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# Ethics in Public Management: The Case of Spain

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## Abstract:

In recent years there has been a growing interest in improving ethics in the management of public resources. However, while there have been significant improvements in the search for efficiency and effectiveness in the use of public funds, there is not yet a complete and comprehensive development of mechanisms and instruments that enhance ethics in the decisions of public managers. In this article, the Spanish case study and its exercise of ethical responsibility are carried out, through which results of interest to other countries with similar models of public management are obtained.

## Keywords:

Governance  
Transparency  
Open government  
Accountability  
Anti-corruption

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## 1. Introduction

In recent decades, there has been a significant shift in the traditional concept of public management, driven by a series of multidisciplinary changes in economic, social, and cultural spheres <sup>[1]</sup>. This new approach goes beyond modifications in organizational levels and operational methods, aiming to align public management with the new values of society at large and, in particular, with public ethics.

This research delves into the state of ethics in public actions, first from a general perspective and then specifically in the context of Spain. Based on this analysis, a series of general recommendations are proposed, applicable to countries with public management models similar to Spain's. This effort

identifies actions to improve the current system, which can be extrapolated to both the European and Ibero-American contexts, given the many elements Spain shares with these regions. Consequently, the study offers a comprehensive examination of ethics in public governance, enabling reflection to advance toward efficient, transparent management, free from any trace of public corruption.

To achieve this objective, the article is structured as follows: after this introduction, the first section addresses the concept of public ethics. The second section links public ethics to the principle of conduct in the functioning of public institutions. The third section explores, from a general perspective, the Institutional Integrity System

(IIS), with a specific focus on the European case. The subsequent section proposes improvements in public procurement, emphasizing the creation of an independent project evaluation office. The fifth section outlines measures implemented to reduce public corruption. This is followed by a series of recommendations to enhance ethics in public management, and the article concludes with a summary of findings.

## 2. The dimension of public ethics

Exploring the dimension of public ethics is no simple task, as it lacks a singular definition. According to the *Cambridge Dictionary of Philosophy*, the concept of ethics is often used interchangeably with morality but can also refer to the moral principles of a tradition, group, or individual. Ethics is sometimes mistaken for compliance with the law; however, it is crucial to note the clear distinction between the two. While the law is based on ethical principles, ethics itself is not legally enforceable, unlike the law. Conversely, the application of laws is strictly limited to their written provisions, whereas the scope of ethics is significantly broader.

Paul and Elder<sup>[2]</sup> provide an explicit approach to ethics from a public perspective, defining it as the set of concepts and principles that guide public action to determine behavior that benefits or harms society. Earlier, the book *Ethics for Bureaucrats*<sup>[3]</sup> served as a key reference for the broader application of ethics within organizations, especially in countries with Anglo-Saxon cultural traditions, where this concept has taken deeper root.

The United States stands as a leading example in the field of public ethics. The American Society for Public Administration (ASPA) adopted a Code of Ethics for its members. Shortly thereafter, the National Association of Schools of Public Affairs and Administration (NASPAA) developed a code of conduct aimed at enhancing students' moral values, knowledge, and skills to act ethically and effectively. The U.S. Office of Government Ethics (OGE) established the necessary guidelines to safeguard democracy, a market economy, and public trust in the integrity of institutions, officials, and public employees.

These three initiatives highlight the importance of public ethics in the functioning of U.S. administrations.

They also underscore the need for a code of ethics for public servants, outlining the behaviors required for effective public management, including integrity, efficiency, safeguarding institutional image, and ensuring public trust in institutions.

Numerous international organizations and institutions have incorporated these principles into their philosophy of public administration. The Organization for Economic Cooperation and Development (OECD)<sup>[4]</sup> is one of the foremost advocates of this approach, having prioritized and established a series of actions for the effective implementation of ethics in public administration. These include:

- (1) Developing and revising policies, procedures, and practices across institutions that influence public administration conduct.
- (2) Promoting government actions to uphold high standards of conduct and combat public corruption<sup>[5]</sup>.
- (3) Integrating ethics into the administrative framework to uphold and secure public service values and principles.
- (4) Adequately evaluating changes in the ethical conduct of civil servants.
- (5) Applying ethical management principles in public service to ensure high standards of behavior in public functions.

The economic and social relevance of the OECD, which encompasses the world's most developed economies and modern public administrations, has elevated the role of ethics in public management to its rightful place.

## 3. Public ethics and the principle of conduct

The seminal reference on public ethics and principles of conduct is found in *Standards in Public Life: First Report of the Committee on Standards in Public Life*<sup>[6]</sup>. This document emerged following several cases of corruption and bribery in the United Kingdom during the 1980s, involving politicians, civil servants, businesspeople, and lobbyists. In the 1990s, a committee of experts was established to restore standards of conduct in public life. Chaired by Judge Michael Patrick Nolan, the *Nolan Report* was approved in May 1995. This report outlines

**Table 1.** Principles of conduct from the Nolan Report <sup>[6]</sup>

| <b>Commitment to the public interest</b> | <b>Prioritize the administration's interest and make decisions solely based on the public good, avoiding personal or third-party benefits.</b> |
|--|--|
| Integrity                                | Prevent undue influence to favor third-party interests.  |
| Objectivity                              | Ensure fairness and impartiality in decision-making for public activities.   |
| Accountability                           | Take responsibility for public officials' decisions.   |
| Transparency                             | Maintain openness in public decision-making processes.   |
| Honesty                                  | Avoid conflicts of interest and safeguard the public interest.   |
| Decision-making capability               | Promote and execute appropriate decisions based on principles of good conduct.   |

the principles and actions that should guide politicians and civil servants to recover and maintain conduct standards in public life while fostering transparency and open governance to ensure the public can verify compliance with both legal and ethical principles (**Table 1**). These principles of conduct remain relevant and have been incorporated into subsequent reports.

A year later, in 1996, the OECD published the study *Ethics in the Public Service: Current Issues and Practices* <sup>[7]</sup>, based on experiences from countries such as Austria, the United States, Finland, Mexico, New Zealand, the Netherlands, Norway, Portugal, and the United Kingdom. Its findings aligned with the principles of conduct outlined in the Nolan Report, emphasizing integrity, objectivity, and accountability among politicians and public employees, while adding a focus on efficiency and effectiveness in public spending.

Building on these principles, the United Nations adopted Resolution 51/59 on December 12, 1996, which approved a declaration against corruption and bribery in public sector commercial transactions.

This widespread concern for public ethics during the late 1990s led several international organizations, including the International Monetary Fund, the World Bank, the Inter-American Development Bank, the Council of Europe, the Economic Commission for Latin America and the Caribbean, and the Latin American Center for Development Administration, to strengthen their codes of conduct. This chain reaction aimed to eradicate or, at the very least, mitigate corrupt practices.

Following the adoption of these codes of good practice, various procedures and instruments were

developed to embed ethics into public conduct through a set of common patterns. Ethical codes in public administration are neither overly broad nor excessively specific; they apply to all actors, both public and private, and serve as useful tools to standardize and regulate relations between public administration and citizens. Their ultimate goal is to ensure that a system of ethical integrity guides public employees beyond merely complying with formal rules of conduct.

Understanding the philosophy underpinning ethical codes is essential, rather than limiting them to punitive measures. A purely punitive approach results in a misconceived and unproductive interpretation. This issue was evident in Spain's Royal Legislative Decree 5/2015 of October 30, which approved the consolidated text of the Basic Statute for Public Employees. This decree largely reproduced the content of Law 19/2013 of December 9 on transparency, access to public information, and good governance, particularly in Title II on good governance <sup>[8]</sup>.

Thus, before advancing regulations and penalties for corruption, it is imperative for all members of public organizations to internalize and embrace the values and ethics underpinning public service actions.

