la Universidad. A partir de esta encuesta, identificamos que la edad, más que el rango de salario y años de experiencia, influyen en las preferencias de los investigadores por los incentivos financieros sobre los no financieros; y que la demora en recibir un incentivo juega un rol relevante en sus preferencias y proceso de toma de decisiones. A través del análisis de AHP, se encontró que el balance vida-trabajo, fondeo de investigación y apoyo institucional, son los factores más valorados en el diseño de una política de investigación efectiva, desde la perspectiva de los investigadores. Finalmente, a partir de los resultados de priorización, se concluye que las estrategias equilibradas para mejorar el rendimiento y el bienestar de los investigadores son relevantes, a fin de procurar la competitividad de las universidades e incrementar su liderazgo. Los escenarios de simulación demuestran cómo los cambios en las variables clave relacionadas con liderazgo, pueden alterar la capacidad de investigación. Estos hallazgos pueden apoyar el desarrollar políticas más eficaces enfocadas o que consideren al personal académico, promoviendo la sostenibilidad de la investigación como uno de los pilares de la excelencia académica.

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Chapter 1. Introduction

In Mexico, public and private institutions encompass the higher education system. The main difference among these institutions is the way they get the resources to operate; while public institutions depend on the resources allocated by the state or federal government, private institutions rely on tuition fees. Given the differences in how public and private institutions operate and get their resources, this thesis will focus only on private institutions. The analysis of public institutions and their contrast with private institutions will be a matter of future studies.

The wide offer of higher education institutions in Mexico has generated significant pressure on private institutions, which seek to stand out for their quality and competitiveness in an international environment. Quality accreditations are a path frequently used by deans to position their institutions in the market, which brings several opportunities like the creation of agreements among institutions and the access to funds. However, obtaining an accreditation is a challenge requiring several years of institutional effort. This is where this research becomes especially relevant to achieve this objective.

With the aim of reaching the highest standards of quality accreditation bodies in terms of research, mainly represented by number and quality of publications, private universities in Mexico have implemented research policies where financial incentives play a relevant role. However, this kind of incentives could be biasing researchers' motivations and in consequence, the decisions they make of where to publish their scientific articles.

The main problem presented in this thesis is policy management. This topic is highly relevant to decision makers in the context of private universities in Mexico, given the impact of research policies on achieving institutional

research goals and in allocating the resources needed to operate. To answer this problem, this thesis analyzes the Mexican research context, identifying the factors and sub-factors that researchers consider should be prioritized by decision-makers when designing a research policy. The obtained results could be the base for developing comprehensive research policies, including different perspectives such as economics, quality of life, institutional support, among others.

Our research question is: from the perspective of researchers, what are the factors that should be considered in the design of a research policy in private universities in Mexico? Four objectives have been defined to answer this question:

1. Explore the Mexican research environment for private universities seeking to obtain quality accreditation.
2. Characterize researchers of private universities in Mexico according to their incentive preferences.
3. Identify the factors and sub-factors related to the design of a research policy from the perspective of researchers at private universities in Mexico.
4. Analyze the relationship between the factors that researchers prioritize for their progress, and the main variables related to leadership that decision-makers implement in the definition of research policies in private universities in Mexico.

This research is framed in the business sciences area, specifically in the management of private universities in Mexico to generate research policies. The analysis presented in this thesis is based on a common problem among private institutions: obtaining national and international quality accreditations. Several reasons lead a dean to pursue an accreditation, like increasing university's reputation (Corona & Mazo-Cuervo, 2018), the desire to demonstrate quality (Blanco Ramírez, 2015), as a management tool to justify hiring certain professors' profiles (Cret, 2011), or because of previous working experience in an accredited institution (Barrett et al., 2020).

Regardless of the reason that leads an institution to pursue a quality accreditation, this decision requires deeper changes. Universities that traditionally had a teaching-oriented mission have made significant changes to become a teaching and research-oriented university or an only research-oriented university. These changes represent several challenges to developing countries, mainly related to insufficient financial resources and lack of international profile of their professors (Altbach, 2013). It also generates pressure among professors to achieve certain research metrics while fulfilling their teaching load (Prasad et al., 2019).

Several authors have analyzed the presence of Latin American universities in international rankings. Authors such as Abramo & D'Angelo (2015) found that achievements in research are possibly some of the most relevant factors when evaluating the ranking of an institution. However, few Latin American universities stand out in international rankings mainly by the challenge of adapting to international standards (Balán, 2012), being universities from Brazil, Chile, Mexico, Argentina, and Colombia those that manage to stand out (Torres-Samuel et al., 2019).

One of the main strategies in research incentive policies has been using economic incentives. Authors have studied the implications of using incentives from the perspective of increasing quality and international visibility (Guzmán Vásquez & Trujillo Dávila, 2011), and also as a tool to increase research productivity to greater extent than a higher salary level (Arechavala Vargas & Sánchez Cervantes, 2017). Studies demonstrate that, although the use of economic incentives has increased (Gregorutti, 2010) and that these incentives are strongly related with researchers' motivations (Zhou et al., 2022), there is a great importance of intrinsic motivations over extrinsic motivations (Blind et al., 2022; Lam, 2011).

However, the pressure to publish and maintain higher productivity levels can lead to practices prioritizing quick results over quality. It is in this point where

the balance between researchers' needs, and institutional goals becomes especially relevant. In this regard, Quimbo & Sulabo (2014) conclude that the relationship between scientific performance and the incentives offered to researchers by universities is the most significant characteristic of research policies. It is important to pay attention to the possible dependence that could be generated to obtain incentives (Daumann et al., 2023) and listen to researchers' concerns about the incentive policies design, in order to integrate aspects like the quality of the research, motivations and researchers' well-being (Lundwall, 2019). Unfortunately, the voice of academics has been frequently ignored when designing programs of paying for outperformance (Field, 2015).

The research presented in this thesis is based in the approach of Engaged Scholarship, concept developed by Van de Ven (2007) that seeks to reduce the gap between theory and practice through the understanding of stakeholders' needs in the real world, framing the problem in a certain area of knowledge. Therefore, studies using this approach should seek to contribute in two ways: solve a practical problem and generate theoretical concepts.

The author Van de Ven (2007) defines four ways in which Engaged Scholarship could be used: Informed basic research, Collaborative basic research, Design and evaluation research, and Action research, being this last one the framework that guided this study, due to its characteristics of solving a problem to a specific client while contributing to the area of knowledge. Kurt Lewin developed the concept of Action Research in the 1940s, an approach that encompasses four fundamental phases: planning, acting, observing, and reflecting, and is characterized by its participatory and collaborative methodology (Kock, 2004). This framework allows researchers and participants to work together to identify problems, implement solutions, observe the results, and reflect on them to make continuous improvements. Lewin's Action Research has laid the foundation for numerous developments

in applied research, emphasizing the importance of active participation and co-creation of knowledge in practical contexts.

With the objective of presenting a comprehensive analysis, this thesis arises from the research environment in Mexico to delve into the factors and sub-factors that researchers consider should be included in the design of a research policy, and finally analyze the results from the perspective of leadership in higher education. The development of this study is presented in four research articles, which will be featured as the main chapters of this thesis.

Chapter 2 answers to the first objective stated above which seeks to understand, through a literature review, the Mexican research environment for business schools seeking to obtain a quality accreditation. This research is based on the quality research standards defined by an international quality accreditation body, the European Foundation for Management Development (EFMD), and a national one, the Council for the Accreditation of Administrative, Accounting and Related Sciences (CACECA, for its acronym in Spanish). The relevance of this study lies in understanding the role that institutions play in the research environment and how research resources available in the national context can be used in alignment with the mission and vision of the institution, as well as with the quality research standards.

For chapters 3, 4 and 5, we designed a cross-sectional survey of 54 questions to understand the motivations, biases, and incentive preferences of researchers. We selected 10 of the largest private universities in Mexico with a strong focus on research and surveyed 86 researchers of business and engineering areas.

Chapter 3 addresses the second objective stated above: to characterize researchers of private universities in Mexico according to their incentive preferences. Through statistical methods, including z-tests for differences in

proportions and correlations tests, we analyzed if demographic aspects such as age, salary, and years of experience, influence researchers' incentive preferences; as well as if receiving incentives with delay has an impact in the decisions made by researchers. This study is relevant to associate deans for research and policymakers, to identify if research policies should be tailored according to certain demographic characteristics of researchers.

Chapter 4 answers the third objective previously stated, which is to identify the factors and sub-factors related to the design of research policies from the perspective of researchers of private universities in Mexico. In this chapter we use the Analytic Hierarchy Process (AHP), a mathematical decision-making technique developed by R. W. Saaty (1987) that decomposes a problem from multiple criteria contexts in three levels: objective, factors, and sub-factors. Through this analysis we seek to understand the perspective of researchers as decision-makers and identify the factors and sub-factors that policymakers should consider in the design of a research policy.

Chapter 5 addresses the last objective stated above, which is to analyze the relationship between the factors that researchers consider fundamental for their progress, and the main variables related to leadership that decision-makers implement in private universities in Mexico. In this chapter, we use System Dynamics (SD), a methodological framework developed by Forrester (2009) that allows us to understand the complex structure of systems through causal loop diagrams (CLDs) as well as the interactions within the structure using Forrester or Stock and Flow diagrams. This research is relevant for decision-makers in university leadership, highlighting the importance of balancing strategy and policy design.

The analysis carried out throughout this thesis lead us to significant findings. While the success of a research strategy depends on its alignment with the mission and vision of private universities, it is highly valuable to listen to researchers' concerns and identify their incentive preferences. It is

demonstrated that demographic aspects such as age, rather than salary range and years of experience, influence the preference for financial incentives over non-financial incentives, and the time to receive an incentive guides researchers' decisions. Three factors are identified to be relevant in the design of an effective research policy: work-life balance, research funding, and institutional support. Finally, a balanced perspective between strategy and policy design is fundamental to maintaining university leadership.

Chapter 2. Relationship between research environment in Mexican business schools and the research standards established by CACECA and EFMD[1]

Abstract: An institutional accreditation represents an opportunity for business schools to demonstrate the quality of its programs, increasing its prestige and its national and international visibility. In this paper, we study the relationship between the research environment in Mexican business schools and the research standards established by CACECA and EFMD. The relevance of this research is allowing the Deans of business schools in Mexico to design the strategy that aims to incentivize research activities of their faculty in order to pursue the standards of the accrediting bodies. Findings suggest that despite the existence of several resources within the Mexican research environment, a fundamental factor for the success of any research strategy is its alignment with the mission and vision of the institution.

Keywords: quality; accreditation; research; CACECA; EFMD

[1] Conference paper in: Núñez-Acosta, A., & Ramirez-Nafarrate, A. (2021). Relationship between research environment in Mexican business schools and the research standards established by CACECA and EFMD. *Proceedings of the Eleventh International Conference on Engaged Management Scholarship – EMS 2021*, 29. https://ssrn.com/abstract=3944718

2.1 Introduction

Quality assessment has become an important objective among business schools around the world. Standing out from competition, reaching top positions in rankings and increasing its international visibility are some of the reasons that lead institutions to evaluate their quality through an institutional accreditation.

In this paper, we study the relationship between the Mexican research environment for business schools and the factors associated with the research component taken into account for national and international accreditations. Our objective is twofold, first identifying the factors that promote research in Mexican business schools and that would allow them to comply with accreditation requirements and second, to identifying the weak elements that might represent barriers to transition from teaching to a research university.

The research environment In Mexico is complex. It encompasses the efforts made by each higher education institution, through research incentives, participation in congresses, and in general, through institutional policies and resources. This environment is complemented by programs like the National System of Researchers (SNI, for its acronym in Spanish), founded in 1984, a quality icon among researchers and a program that positions national research in the global context (SNI, 2023). It also considers the national available resources to support research, like scholarships, grants, research centers, among others, provided by the National Council for Science and Technology (CONACYT, 2023); and the resources obtained through the private initiative.

Unlike other countries, the accreditation process in Mexico is not mandatory. Often, it is seen as a complex and expensive process that only few institutions can afford and are willing to pursue. According to the Organization

for Economic Co-operation and Development (OECD, 2019), the Mexican higher education system lacks of strategy and tools to ensure the quality of its programs.

In Mexico, the national accreditation agency for business schools is the Council for the Accreditation of Administrative, Accounting and Related Sciences (CACECA). This accreditation body was founded in 1996 and it is endorsed by the Council for the Accreditation of Higher Education (COPAES), organization authorized by the federal government (CACECA, 2020). Numerous programs of both public and private universities in the country have CACECA accreditation.

In the global context, three accreditation bodies are known as the most prestigious for business schools: the Association to Advance Collegiate Schools of Business (AACSB) based in Tampa, United States; the European Foundation for Management Development (EFMD) established in Brussels, Belgium; and the Association of MBAs (AMBA) based in London, England (Dudin & Shishalova, 2019; Sánchez-bayón et al., 2020). When a business school is accredited by these three bodies, it is colloquially considered that it holds the “Triple Crown” (Dudin & Shishalova, 2019; Sánchez-bayón et al., 2020). An interesting fact is observed among Mexican business schools. As of 2021, only private institutions hold at least one of these three accreditations (AACSB, 2021; AMBA, 2021; EFMD, 2021), and only two hold all of them: the Instituto Tecnológico Autónomo de México (ITAM) and EGADE Business School. Therefore, this analysis will focus mainly on private Mexican universities.

Both national and international accreditations evaluate categories such as faculty, curriculum, students, research, resources, internationalization, strategic planning, ethics, etcetera. The focus in this article will be the research standard, since achieving a competitive level in this category represents a challenge given the variety of activities that are evaluated.

This paper provides a descriptive analysis of the research environment in Mexico, and it is organized as follows: after the introduction, a literature review is presented. The next section offers some highlights of the Mexican higher education system and its research environment. Then, a brief explanation of how quality is assessed in business schools by CACECA and EFMD is presented. In the following section is discussed the alignment between these quality accreditations and the research resources available in Mexico, both internally in the institution and externally at a state or national level. Finally, some conclusions and recommendations are provided.

2.2 Literature Review

Several reasons lead Deans of business schools to pursue a quality accreditation. Reputation and positioning in the national and international educational market (Corona & Mazo-Cuervo, 2018), internal and external motivations associated to globalization (Attuluri, 2019) and an opportunity to demonstrate quality in a competitive global market through an external accreditation body (Blanco Ramírez, 2015) are among the most common. In contrast, Cret (2011) considers that Deans use the accreditation process as a management tool and as a way of legitimizing their position within business schools, influencing decisions regarding hiring specific faculty profiles or supporting some programs more than others.

Lombana & Zapata (2017) consider that institutional quality accreditations are still a topic to discuss, especially in developing countries, since every accreditation agency defines different standards that are perceived distinct among institutions. Barrett et al. (2020) identify two reasons that lead deans in Mexico to pursue an US accreditation: their previous education or work experience in US universities, and the possibility to gain international prestige through an accreditation. This is especially important considering that, unlike the US, quality accreditations are not mandatory in Mexico.

Beyond the requirement or personal motivation that drive Deans to seek an accreditation, there must exist congruence between this objective and the strategies defined by the Dean. One of the most important elements that quality accreditation bodies assess is related to the mission of business schools and the school's strategy to achieve it. Bieker (2014) studies if AACSB accreditation enhances quality in business schools whose missions are mainly teaching, considering that business schools could also declare as research, or a mix of teaching and research institutions. He concludes that there is not empirical evidence that supports a different quality improvement for business schools according to their declared mission. Prasad et al. (2019) on the other hand, analyze the pressure that pursuing an AACSB accreditation represents to faculty members, especially when their business school has recently redefined its mission as research oriented. By comparing an accredited institution with another seeking for accreditation for the first time, he found out some factors that need to be adjusted in order to achieve the research objectives: teaching load, organizational structure and resources.

Some higher education institutions in developing countries choose to adopt a mission focused on research not only because of the reputation it represents, but also because of the opportunity to bring innovations and development to the country and its inhabitants (Aviso et al., 2019). It is identified that in Latin America region, unlike other regions of the world, the allocated resources to R&D are low, which makes essential the position of business schools as a link between academy and industry (Gonzalez-Brambila et al., 2016).

Some authors have focused on the additional challenges that research universities face in developing countries. Altbach (2013) recognizes that the involvement in the global research network requires a significant amount of financial resources for infrastructure and participation of its members, as well as their proficiency in English and international profile. Aviso et al. (2019)

study the challenge of organizing human resources when switching from a teaching-oriented mission to a research-oriented mission in the context of Philippines, finding that different human resources structures could favor research productivity.

An Emerging Global Model (EGM) was proposed by Mohrman et al. (2008) taking into account features of the most recognized research universities in the world and identifying a series of common elements such as global mission, diversified funding and international linkages to industry. Whether located in a developed or developing country, research universities face similar difficulties like the impossibility to depend completely on government resources and the high cost related to research activities (Mohrman et al., 2008).

One of the main challenges that universities face when deciding to become a research oriented institution is how to incentivize knowledge production. Guzmán Vásquez & Trujillo Dávila (2011) study the case of Universities in Colombia that switched their orientation from teaching to research using the Theory of Contracts (this theory studies agreements between people and organizations, and their respective incentives to act in certain way (Bolton & Dewatripont, 2019)). The authors conclude that a clear definition of incentives could improve research quality and international visibility. Arechavala Vargas & Sánchez Cervantes (2017) agree that incentives could increase knowledge production, unlike salary level, which does not influence it. Hedrick et al. (2010), on the other hand, study the relationship between salary and productivity among AACSB accredited and non-accredited business schools. They conclude that in AACSB accredited business schools, a higher salary and a reduced teaching load, influence positively in an increased number of publications. However, they argue that this conclusion could be also a consequence of the strategies implemented by the business school regarding

their faculty, in order to hire certain profiles to achieve the standards required by this accreditation agency.

It is important to mention that with the challenge of incentivizing knowledge production, comes the stress suffered by researchers. Lloyd (2018) presents an analysis of the survey applied by the Network of Researchers on Academics (RDISA), identifying that researchers get stressed by the pressure to achieve the metrics defined to evaluate their production. Prasad et al. (2019) conclude that this stress is even higher among researchers working in universities that recently shifted its mission to research instead of teaching, because their teaching load, for example, does not support the achievement of their new research metrics.

However, although the first efforts to promote research depend directly on the universities, a whole environment at the state and national level complements them. In Mexico, the national impulse to research is relatively recent and through the years has suffered several changes. The year of 1984 denotes an important step with the foundation of the National System of Researchers (SNI), whose objective is to promote and incentivize the quality of research in the country. For the period between 2019 and 2024 the SNI has defined five strategic lines: strengthening of the scientific community, frontier science, national strategic programs, technological development and universal access to knowledge (SIICYT, 2020)

As a renowned program, the SNI supports its processes in a regulation that its members must adhere to. Reyes Ruíz & Suriñach (2015) study if the SNI represents a success for the scientific research developed in Mexico, analyzing its evolution through the years and the way in which the production of its members is assessed. He concludes that some changes are required, for instance, in the way the SNI accepts its members, adapting its criteria to the area of knowledge of the prospect. Other authors, like Lloyd (2018) agree that the criteria to evaluate researchers could be unequal among areas of

knowledge. He adds that when comparing the SNI to similar systems in other Latin-American countries, the national system is in disadvantage regarding the periodicity of the economic incentives provided, since, unless being an emeritus researcher, the economic stimulus is suspended after retirement.

This paper contributes to existing literature by presenting an analysis of the Mexican research environment, incorporating three elements: research standards of a national and international agency, internal institutional resources and external state or national resources. This analysis is especially relevant, given that the existing literature highlights the challenge that research faces within universities in developing countries.

2.3 The Mexican higher education system and its research environment

In Mexico, public and private institutions comprise the higher education system. When analyzing the Research Rank provided by the Journal Rank SCIMAGO (2021) and filtering it by Mexico, public institutions lead the ranking. However, private institutions that already hold any of the three international accreditations of the so-called Triple Crown also stand out among the top 35 ranked institutions. In fact, when studying exclusively private universities, the Instituto Tecnológico de Estudios Superiores de Monterrey (ITESM) stands out as the undisputed number one with 906 and 781 indexed publications in SCOPUS and Web of Science (WoS) in 2019, respectively (UNAM, 2020). This is considered a relevant indicator, since EGADE Business School is the graduate school of ITESM. Besides EGADE Business School, the second Triple Crown accredited institution in Mexico, ITAM, is positioned in the top 10 as well, with 76 and 77 indexed publications in SCOPUS and WoS in 2019, respectively (UNAM, 2020).

Complementing the research efforts made by each public or private institution, the research environment in Mexico offers a wide variety of

resources, including programs like PRODEP, as well as state and national councils.

The Faculty Professional Development Program (PRODEP) is an initiative of the Secretariat of Public Education (SEP), which focuses on academic training of professors of public universities, through research projects, in order to improve the performance of their activities (SEGOB, 2022).

In addition, every state has a council that seeks to promote innovation and technology. These councils are organized through the National Network of Councils and State Organizations of Science and Technology (REDNACECYT, 2021). This association was founded in 1998 and it represents a link among academic sector, government, society and organizations.

The National Council for Science and Technology (CONACYT) is a public agency of the federal government founded in 1970, that promotes research, innovation and technology in Mexico (CONACYT, 2023). It covers a variety of research areas such as Physics-Mathematics and Earth Sciences; Biology and Chemistry; Medicine and Health Sciences; Behavioral and Education Sciences; Humanities; Social Sciences; Agricultural, Forestry and Ecosystem Sciences; Engineering and Technological Development; and Interdiscipline. The business and management area, which this article focuses on, is included within the research area of Social Sciences.

In order to achieve its objectives, this council establishes a series of programs to support the education of researchers and promote the production and dissemination of scientific knowledge. The programs and institutions that are part of CONACYT include research centers, National System of Researchers (SNI), scholarships, grants, graduate program census, endowment program, index of Mexican journals of scientific and technological research, etcetera.

The Public Research Centers promote” knowledge production and technological development in the country. Among their main objectives are performing research activities, promoting graduate programs and advancing science and technology in the productive sector.

The SNI is probably one of the most recognized programs of CONACYT. Through yearly calls and a rigorous evaluation process, it accepts its members and assigns them in a specific category, according to their research merits. Being part of this system represents quality and prestige, and researchers that are part of the system are recognized with an economic incentive. As of 2021, the SNI has 35,178 members (SNI, 2023).

Among the most popular programs are the scholarships and CONACYT sector grants. These scholarships allow graduate students to pursue master and doctorate degrees in national or international programs. There are other scholarships for postdoc experiences and sabbatical stays. The sector grants focus on specific projects or social and productive needs. Several calls are open during the year, to public and private higher education institutions and organizations, research labs, among others.

To encourage research, innovation and development of new products among companies, CONACYT developed the Innovation Stimulus Program. Through this scheme, registered companies receive complementary resources to those allocated by the company, in order to increase their national competitiveness. Additionally in 2020, in response to the COVID-19 pandemic, CONACYT launched a Fiscal Stimulus Program to incentivize private investment in innovation and technology sectors.

To promote quality and continuous improvement, CONACYT and SEP have developed the Mexican Postgraduate Quality Program (PNPC). This program seeks to recognize, through a qualitative and quantitative peer evaluation, the quality of postgraduate programs, and to offer students the possibility of

scholarships. It encompasses a wide variety of programs, classifying them in four: recent creation, in development, consolidated and international competency.

The global approach of CONACYT gives special relevance to the incorporation of researchers to the market. In addition to the Labor Bulletin, which focuses on former scholarship holders, CONACYT has created the CONACYT endowment program. In this program researchers are assigned to specific projects that were previously authorized to applicant public institutions. The variety of topics covered in these projects are technological development, health, society, energy, etcetera.

CONACYT has also established the Program for Retention and Return, which seeks to return Mexican researchers working abroad, to incorporate them into Mexican higher education institutions.

Finally, in order to promote scientific divulgation and to recognize the quality of national publications, CONACYT has created the index of Mexican journals of scientific and technological research.

The Mexican research environment represents an important source of state and national resources that could complement the research strategy of higher education institutions, especially the ones seeking a quality accreditation. The access to research programs, funds, scholarships among others, are elements highly valued by the accrediting bodies, and could potentiate the internal efforts made by business schools.

2.4 Quality assessment in business schools

Accreditation is the process where an external body evaluates, according to some standards, the quality of a program or institution, regularly thorough an on-site visit (Stura et al., 2019). This process reduces market uncertainty by evaluating institutions under common criteria (Cret, 2011). In order to contrast

the national and international approaches of accreditation processes, two bodies were selected, CACECA and EFMD.

CACECA

The office responsible for evaluating and certifying the quality of business programs in Mexico is CACECA. This accreditation body was founded in 1996 and it is endorsed by COPAES, organization authorized by the federal government to issue accreditations (CACECA, 2020). Its international relevance lies in being a member of important organizations such as the International Network for Quality Assurance Agencies in Higher Education (INQAAHE), the Council for Higher Education Accreditation (CHEA), the European Association for Quality Assurance in Higher Education (ENQA) and the Asia-Pacific Quality Network (APQN).

The accreditation process consists of the evaluation of 10 categories of the academic program: faculty, students, curriculum, learning assessment, integral development support services, connections to the world of practice, research, facilities, and management.

As a voluntary process, business schools define which programs to accredit and formally request the beginning of the quality assessment process. Institutions need to pay a fee, submit documentation, and take a mandatory training provided by CACECA, before the visit of the evaluating committee. The evaluation result could be “accredited” or “not accredited”. The accreditation granted by CACECA lasts 5 years, period that allows business schools to demonstrate their continuous improvement.

Research is one of the 10 categories defined by CACECA to evaluate quality of programs and represents 10% of the total assessment. Within the research category, they define 11 criteria and assign them different weights. According

to their level of compliance, a program could obtain the highest score on each criterion or the proportional part, depending on the provided evidence.

This accreditation considers aspects such as definitions of research policies and research lines and organizational processes aligned to these research definitions. It also takes into account the involvement of faculty and students on research, the time allocated in these activities and the quality of their academic production. Special importance is given to the national and international impact of knowledge production, the link between this knowledge and society problems and the existence of mechanisms to innovate and generate patents. Finally, this accreditation evaluates if institutions have enough financial and human resources to accomplish their research goals.

EFMD

This organization, founded in 1972 in Belgium, seeks to promote management development through its network and provide quality accreditation for business schools and their programs (EFMD, 2020).

The EFMD Quality Improvement System (EQUIS) is the main accreditation granted by EFMD. It evaluates business schools from the perspective of 10 standards: governance and strategy, programs, students, faculty, research and development, executive education, resources and administration, internationalization, ethics and sustainability, and corporate connections. This accreditation system consists of different stages, including enquiry, eligibility, self-assessment, and peer review visit. The final decision of the process could be “non-accredited”, “3-year accredited” and “5-year accredited”. During the years that the accreditation lasts, business schools need to define and fulfill a development plan related to continuous improvement.

In EQUIS accreditation, Research and Development are grouped into one of the 10 standards defined by EFMD, encompassing key areas such as research activities; development and innovation; international features of R&D; ethics, responsibility, and sustainability; and connections between R&D and the world of practice. The main purpose of this standard is to validate the relevance and impact of the original contributions of knowledge. It is considered that high quality research improves recognition of business schools.

For this accreditation body, research comprehends a wide variety of approaches, considering that missions could be different among business schools. It classifies research activity into three categories: academic research, practice-oriented research and pedagogic development and innovation. Depending on the category, the EFMD evaluates the impact following different criteria like number of citations, reputation of the journal where a paper is published, funding received by external organizations, individuals making use of pedagogic materials, etcetera.

To meet this standard, business schools must demonstrate a clear and realistic research strategy, aligned to their mission, and sufficient time and resources allocated to achieve it. EQUIS evaluates not only the existence of plans for the future, but also the evidence of a continuous improvement in this topic.

Despite being an international accreditation, EQUIS considers the national context of business schools. It requires describing the national research schemes and how they have influenced the research results of the business schools. Regarding innovation, schools also need to explain how it is interpreted within the national context.

Both CACECA and EFMD assess quality and continuous improvement, however, their approach in some areas is different. While CACECA focuses

some of its criteria to the specific fulfillment of indicators, like a minimum of publications, EQUIS accreditation has a broader perspective, evaluating not only the quality of the publications but also their impact in academic research, practice-oriented research and pedagogic development.

2.5 Analysis and discussion

In order to identify the factors that foster or hinder research in business schools seeking for a quality accreditation, we propose an analysis between CACECA and EFMD research quality standards, and the Mexican research environment. This analysis will assess Deans with the elements to make decisions regarding their research strategy in the pursuit of a quality accreditation.

Table 1 provides a structured representation of this analysis. In the first column, five categories were determined through common topics between CACECA and EFMD research standards: 1.- Research activities; 2.- Resources for research; 3.- International dimension and dissemination of research; 4.- Research development and Connections to the world of practice; and 5.- Ethics, responsibility, and sustainability. A brief description of the research criteria of CACECA and EFMD is provided in the second column. Finally, two different levels of research activities were identified within the last column, Mexican research environment: internal activities, which are promoted within the university, and external activities, which can be found at the national or state level.

A strong alignment is observed in the first category (Research activities) among accreditation requirements of national and international quality agencies. Both CACECA and EFMD require a clear research strategy and a demonstration of improvement through the years. This is probably the category in which most resources were found. On the one hand, it is suggested that the definition of strategies and policies depends entirely on

the university and are the basis for the rest of research activities. On the other hand, several programs can be found within the state and national context, being the National System of Researchers (SNI) the most outstanding.

In the second category, Resources for research, accrediting agencies evaluate the assignment of adequate profiles for research projects; however, the focus lies on the availability of financial resources. Despite the fact that some resources could be obtained externally through scholarships or national or state grants, it is still required that universities allocate a budget aligned with their strategic planning.

The International dimension and dissemination of research are included in the third category. While the national accrediting agency evaluates only a minimum of national and international publications, the international agency gives special importance to links with universities and professors abroad. For a university, achieving publication goals and international linkage requires the definition of clear objectives and allocation of resources. These actions are aligned with national programs, such as the SNI, through quality. A professor who seeks to be categorized in this system requires not only a minimum number of publications, but also national and international recognition, to aspire to categorization at higher levels.

The fourth category encompasses Research development and Connections to the world of practice. Both national and international agencies seek to promote innovations; however, despite the fact that universities could include innovation as an important element in curriculum and program design, not all institutions can afford its own innovation center. In these categories, national innovation and fiscal stimulus programs are particularly relevant, along with agreements with public and private innovation centers.

Finally, the fifth category evaluates how the school integrates Ethics, responsibility, and sustainability, within their research activities. While there

are external resources that complement this category, it is suggested that these topics depend mainly on the values of the institution itself. It would be difficult to align external resources for this category, if the institution does not integrate these issues into its research in the first place.

Table 1. Description of research criteria in national and international accreditation bodies, and its relationship with the Mexican research environment.

Category	1) Quality agencies	2) Mexican research environment	
		Universities	National and State
1) Research activities Overall research strategy and policy (types of research, current research potential, evolution over the last five years).	**National (CACECA)** - Lines of research. - Research projects. **International (EFMD)** - National research context. - Organization of research within the school. - Faculty workload. - Research assessment processes. - Contribution to the quality and innovation. - Doctoral programs and School's research profiles.	**Universities** - Alignment to research (mission and vision). - Institutional research regulations. - Internal policies. - Strategic plan. - Internal calls for research projects.	**National** - CONACYT research areas. - CONACYT endowment program. - CONACYT sector grants. - National System of Researchers (SNI). - REDNACECYT. **State** - Example: Jalisco State Council of Science and Technology (COECYTJAL).
2) Resources for research Allocation of enough resources for each research project	**National (CACECA)** - Faculty profile for research projects. **International (EFMD)** - How research is funded.	**Universities** - Faculty categorization. - Research funds. - Research incentive program. - Budget for research department.	**National** - CONACYT scholarships. - CONACYT sector grants. - CONACYT labor bulletin. - Program for Faculty Professional Development (PRODEP). - Program for Retention and Return. - SNI faculty categorization **State** - COECYTJAL grants.
3) International dimension and dissemination of research Contribution of the research agenda to the international dimension of the school	**National (CACECA)** - At least 3 national and 3 international research publications in the last 3 years. - At least 3 research publications have been awarded in the last 5 years. **International (EFMD)** - Joint research with colleagues abroad. - International academic visitors.	**Universities** - Scientific journals. - Publication of thesis. - Budget for research publications.	**National** - Index of Mexican journals of scientific and technological research. - CONACYT sector grants. - SNI faculty categorization (research publication requirements).
4) Research development and Connections to the world of practice Overall policy to promote innovation. How the School's overall R&D production can be considered relevant to its practitioner markets	**National (CACECA)** - Mechanisms to incorporate educational innovations resulting from research projects. - Agreements with organizations of public, private and social sectors. **International (EFMD)** - How the School interprets innovation within the national context. - Key achievements (new courses, educational materials, new learning and delivery methods). - Participation of practitioners (research proposals, match funding, research centers).	**Universities** - Innovation through curriculum. - Undergraduate and postgraduate programs design. - University innovation centers. - Link with industry and government	**National** - CONACYT Innovation Stimulus Program. - CONACYT sector grants. - Grants awarded by industry or government. - CONACYT Fiscal Stimulus Program.
5) Ethics, responsibility and sustainability How the School integrates these topics into its research, development and innovation activities	**National (CACECA)** - Mechanisms to transfer research results to social and technological improvement (patents). **International (EFMD)** - Principles of research integrity.	**Universities** - Code of Ethics for Researchers.	**National** - CONACYT Code of Ethics. - SNI regulation (ethics). - CONACYCT fund calls (national issues, young talents, women who head families, etcetera).

In practice, it is hard to separate the resources that specifically affect a category, since the research activities and available resources are interrelated. Figure 1 shows how this relationship could be perceived. In the center star are the quality accreditation bodies that, despite being national or international, assess similar elements classified in five categories. The inner ring represents the strategies and resources that depend entirely on the institution pursuing an accreditation. The outer ring shows the different resources available at the state and national level that could complement the research strategies defined by the Dean. A similar model was proposed by Lovitts (2008) when analyzing the interactions of the micro and macro environment in students degree completion and creative performance.

Figure 1. Description of available resources to complement research activities

This analysis becomes even more relevant for Deans, when analyzed from the institution perspective. In this way, the inner ring could be classified as strengths or weaknesses, and the outer ring as opportunities or threats.

Table 2 summarizes this SWOT analysis. In the case of strengths and weaknesses, it is suggested a combined cell since when implemented, all of the listed resources represent a strength. However, considering that not all institutions share the same characteristics, the lack of these resources, or their misalignment with the institutional mission, represents a weakness for the institution.

As for the opportunities, several resources are available at a state and national level, standing out CONACYT programs. However, being a public agency makes it a vulnerable body to government decisions and priorities. The publication of a new regulation of the SNI and the disappearance of trusts during year 2020, reflects why this vulnerability should be considered as a threat.

Table 2. SWOT analysis.

<table>
<tr><th colspan="2">Strengths</th><th colspan="2">Weaknesses</th></tr>
<tr><td colspan="4">• Mission and vision
• Strategic plan
• Internal policies
• Code of Ethics
• Resources (research funds, innovation centers)
• Links with industry
• Faculty (number of researchers, international profile, teaching load)</td></tr>
<tr><th colspan="2">Opportunities</th><th colspan="2">Threats</th></tr>
<tr><td colspan="2">• CONACYT endowment program
• CONACYT Fiscal Stimulus Program
• Financial resources (sector grants, fund calls)
• National System of Researchers (SNI)
• Scholarships
• Labor Bulletin
• CONACYT Code of Ethics
• Innovation Stimulus Program
• Research projects in industry</td><td colspan="2">• Vulnerability of public agencies
• SNI regulation updates
• Cancellation of trusts
• Brain drain (foreign scholarships, research funds, labor opportunities)
• Limited investment in R&D as a country</td></tr>
</table>

It is important to highlight the limited investment in R&D as a threat. In Mexico, the R&D spending as a percentage of the GDP is 0.4%, while in the United States it represents the 2.7% and in Korea, the top of the ranking, 4.1% (UNESCO, 2021). When analyzing this information as purchasing power parity dollars (PPP$), the United States tops the ranking with a total spending of 476 billion, while Korea spends 73 billion and Mexico 9 billion (UNESCO, 2021).

This difference in investment in R&D could partially explain some characteristics among universities in Mexico and in the United States. The World University Research Ranking (WURR, 2020), index that evaluates the research multi-disciplinary, impact and collaborative-ness of 250 universities in the world, includes 53 universities of the United States and only 2 Mexican universities. This suggests a challenge for Mexican private universities that are looking to become a research university, since most of their graduate programs are part time and with a professionalizing approach, so their research productivity is low. Another important difference are the sources of financing. While Mexican private universities tend to depend mainly on tuition and, consequently, they have a higher teaching load, universities in the United States diversify their sources of income including tuition, subsides, grants, donations, among others.

2.6 Implications and conclusions

Several reasons lead a dean to pursue a quality accreditation, mainly related to institutional visibility and competitiveness. While common research topics were assessed by national and international accreditation bodies, differences in approaches were detected too. It is suggested that the mission of the institution as well as the definition of the strategic plan, guide the rest of the efforts carried out in terms of research. A university that is not clear about how to achieve its objectives will also find it difficult to take advantage of the resources available outside.

In this study, five categories encompassed the common topics between the selected national and international accreditations, CACECA and EFMD, respectively. These categories included topics like research strategies, resources, internationalization, ethics and connections to the world of practice. In fact, with the exception of some standards with highly quantifiable indicators, most of them evaluate the coherence between the university's strategy and its actions to achieve it. Although this article focuses on accreditations for business schools, the strength of research activities is highly influenced by the decisions and policies defined at the university level, not simply at the school level.

A fundamental factor for the success of any research strategy is its alignment with the mission and vision of the institution. However, this alignment represents a challenge for many Mexican business schools, since their missions have shifted from teaching to research without having the structure and resources like in the United States, which traditionally have a focus on research and a culture of quality assessment.

Internationalization represents one of the most challenging categories to achieve. Despite being a standard evaluated by national and international quality agencies, the latter are the ones that give this dimension a special weight. Evaluating this category considers the number of publications, their quality and connections with other countries. Universities must do important efforts in innovation as well, not only through curriculum updates, but also through the creation of links with government and industry. It is important to note that sufficient financial resources must be allocated in order to attain internationalization and innovation goals.

On the other hand, the Mexican research environment offers a wide range of resources that represent an opportunity and could complement the institutional strategy. CONACYT stands out nationally for promoting research through a series of programs, being the SNI the most recognized. However,

as a public agency, CONACYT is subject to governmental decisions and priorities that could affect the operation of these programs and its allocated budget. Therefore, these resources should be seen as a complement and not as a primary strategy for any institution.

This analysis leads us to valuable future research. A deeper study is suggested to compare public and private universities accreditation interests, since no public university currently has an international accreditation. AACSB and AMBA accreditations could also be included in the discussion of research quality standards. These two accreditation bodies, in addition to EFMD analyzed in this paper, could show a complete picture of the most recognized quality accreditations for business schools.

Finally, several research questions could be addressed in future studies: What factors determine the high research productivity of public universities in Mexico? Why is no Mexican public university currently accredited by a Triple Crown body? Is the declared mission of the institution a determinant factor to obtain a quality accreditation? What are the challenges in developing countries to foster a culture of research?

Chapter 3. Factors affecting researchers' incentive preferences: A cross sectional study of private universities in Mexico[2]

Abstract

Incentives to scientific products have become an important tool to increase research productivity in universities around the world, usually through financial incentives policies aimed to foster publications or citations. In this paper, we study the preferences of researchers regarding research incentives in Mexican private universities. Through statistical methods, including z-tests for differences in proportions and correlation tests, we analyzed the results of a survey applied to researchers of business and engineering areas. Results suggest that demographic aspects like age, rather than salary range and years of experience, influence researcher's incentive preferences, and that non-financial incentives are significant to young researchers. We also find that timing for receiving incentives is a significant factor that might drive researchers' decisions. This study contributes to identifying the right incentives for researchers, considering that in Mexico these incentive programs are entirely financed by universities. The relevance of this research is that it allows policymakers to design comprehensive research policies including not only university research goals, but also researchers' preferences to ensure their commitment and motivation.

Keywords: financial incentives; non-financial incentives; delay-reward; reward schemes; research policy.

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3.1 Introduction

In the context of Mexican private universities, the use of financial incentives plays a crucial role in increasing research productivity. Whether to meet institutional research metrics, or to reach research standards established by quality accreditation bodies, universities invest important amounts of money to keep their researchers motivated through incentives programs. In Mexico, the number of annual articles per million people published in scientific and technical journals have increased 254% from 2000 to 2018 (World Bank 2022; United Nations 2022 – processed by Our World in Data, 2023)This significant increase could be a result of several strategies, one of which could be the implementation of research incentives policies. However, a question arises, how should incentive programs be aligned with institutional objectives while considering the individual preferences of researchers?