#### **4. The institutional integrity system: From government action to accountability**

The effective implementation of a code of conduct requires the establishment of an Institutional Integrity System (IIS) <sup>[9]</sup>. The IIS aims to strengthen the ethical infrastructure of public organizations and prevent

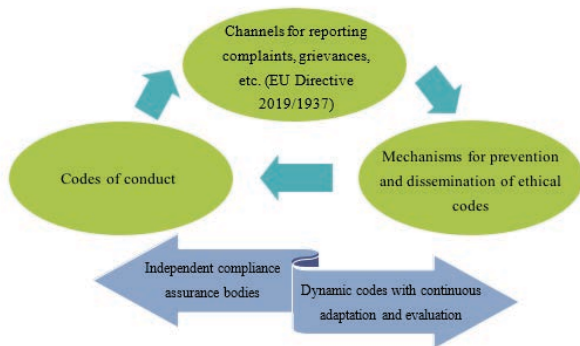


**Table 2.** Set of actions and guidelines for organizational functioning that safeguards public integrity <sup>[10]</sup>

| Dimension            | Description   |
|----------------------|---|
| Individual           | The way employees are evaluated and compensated is a key factor that sustains—or diminishes—the ethical culture.  |
| Interpersonal        | Organizations are responsible for the interaction of employees across various hierarchical levels.<br>The interpersonal ethical culture requires mechanisms and protective measures to allow employees to work freely.<br>Public team leaders must influence the integration of ethical awareness within organizations. |
| Team                 | Group socialization is a central aspect of work.<br>Teamwork development promotes a culture of ethics and effective working methods.  |
| Inter-team           | The quality of relationships between groups is essential to building an ethical culture.  |
| Inter-organizational | The impact of external organizational matters is critical for fostering the adoption of an internal ethical culture.  |

corruption and improper public behavior. An IIS establishes a comprehensive ethical structure that includes a code of ethics and conduct, an anti-fraud action plan, dissemination and training efforts, a communication channel, an anti-fraud committee, and mechanisms for monitoring, evaluation, and revision.

The IIS (**Figure 1**) should encompass the entire public organizational structure, linking institutional ethical culture with society. It must incorporate precise monitoring and evaluation mechanisms and an adaptive system to address an ever-changing reality, forming the Institutional Integrity Framework (IIF).

**Figure 1.** Institutional Integrity System (IIS)

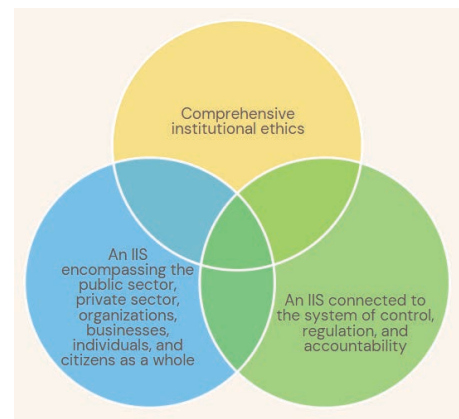
Possessing an IIF is a necessary, though insufficient, condition to address the ethical challenges in administrative behavior. Taylor <sup>[10]</sup> emphasizes the need to move beyond a traditional compliance-based approach to ethics, addressing informal cultural aspects through actions and guidelines across five dimensions: individual, interpersonal, team, inter-team, and inter-organizational (detailed in **Table 2**).

Thus, the IIF should include a set of norms, processes, and bodies within each public organization to prevent immoral behavior as outlined in its code of ethics <sup>[8]</sup>. Its purpose is not only to foster ethical governance but also to contribute to the creation of the IIS <sup>[5]</sup>. The IIS should cover at least three essential areas: internal, mixed, and external (**Figure 2**).

(1) Internal area: The administration must have a preventive integrity plan followed by a code of conduct. A framework for guarantees, conflict resolution mechanisms, and evaluation and compliance systems is also necessary.

(2) Mixed area: This includes integrity in public procurement, preventive codes of conduct, anticipation of conflicts of interest, and oversight of integrity in selection processes, personnel management, grant allocation, public aid, and the ethical framework of public service.

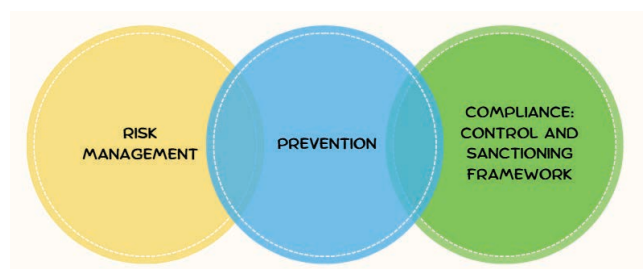
(3) External area: This involves oversight by anti-corruption prevention and enforcement agencies, supported by control bodies and transparency councils.

**Figure 2.** Institutional Integrity Framework (IIF) <sup>[8]</sup>

In **Figure 2**, oversight agencies and entities play a fundamental role in enhancing efficiency, accountability, and transparency in public administration. The UN General Assembly Resolution 69/228, “Promoting and Fostering Efficiency, Accountability, Effectiveness, and Transparency in Public Administration by Strengthening Supreme Audit Institutions”, highlights the crucial role of Supreme Audit Institutions (SAIs) in these efforts.

SAIs are central, independent, and indispensable actors in improving public functions and consolidating democratic systems. They foster efficient, transparent, and ethical institutions while overseeing and tracking progress on the United Nations’ 2030 Agenda Sustainable Development Goals (SDGs).

Additionally, institutional integrity should adopt a 360-degree approach (**Figure 3**), as recommended by the Inter-American Development Bank <sup>[11]</sup>. This approach requires coordination between the institutional integrity body and the corrective or sanctioning system, to be utilized when other alternatives fail.



**Figure 3.** 360° institutional integrity approach <sup>[11]</sup>

Within this framework, transparency emerges as the primary tool in combating public corruption. Public information of interest to citizens must be accessible, ensuring consultation and oversight. On an international scale, transparency is both a necessity and a right. One key initiative in this regard is the Open Government Partnership (OGP), which seeks to secure government commitments to promote transparency, empower citizens, combat corruption, and leverage new technologies to improve governance.

Spain, as a member of the OGP, has implemented three Open Government Action Plans. These plans feature broad-spectrum mechanisms and measures ranging from comprehensive anti-corruption regulations to prevention and early detection through verification

mechanisms across all levels of public administration.

## 5. The European context in the framework of institutional integrity

The objective of an institutional integrity framework is to ensure that national institutions operate effectively to limit abuse of power, crimes, and misappropriation of public funds. Strengthening the national integrity system also advances governance and promotes a fairer society. This framework relies on three key dimensions: measuring the overall capacity of institutional functioning, accountability in internal governance regarding integrity and transparency, and contributing to the overall integrity of the national governance system.

This multidimensional approach requires resources and independence, transparency and accountability, and integrity in governance. However, the effort must extend beyond the public sector; individual actions, civil society, and businesses directly influence integrity compliance. Therefore, a comprehensive pact is needed to achieve proper public management, as highlighted by leading international organizations.

The OECD emphasizes that ensuring public integrity requires recognizing the role of civil society, fostering respect and shared values with the administration, and promoting shared responsibility. This involves engaging all stakeholders in developing, updating, and implementing public integrity systems, raising societal awareness of their benefits, and reducing tolerance for violations of ethical standards. Consequently, governments must commit to collective and cooperative accountability for effective governance.

The European Union launched the European Integrity Systems Project (ENIS) to evaluate governance institutions within national integrity systems. This initiative builds on existing practices. For decades, the Netherlands has prioritized transparency and public accountability through its independent Public Sector Integrity Promotion Office, established by the Ministry of the Interior to support integrity policies across all levels of government.

In 1998, the United Kingdom passed the Public Information Disclosure Act to protect whistleblowers reporting irregularities in public management. Similarly,



the Bribery Act (2010) shifted the burden of proof onto the accused and imposed objective liability on companies failing to prevent public employees from benefiting from contracts. This legislation also incentivizes companies to adopt preventive and deterrent measures against bribery, complementing traditional punitive mechanisms.

Inspired by the British model, Ireland enacted the Protected Disclosures Act (2001), offering protective measures for whistleblowers in public bodies. In 2014, additional legislation expanded protections to public and private sector workers, aiming to encourage reporting of corrupt or improper behavior without fear of retaliation.