In this paper we study research incentives from the perspective of researchers. Our objective is twofold: first, identifying if demographic aspects such as age, salary range and years of experience, influence researchers' preferences towards incentives, and second, identifying researchers' perspective of receiving a financial incentive with delay. These findings will allow policymakers of private universities to include researchers' perspectives and most valued attributes of incentives, in the design of their research incentive policies. This is particularly relevant since in Mexico these incentive programs are entirely financed by universities.

Considering aspects like the decision-making process of researchers is especially important. As firstly noted by Kahneman & Tversky (1979) in their Prospect Theory, participants evaluate differently gains and losses, so it is important to understand how people behave when making decisions under risk. However, since decisions generally include a time frame, this is an aspect that should also be analyzed. As stated by Frederick et al. (2002), the time-discounting occurs when people value more immediate rewards than

future ones. The opposite has been studied too, this is, rewards when provided with delay (Skylark et al., 2020).

The emphasis in designing a comprehensive research policy arises from literature, where the use of incentives and reward systems have partially explained the increase in productivity (Kyvik & Aksnes, 2015). It has been noted that the quality of the policies in higher education institutions, as well as the correct incorporation in the institutional culture, impacts favorably their research productivity (Ghozi et al., 2023). However, incentive programs face the risk of losing effectiveness over time and being designed considering only the institution's interests, leaving behind the preferences of the individuals to be motivated. Field (2015) highlights the fact that the voice of the academics is frequently ignored when designing programs of paying for outperformance, and that academics from different disciplines tend to have different opinions regarding this payment scheme. In fact, researchers' perception of the incentives as supportive or controlling, has an impact on their motivation (Andersen & Pallesen, 2008; Kim & Bak, 2020).

As stated by Sánchez-Cruz (2022), it is fundamental that higher education institutions in Mexico implement research policies to contribute to the country's development. Given the characteristics of research in developing countries, studying researchers' perceptions from the Mexican perspective is relevant. Attributes like language, access to funds, area of knowledge, publication culture, and availability of research resources, represent additional aspects that should be considered when identifying the factors of research output (Gonzalez-Brambila & Veloso, 2007). In general, Latin American countries face the risk of low scientific and technological development due to the reduced importance given to knowledge production (Sánchez-Cruz, 2021). This led us to realize the importance of understanding researchers' preferences in a specific context when designing a research policy.

This paper highlights researchers' incentive preferences in the Mexican context and is organized in the following sections. After the introduction, a brief literature review on incentives is presented. The next section provides details of the study design, followed by the analysis of the three stated hypotheses. Then, in the results and discussion section, findings are interpreted and contrasted with literature. Finally, some implications and conclusions for future research are presented.

3.2 Literature review

The implementation of incentives as a motivating tool has been a widely studied topic. Literature as the Maslow's hierarchy of needs (Maslow, 1943) and Herzberg's motivation hygiene theory (Herzberg et al., 1959) have provided us a better understanding about people's needs and motivations. Institutions are now aware that it is not enough to achieve their organizational objectives, but they must also ensure they meet the needs and motivations of their employees. In fact, Hao (2023) defined incentives as path to reach both organizational and personal goals.

Diverse classifications of incentives are found in literature. Jeffrey et al. (2013) define tangible incentives the ones that despite having a market value, are not cash, like prepaid cards and merchandise. Li & Ou-Yang (2010) classified them as implicit and explicit incentives, like internal motivations and wage increases, respectively. And several authors classify incentives as financial and non-financial (Lubarsky et al., 2019; Wiese & Coetzee, 2014; Yousaf et al., 2014).

Incentives have been studied in different contexts. In the educational context, for example, Levitt et al. (2016) conducted some experiments in elementary and high school students in the US, to determine the short-term effects of incentives on student performance. They identified two factors in the effectiveness of the use of incentives: age of the participant and moment of

handing out the incentive. While younger students prefer non-financial incentives, older students prefer financial incentives; and in general, incentives delivered with delay tend to lose their motivating effect (Levitt et al., 2016). Skylark et al. (2020) studied the role of expectations and age, in the trade-off of delays and monetary rewards, and Njenga (2023) identified that the use of financial incentives could influence the interest of teachers to participate in professional development programs. In the medical context, financial incentives have been used to promote healthy behaviors, like exercising while discouraging the unhealthy ones, like smoking (McGill et al., 2019; Vlaev et al., 2019), and as a way of boosting vaccination rates (Campos-Mercade et al., 2021). In the social context, as a way of promoting the prosocial behavior among population such as charity (Ariely et al., 2009), and contributions to public goods in presence of norm enforcement mechanisms (Fuster & Meier, 2010).

Specifically talking about incentives programs design, this topic has been widely studied. Emanuel et al. (2016) and Lubarsky et al. (2019) analyzed from a behavioral economics perspective some factors that should be considered when designing successful incentive programs for physicians. They concluded that the amount of the incentive, the timing to deliver it, the level of difficulty of the task to be incentivized, and the number of performance metrics are some of the factors that reduce the negative effects of incentives, like noncooperative behaviors. Authors like Mitchell et al. (2013), studied not only the incentives design features when promoting exercise adherence among adults, but also the period that incentives should be kept to achieve this goal. Other authors studied the impact of tax incentives in reducing obesity (Wallace, 2016), the ageing factor in reward preferences for health care (Von Bonsdorff, 2011), the most valued features of incentives (Mitchell et al., 2015), and the demographic variables to consider when designing an incentive policy (Hao, 2023).

The existing literature related to incentives, demonstrates that industry and characteristics of the participants, influence their motivating factors (Yousaf et al., 2014). A study among academic economists in the US, showed that the time spent in research activities have a stronger relation with gender and rank of faculty members, than with the incentives provided by the institution to increase research productivity (Harter et al., 2011). Li & Ou-Yang (2010) studied in the context of the US if obtaining the tenure affects researchers' productivity and impact (i.e., their total number of papers and citations). They concluded that, since productivity and impact remain consistent after tenure, the implicit incentives would still strongly motivate them. Authors like Lacorte Ayroza et al. (2019) studied the effects of incentives in researchers that belong to a research productivity program in a university in Brazil. They concluded that, despite incentives having a positive effect in researchers' productivity, there is a limitation on the financial incentives provided, possibly because the rewarded activities correspond to those that researchers would naturally do.

The use of either financial or non-financial incentives is also an issue. Through a survey applied in the Republic of Macedonia among employees of 40 years and over that work in the telecommunication sector, the authors identified that financial incentives are more related to job satisfaction than non-financial incentives; however, it was also identified that the existence of both types of incentives are fundamental in employees' motivation (Stefanovska-Petkovska & Bojadziev, 2017). In fact, the total reward system, was studied in the telecom sector as a better alternative than using only financial rewards (Riaz et al., 2018). In the educational context this topic was examined too. Hassan et al. (2022) studied the impact of financial and non-financial interventions in less developed countries, concluding that financial incentives have a stronger impact on improving learning outcomes.

An increase in motivation and personal effort have been identified as advantages in the use of financial incentives (Lacorte Ayroza et al., 2019); however, authors highlight their negative side. Necker (2016) applied behavioral economics concepts to understand why rewards can lead scientists to dishonest behaviors. Environments with a high pressure to publish and competitive schemes could favor cheating, since scientists could opt for activities that maximize their utility (Necker, 2016) and that represent a quickest way to reach the objectives (Fernández et al., 2020). The decrease in internal motivation has also been studied as a negative side of incentives among sale representatives, especially when they are motivated by expected rewards (Wiese & Coetzee, 2014).

Considering the advantages and disadvantages of incentives, some authors have proposed the use of efficiency wages and Pay-for-Performance (P4P) schemes as reward alternatives. As defined by Way (2014), efficiency wages are the wages above the market paid to employees to increase their productivity. Fernández et al. (2020) argument that efficiency wages could improve the organizational productivity by committing the employees, while reducing the negative side of the incentives. This commitment could be a consequence of the endowment effect, this is, since employees already have a higher wage, it would be more painful for them to lose something they already possess. Other authors highlight the P4P schemes as a way of ensuring both efficiency and quality, using financial incentives (Kyeremanteng et al., 2019). In the health systems for example, despite the recognized advantages of this scheme, it also faces several disadvantages like ignoring patients that require specific attention, and providing a wrong interpretation of the purpose of the incentive both by doctors and patients (Kyeremanteng et al., 2019). Authors like Zaresani & Scott (2021) studied if the increasing implementation of the P4P in healthcare, has been equally successful, concluding that there is not strong evidence.

The use of incentives is studied in a variety of academic contexts. For instance, in Saudi Arabia (AlShareef et al., 2023) and Denmark (Andersen & Pallesen, 2008) were studied the effects of financial incentives on research production, and in Pakistan, the pay-for performance schemes for teachers in public and private universities (Sarwar et al., 2014). There is also literature regarding the culture conflicts and pressure to publish in universities that are moving from a teaching-oriented mission to a research-oriented mission in United States and Mexico, finding that in both countries, researchers value non-financial aspects such as reduced teaching-load (Gregorutti, 2010). However, since literature is still inconclusive about the best incentive scheme to favor research in universities, this paper aims to contribute to the existing literature by focusing on researchers' incentives preferences, a frequently understudied side in the design of research policies. Analyzing the demographic aspects of researchers' incentive preferences, as well as studying the effect of time preference on decision-making, allow us to have a broader vision of researchers' preferences. A special weight is given to the value that financial and non-financial incentives represents to researchers; an opportunity detected in the previous literature.

This analysis is therefore relevant to policymakers and administrators in the academic context, as well as in areas with highly specialized employees. Along with the institutional objectives, including the perception of the individual to be motivated in the design of an incentive policy, represents a huge opportunity for universities that seek to achieve their research productivity goals while keeping their researchers motivated. To the best of our knowledge, this paper is one of the first studies related to research productivity incentives and researchers' perceptions in private universities in Latin America.

3.3 Study design

A cross-sectional survey (Babbie, 1973; Setia, 2016) of 54 questions was designed to understand the motivations, biases and most valued attributes of incentives by researchers of private universities in Mexico. It included a variety of question types, such as multiple choice, open-ended, rankings, dichotomous, and scenario analysis. This kind of survey is useful in a wide range of social science applications, and it holds a great potential for researchers and managers as it helps to predict many economic behaviors. In our study design we also included some aspects assessed by Baumann (2022), such as age, gender, research experience, research time, and research motivation, used to cluster lecturers of non-traditional higher education institutions by their research profile.

The survey sections are as follows: 1) demographic and academic background, 2) researcher profile, 3) biases, and 4) research incentives. We also created a database of researchers, considering their area of knowledge and the university where they work. In this paper we will only focus on the relationship between survey sections 1, 2 and 4, being section 3 an issue of a different study.

3.3.1 Survey sections

The first section, demographic context variables, comprises a series of questions with the objective of classifying the participants. Aspects like age, gender, civil status, in combination with data like years from obtaining the doctoral degree, country where the degree was awarded and the percentage distribution of teaching, research and service activities, are the basis for a complete classification of researchers.

The second section, researcher profile, seeks to understand not only the goals and challenges as researchers, but also to identify their most valued characteristics to carry out its functions. Aspects like years of experience as

researcher as well as belonging to the National System of Researchers (SNI) are considered. Being part of the SNI allow researchers of universities to have benefits and represents a national recognition, since this program depends on the National Council for Humanities, Science and Technology (CONAHCYT).

The fourth section focuses on research incentives. The goal in this section is to identify the financial and non-financial incentives most valued by researchers, the proposed financial incentives for publications depending on the quartile ranking of the journal, and aspects related to delay-rewards.

For a generalized understanding of the incentives, participants were provided with examples in the corresponding questions. Financial incentives encompass rewards for indexed and non-indexed publications, for participation in conferences, to cover fees to publish in journals, etcetera. While non-financial incentives include reduced teaching load, private office (some universities use shared spaces for professors), schedule flexibility, dissemination of achievements, sabbaticals, additional free days, etc.

During the survey, participants were asked to answer some questions about potential target journals for their publications. In this case, the quartile ranking of the journal is an important factor to consider. The quartile ranking of the journal corresponds to the classification made by SCImago Journal Rank (SJR) and Journal Citation Reports (JCR), where journals are classified into four quartiles (Q1, Q2, Q3, and Q4) according to their impact factor. Journals classified as Q1 represent the most prestigious journals in certain subject area.

3.3.2 Survey platform

The survey was designed using Question Pro software. This platform was selected due to the wide variety of question types, the completeness of its reports as well as the possibility to respond in different devices, like computer

or mobile phone. A main feature was the possibility of sending the survey to lists of emails and to send periodic reminders.

3.3.3 Population

Ten of the largest private Mexican universities were selected. These universities are: Instituto Tecnológico de Estudios Superiores de Occidente (ITESO), Centro de Enseñanza Técnica y Superior (CETYS Universidad), Instituto Tecnológico Autónomo de México (ITAM), Instituto Tecnológico y de Estudios Superiores de Monterrey (Tec de Monterrey), Universidad Anáhuac, Universidad de las Américas Puebla (UDLAP), Universidad de Monterrey (UDEM), Universidad Iberoamericana (IBERO), Universidad Panamericana (UP), and Universidad Popular Autónoma del Estado de Puebla (UPAEP).

Six of the 10 selected universities are among the Top 100 in the Latin American & The Caribbean University Rankings 2024. Their position in this ranking, as well as some university statistics of the year 2021, are presented in Table 1. These statistics allow us to have a whole perspective of the institution including all their academic departments, even the ones out of the scope of this research. It is worth highlighting that the Professors' column includes not only researchers but also teaching professors, which represents most professors. The data provided also includes full time, part time and adjunct faculty. The columns of articles in Web of Science (WoS) and in Scopus represent the annual production in 2021.

Table 1. QS LatAm & The Caribbean University Rankings 2024 and university statistics 2021

University	LatAm & The Caribbean Rank (2024)	Professors (2021)	Students (2021)	Articles in Web of Science (WoS) (2021)	Articles in Scopus (2021)
Tec de Monterrey	4	12,314	96,690	1,026	1,330
IBERO	42	1,942	22,225	226	193
ITAM	44	602	4,962	92	114
UDLAP	58	830	9,740	136	161
UP	68	2,235	14,730	121	190
Universidad Anáhuac	74	5,146	27,215	121	174
UDEM	105	1,086	13,507	91	141
ITESO	139	1,799	10,545	27	33
UPAEP	201-250	1,244	13,959	71	82
CETYS Universidad	301-350	791	5,493	14	19

Source: QS Quacquarelli Symonds (2024); UNAM (2023)

3.3.4 Profile

In order to define our research subjects, we considered the following criteria: the participants 1) must hold a doctoral degree, 2) must belong to either engineering or business academic departments, 3) must spend part of their time doing research activities and 4) must be full-time employee in one of the selected private universities. It was decided to focus only on researchers of engineering and business areas since the ten selected universities have a strong focus on both areas, and participants represent 45% of the SNI members by 2022, the year in which the sample was formed.

With information of the official directory of SNI, a database of 350 researchers of the 10 selected universities was integrated, including researcher's full name, affiliation, and email address. The survey was electronically sent to the participants by early November 2022. It remained open for three months, until 86 valid responses were reached. Table 2 shows the demographic context of these participants.

Table 2. Summary of demographic context variables

	Frequency (n=86)	**%**
Gender		
Male	64	74%
Female	22	26%
Range age		
30-39	25	29%
Young	**25**	**29%**
40-49	31	36%
50-59	17	20%
>60	13	15%
Senior	**61**	**71%**
Academic area		
Engineering	38	44%
Business	48	56%

Source: Self elaboration based on survey results

3.3.5 Hypotheses

In this study three research hypotheses were examined:

H1: Younger researchers prefer the non-financial aspects of incentives more than senior researchers.

In the context of a Mexican private university, research incentive programs are financed with university resources. Identifying the preference for financial or non-financial incentives among researchers give the opportunity to policymakers to design a more tailored policy that increases motivation among researchers and potentially reduce the financial resources needed to implement it.

> H2: There is a positive correlation between the amount of financial incentives proposed by researchers and the willingness to delay the gratification.

A key factor to consider in the design of a research incentive policy is to determine the best moment to deliver an incentive while maintaining researcher's motivation. Studying the preference for an immediate but reduced incentive against a delayed but higher incentive could have a significant impact in the policy design and financial planning of the institutions.

> H3: The salary range of the participants and the years of experience as researchers, are positively correlated to the financial incentives for publications proposed by participants.

The demographic composition of the researchers that belong to an institution could influence their expectation to receive an incentive that they consider to be fair. The wrong determination of a financial incentive could generate a demotivating effect.

3.4 Analysis

> H1: Younger researchers prefer the non-financial aspects of incentives more than senior researchers.

To analyze this hypothesis, participants were divided into two groups according to their age range: young and senior researchers. Young

researchers correspond to participants that are younger than 40 years old, while senior researchers are 40 or more years old. Existing literature related to motivation and incentives, have classified employees with this age criteria (Stefanovska-Petkovska & Bojadziev, 2017).

Through a multiple-choice scenario question, participants were asked what they would prefer to receive as incentive when a research paper is accepted. There were four possible answers: financial incentive depending on the quartile ranking of the journal, financial incentive regardless of the quartile ranking of the journal, a combination of financial and non-financial incentives, and only non-financial incentive.

This question provided us a full perspective of researchers' preferences. While senior researchers have a strong preference for financial incentives depending on the quartile ranking of the journal (48%), young researchers show an inclination for combination of financial and non-financial incentives and financial incentives depending on the quartile ranking of the journal (32%). Results are presented in Figure 1.

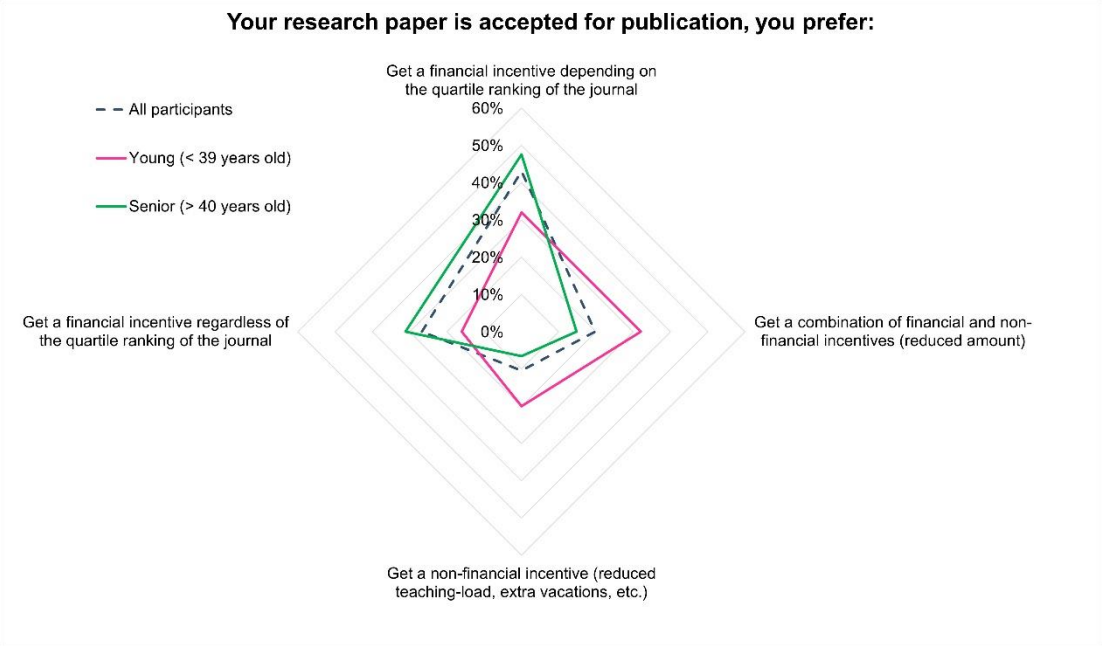

Figure 1. Preference for financial and non-financial incentives according to participants' age

Source: Self elaboration based on survey results

When analyzing the previous question not only by age, but also by academic area, interesting results came out. While senior researchers of both business and engineering have similar preferences regarding incentives, young researchers of business have a stronger preference for getting a combination of financial and non-financial incentives (54%). Young researchers of engineering for their part, despite preferring financial incentives depending on the quartile ranking of the journal (42%), have also moderate preference (25%) for both financial incentives regardless the quartile ranking of the journal and non-financial incentives. Results are presented in Figure 2.