Portugal has pursued transparency through initiatives like the Transparency Portal, Open Data, Big Data, and electronic procurement. The BASE Portal, a national public procurement platform, centralizes information from pre-award stages to execution, enabling comprehensive monitoring and deterring corruption.

Similarly, Slovenia and Croatia have mechanisms to prevent and detect misconduct in public management. Slovenia's "Supervizor" platform provides data on public transactions, including contracting parties, beneficiaries, relationships, and transaction purposes. In Croatia, public procurement oversight is less institutionalized, relying on NGOs to collect procurement and financial data, yet still facilitating process monitoring.

While these preventive measures are valuable, ex-post actions must also be considered. External control bodies (OCEX) typically oversee public actions for legal and financial regularity but rarely prioritize economic efficiency or ethical control. Addressing this gap is crucial, as highlighted by the European Commission<sup>[12]</sup>, which outlined guidelines to enhance OCEX operations (see **Table 3**).

Lastly, it is worth noting that the oversight of public resources has accelerated in Europe following the extraordinary Next Generation EU Funds program to address COVID-19 impacts. This initiative has significantly strengthened legal and ethical codes in the allocation and monitoring of these resources<sup>[13]</sup>.

## 6. Instruments for improving efficiency: Independent office for project evaluation

The European Commission estimates that public procurement accounts for approximately 19% of the EU's GDP. For Spain, the OECD<sup>[14]</sup> estimates its importance at 9.6%, as outlined in the Government at a Glance 2019 report, with a weight of 23.4% on total public expenditure, according to the Independent Office for Regulation and Supervision of Procurement<sup>[15]</sup>. Its significance necessitates employing every mechanism and tool available to enhance efficiency in management. Adherence to legal procedures is necessary but insufficient to ensure compliance in alignment with SDG 16—focused on the need for strong, integral, and trustworthy institutions—and to combat corruption, as highlighted by Daniel Kaufman. Thus, a comprehensive shift is required in public management in general and public procurement in particular.

Integrity policy demands proactive risk management, including a comprehensive map of identified risks, consistent with the OECD's Integrity Frameworks. According to Directive 2014/24/EU on public procurement, "contracting authorities must utilize all available national legal means to prevent procurement processes from being affected by conflicts of interest, designed to detect, prevent, and resolve conflicts of

**Table 3.** Actions and guidelines for progress in external control bodies (OCEX) according to the European Commission<sup>[12]</sup>

Full transparency of public spending, with transparent and accessible information on the criteria and use of public resources.

Access to all information from public bodies and evaluation of the efficiency in service delivery.

Public disclosure of potential conflicts of interest in public procurement.

Regulation of lobbying and its relationship with the administration.

The necessity of an independent body for resolving conflicts of interest.

Oversight of the principles of good conduct for public servants.

interest.” Developing a risk management policy based on compliance techniques is essential.

Moreover, emphasis must be placed on preventing conflicts of interest and facilitating preventive reporting, as outlined in the European Commission’s proposal to the European Parliament, the Council, and the European Economic and Social Committee, “Strengthening Whistleblower Protection in the EU,” dated April 23, 2018. This proposal culminated in an agreement on March 11, 2019, establishing reporting channels that protect whistleblowers from any form of sanctions or reprisals.

Sustainable and inclusive public procurement aligns with the “fourth-generation” EU public procurement directives: Directive 2014/23/EU (on concession contracts), Directive 2014/24/EU (on public procurement), and Directive 2014/25/EU (on procurement by entities in water, energy, transport, and postal services). These aim to enhance public spending efficiency and increase small and medium-sized enterprises (SMEs) participation in public sector procurement, establishing common procedures for all public entities.

Following the enactment of Spain’s Law 9/2017, which transposed Directives 2014/23/EU and 2014/24/EU into national law, compliance policies were integrated with self-cleaning measures, many directly linked to public procurement. This area is one of the most corruption-prone within public administration, as noted in the European Commission’s Anti-Corruption Report, which encourages member states to adopt preventive and proactive stances against corrupt practices to foster competitiveness within the EU.

Countries must establish mechanisms to ensure preventive control, address procurement irregularities, and guarantee processes while rejecting less economically advantageous bids. The EU’s Decision 2017/984 highlights the necessity for Spain to adopt measures to reduce structural deficits by ensuring transparency and coordination in public policies.

The absence of an independent entity to oversee public procurement functions has been identified as a drawback. Addressing this, Spain established the Independent Office for Regulation and Supervision of Procurement (Oirescon) to ensure proper adherence

to regulations, transparency, and competition, thus combating illegalities in public procurement. Oirescon operates with full organic and functional independence (Article 332 of Law 9/2017). However, its capacity is limited by reliance on data from other entities like regional anti-fraud offices and major city councils, such as Madrid or Barcelona. Despite these challenges, Oirescon’s reports provide a valuable analysis of issues arising from malpractice in public procurement.

Oirescon’s strategic plan for 2020–2024 reflects its ambition to strengthen government commitment and institutional coordination to achieve its objectives.

Project evaluation offices must fulfill three key functions:

(1) Improvement: Enhancing ongoing projects.

(2) Accountability: Ensuring all parties involved in public expenditure are held accountable.

(3) Enlightenment: Drawing on past experiences to inform future projections.

This approach aims to reduce—though not entirely eliminate—malpractice in public administration.

## 7. Corruption control

Article 6 of the 2003 United Nations Convention against Corruption (Resolution 58/4 of the General Assembly, October 31, 2003) emphasizes the need for independent bodies to prevent corruption. It recommends that each state ensures the establishment of the necessary organs to prevent corruption by implementing the policies outlined in Article 5. These bodies should oversee, and coordinate the implementation of such policies, and enhance the dissemination of knowledge regarding corruption prevention.

Additionally, it requires that each state guarantees the independence necessary for these bodies to function effectively and free from undue influence.

In Spain, there is no national anti-fraud office; however, some Autonomous Communities have established regional regulations and created agencies to combat public corruption. Notably, Catalonia, Valencia, and the Balearic Islands have independent anti-fraud offices, while regions like Galicia and the Canary Islands have corruption monitoring sections within their respective audit offices. Contrastingly, Castilla-

La Mancha abolished its audit office, which previously carried out anti-fraud functions, in 2014 (Law 1/2014, April 24). Since then, the oversight of its autonomous administration has fallen to the Spanish Court of Auditors.

### 7.1. Anti-fraud institutions in Spain

(1) Catalonia's Anti-Fraud Office: Established under Law 14/2008 (November 5), this office operates as an independent and autonomous control body. Its primary objectives include:

(a) Preventing and investigating potential cases of misuse of public resources or other irregular practices, such as conflicts of interest or the private use of information gained through public employment.

(b) Advising entities within its jurisdiction on measures to combat corruption and promote transparency.

(2) Valencia's Agency for the Prevention and Fight Against Fraud and Corruption: Created in 2017, this institution focuses on:

(a) Protecting and assisting whistleblowers within its jurisdiction.

(b) Investigating complaints and promoting public integrity and ethics, particularly in public procurement, subsidies, urban planning, and public assets.

Valencia was the first region to establish a Whistleblower Protection Statute, covering individuals or entities reporting fraudulent or corrupt activities, as well as their witnesses, experts, and relatives, shielding them from retaliation or threats.

(3) Balearic Islands' Office for the Prevention and Fight Against Corruption: Regulated by Law 16/2016 (December 9), this office is under the jurisdiction of the Balearic Parliament. It is tasked with preventing and investigating fraudulent use of public resources and unethical conduct involving conflicts of interest or misuse of confidential public sector information.

(4) Galicia's Anti-Corruption Section: Established through Law 8/2015 (August 7), this section operates within the Galicia Accounts Council, focusing on corruption prevention. Modeled after Portugal's system, it:

(a) Collaborate with administrations to implement prevention systems and corruption risk management manuals.

(b) Evaluate existing prevention measures and

provide advice on regulatory tools to prevent corruption.