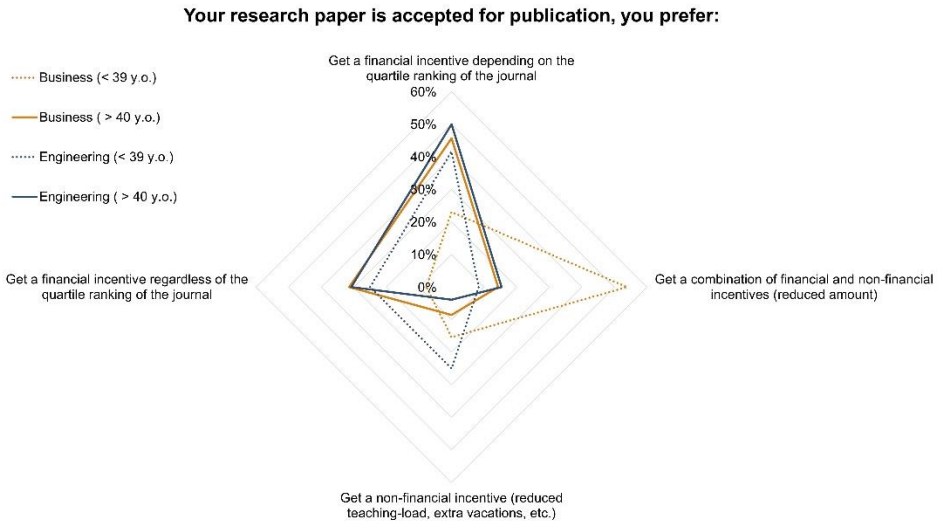

Figure 2. Preference for financial and non-financial incentives according to participants' age and academic area

Source: Self elaboration based on survey results

A z-test for the difference in proportions between young and senior participants who prefer non-financial incentives over financial incentives was performed using Minitab (version 21.4). Table 3 shows the descriptive statistics of the groups, and Table 4 shows the results of the z-test for the difference in proportions. The results suggest that there exists a significant difference on the preference of non-financial incentives by young researchers compared with the preference of senior researchers (p-value < 0.007).

Table 3. Descriptive statistics of young and senior participants that prefer non-financial incentives over financial incentives

Group	Observations	Number of participants that prefer non-financial incentives	Proportion
Young	25	13	0.52
Senior	61	13	0.21

Source: Self elaboration based on survey results

Table 4. Summary of z-test for proportions

Method	Z-value	p-value
Normal approximation	2.72	0.007*

Source: Self elaboration based on survey results

**Significant difference between number of young and senior participants that prefer non-financial incentives over financial incentives.*

Finally, the analysis of this hypothesis was complemented with a ranking question regarding elements of incentives that institutions should consider in their policy design to favor life-work balance (being the number 1 the most important). The four possible answers were: have a financial impact in my personal economy, allow me to enjoy more personal time, provide me with flexible working conditions (time and space to execute), and promote my professional development. Table 5 presents a summary of the top 3 answers.

Table 5. Ranking of elements that an institution should consider in their research incentives policy design that favor life-work balance

Rank	Young (< 39 years old)	Senior (> 40 years old)
1°	Have a financial impact in my personal economy	Have a financial impact in my personal economy
2°	Allow me to enjoy more personal time	Provide me with flexible working conditions (time and space to execute)
3°	Provide me with flexible working conditions (time and space to execute)	Allow me to enjoy more personal time

Source: Self elaboration based on survey results

There is a clear preference for incentives with a financial impact in researchers' economy. However, it is important to note the generalized preference for flexible working conditions (time and space to execute) for both groups of researchers, young and senior. This aspect could be related to the

need of autonomy that researchers claim in terms of organizing their research activities.

The findings presented in this section suggest that both young and senior researchers value financial incentives; however, young researchers would prefer to receive a combination of financial and non-financial incentives in the same extent. This ageing factor in rewards preferences is consistent with Stefanovska-Petkovska & Bojadziev (2017) and Wiese & Coetzee (2014), whose findings will be discussed in the Results and discussion section.

> H2: There is a positive correlation between the amount of financial incentives proposed by researchers and the willingness to delay the gratification.

To evaluate this hypothesis, participants were asked to suggest a financial incentive amount that they consider institutions should give researchers when publishing in journals of different quartile rankings (Top 10, Q1, Q2, Q3, and Q4). The proposed incentives were contrasted with other three questions that asked them scenarios of time preference. The scenario questions asked participants to consider their previous reported amounts, and to select one of the following options: receiving the 100% of the incentive in 1 year after publication, 75% in 9 months, 50% in 6 months, 25% in 3 months, and 20% in 15 days.

To calculate the real incentive to be received, we multiplied the reported amounts of incentives by the percentage of incentive according to the selected waiting time. Figure 3 presents the average of real incentives for each quartile and waiting time. No Top 10 column is reported in the 9-month period, since none of the participants selected that waiting period for that kind of publication.

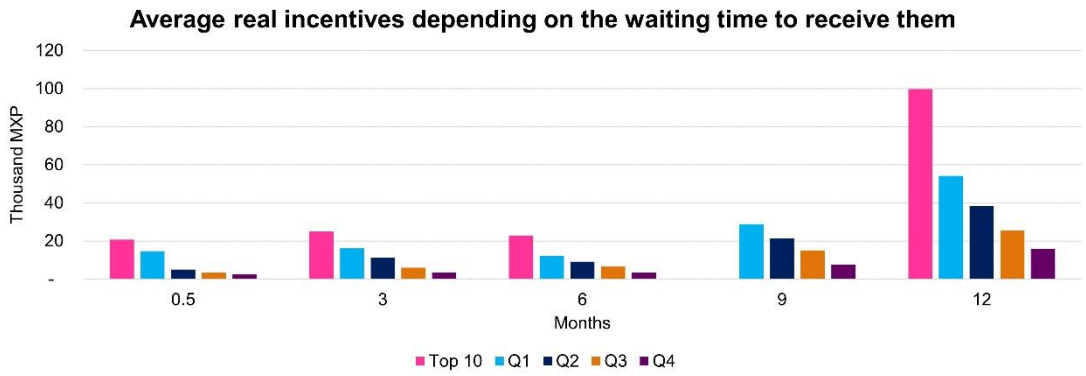

Figure 3. Average of real incentives depending on the waiting time to receive them, clustered by quartile ranking of the journal

Source: Self elaboration based on survey results

It is worth highlighting that 77% of the participants prefer the option of waiting 12 months to get the 100% of the incentive, regardless their proposed amount of incentive and the quartile ranking of the journal.

To examine the relation between the amount of real incentive to receive, and the time that participants are willing to wait, a Spearman correlation analysis was employed using Jamovi (version 2.3.28). For this analysis, the data of one participant was eliminated (equivalent to 5 responses) due to inconsistencies in his answers. The results of the analysis with the remaining participants (85 respondents, 425 answers), are showed in Table 6. The obtained p-value is < 0.001, which implies that there exists a significant positive correlation between the real amount to receive and the waiting time.

Table 6. Spearman's Rho and p-value for the relation between real amount of financial incentives and waiting time

Spearman's Rho	p-value
0.506	< 0.001***

Source: Self elaboration based on survey results

These findings suggest two aspects. First, when there is a trade-off between the financial reward and the delay, researchers are willing to wait the longer

period to get the 100% of the incentive. Second, there is a positive correlation between the amount of the incentive and the waiting time to receive it, this is, the higher the incentive, the higher the willingness to wait longer.

> H3: The salary range of the participants and the years of experience as researchers, are positively correlated to the financial incentives for publications proposed by participants.

To assess this hypothesis, the salary range of the 86 participants was contrasted with the proposed unique financial incentive for publications, this is, an amount of incentive when the quartile ranking of the journal does not matter. Since these variables are ordinal categorical and continuous, respectively, a Spearman correlation analysis was performed using Jamovi (version 2.3.28). The results of the correlation are presented in Table 7 showing that there is not a significant correlation between the variables, since the obtained p-value is 0.581.

Table 7. Spearman's Rho and p-value for the relation between salary range and proposed unique amount of financial incentive

Spearman's Rho	**p-value**
-0.06	0.581

Source: Self elaboration based on survey results

To evaluate the correlation between two continuous variables, a Pearson correlation factor was calculated between the years of experience of the 86 researchers and the proposed unique financial incentive for publications. Results are presented in Table 8, where it can be noted that there is not a significant correlation between the variables, since the obtained p-value is 0.664.

Table 8. Pearson's R and p-value for the relation between year of experience as researcher and proposed unique amount of financial incentive

Pearson's R	p-value
-0.047	0.664

Source: Self elaboration based on survey results

These findings suggest that there is not a significant correlation between salary range and years of experience with the proposed unique financial incentive. Finally, participants were asked to suggest amounts of incentives for publications according to the quartile ranking of the journal, this is, for publications in Top 10 journals, Q1, Q2, Q3, and Q4. For each participant, these amounts were contrasted with their first reported amount, the unique financial incentive, to assess if there exists certain anchoring bias. The anchoring bias was first studied by Tversky & Kahneman (1974) to explain that people make estimates influenced by a reference point. Findings confirm the existence of this bias, since the unique proposed incentive is the same or very similar to the reported for Q3 publications (35%), followed by Q2 publications (27%), Q4 publications (17%), Q1 publications (14%), and Top 10 publications (7%).

3.5 Results and discussion

The analysis of the three hypotheses showed us that age is a factor that affects the preference of non-financial incentives over financial ones (H1). The expected amount of the incentive is influenced by the waiting time to get it (especially when the longer the waiting time, the higher percentage of incentive to receive) (H2) but is not correlated with the salary range and year of experience (H3). This research is useful for institutions that want to design a comprehensive incentive policy, given the findings that show that researchers value having alternatives over a limited policy.

Our findings in H1 are consistent with Stefanovska-Petkovska & Bojadziev (2017) that older employees have stronger preference for financial incentives

than for non-financial incentives. This is consistent with a study of reward preferences among Finnish nurses, Von Bonsdorff (2011) found that age tend to modify reward preferences, and that both financial and non-financial rewards are recognized by nurses. This preference for both types of incentives has been also identified in our study among young researchers, since results show that they value on the same extent receiving only financial incentives and combination of financial and non-financial incentives. This change in motivating patterns as people age, has been also studied in contexts like sales (Wiese & Coetzee, 2014). Therefore, the design of a research policy should consider not only the ageing factor, but also include elements of both financial and non-financial incentives. This will allow institutions to define strategies to boost research production of both young and senior researchers while will benefit the institution financially by including both types of incentives.

Regarding H2, our analysis is consistent with the delay-reward heuristic stated by Skylark et al. (2020), who found that people tend to expect long time to receive larger rewards, and this behavior is more evident among senior participants. In our study, even though the amount of financial rewards were proposed by each participant, when they were asked through scenario analysis questions, when and how much of the reward they would prefer to receive, most of the participants opted for options with longer delays. However, our study findings differ from those of Levitt et al. (2016) who stated that among primary and secondary school students, the motivating effect of a reward diminishes when it is given with delay. Therefore, the motivating force of rewards could be related not only by the amount and delay of the reward, but also by context and age of the people who will receive the reward.

It is worth highlighting an important aspect that arose with our analysis, the high variability of the proposed financial rewards since the questions were designed as open-ended. These results show that there is not a common

criterion to determine the ideal amount. This is consistent with Jeffrey et al. (2013), when analyzed the way incentive program managers define the proper amount of incentives, which are mainly defined by intuition and not by hard data. Hence, an important aspect to consider when designing a research policy is not only the delay of the reward, but also the amount itself. Our study provided two important insights that should be considered by policymakers. First, the unique incentive suggested by researchers is similar to the incentives proposed for publications in low quartiles (Q2, Q3, and Q4). Second, when researchers have the possibility to suggest incentives according to the quartile ranking of the journal, almost no one proposes the same amount between quartiles.

Finally, our findings in H3 are consistent with Hao (2023), who concluded that demographic aspects such as years of experience in teaching should be considered when designing an incentive policy. Von Bonsdorff (2011) for his part, pointed out that demographic aspects should be considered when identifying employees' reward preferences, especially if employees could be discontented with their current revenue. Despite that our results show that salary range and years of experience are not correlated to the proposed amount of unique incentive, these variables could play a relevant role in other aspects such as the preference of certain type of incentive. A deeper analysis is then recommended to identify additional demographic aspects, such as gender or academic area, that could influence researchers' incentives preferences and could impact the incentive policy success.

3.6 Implications and conclusions

Research productivity is a key metric for universities and accrediting bodies to assess research development and, therefore, has become an important factor that contributes to an institution's overall quality. To achieve this objective, universities often implement incentive programs as a way of motivating researchers.

However, the existing literature shows that incentives do not always help to increase motivation and effort, since a wrongly designed incentive program could lead to the opposite effects, like demotivation and dishonest behaviors. Therefore, the design of a comprehensive incentive policy that considers not only institutional goals but also employees' incentive preferences become crucial in the success of the reward scheme.

Findings show that demographic aspects like age, influence researchers' preference of non-financial over financial incentives. This result suggests that the existence of differentiated research policies according to age would not only increase researchers' motivation but would also represent financial savings for the institution. This is especially relevant since universities usually invest significant amounts of money in the implementation of these incentive programs. However, it is important to note that the preference of a certain type of incentive could be related not only to age, but also to the current personal and working conditions of the researcher. This is, the preference for a nonfinancial incentive such as reduced teaching load or schedule flexibility could be related to having insufficient time to do research. Therefore, incentives could be used as a way of promoting researcher's well-being.

Contrary to what was hypothesized that salary range and years of experience influence the desired amount of incentive for publications, the delay in receiving an incentive plays a relevant role in researchers' preferences. Despite the suggested amounts of incentives, most of the participants are willing to wait the maximum period to get the highest percentage of their proposed incentive. The timing to deliver an incentive is probably an element that has been disregarded in the design of research incentive policies but could have a significant impact to both researchers and institutions.

As mentioned in existing literature, cultural differences could also have an impact in reward preferences. Our study was carried out in a developing country, which contributes to the current discussion on incentive policies

design by considering researchers' preferences in a private university context, where most of the research is financed with university resources. For future research, this analysis could be addressed from the perspective of researchers of public universities, where most of the research is governmental funded.

In summary, this research contributes to the existing literature in the following aspects. It highlights the relevance of including an understudied side in the design of research policies and the incentive preferences of researchers. The influence of demographic aspects in researchers' incentive preferences, as well as the inclination towards financial or non-financial incentives are analyzed in this research as fundamental elements to consider in the design of a research policy. The preference for delayed gratifications in researchers' decision-making process is a key finding of this research that policymakers should consider when defining when to deliver the incentives. Finally, carrying out this research in the context of Mexican private universities, adds to the existing literature of research incentives, which is mainly focused on developing countries.

Despite suggesting a different perspective of incentive design by including researchers' preferences, we acknowledge that this study has limitations. Conclusions may not be generalizable to researchers of different academic areas, other than business and engineering. Then, expanding this research to additional academic areas as well as to a wider sample of Mexican private universities, could lead us to more generalizable conclusions.

Finally, in future studies this research could be complemented by including not only researchers' preferences but also contrasting with the current incentive policy in their universities. That would allow us to have a wider panorama of the elements to be considered in designing a successful research incentive policy in Mexico. This research could also be further extended in different countries with similar cultural characteristics.

Chapter 4. Evaluating factors and sub-factors for research policy design: The case of private universities in Mexico[3]

Abstract

Research institutionalization has become a significant aspect for universities wanting to outstand by their excellence in research. Through the Analytic Hierarchical Process (AHP) we assessed the factors and sub-factors that affect the design of research policies from the perspective of researchers. The aim of this research is to prioritize these factors and sub-factors, to help universities' decision-makers to design comprehensive research policies that incorporate researchers' preferences, from the context of Mexican private

universities. Our findings suggest that three factors are determinant in the design of research policies: work-life balance, research funding, and institutional support. Besides being relevant for university authorities and decision-makers, this research highlights the importance of a well-designed research policy, which can help to achieve the institutional research objectives, promote researchers' welfare, and positively impact society through the generation of knowledge.

Keywords: Analytic Hierarchical Process (AHP), research policy, work-life balance, research funding, institutional support

4.1 Introduction

Research plays a fundamental role in academic institutions due to its impact in reputation, opportunity of making academic connections, and possibility of obtaining national or international accreditations. Important amounts of capital

[3] Núñez-Acosta, et al. (article under review).

have been invested by several developing countries to support research (Siddiqui & Lento, 2024). Nonetheless, aspects like academic productivity, quality of research, number of publications, as well as social impact, influence the recognition and reputation of these institutions (Masinde & Coetzee, 2023).

As stated by Torres-Samuel et al. (2019), private universities in countries like Brazil, Chile, Mexico, Argentina, and Colombia have improved their performance in rankings by integrating scientific research into their strategic planning. This article will focus on private universities in Mexico, which represent the 65% of the higher education services provided in the country (ANUIES, 2024). This is especially relevant since some of these institutions have been switching from a teaching-oriented mission to a research-oriented mission, to have a bigger impact on society.

However, despite promoting research, private universities face several challenges to guarantee the generation of high-impact knowledge, like the lack of government funds (OECD, 2024), inadequate management model to organize research efforts (Siddiqui & Lento, 2024), inefficient adaptation to international standards (Siddiqui & Lento, 2024), and incomplete policies to promote researchers' productivity (AlMubarak, 2021). Furthermore, the use of research management models of developed countries, without listening to the researchers' perspective, could lead, in certain contexts, to depend entirely on the economic incentives to promote research (Fonseca & Nieth, 2021).

Therefore, focusing on the design of research policies including the perspective of researchers is highly relevant and could reduce the gap between strategic planning and researchers' efforts. This research seeks to identify and assess the factors that a private university should consider in the design of policies to improve researchers' performance. This article is organized in three sections. First, a literature review is presented. Then, the methodology section describes how the data is analyzed using the chosen

tool. Lastly, the discussion and conclusion sections are presented, including the limitations of this research.

4.2 Literature Review

Research is a key factor of private universities that impacts several aspects of the institution, such as reputation and productivity, influencing the possibility of obtaining national and international accreditations. The existence of research in private universities is a factor that influences their progress (Siddiqui & Lento, 2024; Woldegiyorgis et al., 2021).

To attract and retain researchers, private universities have implemented different approaches like the development of research capacities (Abramo et al., 2023; Forbrig, 2020; Yildiz & Esmer, 2023), implementation of financial incentives (Barbour, 2015; Daumann et al., 2023; Wang et al., 2020), promotion of researcher motivations (Alsuwailem, 2023; Masinde & Coetzee, 2023), and design of incentives (Jørgensen & Hanssen, 2018; Sharma & Sharma, 2021). However, a unique characteristic of research policies is identifying the relationship between scientific performance and incentives (Banal-Estañol et al., 2023; Quimbo & Sulabo, 2014).

Table 1 summarizes the perspective of other authors about the design of research policies in private universities.

Table 1. Literature review on analysis and development of research policies in universities [4]

Author	Analytical approach	Insights
Daumann et al. (2023)	Economic behavioral model	Individual researchers drive the progress of knowledge in their fields and strive for recognition and financial stability through exceptional publications and research funds. Funding competitions enhance productivity and quality of work, but they can create economic dependencies that undermine long-term research productivity. Funding

[4] Núñez-Acosta et al. (article under review).

		mechanisms tend to favor established researchers, leading to an uneven distribution of resources between new and established researchers.
Quimbo & Sulabo (2014)	Analysis of research self-efficacy and research productivity using multiple regression analysis	The study proposes a model that examines the factors that affect productivity in research policies. The model uses multiple regression analysis to explore individual and institutional variables and their relationship with self-efficacy and scientific productivity. The results suggest that a viable strategy could be to link researchers' salary growth to their contributions and achievements.
Tien (2008)	Discriminant analysis of the quality indicator of research productivity	The research differentiates professors based on their attitudes towards academic progress and dedication to research, revealing a tendency towards a greater commitment among younger professors. Also identifies a correlation between the desire for promotion and external and internal rewards and how dedication to research is influenced by the type of institution (public vs. private) and holding a doctoral degree. The study also highlights significant differences in scientific output between genders and disciplines, indicating a need for inclusive policies that promote diversity in research.
Barbour (2015)	Monetary value analysis of scientific publications	Academics face pressure to publish for tenure, grants, and promotions. Two types of fraud are identified: the sale of pre-written papers to eager scholars and submitting papers to non-related journals to speed up publication.
Franzoni et al. (2011)	Correlational analysis between incentives policies and the submissions and publications.	In this study, the authors analyzed funding and reward policies and categorized them into three types of incentives. The results showed that career incentives are associated with higher submissions and publications, motivating faculty to submit their best work. Institutional incentives are correlated with submissions but not with publications. Monetary incentives, on the other hand, promote research submissions regardless of quality, as the correlation with lower acceptance rates indicates.