However, it does not possess investigative or inspection powers.

(5) Canary Islands' Audit Office: Created by Law 4/1989 (May 2), this office offers recommendations and reports on best administrative, accounting, and financial practices to prevent corruption in its jurisdiction.

### 7.2. Local and metropolitan initiatives

(1) Madrid's Municipal Office Against Fraud and Corruption: Established in 2016, it inspects, verifies, and prevents potential cases of fraud or corruption involving municipal employees.

(2) Barcelona's Ethical Mailbox and Good Governance Service: Part of the Barcelona City Council's Analysis Services Directorate, this initiative acts as a primary channel for reporting municipal malpractice.

(3) Barcelona Metropolitan Transparency Agency: This agency promotes transparency and good governance throughout the metropolitan area. It focuses on coordinating actions, developing internal protocols, and strengthening public ethics.

## 8. Recommendations

Throughout this article, a series of actions aimed at improving ethics in the management of public resources, with a focus on the Spanish case, have been outlined. Following the review and lessons learned, the authors propose the following recommendations:

(1) Ethics in public management should not be limited to political leaders and public officials but must extend to all citizens. Corruption is only possible when such behavior is tolerated and encouraged in the non-public sphere. Consequently, the fight against public corruption is the responsibility of everyone, both within and outside the administration.

(2) The digitization of procurement processes not only represents a significant change in the timeframes for processing and resolving public contracts but also enables a comprehensive and intense exercise of transparency. For this reason, it is essential for public administrations to commit to implementing all the digital tools at their disposal. Doing so will allow for greater citizen engagement and understanding of public work

while also enabling the detection and prevention of inappropriate practices in the public sector. Transparency in administration is fundamental to gaining public trust, and digital tools offer the most straightforward and immediate means to achieve this goal.

(3) Greater coordination between different public administrations is necessary, particularly in politically decentralized countries like Spain. A national regulatory framework should be established to define general parameters in the field of public ethics, which can then be further developed and improved by sub-central levels of government. Public corruption occurs at all levels—state, regional, and local—underscoring the need for actions and protocols that are universally applicable regardless of the administrative level where it occurs.

(4) Periodic analysis of measures implemented in other countries to improve public ethics is recommended. This study has highlighted practices from the United Kingdom, Ireland, Croatia, Slovenia, and Portugal, although these examples are not exhaustive. Other cases also merit study, even if extrapolation is not always immediate or straightforward due to the unique characteristics of each country. However, this should not deter the observation and adaptation of “best practices” to enhance public ethics, increase transparency, and reduce corruption levels.

(5) Spain can serve as a reference point. Some episodes of public corruption—particularly at the local level, where there are over 8,100 municipalities—have been uncovered, and in many cases, timely action was not taken, allowing certain abuses, most of which have been prosecuted and punished. These lessons have prompted recognition of the harms caused by public corruption and the need for more thorough and efficient updates to control and oversight mechanisms. However, continuous monitoring of the public sector is necessary, especially in procurement, given its significant economic impact <sup>[16]</sup>.

(6) The best way to improve public ethics is first to embrace it and then to prevent corrupt practices. While sanctions and punishments are important, it is more necessary and effective to promote a culture of transparency in public actions so that both the administration itself and businesses and citizens understand that corruption is a harmful malpractice

that negatively affects everyone. Consequently, a civic transparency culture is required, characterized by greater professionalism and independence among public officials, whose criteria and evaluations should carry weight in political decision-making.

## 9. Conclusions

The growing interest in improving public ethics in resource management leads to enhanced efficiency and effectiveness. Over the past decade, significant progress has been made in the comprehensive development of mechanisms and instruments that strengthen ethics in public management decisions. Following a review of various implemented models, this work proposes a series of recommendations as best practices, applicable not only within Europe but also across Latin America.

The case of Spain is paradigmatic. After several cases of public corruption, primarily at the local level, exemplary measures have been taken to counteract malpractice. Controls are now far more intensive and extensive than they were a decade ago, and most importantly, they have served an educational purpose for the public, instilling the importance of combating and eradicating corrupt behaviors.

Embedding ethics in public administration requires collective responsibility, a process that is neither simple nor automatic. On the contrary, it demands proactive efforts from the administration, supported by the active engagement of citizens.

There is no denying the significant progress made in recent years toward the efficient functioning of the public sector, largely due to improvements in information management and changes in how public employees work. Central to this process is the adoption of an Integrated Institutional System (IIS) that evolves into an efficient Integrated Institutional Framework (IIF). This requires instilling both the administration and the public with an ethical culture that goes beyond merely implementing measures. It also calls for greater independence and professionalization of public employees, along with a clear separation between political and public management functions, to help reduce corruption.

Despite the advances made, there is still much work to be done.



**Disclosure statement**

The authors declare no conflict of interest.

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# The Impacts of Institutional Pressures on Environmental Performance: The Mediating Role of Voluntary Environmental Regulation in Mexico

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## Abstract:

This research analyzes the mediating role of voluntary environmental regulation on the relationship between mimetic, normative, and coercive pressures and the environmental performance of certified companies in an emerging country. This study uses an instrumental variable research design and structural equation modeling with survey data from 225 certified companies. It was found that voluntary environmental regulation increases the predictive validity of mimetic and normative pressures on environmental performance. Voluntary environmental regulation also fully mediates the relationship between pressure for compliance with regulation and environmental performance. This study contributes to the body of environmental management and policy literature in two ways: (1) it demonstrates the usefulness of institutional theory in explaining the adoption of voluntary environmental regulation; (2) it offers empirical evidence of the benefits and limits of voluntary environmental regulation in a context characterized by institutional voids.

## Keywords:

Voluntary environmental regulation  
Institutional theory  
Mimetic pressures  
Coercive pressures  
Normative pressures

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## 1. Introduction

Voluntary environmental regulation represents an effective tool for pollution control in developed economies as it contributes positively to improving environmental performance <sup>[1-4]</sup>. In democratic societies, policies involving public-private regulation, transparency,

monitoring mechanisms, and a trigger for government intervention in case of ineffectiveness tend to receive greater public support <sup>[5]</sup>. However, certain types of democracies (e.g., social-liberal democracies with low inequality levels) may favor the adoption of higher voluntary environmental commitments <sup>[6]</sup>. In developed

countries, companies comply with the guidelines set by voluntary and non-voluntary environmental regulations by implementing environmental practices, adopting an environmentally conscious culture, or implementing green innovations <sup>[7,8]</sup>.

However, it has been found that voluntary environmental regulation is less effective in emerging economies <sup>[9]</sup>. For instance, studies conducted in Mexico by Camacho <sup>[10]</sup> analyzed the industrial manufacturing sector to evaluate the effects of inspection and oversight, observing whether companies certified by the Federal Attorney for Environmental Protection (PROFEPA) comply with environmental standards. Elizondo and Hernández <sup>[11]</sup> focused on describing the official Mexican standard aimed at reducing the negative impacts of the automotive sector. Montiel and Husted <sup>[12]</sup> and Rivera <sup>[13]</sup> found that social, political, and economic issues often negatively affect legislation and compliance with environmental regulations in developing countries.

In these contexts, attention must also be paid to institutional voids—the absence or underdevelopment of institutions that enable effective markets (e.g., governance mechanisms to prevent corruption, public infrastructure, constant monitoring, and protection of property rights)—as these hinder companies from achieving appropriate standards in their operations and affect their environmental behavior <sup>[14-17]</sup>.

Research on voluntary environmental regulation in emerging economies is scarce, although some studies have been conducted in this context, such as in Costa Rica <sup>[13]</sup>, Mexico <sup>[12,18]</sup>, India <sup>[19]</sup>, Malaysia <sup>[20]</sup>, and Pakistan <sup>[21]</sup>. However, the lack of data on environmental performance in emerging economies complicates consistent monitoring and evaluation <sup>[13,22]</sup>.

Investigating voluntary environmental regulation in emerging economies is important because these countries often experience rapid industrialization and economic growth processes, which can lead to greater environmental degradation. Some of these countries play significant roles in global supply chains and could potentially reduce their environmental footprint and mitigate environmental challenges. Moreover, voluntary environmental regulation can create economic opportunities in these countries. By adopting environmentally friendly practices, companies can

improve their reputation and competitiveness, attract responsible investors, increase stakeholder commitment and collaboration, and tap into the growing demand for sustainable products and services.

Emerging countries often lack an integrated environmental policy and reinforcement mechanisms to facilitate their implementation and compliance. Fernández-Vázquez <sup>[23]</sup> highlighted that, although environmental policy in Mexico's agricultural sector provides an open space for discussion among public institutions, it is neither a priority on the political agenda nor an integral policy mandate. Traditional distrust among public agencies complicates the use of environmental policy, leaving it at the personal discretion of politicians in office. Rius <sup>[24]</sup> confirmed deficiencies in public policies conceived as parallel and autonomous channels, which seem to be the norm in Mexico and other Latin American countries.

Institutional theory <sup>[25]</sup> has been widely used to analyze voluntary environmental regulation in developed countries. The central point of institutional theory is its focus on the requirements organizations must meet to gain legitimacy, such as acceptance by peers <sup>[26]</sup>. These requirements arise from companies or widespread belief systems (through mimetic pressures) <sup>[26,27]</sup>, professional associations (through normative pressures), and the state (through coercive pressures).

Mimetic pressures refer to the influences exerted by certain organizations, typically leaders in their field, on other organizations, encouraging imitation <sup>[26]</sup>. Normative pressures are defined as those arising from standards established by institutions, such as professional or industrial organizations. Coercive pressures, on the other hand, are those imposed by regulatory bodies that directly establish the rules a company must follow <sup>[28]</sup>. Normative pressures differ from coercive pressures in that institutions exerting normative pressures lack the authority to directly mandate compliance and cannot penalize noncompliance <sup>[28]</sup>.

Therefore, according to Raza <sup>[7]</sup> and Zhu and Sarkis <sup>[29]</sup>, institutional theory allows us to explore mimetic, normative, and coercive pressures that may influence companies' environmental performance. For instance, Fransen and Burgoon <sup>[4]</sup> found that social pressures from NGOs, along with consumer and media

influences, determine the types of responsibilities chosen by companies in the European garment industry. Additionally, recent studies have reported a positive relationship between institutional pressures and environmental performance in Italy<sup>[9]</sup> and China<sup>[30]</sup>.

However, scientific evidence on the effects of voluntary environmental regulation in developing countries is limited and inconclusive. Henriques *et al.*<sup>[18]</sup> identified a positive effect of voluntary environmental regulation on environmental performance. In contrast, Blackman *et al.*<sup>[31]</sup> found that such regulation does not have a strong or lasting impact on companies' environmental performance. Other authors have stated that voluntary environmental programs are challenging to evaluate due to poor organizational monitoring and data reporting<sup>[32]</sup>. Montiel and Husted<sup>[12]</sup> proposed that institutional entrepreneurs (decision-makers) play a significant role in pursuing voluntary environmental certifications in Mexico, which in turn grant legitimacy to companies. Latif *et al.*<sup>[21]</sup> argued that the adoption of voluntary environmental certifications may be motivated by mimetic, normative, and coercive institutional pressures, which, due to their differing origins, should be analyzed separately in a developing country to understand their roles—a subject that has yet to be sufficiently studied. This research aims to address this gap.

To this end, the effects of different types of institutional pressures on voluntary environmental regulation are explored, addressing the following research question: How does voluntary environmental regulation mediate the relationship between different types of institutional pressures and companies' environmental performance in an emerging economy? Based on survey data from 225 companies located across Mexico (all of which held a valid certification in a voluntary environmental program at the time of the survey) and structural equation models, empirical evidence is provided on the mediating effects of voluntary environmental regulation on the relationship between different types of institutional pressures and companies' environmental performance.

This study contributes to the environmental policy and management literature in two ways:

(1) It demonstrates the utility of institutional theory

in explaining the adoption of voluntary environmental regulations in an emerging country.

(2) It provides empirical evidence of the benefits and limitations of voluntary environmental regulation in an emerging country characterized by institutional voids.

The remainder of the article is organized as follows: the literature review is presented, and the hypotheses are developed; the research method is then described; the results of the statistical analysis and discussion are presented, and the paper concludes with the conclusions, limitations, implications, and recommendations for future research.

## 2. Literature review and hypothesis development

### 2.1. Institutional theory

This theory examines institutional fields or socially constructed normative worlds in which organizations exist<sup>[25,33]</sup>. Organizations adhere to social rules to gain support and legitimacy. These requirements originate from the state, professional associations, other companies, generalized belief systems, and similar sources<sup>[25]</sup>. Some authors have used institutional theory to explain certain organizational behaviors, such as the adoption of environmental practices<sup>[34]</sup> and the development of strategies to combat climate change<sup>[9]</sup>.

According to this theory, institutions exert three types of pressures on organizations: mimetic, normative, and coercive<sup>[25]</sup>. Mimetic pressures lead organizations to imitate practices considered successful in their institutional field to gain legitimacy<sup>[25,35]</sup>. Normative pressures arise through norms and values. Regulatory systems specify objectives and how they should be achieved; when new elements become legitimate, organizations react by adopting them in their structures<sup>[36,37]</sup>. Coercive pressures come from other organizations or society's cultural expectations. These pressures can manifest as force, persuasion, sanctions, or penalties, and are generally imposed by the state<sup>[37,38]</sup>.

Studies have demonstrated that the concept of institutional pressures helps explain organizational behavior in response to growing interest in developing environmental practices<sup>[39-41]</sup>. In various regions worldwide, institutional pressures have been shown



to drive organizations to improve their environmental performance by complying with environmental regulations <sup>[2,13,42]</sup>.

## 2.2. Institutional pressure and environmental performance

Institutional pressures have been found to positively influence companies' environmental practices and performance <sup>[29,43,44]</sup>. Dubey *et al.* <sup>[45]</sup> discovered that institutional pressures help reduce waste and pollutant gas emissions. Lu *et al.* <sup>[30]</sup>, Phan & Baird <sup>[40]</sup>, and Rivera <sup>[13]</sup> found that institutional pressures promote environmentally friendly behavior. In a study of Chinese manufacturing companies, Lu *et al.* <sup>[30]</sup> concluded that the most influential pressures are those that encourage environmental management and regulatory compliance. Babiak & Trendafilova <sup>[39]</sup> found that institutional motives, such as social expectations and pressure to adopt similar management practices, drive companies to adopt environmental initiatives.

Based on institutional theory, Ma *et al.* <sup>[41]</sup> identified a positive relationship between green procurement market pressure and environmental certification practices in Chinese manufacturing companies. In a European Union study, Raza <sup>[7]</sup> found that incorporating green technological innovation benefits both the economy and environmental performance in manufacturing companies, with these benefits directly driven by institutional pressures. Similarly, Qi *et al.* <sup>[8]</sup> concluded that institutional pressures positively influence firms' green technological innovation, prompting them to establish environmental management systems to improve environmental performance. Based on the above, the following hypothesis is proposed for companies in emerging economies:

**Hypothesis 1 (H1):** Institutional pressures have a positive effect on companies' environmental performance.

### 2.2.1. Mimetic pressures

Mimetic pressures can positively impact environmental performance as companies may imitate actions and activities with positive effects on environmental conservation. However, the scientific literature reveals no consensus on the analysis of mimetic pressures.

On the one hand, Phan & Baird <sup>[40]</sup> found that mimetic pressures do not contribute to implementing an efficient environmental management system that enables organizations to improve their environmental performance. Saeed *et al.* <sup>[46]</sup> found in Pakistan that mimetic pressures are not strong enough to drive the adoption of sustainable practices in supply chains, thus having no favorable effect on environmental performance.