Santo et al. (2009)	Principal component analysis (PCA).	Academic institutions need to shift towards a research-oriented culture to increase their relevance. This requires a change in the mentality of teachers and administrators towards more research-oriented roles.
Jalal (2020)	A systematic literature review of research productivity in higher education institutions.	The author emphasizes that research productivity can significantly improve the quality of higher education institutions. Intrinsic motivations are driving factors, such as peer recognition, student respect, contributions to the field, creativity, curiosity, and collaboration. On the other hand, extrinsic motivations encourage professors to conduct research to receive external rewards. In essence, external rewards create obligations not inherent to the activity.
Xu et al. (2021)	Conceptual review of incentives for international publications	The authors argue that universities should take a human-centric approach to research cultures, valuing and supporting academics as thinkers, researchers, scholars, and educators rather than just producers of measurable outcomes. Researchers have some leeway to question the prevailing research cultures and can add more value by participating in decision-making and implementing research assessments. Assessments should consider the intrinsic value, quality, originality, contribution, and impact of research in local, national, and international contexts rather than relying solely on the number of publications or other limited parameters.
Lundwall (2019)	Conceptual review of institutional incentives to foster sound scientific practices	The research suggests that actively listening to researchers' concerns can be a significant improvement in the management of incentives. This can lead to better outcomes that are more viable and acceptable. The current incentive structure conflicts between open science and researchers' earnings. However, since science relies on both replication and innovation, institutions need to accommodate and incentivize those who aim to produce superior research that benefits the field of development sciences.

Source: Self-elaboration based on literature review

As presented in Table 1, incentives are fundamental to keep a high productivity rate. Even though incentives could cause dependence and lower the quality of research (Daumann et al., 2023; Stilwell, 2003), there is also a positive correlation between obtaining grants and motivating researchers (Daumann et al., 2023; Quimbo & Sulabo, 2014; Stilwell, 2003). As suggested by Tien (2008), universities' decision-makers should design dynamic schemes to incentivize academics.

The previous table also presents articles that study the impact of motivations and behavior on researchers' productivity. Authors like Goncharuk & Vinot (2023) and Jalal (2020) studied the intrinsic and extrinsic motivations, concluding that the extrinsic factors are usually overlooked in the design of research policies. Other authors, like Alsuwailem (2023) and Masinde & Coetzee (2023), identified that including more experienced researchers in the design of research policies can be enriching for the institution to promote a research culture. However, as stated by Barbour (2015) and Franzoni et al. (2011), a complete focus on incentives can place high pressure on researchers to publish, sacrificing research quality. Therefore, researchers could seek for journals that provide quick reviews but not detailed feedback.

An important aspect to consider is that basing incentives only on the number of published papers or quick results, could significantly reduce academic integrity and research quality. Considering both personal and research needs is beneficial for researchers and institutions since the policies are perceived by researchers as feasible and shared (Lundwall, 2019). Assuring to researchers a balance of teaching, research, and service, is positively correlated with their level of satisfaction (Mamiseishvili & Lee, 2018). Therefore, this research seeks to identify, from an integrative approach, the factors that may affect the design of a research policy from the perspective of researchers (Sánchez-García et al., 2023).

From what was presented above, we emphasize the importance of not only of increasing research productivity through the implementation of economic and professional incentives, but also the risk that a total dependence on incentives could cause. It is also highlighted that both intrinsic and extrinsic motivations play a relevant role in policy design, and that institutions should balance the pressure to publish to guarantee quality.

Therefore, we believe that addressing the gap of factors that university managers should consider when designing a research policy could have a double positive impact. On the one hand to the institutions, allowing them to meet their research goals. On the other hand, to the researchers, letting them to reach their professional goals and personal development.

4.3 Methodology

To consider the perspective of researchers in research policies, we selected the Analytic Hierarchical Process (AHP), a multi-criteria decision-making technique that allows us to prioritize the selection of the most suitable option (R. W. Saaty, 1987).

The AHP has been applied in diverse areas, such as medicine, sustainability, manufacturing, automobiles, construction, education, among others (Petrillo et al., 2023; Russo & Camanho, 2015; T. L. Saaty & Vargas, 2012). In the educational context, the AHP has been used to assess alternatives for a reward system in the United Arab Emirates University (Badri & Abdulla, 2004). López-Torres et al. (2023) applied this tool to compare and identify inconsistencies between the expected and actual organizational outcomes. In other words, the AHP is a helpful for unstructured problems, where decisions could have a significant impact in different dimensions of the system, like operations (López-Torres et al., 2023). For this reason, the design of a research policy is suitable to be analyzed with AHP.

To implement the AHP tool it is important to decompose the problem using a hierarchical diagram, identifying alternatives, and making comparisons to make decisions (T. L. Saaty, 2008). This allows us to reduce the complexity of the problem, systematizing the decisions. Figure 1 presents the phases to integrate AHP in our proposal:

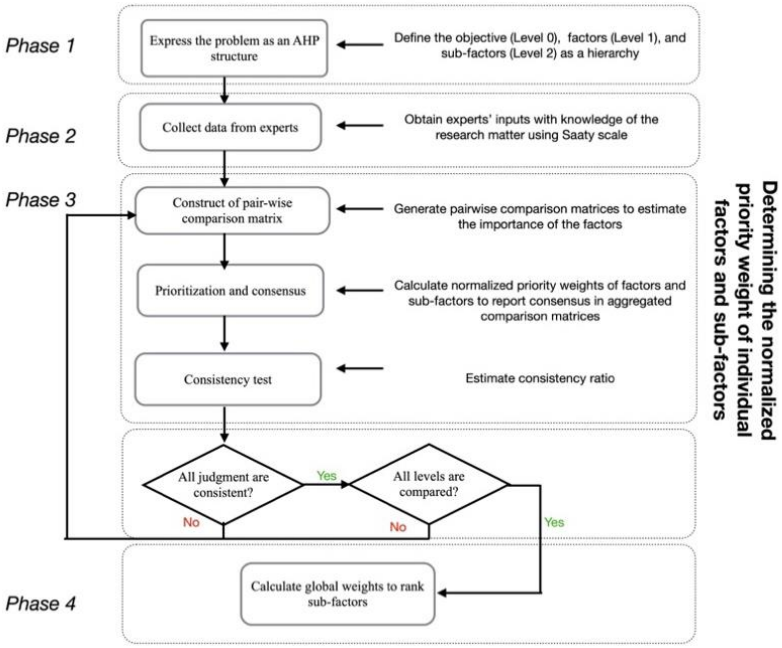

Figure 1. AHP methodology [5]

Source: Self-elaboration based on T. L. Saaty & Vargas (2012)

4.3.1 Phase 1: Structure the problem using AHP

The aim of this step is to facilitate the understanding of the problem through a hierarchical structure. Level 0 corresponds to the objective that will conduct the decision-making process. In our study, the main objective is to rank the organizational factors to design a research policy for private universities in Mexico. These factors are presented in Table 2:

[5] Núñez-Acosta et al. (article under review)

Table 2. Definition of main factors [6]

Main factor	Focus	Literature
Financial incentives	Economic or financial rewards offered by universities to support high-quality research.	Barbour (2015); Daumann et al. (2023); Franzoni et al. (2011)
Recognition Programs	These are mechanisms or initiatives designed to support academic institutions or universities that reward outstanding achievements and social or academic contributions of their researchers.	Franzoni et al. (2011); Jalal, (2020)
Research and Professional Development	Resources and programs to foster the growth and development of researchers in their academic careers. These opportunities are designed to enhance their skills, knowledge, and competencies, facilitate research progress, and improve academic contributions.	Barbour (2015); Jalal (2020)
Institutional support	An academic institution provides resources, services, and facilitation to its researchers to support and promote a research culture.	Franzoni et al. (2011a); Lundwall (2019)
Work-life balance	Satisfactorily equilibrium work, personal, and family responsibilities.	Alsuwailem (2023); Goncharuk & Vinot (2023); Masinde & Coetzee (2023)

Source: Self-elaboration

From the literature review, also the sub-factors were defined. A summary is presented in Table 3.

[6] Núñez-Acosta et al. (article under review).

Table 3. Sub-factors for the AHP model [7]

Main subfactor	Focus
Awards and Distinctions	• Awards and Distinctions: To offer awards and distinctions to researchers who have made significant research contributions, whether at the institutional, national, or international level. • Awards for Outstanding Publications: To recognize excellence in research publication in renowned scientific journals, books, or relevant works. • Research Chairs: Establish unique academic chairs or positions for outstanding researchers, giving them recognition and additional resources to continue their work. • Committee Participation and Academic Leadership: Allow outstanding researchers to participate in academic decision-making committees or assume leadership roles in the institution. • Recognition at Academic Events: Highlight and celebrate the achievements of researchers at academic events, such as award ceremonies or symposia.
Research funding	• Research Subventions: Providing direct funding for research projects, enabling researchers to conduct studies effectively with adequate resources. • Scholarships and Awards: Recognizing and rewarding outstanding researchers with scholarships or monetary awards for their significant research contributions. • Publication Bonuses: Offering additional financial incentives for publishing research in renowned scientific journals or presenting work at international conferences. • Research-based Salary Increases: Linking researchers' salary growth to their performance and achievements in research.
Professional Development	• Training and academic development: Courses, specialized workshops, training in research, presentation, and communication skills. • Mentoring Opportunity: Learning from a more experienced mentor in the academic field. • Research infrastructure and equipment: Research facilities, technology, and equipment are available to support research activity.
Impact on the Academic Community	• Academic reputation: Improvement of the institution's reputation and its researchers in the academic community. • Contribution to knowledge: Advancement of knowledge in a specific field and its influence on the direction of future research.
Professional and Personal Commitments	• Work-life balance: Measures and practices that universities implement to help researchers balance their work responsibilities with their personal and family needs. • Administrative assistance for research projects: Services and support provided by the institution to assist researchers in managing and administrating their research projects and reducing the researcher's effort in these activities
Characteristics of journal	• The evaluation that researchers make to publish: Language, quality, and type of journal may impact researchers' publication decisions.

[7] Núñez-Acosta et al. (article under review).

Bounded Rational	• Due to the workload and demands of their research, researchers may only sometimes have the time and resources to critically evaluate the factors involved in their study. As a result, they may adopt a short-term strategy of focusing on producing quick results and publications instead of taking a more comprehensive and thoughtful approach.
Intrinsic Motivation	• Interest: Researchers are genuinely interested in research; this personal interest is the initiative to conduct research and projects rather than being driven by external pressures. • Dedication and perseverance: Personal motivation drives researchers to work steadily and dedicatedly on their projects, even without immediate external rewards.
Extrinsic Motivation	• External pressures: Researchers often face external pressures to meet productivity standards or conduct specific research due to institutional or social expectations.

Source: Self-elaboration

The conceptual model of our study is presented in Figure 2. This diagram is based on Tables 2 and 3.

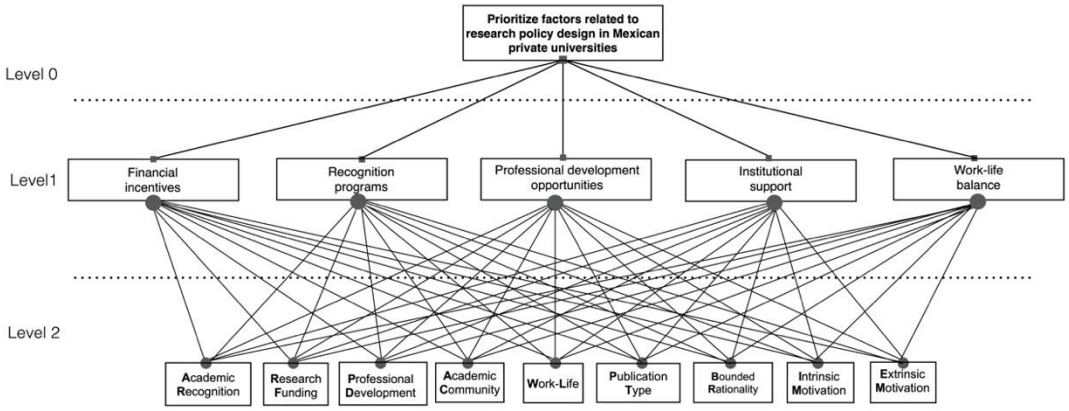

Figure 2. Conceptual model [8]

Source: Self-elaboration following T. L. Saaty (2008)

4.3.2 Phase 2. Data collection

Our data was obtained from 86 researchers of private universities in Mexico. Even though private universities represent less than 5% of the number of researchers in the country, these researchers have an important contribution

[8] Núñez-Acosta et al. (article under review).

on knowledge production in Mexico, producing almost 48% of the high impact indexed national research (CONAHCYT, 2022). The selection criteria of these participants attended to the following elements: researchers must have a doctoral degree, need to be full-time employees of the selected private universities, must spend more than 50% of their workload doing research, and need to be part of the National System of Researchers (SNI). Being part of the SNI reflects quality, since it is a recognition granted by the government of Mexico to the most outstanding researchers, assigning them a different level according to their research achievements and years of experience (CONAHCYT, 2022).

It is worth mentioning that the AHP is a non-parametric tool, which means that aspects like the normal distribution or sample size are not relevant, since the value of the analysis is obtained from the depth of the knowledge of the experts, in this case, researchers (Kurek et al., 2022; Melillo & Pecchia, 2016). We used the Saaty scale to assess the model (T. L. Saaty & Vargas, 2012), the description of this scale is presented in Table 4.

Table 4. The fundamental scale of absolute numbers [9]

Z	Definition	Explanation
1	Equal Importance	Two activities contribute equally to the objective.
2	Weak or slight	
3	Moderate importance	Experience and judgment slightly favor one activity over another.
4	Moderate plus	
5	Strong importance	
6	Strong plus	Experience and judgment strongly favor one activity over another.
7	Very strong or demonstrated importance	
8	Very, very strong	An activity is favored very strongly over another; its dominance is demonstrated in practice.
9	Extreme importance	
Reciprocals of above	If activity *i* has one of the above non-zero numbers assigned to it when compared with activity *j*, then *j* has the reciprocal value when compared with *i*	The evidence favoring one activity over another is of the highest possible order of affirmation. A reasonable assumption.
1.1-1.9	If the activities are very close	May be difficult to assign the best value but when compared with other contrasting activities the size of the small numbers would not be too noticeable, yet they can still indicate the relative importance of the activities.

Source: T. L. Saaty (2008)

In AHP, since the data is provided by experts, the sample size has an important variation among published articles, in some cases, smaller than the sample of our study. Literature was found with studies of only three participants, like the presented by Timóteo et al. (2024) were the variables associated to startups were studied. A study of fifteen participants was developed by Al Qubaisi et al. (2016) to analyze the quality of school processes in the Arab Emirates. Dash & Gupta (2023) presented a study of sixty-four students about the psychological impact of the hybrid mode, and Ebrahimzadeh Pezeshki et al. (2020) analyzed the data of sixty-two participants to identify their satisfaction with public Iranian universities.

[9] Núñez-Acosta et al. (article under review).

4.3.3 Phase 3. Normalized weight of individual factors and sub-factors

We determined the normalized weights of factors and sub-factors as follows:

4.3.3.1 Comparison matrix of factors and sub-factors

We used the table scale to compare n factors and sub-factors. Every level is stated in positive reciprocal matrices A based on the expert judgements a_{ij}.

$$A = \begin{bmatrix} 1 & a_{12} & \cdots & a_{1n} \\ \vdots & 1 & \ddots & \vdots \\ a_{31} & a_{32} & \cdots & 1 \end{bmatrix}, where\ a_{ji} = \frac{1}{a_{ij}}\ \text{i, j} = 1,2, \dots, n. \quad (1)$$

4.3.3.2 Normalization of par-wise comparisons matrix

We applied Eq. (2), where the normalized value of a_{ji} is n_{ij}

$$n_{ij} = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}}, where\ \text{i, j} = 1,2, \dots, n. \quad (2)$$

4.3.3.3 The final weight of each criterion

It is obtained using Eq. (3), where w_j is the final weight factor i

$$w_{j=} \frac{\sum_{j=1}^{n} n_{ij}}{n}\ where\ \text{j} = 1,2, \dots, n. \quad (3)$$

4.3.4 Phase 4. Evaluating the coherence of each comparison matrix to confirm the results

We used the consistency index CI to assess the coherence of each comparison matrix.

4.3.4.1 Determine λ_{max} the highest eigenvalue of the matrix applying Eq. (4)

$$Aw = \lambda_{max} w \quad (4)$$

Where λ_{max} is the greatest eigenvalue of A. λ_{max} can be calculated by $\det(\lambda I - A) = 0$. Where I is the identity matrix.

4.3.4.2 Obtain CR by employing Eq. (5).

If $CR < 0.10$, the comparison matrix A is found satisfactory for ranking results. If $CR > 0.10$, the results cannot be accepted, and the evaluation process should be examined by the decision maker (R. W. Saaty, 1987; T. L. Saaty, 2008).

$$CR = \frac{CI}{RI} \tag{5}$$

Where consistency index (CI) can be estimated as follows:

$$CI = \frac{\lambda_{max} - N}{n-1} \tag{6}$$

Distinct numbers of criteria (n) refer to diverse values of random index (RI). Based on T. L. Saaty & Ergu (2015) the RI of factors is 1.12 and for sub-factors is 1.45

4.3.5 Phase 5. Global weights

Using Eq. (3) the local factor weights are calculated, yet global weights stay the same to their local weight. It is fundamental to determine the weights of the components within the factors.

$$Global\ weight\ of\ subfactors = local\ subfactor\ weight \times Global\ factor\ weight$$

4.4 Results and discussion

Table 5 and 6 show the results for the factors and sub-factors. In all cases the CR values are < 0.10 which confirms the consistency of the suggested model and lead us to accept the obtained weights.

In Table 5 can be found the top 5 factors, where “Work-Life Balance” is positioned in the first place with a weight of 0.408. In the second place are the “Financial Incentives” with a weight of 0.310. The third place is occupied by the “Institutional Support”, with a weight of 0.143. In the fourth place are the “Professional Development Opportunities” with a weight of 0.087. Finally, in the fifth place are the “Recognition Programs” with a weight of 0.051. These results highlight the importance that researchers give to the equilibrium between work and personal life, through flexible work schedules, free time, etcetera. These aspects have a significant impact in satisfaction and productivity, so they should be considered in the design of research policies. In fact, some authors have supported the idea of focusing on researchers and their balance between health and motivation, rather than focusing only on their research output (Alsuwailem, 2023; Xu et al., 2021).

While funding is recognized to have positive impact on researchers’ productivity (Franzoni et al., 2011b), some authors highlight the importance of identifying the possible consequences of basing a research policy on incentives (Daumann et al., 2023). Some of the challenges identified with the use of incentives are competition, unethical behaviors, and dependence on immediate rewards. For what was mentioned above, the use of financial incentives should be carefully designed to guarantee the high-quality of research. The results of this study confirm the relevance of institutional support to researchers as an element that increases their reputation and favors them to make a significant impact on their academic field. The importance that institutions provide enough resources to promote research has been identified by Lundwall (2019).

Table 5. Comparison matrix of core factors

Factor	Financial incentives	Recognition programs	Professional development opportunities	Institutional Support	Work-Life balance	**Weight**	**Consistency test**
Financial incentives	1	5.67	4.17	4	0.44	0.310	$\lambda_{\max} = 5.277$
Recognition programs	0.18	1	0.48	0.30	0.18	0.051	CI=0.069
Professional development opportunities	0.24	2.08	1	0.36	0.29	0.087	RI=1.1 2
Institutional Support	0.25	3.38	2.75	1	0.27	0.143	CR=0.062
Work-Life balance	2.30	5.56	3.42	3.72	1	0.408	

Source: Self-elaboration following T. L. Saaty (2008)

Table 6 summarizes the weights of each sub-factor, as well as consistency test results resulted from the comparison between the five factors and the nine sub-factors.

In Table 6 it can be noted that research funding (W=0.248), bounded rationality (W=0.184), and professional development (W=0.142) are the three sub-factors that integrate the financial incentives factor. The common topics among these sub-factors are the access to training to improve academic development, as well as economic aspects such as obtaining resources and salary increases. In fact, the access to funding represents a critical aspect that can influence the achievement of institutional objectives. However, as mentioned before, while the use of incentives could promote research, they could also affect research quality (Franzoni et al., 2011b).

Nonetheless, the possibility to get an immediate income could influence researchers' decision to publish more articles with lower quality, rather than focusing on high-quality projects, which can result in a competitive environment within the institution. Therefore, a wrong implementation of financial incentives can cause researchers to only focus on obtaining a reward, while their intrinsic motivation is being diminished. Hence, extrinsic and intrinsic factors should complement each other, rather than being substitutes (Goncharuk & Vinot, 2023). Furthermore, bounded rationality is

influenced by the pressure to publish and the incentives (Barbour, 2015; Franzoni et al., 2011b).