Conversely, Dai *et al.* <sup>[47]</sup>, in a study conducted in China, and Chu *et al.* <sup>[48]</sup>, in a study conducted in Korea, found a positive effect of mimetic pressures on the implementation of sustainable practices, which positively impacted environmental performance. Given these contrasting findings and the foundation of institutional theory, it is proposed that:

**Hypothesis 1a:** Mimetic pressures have a positive effect on companies' environmental performance.

### 2.2.2. Normative pressures

Regulatory pressures are those that drive companies to adhere to the standards of their external stakeholders (e.g., customers) to gain social legitimacy <sup>[48]</sup>. Berrone *et al.* <sup>[1]</sup>, in a study conducted in the United States, found a positive relationship between regulatory pressures and environmental issues in companies, which favorably impacts environmental performance. Similarly, Chu *et al.* <sup>[48]</sup> found that in South Korea, regulatory pressures from customers significantly impact green supply chain management and, ultimately, companies' environmental performance. Based on these references, the following hypothesis is proposed:

**Hypothesis 1b:** Normative pressures have a positive effect on companies' environmental performance.

### 2.2.3. Coercive pressures

Coercive pressures are those exerted by the government, involving sanctions for non-compliance with authority-established mandates <sup>[1]</sup>. Different studies have independently explored this dimension of institutional pressures, yielding varied results. For instance, Dai *et al.* <sup>[47]</sup> found a positive effect of coercive pressures on the adoption of sustainable supply chains, which ultimately positively impacts the environment. Moreover, Zhu and Sarkis <sup>[29]</sup> found that in China, coercive pressures can

positively influence environmental performance.

However, Chu *et al.* <sup>[48]</sup> and Tate *et al.* <sup>[49]</sup> found no relationship between coercive pressures and environmental performance. Given these conflicting findings and considering the logic of institutional theory, we propose the following hypothesis:

**Hypothesis 1c:** Coercive pressures have a positive effect on companies' environmental performance.

### 2.3. Voluntary environmental regulation

Voluntary environmental regulation involves reaching an agreement between the regulator and the organization on implementing environmental policies without resorting to public coercive pressures <sup>[50]</sup>. Vargas and Olivares <sup>[51]</sup> found that voluntary self-regulation instruments encourage the use of better practices in production and supply processes. Furthermore, companies enhance their public image and reduce operating costs.

Voluntary self-regulation also enables companies to prevent pollution by providing alternatives not typically included in command-and-control regulations <sup>[32,52]</sup>. In Mexico, relevant voluntary environmental regulation programs include ISO 14001 and the National Environmental Audit Program <sup>[31]</sup>.

Mexican voluntary environmental regulation is based on the General Law of Ecological Balance and Environmental Protection <sup>[53]</sup>. This legal framework established a procedure for manufacturing and service sector companies to obtain certification by verifying improvements in their environmental performance.

The National Environmental Audit Program, administered by PROFEPA, grants three types of certificates:

(1) Clean industry: Directed at the manufacturing and transformation sectors.

(2) Environmental quality: Includes companies in the commercial and service sectors, except tourism services.

(3) Tourism environmental quality: Targeted at companies offering tourism services <sup>[54]</sup>.

On average, it takes a company about three months to obtain certification issued by PROFEPA, which is valid for two years with the possibility of renewal.

Various authors <sup>[10,12,18,31]</sup> have studied voluntary environmental regulation in Mexico, providing valuable

insights into the program's context and progress. However, none have conducted an empirical analysis of the program's effects on the environmental performance of certified companies.

### 2.4. The mediating effect of voluntary environmental regulation on the relationship between institutional pressures and environmental performance

Studies on the relationship between institutional pressures and environmental performance have commonly analyzed the effects of management relations with suppliers, total quality management <sup>[45]</sup>, ambidexterity <sup>[55]</sup>, and environmental management systems <sup>[40]</sup>.

Environmental regulation has been used as a mediating or moderating variable but never in interaction with institutional pressures and environmental performance, as is the case in this research. For instance, Li *et al.* <sup>[56]</sup> found that environmental regulation explains the relationship between environmental management and green innovation. Similarly, Cao *et al.* <sup>[57]</sup> observed that the relationship between industrial structure and technological innovation is mediated by environmental regulation.

This study proposes that voluntary environmental regulation mediates the relationship between institutional pressures and environmental performance. Voluntary environmental regulation can help explain environmental performance in the context of an emerging country. Thus, the following research hypothesis is proposed:

**Hypothesis 2 (H2):** Voluntary environmental regulation mediates the relationship between institutional pressures and firms' environmental performance.

#### 2.4.1. Mimetic pressures

Firms may perceive that having environmental certification provides significant benefits to certified firms and may decide to imitate this behavior. Generally, these certifications (e.g., ISO 14001 and Clean Industry) result in improved environmental performance, making mimetic pressures a key factor in encouraging compliance with voluntary environmental regulation to enhance firms' environmental performance <sup>[22]</sup>.

Some studies support these ideas. For example, Fikru <sup>[58]</sup> found that mimetic pressures drive voluntary

international certification in developing countries. Similarly, Zhu *et al.* <sup>[2]</sup> found that mimetic pressures positively influence the adoption of ISO 14001 international certification in China, which has a positive impact on environmental performance. Based on these findings, the following hypothesis is proposed:

**Hypothesis 2a:** Voluntary environmental regulation mediates the relationship between mimetic pressures and firms' environmental performance.

#### 2.4.2. Normative pressures

Like mimetic pressures, normative pressures can positively influence environmental performance by promoting voluntary certifications. Rivera <sup>[13]</sup> found that normative pressures encourage companies to participate in a sustainable tourism certification program aimed at improving environmental performance in Costa Rican hotels.

Similarly, Fikru <sup>[58]</sup> and Zhu *et al.* <sup>[2]</sup> observed that normative pressures promote the ISO 14001 voluntary certification, which contributes to implementing environmental management systems that enhance environmental performance. Based on the literature, the following hypothesis is proposed:

**Hypothesis 2b:** Voluntary environmental regulation mediates the relationship between normative pressures and firms' environmental performance.

#### 2.4.3. Coercive pressures

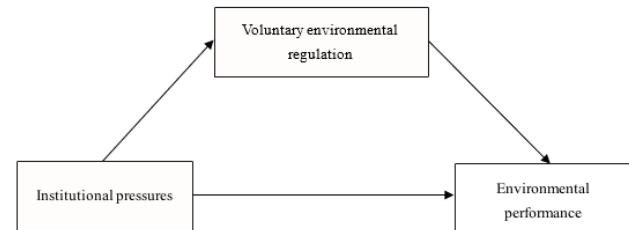
Coercive pressures originate from institutional actors, such as the government or other institutions, that enforce environmental regulations through sanctions <sup>[59]</sup>. Such institutional pressures may positively influence firms' decisions to obtain voluntary certification.

For instance, Fikru <sup>[58]</sup> found that in developing countries, coercive pressures like government inspections encourage the adoption of voluntary environmental certifications, which positively contribute to environmental performance. Similarly, Rivera <sup>[13]</sup> and Zhu *et al.* <sup>[2]</sup> found that regulatory compliance and governmental oversight act as coercive pressures positively impacting voluntary certifications that improve environmental performance. Based on this information, the following hypothesis is proposed:

**Hypothesis 2c:** Voluntary environmental regulation

mediates the relationship between coercive pressures and firms' environmental performance.

**Figure 1** illustrates the research model, which proposes that institutional pressures (mimetic, normative, and coercive) positively influence firms' environmental performance through voluntary environmental regulation.



**Figure 1.** Research model

### 3. Method

This cross-sectional study employs an instrumental variable research design based on survey data collected from a sample of firms. The research hypotheses are tested using structural equation modeling. Common method variance (the variance attributable to the measurement method) is a concern in cross-sectional studies, especially when all data are collected using the same instrument. To minimize this potential issue, recommendations by Podsakoff *et al.* <sup>[60]</sup> were followed: survey items were carefully adapted from the literature to avoid vague terminology, questions were kept simple, and their clarity was enhanced. Respondents were assured that there were no right or wrong answers, but that they should answer as honestly as possible. Furthermore, participation in the survey would have no consequences regarding environmental certification.