The following three sub-factors are highlighted for the recognition programs factor: impact on the academic community (W= 0.275), awards and distinctions (W=0.180), and characteristics of the journal (W=0.150). Hence, the visibility obtained by publishing in high-impact academic journals, the prestige within the academic community, as well as external factors like recognitions and awards, are aspects highly valued by researchers when engaging in academic projects. Goncharuk & Vinot (2023) studied both intrinsic and extrinsic motivations of researchers, leading two important conclusions: first, researchers value more the extrinsic motivators like salaries and incentives, and second, institutions should benefit more of eliminating negative incentives rather than focusing on introducing new ones.

Regarding Professional development opportunities, three main sub-factors are prioritized: characteristics of journals (W=0.284), bounded rationality (W=0.212) and professional development (W=0.161). Therefore, researchers consider that publishing in high-quality journals could increase their prestige among academic community. However, the bounded rationality could influence them to preferer projects with immediate professional development. In general, researchers would seek to participate in conferences, workshops and courses that allow them to increase their research skills and academic development.

Specially in private universities, Institutional support plays a relevant role in promoting research, through funding, research opportunities and work-life balance. Three sub-factors are identified as priorities within this factor: professional development (W=0.245), research funding (W=0.185), and awards and distinctions (W=0.154). As mentioned before, the existence of learning opportunities such as training programs and workshops are highly valued by researchers as opportunities to grow. The institutional support is

key in promoting high-quality research. As stated by Mamiseishvili & Lee (2018) and Lundwall (2019), the dynamism that institutions have in adapting the right incentives could improve their academic environment.

Lastly, the Work-life balance factor is reported with the following sub-factors: professional and personal commitments (W=0.238), Intrinsic motivation (W=0.177), and characteristics of journals (W=0.139). The first sub-factor, professional and personal commitments, is directly related to the work-life balance factor, given the balance that researchers expect to have both in work and personal activities. Intrinsic motivation refers to the internal force that guides researchers to do research. Finally, the prioritization of characteristics of journals as sub-factor of Work-life balance, results from the importance given by researchers to journals that while allowing them to contribute to their academic field, improve their quality of life through suitable schedules.

Table 6. Summary of priorities and consistency measures core factors vs sub-factors.

Factors / Sub-factors	Financial incentives	Recognition programs	Professional development opportunities	Institutional Support	Work-Life balance
Awards and Distinctions	0.043	0.180	0.098	0.154	0.059
Research Funding	0.248	0.077	0.108	0.185	0.053
Professional Development	0.142	0.058	0.161	0.245	0.076
Impact on the Academic Community	0.036	0.275	0.031	0.090	0.099
Professional and Personal Commitments	0.109	0.047	0.047	0.111	0.238
Characteristics of journals	0.104	0.150	0.284	0.076	0.139
Bounded rationality	0.184	0.033	0.212	0.036	0.033
Intrinsic Motivation	0.080	0.105	0.070	0.058	0.177
Extrinsic Motivation	0.055	0.103	0.057	0.046	0.110
λ_{max}	9.440	9.533	9.532	9.441	9.449
CI	0.0550	0.0666	0.0665	0.055	0.056
CR	0.0380	0.046	0.046	0.038	0.039

Source: Self-elaboration following T. L. Saaty (2008)

The complete prioritization of sub-factors is presented in Table 7. According to the AHP algorithm, the three main sub-factors that should be considered in the design of an effective research policy are: professional and personal commitments, research funding, and characteristics of journals.

Table 7. Global weights and ranks of conceptual model

Sub-factors	Global weights	Global ranks
Awards and Distinctions	0.0773	9
Research Funding	0.1385	2
Professional Development	0.1272	4
Impact on the Academic Community	0.0812	7
Professional and Personal Commitments	0.1533	1
Characteristics of journals	0.1323	3
Bounded rationality	0.0959	6
Intrinsic Motivation	0.1168	5
Extrinsic Motivation	0.0788	8

Source: Self-elaboration following T. L. Saaty (2008)

4.5. Conclusions

In the pursuit of academic excellence, private universities make important efforts to increase knowledge production at a global level. The effects of incentives have been widely explored. Literature review presented studies were the use of incentives increase knowledge production in universities. However, it is also noted the high dependence that some researchers have to these rewards, and the relevant role that institutions play in granting these incentives. For this reason, the correct design of research policies is crucial both to the institution and researchers. Through the literature review we identified interrelated factors in the implementation of incentives, such as

funding, professional development, recognition and impact within the academic community, and work-life balance.

While some of the factors are constantly found in literature, our research presents a new perspective on research policy design in private universities, the importance of considering work-life balance. Including this factor as a key element in policy design is beneficial for both institution and researchers. On the one hand, institutions would promote high-quality research, while being attractive to new talent. On the other hand, researchers' well-being is prioritized, and their satisfaction is increased.

We selected the AHP method as a framework of our research for its rigor. We assigned weights to the identified sub-factors to assess their relative importance based on researchers' preferences. Including a wide range of factors allowed us to have a more holistic approach by including researchers' well-being, broader than what some reviewed authors emphasize, this is, the use of financial incentives and the importance of academic recognition. This research contributes to the current discussion on research promotion policies by including a constantly overlooked factor, satisfaction, and researchers' well-being.

The purpose of our study was to evaluate decision-makers in the design of effective research policies that enhance researchers' well-being while promoting high-quality research. The selected analytical method, AHP, provides rigor to this analysis; however, we are aware that our research could be expanded using different techniques such as system dynamics. Despite the wide perspective that our research provides, there are limitations that should be noted. Our study could be expanded to more academic fields and universities, not only in the country but in different ones. This would bring an enlarged perspective of the effectiveness of policies in different academic and cultural contexts. Therefore, considering both institutional and personal

aspects in determining the right incentives, is critical for the success of a research policy.

Chapter 5. Leadership in private universities for the sustainable performance of research: A system dynamics approach[10]

Abstract: In the context of private universities, improving researchers' performance is critical for universities to remain competitive. This article utilizes system dynamics to analyze how key variables related to leadership, such as satisfaction, motivation, efficiency, research capabilities, and morale, interact and influence each other. We use causal loop diagrams to illustrate these relationships based on the priority assessments of 86 private university researchers, evaluated using the Analytic Hierarchical Process (AHP). Our findings emphasize the critical importance of a balanced approach to strategy and policy design, suggesting that improving one factor may inadvertently affect others, thereby influencing the outcomes for leadership in educational settings. This study provides valuable insights for decision-makers and leaders who aim to foster and enhance their academic staff's sustainable performance.

Keywords: system dynamics; effective organization; research capabilities; AHP

5.1 Introduction

In the academic context, researchers' performance is an essential component of institutional success and long-term sustainability. As a developing country, Mexico faces specific challenges impacting its higher education and academic research (Perales Franco & McCowan, 2021). In an increasingly

[10] This article is published in: Núñez-Acosta, A., & Sánchez-García, J. Y. (2024). Leadership in Private Universities for the Sustainable Performance of Research: A System Dynamics Approach. *Administrative Sciences*, 14(8), 166. https://doi.org/10.3390/admsci14080166

competitive academic environment, these institutions must find ways to optimize academic performance and the well-being of their research staff to remain relevant and competitive (Cervantes et al., 2021).

Sustainability in Mexican higher education is not limited to the management of physical and financial resources but also encompasses human sustainability, including academic staff's development and well-being. Universities having the capability to create a working environment that promotes high-quality research and continuous professional development is necessary and holds the potential to improve the academic landscape significantly. Implementing policies and leadership strategies that consider these dynamics can improve academic performance, researcher satisfaction, and morale, thus contributing to institutional sustainability.

Despite the vast literature available about school leadership, research, and accreditations, there is a significant gap in the research in terms of exploring how researchers' perceptions about these topics could influence school leadership (Edgerton & McKechnie, 2023; Tan et al., 2024). Our study aims to fill this gap using system dynamics (SD) to incorporate the final priority that participating researchers assigned to the factors assessed through the Analytic Hierarchy Process (AHP), methodologies that, despite being well established, have not been widely applied in this specific context. This methodological combination allows for a deep and structured comprehension of the interactions and dependencies between the different factors involved, providing a solid base for decision-making and the implementation of improvements in school leadership. By connecting academic research priorities with effective school leadership practices, this study aims to contribute to developing more robust educational strategies aligned with the needs of the Mexican context.

Considering the above, the variables assessed in this study were defined in terms of leadership, considering the elements prioritized by 86 private

university researchers using the AHP approach. These elements include work–life balance, institutional support, professional development programs, financial incentives, and recognition programs. The relationships between these variables are illustrated using causal loop diagrams, providing a comprehensive view of the factors that should be considered in designing leadership strategies and policies in the Mexican educational environment. The findings of this study have significant implications for decision-makers and university leaders in Mexico, who must adopt a balanced approach to improve academic performance and research staff's well-being.

Our article strives to offer a comprehensive perspective on how different interrelated factors influence leadership and sustainability in private Mexican universities. Through an in-depth analysis using system dynamics tools, it aims to provide insights that can guide university leaders in creating more effective and balanced strategies. Our results can help design policies that improve a specific aspect of the academic environment and consider its overall impact on the institution.

This study proposes a framework that assesses the relationship between the factors researchers consider a priority for their development and the leadership decision-makers adopt in private universities. Specifically, we seek to (a) establish the research priorities of academics in private universities using the AHP. (b) Assess the relationships between the factors each researcher considers a priority for their development using the systems dynamics approach. (c) Determine the effect of key factors and decision-makers' leadership. (d) Propose strategies, guided by dynamic systems, to improve the alignment between research priorities and the school leadership adopted in private universities.

In the Mexican context, where resources for education and research may be limited, maximizing the positive impact of any intervention is essential. Improving the performance and well-being of researchers will not only

strengthen the scientific production of private universities but also contribute to the country's development, promoting greater equity and quality in higher education.

5.2 Literature review

Leadership in higher education has been studied in educational administration because of its impact on academic performance and staff well-being. Effective leadership is characterized by leaders' ability to inspire and motivate their teams, promote a positive working environment, and support continuous professional development (Haar et al., 2014; Khan et al., 2023). Within this context, two types of leadership have been identified as effective in the educational setting.

Transformational leadership is based on inspiring and motivating academics and students through a shared vision and mutual commitment (Elshaer et al., 2024). This approach fosters the development of individual and collective capabilities within the institution, promoting a culture of collaboration and continuous improvement (B. Bass & Avolio, 1994; Hallinger, 2003; Marks & Printy, 2003). Transformational leaders can generate a high level of enthusiasm and commitment among academic community members, resulting in an environment conducive to learning and innovation.

Instructional leadership, on the other hand, is a collaborative effort that focuses on monitoring curricula and teaching, with the aim of enhancing teaching practices and academic outcomes (Burns, 1978). This type of leadership involves paying careful attention to the quality of education, ensuring that teachers receive the necessary support and guidance to improve their teaching practice. Instructional leaders work hand in hand with teachers to develop effective teaching and learning strategies, which significantly contribute to raising the educational standards of the institution.

Studies such as those by Almutairi (2020) and Cruz-Bohorquez et al. (2024) have explored how effective school leadership can influence the educational environment. These studies highlight the importance of strong and clear leadership in achieving academic success, underlining that leaders who combine transformational and instructional leadership elements are particularly effective. Cruz-Bohorquez et al. (2024) examined the impact of institutional support and professional development programs on academic performance, while Almutairi (2020) investigated the role of financial incentives and recognition programs in academic staff's motivation and satisfaction.

Sustainability in higher education involves the efficient management of physical and financial resources and the creation of an environment that promotes the well-being and continuous development of academic staff. Sterling (2001) argues that sustainability in higher education must include a holistic approach that considers environmental, social, and economic sustainability. This approach ensures that educational institutions are sustainable not only in terms of their resources but also in terms of the quality of life of their staff and students. Wals & Jickling (2002) highlight the importance of integrating sustainability principles into the curriculum and institutional management, promoting sustainable practices that can positively impact the academic community and beyond. Yanniris (2021) proposed an integrative approach to sustainability, peace, and global citizenship education, emphasizing the importance of leadership that fosters these areas for long-term sustainable impact.

Gunnulfsen (2023) explored how higher education institutions can address socioeconomic and environmental challenges through sustainable practices, highlighting the importance of leadership in promoting these efforts. Hashim et al. (2022) provided strategies and perspectives on leadership for sustainability in higher education, highlighting the need for integrated and

collaborative approaches. Constantinides (2023) discussed innovative approaches to sustainable development in higher education, including case studies and the successful practices implemented in various institutions.

Ghasemy et al. (2024) identify several essential practices for sustainability in educational institutions. These practices include institutional support, professional development programs, financial incentives, and recognition programs. In addition, they highlight the importance of community involvement, the integration of sustainability into the curriculum, and commitment to reducing the institution's carbon footprint. The major contribution of this study lies in its holistic approach to addressing sustainability, suggesting that higher education institutions should adopt a comprehensive strategy that encompasses both operational and educational aspects to achieve lasting impact.

Aleixo et al. (2018) provide a conceptual model that analyses how the academic system influences the adoption of research-based instructional strategies, emphasizing the role of institutional support and professional development programs in academic performance in Mexican private universities. This study underlines the importance of understanding the internal dynamics that affect the adoption of new teaching practices. This approach is particularly relevant for analyzing how to improve leadership and sustainability in private universities in Mexico.

Jørgensen & Hanssen (2018) investigated the role of financial incentives and recognition programs in the motivation and satisfaction of academics, showing that these factors are essential for fostering a positive and productive work environment.

The system dynamics (SD) methodology, introduced by Forrester (Sterman, 2000), has been utilized in educational studies to analyze the effects of educational policies, resource management, and academic performance

enhancement (Coyle, 2000; Richardson, 1997). This methodology provides an innovative way to address the complexities of school leadership and research in private universities. It allows for modeling interactions and dependencies among different components in a system, making it easier to identify leverage points and develop more effective intervention strategies.

5.3 Methodology

According to Duggan (2016) and Meadows et al. (1982), problems with a high social component can fall into the category of unstructured problems because it is difficult to find a single root cause, while, at the same time, multiple visions converge on a given problem and, commonly, each participant wants his or her solution to be the one that is implemented. In his model of science, Wartfield (2006) proposed adopting the framework of systems science and the analytical tools that comprise it to enrich research processes and overcome the limitations of conventional tools, i.e., to include the relationships between components and the structure and context of a given system and propose courses of action that promote change (Forrester, 2009).

Based on the above, the methodological framework supporting this article's development is Forrester's SD (Forrester, 1971). The selection of SD is because this approach allows researchers to understand the structure of any system using causal loop diagrams (CLDs) and, at the same time, facilitates an understanding of the complex interactions present in the structure through the visualization of Forrester or Stock and Flow diagrams. Together, these elements help to identify and model the causal relationships within the system, allowing us to understand how the effect influences the cause.

The following is a brief description of the stages of SD applied in this study, considering Cole (2012) and Forrester (1989):

1. Frame and articulate the problem: According to Duggan (2016), this phase demands identifying key aspects of the problem and exploring the reasons for

or aspects of the problem that are worth addressing. In other words, this step allows for capturing the underlying aspects of the problem's structure by representing the feedback loops between system elements. To accomplish this step, the results of the final prioritization that the participating researchers assigned to AHP-assessed factors and leadership elements were taken as the base input.

2. Design a conceptual model based on a CLD: Subsequently, a model is proposed using a Forrester diagram, which distinguishes essential resources as stocks of assets or shares, recognizes the nature of the relationships between these resources and the possible levers that change their state, and establishes feedback structures.

3. Build a simulation model: The process of building the simulation model is iterative and thorough. It involves identifying resources and their states and expressing the structure using flows, stocks, and feedback. That is, expressing the equations that formalize key resources as accumulations, potential drivers of those resources or flows, and potential feedback structures and lag effects (Duggan, 2016).

4. Running the simulation model: Once the elements established in the Forrester diagram are parameterized, this model simulates the system's behavior in different scenarios to evaluate how variations in internal and external factors affect system performance.

5. Evaluation and validation: The simulated scenarios are compared with accurate data to validate the model. If the predictions do not match observations, the model is adjusted until it adequately represents reality. Finally, the validated model is used to formulate informed policies and strategies.

The AHP technique complements the SD approach by facilitating decision-making within complex problems by decomposing them into simpler components. Using an algorithm based on paired comparisons, the AHP allows for the prioritization of alternatives and assessing their relative importance (R. W. Saaty, 1987). The AHP has been applied for diverse purposes, including evaluating and prioritizing critical factors in strategic decision-making, selecting educational programs, allocating resources, and identifying research priorities (Timóteo et al., 2024; Vaidya & Kumar, 2006). The ability of the AHP to decompose complex problems and evaluate multiple criteria simultaneously makes it an invaluable tool for educational leaders who seek to make informed and balanced decisions. This approach provides a deep understanding of complex and dynamic systems, facilitating the making of strategic decisions and evaluating systemic interventions (Bloodgood et al., 2015; Conz & Magnani, 2020; Fisunoğlu, 2018; Gharajedaghi, 2011; Lane & Oliva, 1998; Rebs et al., 2019; Sánchez-García et al., 2023; Sánchez-García & López-Hernández, 2020; Wolstenholme, 1990).

Information Collection

The information in this study was collected with the participation of a group of academics belonging to private universities. According to the National System of Researchers of the National Council of Humanities, Sciences, and Technologies, the regulatory body of scientific policy in Mexico, researchers from private universities generate almost 50% of the national high-impact indexed academic production (CONAHCYT, 2022). Subsequently, we used purposive sampling, and the study participants were selected based on the following characteristics: having a doctoral degree, being full-time employees of private universities, and dedicating at least 50% of their working day to scientific research, as well as belonging to the National System of Researchers, which grants them recognition by the Mexican government and

assigns them a level based on their years of experience and research impact. Based on the above, eighty-six academics participated in the study. This sample size, 86, is adequate in the AHP framework since this tool does not take a parametric perspective. Due to the diversity and representativeness of this number, this sample size ensures comprehensive perspectives and opinions, which reduces bias and increases the reliability of the results.

5.4 Results

In an SD analysis, a causal loop diagram is essential to represent and understand complex system interactions and feedback. Figure 1 describes the causal relationships between the problem structure's critical aspects. This step is fundamental to capture the interactions and feedback between system elements, using the paired-wise comparisons from 86 academics affiliated with private Mexican universities, who prioritized factors that could increase their research performance through the AHP.

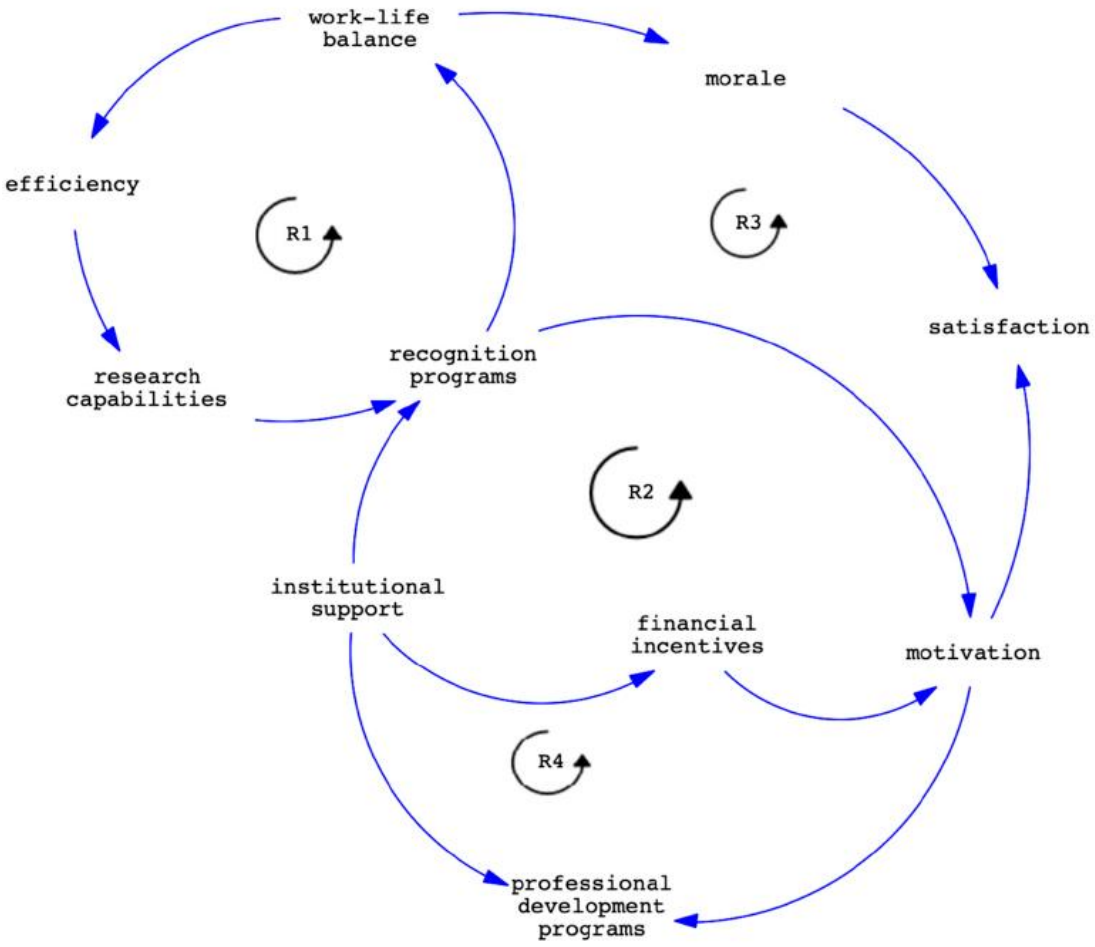

Figure 1. Causal loops based on researchers' prioritization of leadership factors.