Instrumental variables were also included in the models to correct for potential endogeneity, isolate the effects of omitted variables, control for common method variance, and account for reverse causality, as recommended by Antonakis *et al.* <sup>[61]</sup>.

#### 3.1. Sample

The companies participating in this research are located across Mexico and include those with some type of certification granted by PROFEPA under the framework of the voluntary environmental regulation program known as the National Environmental Audit Program.

In 2018, PROFEPA recorded 1,043 certified

companies in Mexico. Of this total, 600 companies were randomly selected and invited to participate in the survey voluntarily. A total of 257 questionnaires were returned, yielding a response rate of 42.8%. Ultimately, 225 questionnaires were used for statistical analysis, as they did not contain missing values. This sample represents 21.5% of the total population. **Table 1** provides descriptive statistics of the sample.

### 3.2. Questionnaire

The data collection instrument consisted of a structured questionnaire comprising 124 items. The questionnaire was divided into five sections:

- (1) Identification information
- (2) Institutional pressures
- (3) Voluntary environmental regulation
- (4) Environmental performance
- (5) Complementary variables, including control and instrumental variables

The questionnaire was emailed by PROFEPA officials to executives responsible for certification.

The survey instrument was reviewed by PROFEPA officials in close collaboration with the researchers. Both groups determined that, given the nature and purpose of the survey, as well as potential risks, legal requirements, and organizational policies, it was not necessary to seek approval or guidance from an ethics committee. The questionnaire included information about the study's purpose and the confidential use of the data. All participants provided informed consent, voluntarily participating in the survey and sharing their opinions.

### 3.3. Measures

The validity of the measures is based on both theoretical and statistical principles. The theoretical considerations began with a comprehensive review of the literature on the variables included in the study. Research articles addressing measures and scales were identified and analyzed by experienced researchers to create an initial draft of the questionnaire. This draft was personally tested in Spanish with the manager of a company in Mexico City to refine the items. The questionnaire was also reviewed by PROFEPA staff to ensure that the items were relevant, clear, coherent, and sufficient to capture the constructs included in the research.

Statistically, the validity of the measures was assessed by estimating the cross-factor loadings for each first-order construct. As shown in **Table 2**, all items load significantly on only one factor, demonstrating discriminant validity. **Table 3** shows the Pearson correlations between the first-order constructs and the square root of the average variance extracted (AVE) values along the diagonal. Both convergent and discriminant validity are demonstrated, as no diagonal element is lower than a unique correlation<sup>[62]</sup>.

The reliability of the measures was evaluated using Cronbach's alpha. All reliability coefficients range between 0.772 and 0.951, which are considered acceptable<sup>[63]</sup> (**Table 2**).

(1) Institutional pressures: Institutional pressures are defined as internal and external pressures perceived by managers that influence decision-making related to improving environmental performance<sup>[9,40]</sup>. This is a second-order factor composed of four first-order constructs: mimetic pressures, employee environmental awareness, regulatory compliance, and PROFEPA pressure. Employee environmental awareness is a normative pressure, while regulatory compliance and PROFEPA pressure are coercive pressures. These constructs were measured using a seven-point Likert scale. Respondents were asked to indicate the extent to which they agreed with a series of statements on a scale of 1 = strongly disagree to 7 = strongly agree. The items were adapted from the research of Chu *et al.*<sup>[48]</sup>, Daddi *et al.*<sup>[9]</sup>, Dubey *et al.*<sup>[45]</sup>, Phan and Baird<sup>[40]</sup>, Tate *et al.*<sup>[49]</sup>, and Zhu *et al.*<sup>[2]</sup>.

(2) Voluntary environmental regulation: This is a first-order construct defined as the impact of public policies on the motivation to adopt environmental practices in companies<sup>[50,64]</sup>. This construct was measured using a seven-point Likert scale. Respondents were asked to indicate the extent to which they agreed with a series of statements, using a scale of 1 = strongly disagree to 7 = strongly agree. The items were adapted from the research of Blackman *et al.*<sup>[31]</sup>, Blackman *et al.*<sup>[65]</sup>, Camisón<sup>[50]</sup>, and Ren *et al.*<sup>[64]</sup>.

(3) Environmental performance: Environmental performance is defined as the cumulative result of a company's activities, processes, and procedures in interaction with the natural environment as perceived



by managers <sup>[43,45,66]</sup>. This is a second-order construct composed of three first-order constructs: natural resource restoration, pollution reduction, and environmental damage prevention. These constructs were measured using a seven-point Likert scale. Respondents were asked to indicate the extent to which they agreed with a series of statements on a scale of 1 = strongly disagree to 7 = strongly agree. The items were adapted from the research of Bae <sup>[66]</sup>, Dubey *et al.* <sup>[45]</sup>, Wang *et al.* <sup>[67]</sup>, and Yu *et al.* <sup>[43]</sup>.

### 3.4. Instrumental variables

(1) Environmental sensitivity: This is a first-order construct defined as the degree to which managers consider environmental issues significant enough for the company to invest financial and human resources to raise awareness about the company's environmental impacts and implement environmental practices. This construct was measured using a seven-point Likert scale. Respondents were asked to indicate the extent to which they agreed with a series of statements, using a scale of 1 = strongly disagree to 7 = strongly agree. The items were adapted from the research of Oreja-Rodríguez and Armas-Cruz <sup>[68]</sup>. Managers with high environmental sensitivity will be more aware of environmental issues and interpret signals from various stakeholders regarding environmental concerns as more relevant compared to less environmentally sensitive managers.

(2) Industry field risk: This is a dummy variable (0 = low risk, 1 = high risk) representing the environmental risk assigned to the industry in which each company is classified, as per PROFEPA. Managers in high-risk industrial fields are expected to be more responsive to institutional pressures related to environmental issues because their businesses are more affected by such environmental concerns.

Both variables were used as instrumental variables in the statistical analysis to mitigate potential endogeneity in the model.

### 3.5. Control variables

(1) Respondent's age: The age of the respondent, coded as follows: 1 = Under 30 years; 2 = 30 to 60 years; 3 = Over 60 years.

(2) Respondent's gender: A dummy variable (0 =

male, 1 = female).

(3) Type of certification: The type of certification the company holds at the time of the survey, classified as: 1 = Clean industry; 2 = Environmental quality; 3 = Environmental quality in tourism.

(4) Location: This variable can take values from 1 to 8, depending on the region of the country where the company is located. **Table 1** includes the states comprising each region.

(5) Company size: The size of the company as defined by PROFEPA <sup>[69]</sup>: 1 = Micro (30 employees or fewer); 2 = Small (31 to 100 employees); 3 = Medium (101 to 500 employees); 4 = Large (501 employees or more).

(6) Years of operation: The number of years the company has been in operation.

(7) Company nationality: The nationality of the company as reported by the respondent (0 = national, 1 = foreign).

**Table 4** shows the items included in the scales.

### 3.6. Data analysis

To test the research hypotheses, the two-step structural equation modeling (SEM) approach recommended by Anderson and Gerbing <sup>[70]</sup> and Hatcher <sup>[71]</sup> was employed: first, a measurement model was created, and second, a structural model was run to test the hypotheses. Statistical analysis was conducted using the EQS structural equation modeling software.

The development of a measurement model, which includes all factors, began with exploratory factor analysis (EFA). It was anticipated that some items might load on two or more factors and that some factors might be closely related enough to collapse into a single factor. After a thorough review of factor loadings, the initial measurement structure was identified. Based on this first structure, confirmatory factor analysis (CFA) was performed to evaluate the model fit. Due to the heterogeneous kurtosis of the data and significant multivariate kurtosis, models were estimated using the heteroskedastic kurtosis estimation method provided by EQS.