Source: elaborated using Vensim (Ventana Systems Inc., 2023)

It is considered appropriate that our article does not aim to show the development of the AHP algorithm but to incorporate the final priority that participating researchers gave as the foundation for the conceptual model.

Table 1 shows the results of this evaluation and highlights the following five factors:

Table 1. Analytical hierarchy process results.

Criterial	Pairwise Comparisons	Priority
Financial incentives	0.310	2
Professional recognition	0.051	5
Research and professional development	0.087	4
Institutional support	0.143	3
Work-life balance	0.408	1
Consistency CI	-	0.069
Consistency rate (CR)	-	0.062

Source: Self-elaborated based on prioritization factors of academics.

The top priority for researchers is “Work-life balance”. This suggests that offering academics and scientists the opportunity to balance their work responsibilities with their personal lives is essential to achieving an effective and productive research environment. This balance can include flexible work schedules, support for work–family balance, and time for leisure activities. Xu et al. (2021) highlight the need to value academics as researchers and educators, and Alsuwailem (2023) and Jindal-Snape & Snape (2006) also support the importance of this balance for health, creativity, and talent retention.

In second place are the “financial incentives”, which indicates their significant influence on the productivity of researchers. Daumann et al. (2023) and Franzoni et al. (2011) point out that although financial incentives could be important motivators, they could also create problems like competition and dependence on immediate income. For this reason, an efficient research policy must balance these incentives with research quality.

“Institutional support” is the third most important factor. According to Lundwall (2019), providing the necessary resources is crucial for researchers to significantly impact their academic community and discipline. This support could improve the profile and reputation of researchers.

“Research and professional development” and “Professional recognition” are also essential components of the system, although with lower weights. These

elements show the need for continuous development and opportunities for recognition to foster a motivating and productive research environment.

To comprehensively address aspects of leadership, this study proposes integrating additional critical factors that show the impact of university leadership. Therefore, we incorporated other fundamental factors like satisfaction, research capacities, morale, efficiency, and motivation, aligning with the Transformational Leadership Theory. This theory, developed by James MacGregor Burns and later expanded by Bernard M. Bass, focuses on a leader's capacity to inspire and motivate followers to reach objectives beyond their interest, promoting their development and well-being (B. M. Bass & Riggio, 2006). In the educational context, transformational leadership has been demonstrated to effectively improve educational culture and academic performance (Leithwood et al., 2010). Additionally, research such as that of Hallinger (2003a) and Marks & Printy (2003) shows that transformational leaders can positively influence researchers' commitment and professional development. For this reason, the integration of these critical factors not only provides a more comprehensive assessment of university leadership but also fosters a more dynamic and practical academic environment.

This integrative perspective not only seeks to add leadership to educational institutions but also promotes an environment that fosters academic excellence and the well-being of the university community. Researchers' satisfaction is fundamental, since a satisfied staff tends to be more motivated and committed, improving their morale and efficiency at work. Their research capabilities reflect the university's ability to produce new and relevant knowledge, a key factor in its reputation and international competitiveness. The morale of the academic staff is an indicator of well-being and cohesion within the institution, which directly impacts the productivity and quality of the work performed. The efficiency in using resources and time is crucial to maximize research results and minimize waste, ensuring that the university

can maintain high levels of scientific production with the available resources. Finally, motivation drives performance and innovation through recognition, appropriate incentives, and continuous professional development.

Therefore, considering these additional elements provides a better understanding of leadership in Mexican higher education, thus allowing for a better evaluation of its capacity to participate in research at a global level. This integrative perspective improves leadership within educational institutions and promotes an environment that fosters academic excellence and well-being in the university community.

Vensim software helped model and simulate complex systems by creating causality diagrams and stock flows. This CLD shows how these factors are interrelated and are essential for effective leadership in a university context. For instance, recognition programs supported by committed leadership increase researchers' motivation. This increase in motivation could foster higher work satisfaction, increasing staff morale. High morale contributes to a better work–life balance, which increases the research work's efficiency (reinforcing loop R1). Improved efficiency strengthens research capabilities, closing a positive feedback loop essential to maintaining a productive and motivated research environment (reinforcing loop R2). In addition, professional development programs increase researchers' motivation, satisfaction and morale, work–life balance and efficiency, and research capabilities in a virtuous cycle (reinforcing loop R4). According to Forrester (1989) and Sterman (2000), positive feedback loops are critical for growth and sustainable innovation in complex systems like private universities.

5.4.1. Model

The CLD provides an initial approximation that helps create a model using a Forrester diagram. This diagram is a crucial tool in dynamic systems, and it is used to illustrate how resource levels (stocks) in a system change over time due to input and output, as well as the possible factors that affect these changes (Figure 2).

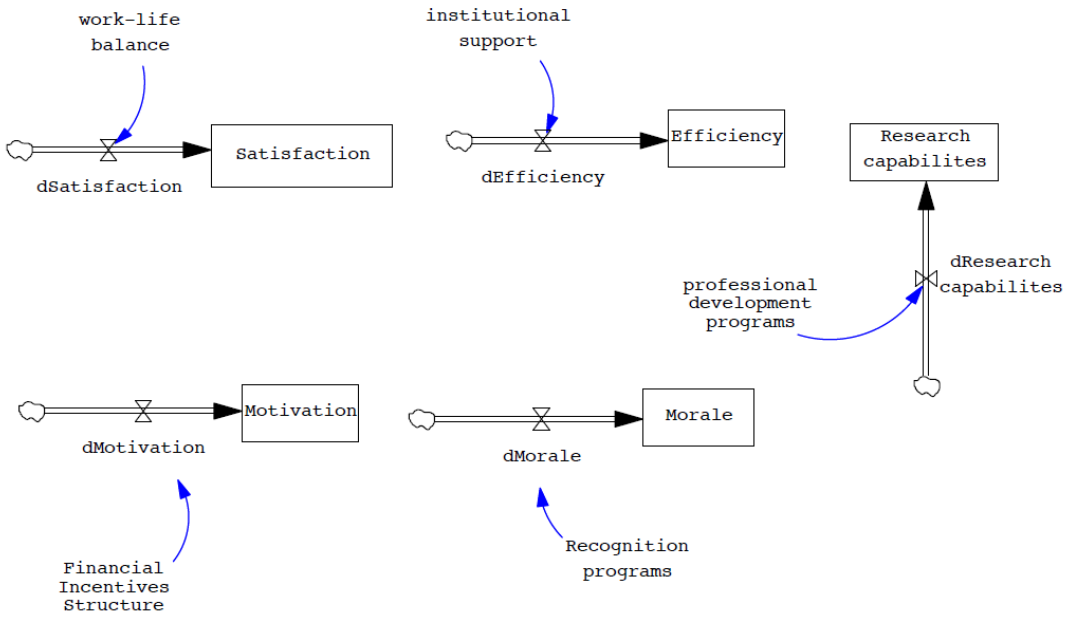

Figure 2. Forrester diagram of leadership factors in private universities in Mexico.

Source: elaborated using Vensim (Ventana Systems Inc., 2023)

The model's simulation uses numeric integration to solve differential equations over time. The input parameters include work–life balance, financial incentives' structure, institutional support level, professional development programs, and recognition programs.

We simulated five scenarios with a specific increase in the key variables (satisfaction, motivation, efficiency, research capabilities, and morale) to assess their impact on the other system variables. This allows us to

understand the feedback dynamics and the interrelations among variables in the context of private Mexican universities.

5.4.2. Level (Stocks), Flow, and Auxiliary Variables

These variables represent the accumulated states in the system and are updated through the integration of flows. Tables 2 and 3 describe the variables that conform to the proposed model.

Table 2. Description of stock variables in the model.

Stocks	Definition	Equation
Satisfaction	Satisfaction level	$Satisfaction(t) = Satisfaction(t_0) + \int_{t_0}^{t} Satisfaction\ dt$
Motivation	Motivation level	$Motivation(t) = Motivation(t_0) + \int_{t_0}^{t} dMotivation\ dt$
Efficiency	Satisfaction level	$(Efficiency(t) = Efficiency(t_0) + \int_{t_0}^{t} dEfficiency\ dt$
Research capabilities	Research capabilities level	$\text{Research capabilities}(t) = \text{Research capabilities}(t_0) + \int_{t_0}^{t} d\text{Research capabilities}\ dt$
Morale	Morale level	$(\text{Morale}(t) = \text{Morale}(t_0) + \int_{t_0}^{t} d\text{Morale}\ dt$

Source: self-elaborated based on the conceptual model.

Table 3. Description of flow variables in the model.

Flow	Definition	Equation
dSatisfaction	Exchange rate of satisfaction level	$d\text{Satisfaction} = (Work\_Life\_Balance\_Policies \cdot 0.1) \cdot \left(1 + 0.5 \cdot \sin\left(\frac{t}{10}\right)\right)$ +random_component +ups_and_downs_component
dMotivation	Exchange rate of motivation level	$d\text{Motivation} = (Financial\_Incentives\_Structure \cdot 0.08) \cdot \left(1 + 0.3 \cdot \sin\left(\frac{t}{10}\right)\right)$ +random_component +ups_and_downs_component
dEfficiency	Exchange rate of efficiency level	$d\text{Motivation} = (Financial\_Incentives\_Structure \cdot 0.08) \cdot \left(1 + 0.3 \cdot \sin\left(\frac{t}{10}\right)\right)$ +random_component +ups_and_downs_component
dResearch capabilities	Exchange rate of Research capabilities level	$d\text{Research capabilities} = (Professional\_Development\_Programs \cdot 0.06) \cdot \left(1 + 0.25 \cdot \sin\left(\frac{t}{10}\right)\right)$ +random_component +ups_and_downs_component
dMorale	Exchange rate of morale level	$d\text{Morale} = (Recognition\_Programs \cdot 0.07) \cdot \left(1 + 0.15 \cdot \sin\left(\frac{t}{10}\right)\right)$ +random_component +ups_and_downs_component

Source: self-elaborated based on the conceptual model.

The flow variables represent the exchange rate in the level variables; that is, they influence the evolution of the stock variable over time.

Table 4 presents the auxiliary variables used for intermediate calculations, which do not have an accumulative state in the system.

Table 4. Description of auxiliary variables in the model.

Auxiliary variables	Definition	Value example
Work_Life_Balance_Policies	Policies of work-life balance	0.8
Financial_Incentives_Structure	Financial incentives' structure	0.7
Institutional_Support_Level	Level of institutional support	0.9
Professional_Development_Programs	Professional development programs	0.85
Recognition_Programs	Recognition programs	0.75

Source: self-elaborated based on the conceptual model.

These definitions and equations cover the main variables used in this model, providing a clear perspective on how they are calculated and interact.

5.4.3. The "What If" Approach to Scenario Simulation

The following interpretations provide a vision of how these variables evolve and are mutually affected and how decision-makers or leaders can address these aspects to enhance research in private universities.

First scenario—the response of variables to an increase in satisfaction: When decisionmakers in private universities in Mexico opt for a significant increase in satisfaction, a characteristic dynamic behavior is observed in the system. Satisfaction significantly increases during the intervention period, reflecting the effectiveness of the applied policy. This improvement in satisfaction drives moderated increments in motivations and research capabilities due to the positive correlation among these factors. However, efficiency and morale tend to relax, suggesting that although satisfaction is crucial, it is not the only determinant of efficiency and research capabilities (Figure 3). SD could explain this behavior, where the effects of the level variables could have direct and indirect impacts. However, the magnitude of these impacts could vary depending on the system's interactions.

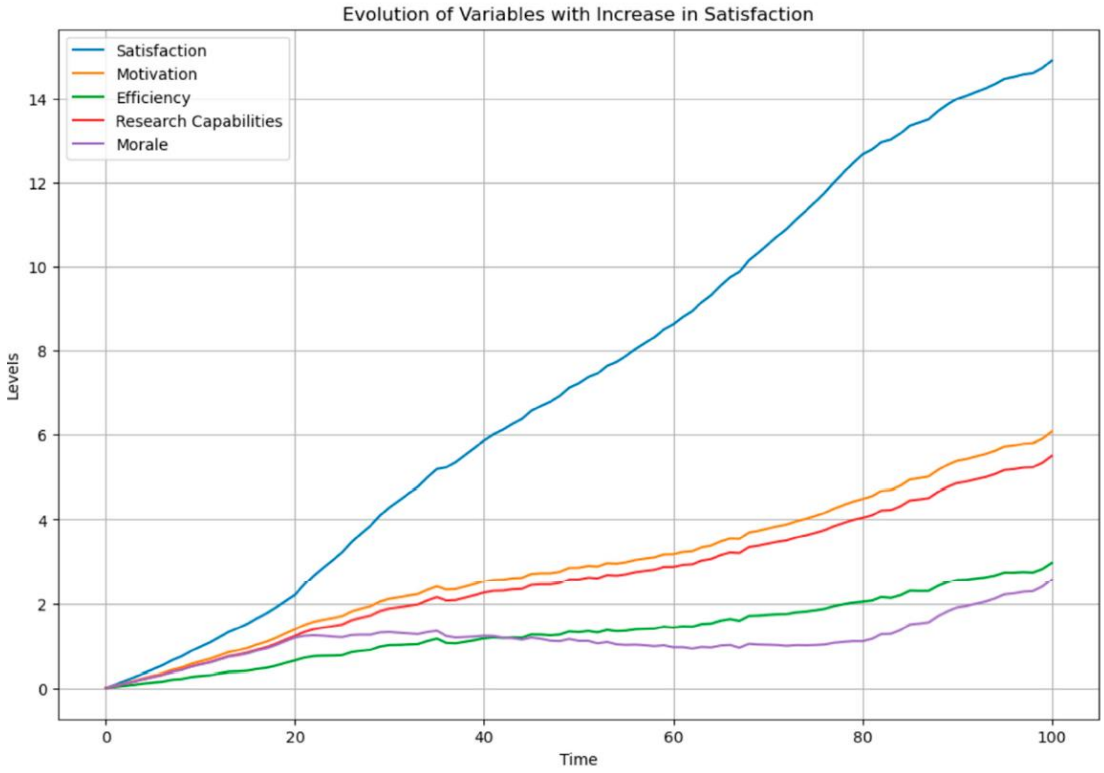

Figure 3. Response of variables to an increase in satisfaction.

Second scenario—the response of variables to an increase in motivation: In the scenario where motivation is increased, the motivation itself shows a pronounced increase, depending on the intervention applied. This increase in motivation generates positive feedback that also increases satisfaction and morale, since motivated researchers tend to feel more satisfied and keep high morale. The efficiency and research capabilities also show improvements, although less significantly (Figure 4). This suggests that motivation is a critical factor for general performance, but its impact on efficiency may be mediated by other factors such as resources and the institutional environment.

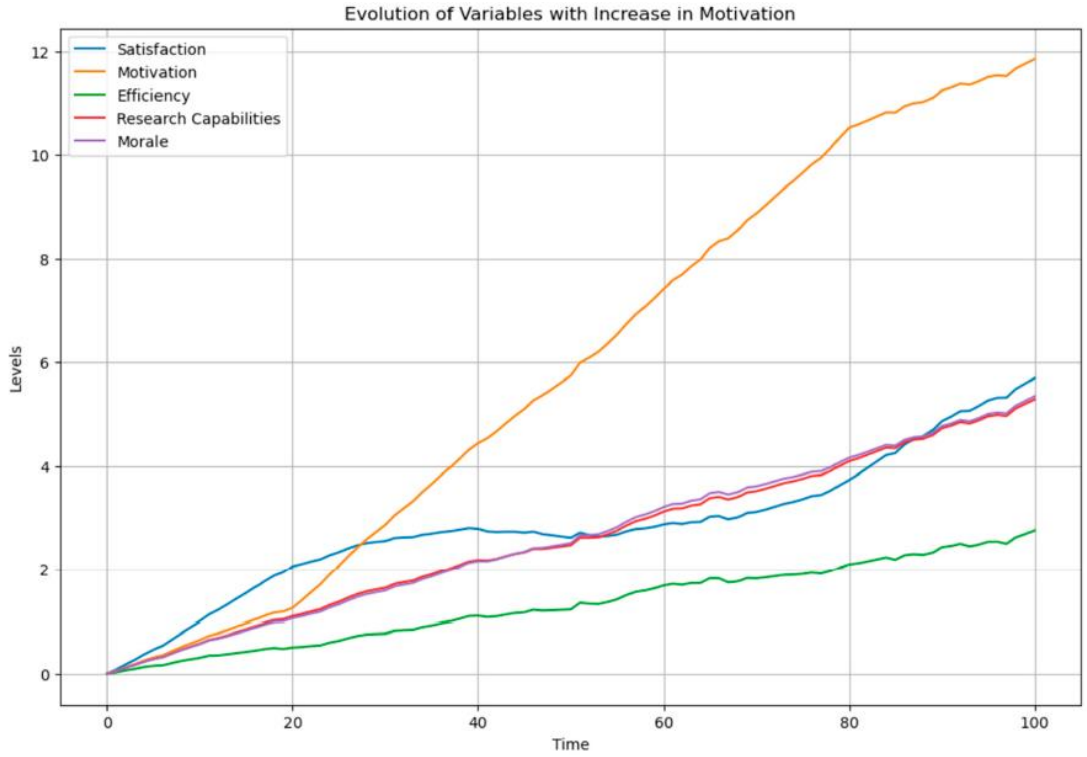

Figure 4. Response of variables to an increase in motivation.

Third scenario—the response of variables to an increase in efficiency: When decisionmakers at private universities opt for a significant increase in the efficiency variable, their behavior is consistent with the exogenous intervention applied, demonstrating that the increase in efficiency is directly reflected in its level. This increase in efficiency results in a notable improvement in the satisfaction and motivation of researchers due to the improvement in institutional processes and the perception of productivity. Additionally, although researchers' research capabilities also increase, this is less pronounced, suggesting a positive indirect effect due to the better utilization of resources and a more productive environment for research. However, morale does not show an increase in behavior since, although efficiency could improve certain aspects of the work environment, other factors like recognition and professional development programs have a more direct influence over research morale (Figure 5).

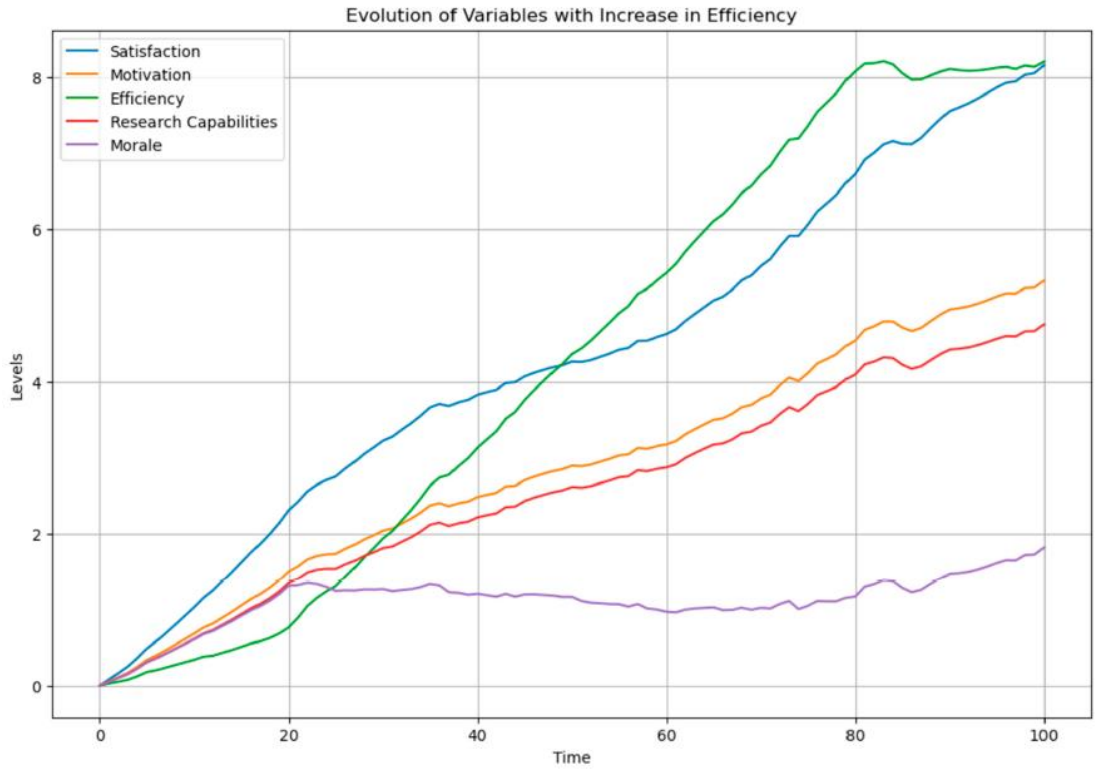

Figure 5. Response of variables to an increase in efficiency.

Fourth scenario—the response of variables to an increase in research capabilities: In the scenario where research capabilities are increased, a considerable increase is observed in this variable, reflecting the applied intervention. Increasing research capabilities improves satisfaction and motivation since a robust research environment can increase the perception of value and employee commitment. The efficiency shows a moderate increase, suggesting that research capabilities positively affect efficiency. The morale increases, but not as steeply as satisfaction and motivation (Figure 6).

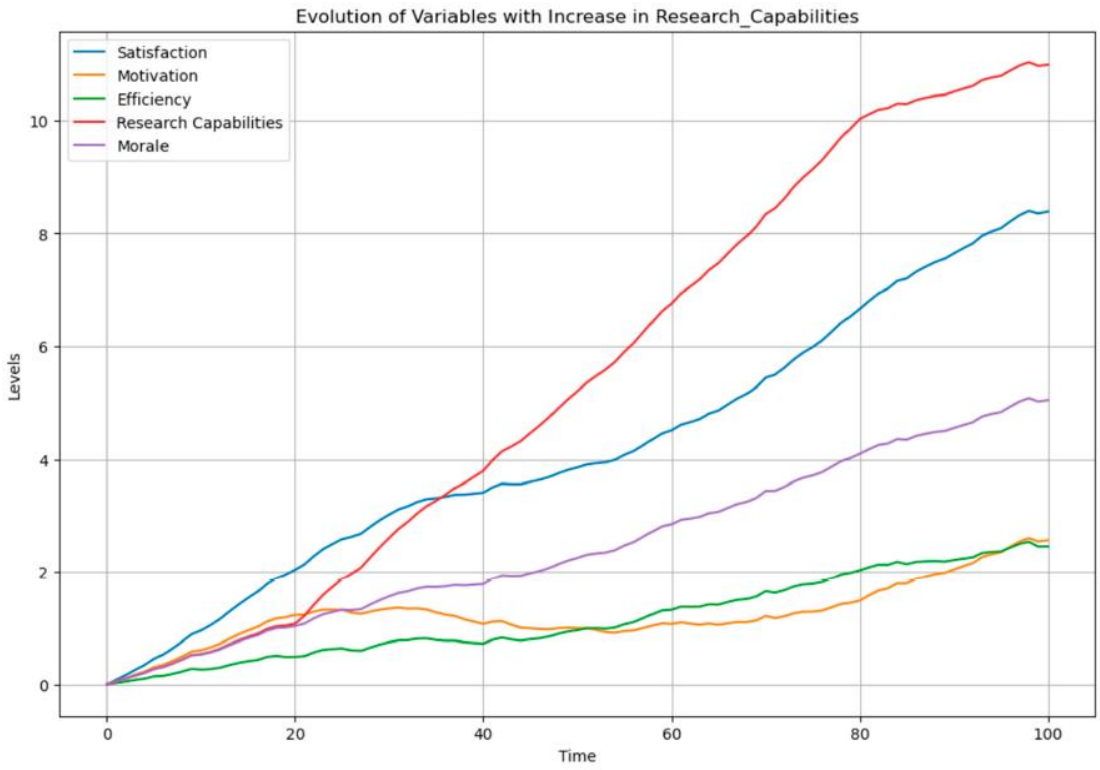

Figure 6. Response of variables to an increase in research capabilities.

Fifth scenario—the response of variables to an increase in morale: When decisionmakers opt for an increase in morale, this variable shows a significant increase during the intervention period. Satisfaction and motivation also significantly increase, creating a more favorable environment for ethical research and the recognition of researchers. Their efficiency and research capabilities, however, show moderate increases. This may be attributed to the influence of other factors not directly related to morale, like extra pressure or high expectations resulting from the new environment (Figure 7).

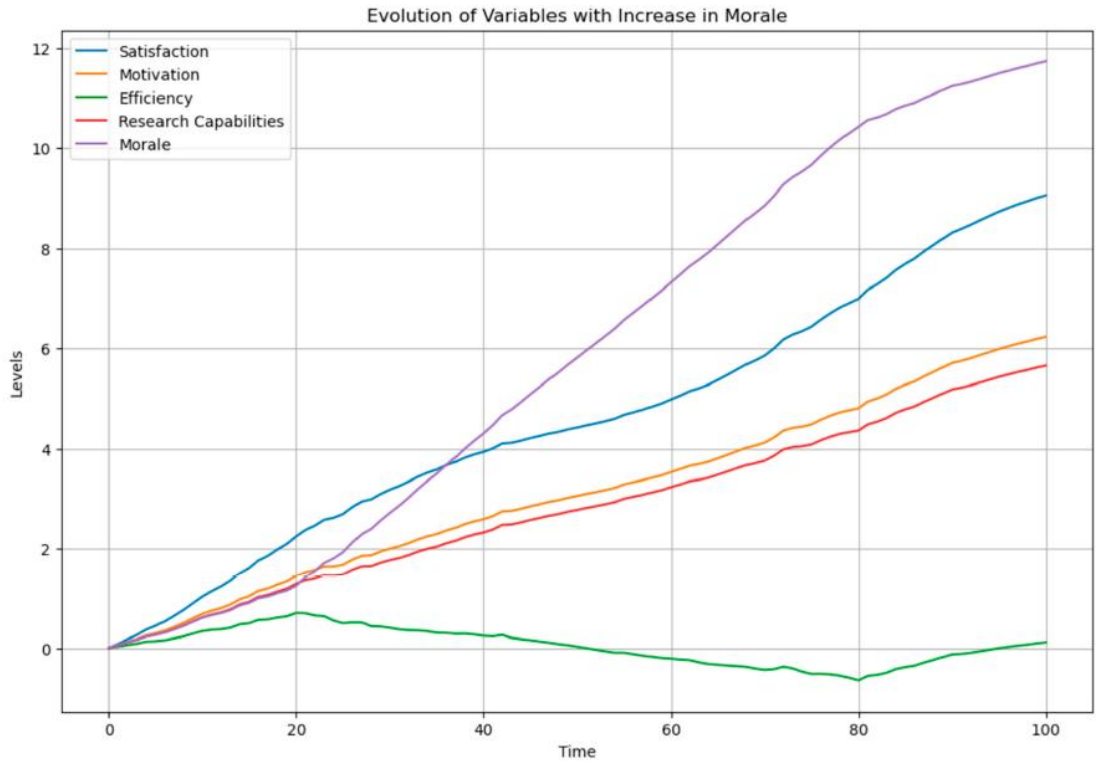

Figure 7. Response of variables to an increase in morale.

5.5 Discussion

Studies by Haar et al. (2014) and Khan et al. (2023) agree on the importance of leadership in the performance of employees. These authors believe that leaders, academics, and administrators should guide the design of policies and practices for work efficiency based on organizational justice. Understanding the dynamics of organizational justice can help academics better navigate their work environments and seek conditions that favor or positively impact their performance or productivity. In a sense, this includes implementing fair and equitable procedures and fostering fair interactions among staff. Our approach differs slightly in this regard because when decision-makers or university leaders choose one of these variables as the focus of their strategies, the impact can be profound and multifaceted. The above scenarios lead us to the following key considerations.

The impact could be significant and sustained if leadership, particularly university managers, recognizes that increasing satisfaction is a critical objective in any academic environment. In the academic context, researcher satisfaction could arise from a variety of factors, including positive work, institutional support, and adequate resources. Higher satisfaction among researchers often translates into higher motivation, which in turn translates into higher efficiency and productivity. These ideas coincide with those put forward by Elshaer et al. (2024), Hallinger (2003a) and Marks & Printy (2003), who state that under the perspective of transformational and instructional leadership, the active participation of researchers should be encouraged to lead their efforts toward the development of collaborative networks that maximize the benefits without neglecting the personal dimension. Based on the results obtained through SD, it is possible to say that satisfied researchers are more likely to improve their research capacity, which reinforces their morale and their commitment to the institution. Therefore, university managers, in particular, should consider satisfaction a crucial variable that drives a cycle of improvement in critical areas.

On the other hand, the proposals of Almutairi (2020) and Cruz-Bohorquez et al. (2024) stress the relevance of leadership and the organizational support and backing that should be provided to researchers. For example, Almutairi's (2020) ideas focus on the self-efficacy that leadership should foster and its impact on the organizational commitment of academic staff members, suggesting that high self-efficacy fostered by the support of leaders would translate into higher levels of loyalty and job satisfaction, while Cruz-Bohorquez et al. (2024) developed a system dynamics model to analyze how the academic system influences faculty’s motivation to adopt research-based instructional strategies. Both works agree that institutional support and the perception of available resources are crucial factors for success in implementing changes and improvements in education. Our results for the scenario in which motivation is increased agree that motivation is a crucial

factor driving researchers' performance and that an increase in motivation is positively associated with personal and professional satisfaction, which can influence the adoption of a culture of continuous improvement in researchers. This is considered fundamental to maintaining a positive and sustainable work environment. Moreover, efficiency in the daily work of researchers is also increased by adopting a motivational approach, which can translate into higher productivity and the optimization of available resources. This can lead to an improvement in capabilities, reflected in the quality and impact of research. On the other hand, researcher morale, which also increases with motivation, contributes to a more dynamic and positive working environment. A high level of morale can foster collaboration and innovation within the team, which is essential for research progress. However, while adopting or implementing a motivation-focused approach has several benefits, decision-makers must be careful not to generate unrealistic expectations among researchers. If incentives and rewards are not properly managed, an over-reliance on these external stimuli may arise, which could diminish researchers' intrinsic motivation in the long run. In addition, if motivation programs are not equitable or fair, they can create a feeling of favoritism or unfair competition, which can deteriorate the work environment and cause tension among team members. Another risk is work overload. To increase motivation, researchers may take on more responsibilities or projects than they can handle.

Efficiency is a direct indicator of researcher performance. In this sense, Aleixo et al. (2018), Constantinides (2023), and Hashim et al. (2022) converge in describing efficiency as a critical factor of performance in both teaching and high-performance academic research. Hashim et al. (2022) accentuate that higher education institutions should adopt emerging strategies that promote adaptability and innovation, thus improving efficiency in their administration and research processes. This approach would enable institutions to respond quickly to technological changes and emerging demands in scientific

research, optimizing resources and improving academic results. Similarly, Constantinides (2023) stresses that efficiency in management and the implementation of research practices is fundamental to achieving high levels of research performance without neglecting the satisfaction of academics. At the same time, Aleixo et al. (2018) emphasize efficiency in the context of institutional authorities. The authors argue that for institutions to achieve high research performance, leaders must implement efficient resource management practices and create a structure to facilitate high-quality research. In this sense, our results agree with Aleixo et al. (2018) in that when efficiency improves, satisfaction increases due to the perception of achievement and meaningful contribution. Efficiency also motivates researchers to maintain their high performance and develop their research capabilities. This continuous improvement process boosts researcher morale, creating a positive cycle of high performance and satisfaction. Leaders should implement systems and processes that facilitate efficiency, such as access to advanced technologies and the simplification of administrative procedures.

The last ideas suggest that developing research capabilities is vital for the professional development of researchers. Increased capabilities often lead to greater satisfaction, as researchers feel more capable and confident in their abilities. Improved research capabilities also motivate researchers to face new challenges and become more efficient. This professional growth strengthens their morale and commitment to the institution. University leaders should invest in continuing education and professional development programs to keep their researchers current and competent. High morale reflects a positive and cohesive environment. When morale increases, researcher satisfaction and motivation are observed, translating into greater effectiveness and the development of research capabilities. High morale fosters a sense of commitment, motivating researchers to actively contribute to the institution’s success. Decision-makers should promote a collaborative

and supportive work environment in which researchers' efforts are recognized.

5.6 Conclusions

This article contributes to developing and validating theoretical models that integrate diverse critical factors such as satisfaction, research capabilities, morale, efficiency, and motivation within the context of university leadership. These models provide a robust theoretical framework for understanding the complex and dynamic relations within educational institutions.

The research results give university leaders and administrators a solid base for informed decision-making. When identifying the key factors that affect research, leaders could design more effective strategies to improve research productivity and sustainability practices.

When comparing the different scenarios, it is evidenced that all variables are interrelated and mutually influenced. Satisfaction, motivation, efficiency, research capabilities, and morale conform to a dynamic system where a variable's increase tends to affect the other variables positively. This virtuous cycle of continuous improvement highlights the importance of a comprehensive focus on managing research strategies in private universities. Leaders should consider strategies that address several aspects simultaneously, creating an environment that favors the sustainable development of researchers.

Decision-makers in private universities should understand that the effective management of researchers cannot focus on a single variable in isolation. Instead, they should adopt a systemic perspective recognizing the interdependence of satisfaction, motivation, efficiency, research capabilities, and morale. When implementing policies and practices that comprehensively favor these variables, leaders can create a work environment that maximizes researchers' potential.

For researchers, this approach means working in an environment where they feel appreciated and supported, which increases their satisfaction and motivation. Their research capabilities and efficiency could significantly improve with adequate institutional support, increasing their morale and commitment to the institution. This positive cycle benefits researchers individually and boosts their general performance and the university's reputation. Decision-makers in private universities should consider dynamic systems when developing management strategies and supporting their researchers. Understanding and managing the interrelation between satisfaction, motivation, efficiency, research capabilities, and morale could foster a favorable context for the success and continuous growth of their researchers and, consequently, the institution as a whole.

Finally, this work is not without limitations, so we shall mention some of them: (1) Although AHP and SD can provide valid results with groups as small as three individuals, we consider it possible that increasing the number of participants would capture more information. (2) The context in which our work was applied was private Mexican universities. To overcome this limitation, leaders or researchers interested in developing policies to increase performance could make minor adjustments to the proposed model to adapt it to other regions or even extend it to public institutions to generate comparisons between groups. In terms of future research avenues, we suggest applying a multivariate network analysis to map organizational structures and predict the shape of their network by considering the scenarios obtained through SD.

Chapter 6. Conclusions

The study developed in this thesis opens a series of possibilities for private universities about research policy management through the Action Research methodology. This methodology is problem-based, so it contributes to this research by seeking to solve a problem to a specific client while contributing to the area of knowledge. The relevance of this research goes beyond the exclusive use of policymakers, since a well or inadequately designed policy has an impact not only at an institutional level, but also at a personal level of researchers.

This thesis began with the definition of the following research question: from the perspective of researchers, what are the factors that should be considered in the design of a research policy in private universities in Mexico? The design of this thesis leads the reader through a structured path to answer this question. After the introduction, Chapter 2 had the specific objective of exploring the Mexican research environment for business schools seeking to obtain a quality accreditation. This first analysis places the reader in a common context where the possibilities and challenges of national research are pointed out. Findings showed that when a university has a clear definition of its mission and vision, and its strategic planning is aligned to them, decision makers can take advantage of what the research environment has to offer. In practice, even the institutions that are not currently seeking for a quality accreditation could benefit from this analysis, since a well-designed research strategy impacts the institution at a local and global levels, through the visibility gained by their research production.

Although there are studies on policy design in the current literature, an overlooked topic is the perception of the person to whom the policy will be implemented. On a day-to-day basis, university decision-makers know that the correct management of human resources is key to achieving their

objectives; however, for some processes that have a direct impact on employees, their voice is rarely heard. A cross-sectional survey was designed to better understand researchers' incentive perceptions in private universities in Mexico. Therefore, the rest of the thesis focuses on the analysis and interpretation of those perceptions.

At a general level, the use of statistical methods such as z-test for differences in proportions and correlation tests, allowed to characterize researchers of private universities in Mexico according to their incentive preferences, which was the objective of Chapter 3. For those who design policies, knowing that certain demographic aspects may influence their incentives perceptions is fundamental to design successful policies. A significant finding in this part of the analysis was the role played by delays in granting incentives. Private universities usually invest considerable amounts of money in the implementation or research incentive schemes; therefore, knowing the incentive type preference as well as the ideal moment to deliver it, may result in significant financial efficiencies. In the context of Mexico, this aspect is even more relevant since research incentive programs are usually fully funded by private universities themselves.

Chapter 4 aimed to identify the factors and sub-factors related to the design of a research policy from the perspective of researchers of private universities in Mexico. Through the Analytic Hierarchical Process (AHP), the results of the cross-sectional survey were explored. A valuable insight for policymakers is the high importance given by researchers to work-life balance. The consensus of the researchers/participants prioritizes the balance between personal and professional needs, which university managers make a reality through the implementation of flexible work plans. Since factors like research funding and institutional support are also high ranked by researchers, the financial dimension of the policy design plays a relevant role. Therefore, the

administrative department's involvement is key in designing a successful policy.

The last objective was addressed in Chapter 5. This chapter aimed to analyze the relationship between the factors that researchers consider fundamental for their progress and the main variables related to leadership that decision-makers implement in private universities in Mexico. The variables satisfaction, motivation, efficiency, research capabilities, and morale, were analyzed using the System Dynamics (SD) methodology. The main conclusion of this chapter was to identify that an institutional strategy must be balanced with the research policy. The results clarify that a policy can be oriented to one or more factors. The five simulated scenarios help those involved in design and decision-making to observe the behavior in promoting a policy focused on a single variable and to become aware of the impact it may have on the rest of the variables that could affect the researcher's performance. The approach presented in this chapter contributes to the current literature of university leadership. Specifically, the use of SD is relevant for decision makers as a "what if" approach, this is, what would be the response of the variables to an increase in a specific leadership variable.

Throughout this research, basic elements of incentives were identified, such as the preference for certain types of incentives, like financial or non-financial, as well as the role of delay in receiving an incentive. Through the prioritization of factors and sub-factors that affect the design of research policies, a broader conclusion was reached, the relevance that work-life balance has for researchers. Finally, this research was taken a step further by analyzing the survey results from the perspective of university leadership. Balancing the key variables related to leadership in the design of research policies is fundamental for institutions to improve research productivity and remain competitive.

Having a general understanding of the research environment in Mexico, as well as identifying the incentive preferences of researchers, can allow decision makers of private universities in Mexico to design a comprehensive research policy while ensuring the fulfillment of the institutional research goals. However, as a complex topic, this research has several limitations that are important to point out. One of the limitations is the size of the sample, since only 10 private universities with the highest representation in research were considered. Increasing the sample to include private universities that are representative in research in other countries and that have a context similar to that of Mexico is highly suggested. Currently, the study encompasses only 86 researchers from business and engineering areas of Mexican private universities, then, it is suggested to extend the scope to other academic areas so that it is possible to analyze the results using other methodologies. Lastly, the survey format was entirely online but could be combined with in-person surveys to increase participation.

From this research arises several future research lines, being some of the most important the following. Within the area of policy management, tools could be developed to support the design of research incentive policies. The current sample of participants could be subdivided into profiles through a detailed characterization of researchers. These profiles could be the base for a differentiated prioritization of factors and sub-factors using AHP. The survey could be also applied to researchers of public universities, to contrast with the findings of private universities presented in this thesis. Different areas of knowledge, other than business and engineering, may be included. The concept of intellectual activity could be diversified to include not only academic research, but also practice-oriented research and pedagogic development and innovation. Lastly, concepts such as motivation theory and incentive theory could be further explored in future research, as well as techniques such as clustering.

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