To refine the measurement model, the Lagrange Multiplier test in EQS was utilized. This test provides information on which item pairs could be freely

**Table 1.** Descriptive statistics of the sample ( $n = 225$ )

| Characteristic  | <i>n</i> | %  |
|---|----------|----|
| Respondent's age  |          |    |
| Under 30 years  | 34       | 15 |
| 30 to 60 years  | 186      | 83 |
| Over 60 years   | 5        | 2  |
| Respondent's gender   |          |    |
| Male  | 138      | 61 |
| Female  | 87       | 39 |
| Type of certification   |          |    |
| Clean industry  | 166      | 74 |
| Environmental quality   | 44       | 20 |
| Environmental quality in tourism  | 15       | 6  |
| Location (state)  |          |    |
| Northwest (Baja California, Baja California Sur, Chihuahua, Durango, Sinaloa, and Sonora) | 62       | 28 |
| Central South (Morelos, Mexico State, and Mexico City)                                    | 47       | 21 |
| Northeast (Coahuila, Nuevo León, and Tamaulipas)  | 29       | 13 |
| Central North (Aguascalientes, Guanajuato, San Luis Potosí, Zacatecas, and Querétaro)     | 28       | 12 |
| East (Puebla, Veracruz, Tlaxcala, and Hidalgo)  | 22       | 10 |
| West (Nayarit, Jalisco, Colima, and Michoacán)  | 20       | 9  |
| Southeast (Tabasco, Campeche, Quintana Roo, and Yucatán)                                  | 12       | 5  |
| Southwest (Guerrero, Oaxaca, and Chiapas)   | 5        | 2  |
| Years of operation  |          |    |
| Less than 5   | 7        | 3  |
| From 5 to 15  | 33       | 15 |
| More than 15  | 185      | 82 |
| Company size  |          |    |
| Microenterprise (30 employees or fewer)   | 4        | 2  |
| Small enterprise (31 to 100 employees)  | 18       | 8  |
| Medium enterprise (101 to 500 employees)  | 67       | 30 |
| Large enterprise (501 employees or more)  | 136      | 60 |
| Company nationality   |          |    |
| Mexican   | 142      | 63 |
| Foreign   | 83       | 37 |
| Industry field  |          |    |
| Chemistry   | 41       | 18 |
| Electronics   | 20       | 9  |
| Automotive  | 14       | 6  |
| Metallurgy  | 13       | 6  |
| Food  | 12       | 5  |
| Other   | 125      | 56 |

Table 2. Cross-factor loadings of first-order constructs

| Number of items     | Institutional pressures |                                  |                             | Voluntary environmental regulation | Environmental sensitivity (instrumental variable) | Environmental performance |                                  |                        | Community |                                    |
|---------------------|-------------------------|----------------------------------|-----------------------------|------------------------------------|---|---------------------------|----------------------------------|------------------------|-----------|------------------------------------|
|                     | Mimetic pressures       | Environmental awareness of staff | Compliance with regulations |                                    |   | Pressure from PROFEPA     | Restoration of natural resources | Reduction of pollution |           | Prevention of environmental damage |
| 61                  | -0.0256                 | 0.2078                           | 0.0388                      | 0.7227                             | 0.0774  | -0.0003                   | 0.1195                           | 0.2632                 | 0.1672    | 0.685                              |
| 62                  | -0.0159                 | 0.3274                           | 0.0475                      | 0.6900                             | 0.2168  | 0.2215                    | 0.1257                           | 0.0600                 | 0.0921    | 0.710                              |
| 69                  | 0.0172                  | 0.1864                           | 0.1466                      | 0.1342                             | 0.8514  | 0.1782                    | 0.0097                           | 0.1164                 | 0.1037    | 0.856                              |
| 70                  | -0.0151                 | 0.1647                           | 0.1069                      | 0.2318                             | 0.8319  | 0.1902                    | 0.0722                           | 0.1609                 | 0.1486    | 0.874                              |
| 72                  | -0.0672                 | 0.1227                           | 0.1255                      | 0.2286                             | 0.7799  | 0.2555                    | 0.1444                           | 0.1638                 | 0.1390    | 0.828                              |
| 84                  | 0.0010                  | 0.2215                           | 0.2680                      | 0.2030                             | 0.2126  | 0.6844                    | 0.1378                           | 0.1734                 | 0.1853    | 0.759                              |
| 86                  | -0.0251                 | 0.2239                           | 0.2401                      | 0.1898                             | 0.1269  | 0.7554                    | 0.1282                           | 0.1806                 | 0.2758    | 0.856                              |
| 87                  | 0.0323                  | 0.2426                           | 0.1779                      | 0.1920                             | 0.2465  | 0.7332                    | 0.0690                           | 0.1547                 | 0.1917    | 0.792                              |
| 88                  | 0.0211                  | 0.2409                           | 0.1873                      | 0.1916                             | 0.1352  | 0.7940                    | 0.1747                           | 0.1641                 | 0.2178    | 0.884                              |
| 90                  | -0.0024                 | 0.3024                           | 0.2059                      | 0.1693                             | 0.2272  | 0.7141                    | 0.1151                           | 0.1622                 | 0.2196    | 0.812                              |
| 97                  | 0.0793                  | 0.1326                           | 0.1167                      | 0.1700                             | 0.0007  | 0.0876                    | 0.8130                           | 0.1922                 | 0.0837    | 0.779                              |
| 98                  | 0.0991                  | 0.1743                           | 0.0832                      | 0.0387                             | 0.0217  | 0.1644                    | 0.8440                           | 0.0363                 | 0.1765    | 0.821                              |
| 100                 | 0.2282                  | 0.0747                           | 0.0228                      | 0.0032                             | 0.1674  | 0.1045                    | 0.8184                           | 0.0804                 | 0.1015    | 0.784                              |
| 102                 | -0.0301                 | 0.2361                           | 0.1007                      | 0.1744                             | 0.1581  | 0.2190                    | 0.0907                           | 0.7821                 | 0.1886    | 0.826                              |
| 103                 | -0.0457                 | 0.1384                           | 0.3879                      | 0.1282                             | 0.1416  | 0.1469                    | 0.1802                           | 0.855                  | 0.7508    | 0.1695                             |
| 104                 | 0.0145                  | 0.1097                           | 0.1726                      | 0.0800                             | 0.2153  | 0.2964                    | 0.1484                           | 0.7366                 | 0.2316    | 0.801                              |
| 107                 | 0.0153                  | 0.1689                           | 0.1900                      | 0.0878                             | 0.1700  | 0.2160                    | 0.1882                           | 0.2095                 | 0.8173    | 0.895                              |
| 108                 | 0.0516                  | 0.1011                           | 0.1933                      | 0.1000                             | 0.1476  | 0.2997                    | 0.1474                           | 0.1697                 | 0.8348    | 0.919                              |
| 109                 | 0.0140                  | 0.1595                           | 0.1955                      | 0.1669                             | 0.1191  | 0.3116                    | 0.1383                           | 0.1841                 | 0.8167    | 0.923                              |
| Explained variance  | 3.529                   | 2.826                            | 3.217                       | 2.571                              | 2.664   | 3.853                     | 2.496                            | 2.316                  | 2.721     | 3.529                              |
| Eigenvalue          | 3.69                    | 1.36                             | 12.49                       | 1.24                               | 2.11  | 0.94                      | 1.86                             | 1.12                   | 1.45      |                                    |
| Cronbach's $\alpha$ | 0.947                   | 0.818                            | 0.887                       | 0.772                              | 0.911   | 0.943                     | 0.858                            | 0.880                  | 0.951     |                                    |

Note: The Kaiser Varimax rotation converged after 5 iterations.

correlated to improve model fit. Based on this information, several items were removed. A well-fitting measurement model was obtained, with a nonsignificant chi-squared test result ( $P > 0.05$ )<sup>[61,72]</sup>. **Table 2** displays the cross-factor loadings for the first-order constructs, including environmental sensitivity, one of the instrumental variables used for hypothesis testing.

The next step in building the measurement model was to execute a model that included the second-order structure. **Table 4** shows the regression coefficients for all constructs. Following Hatcher's<sup>[71]</sup> recommendations, the model was evaluated using a nonsignificant chi-square test result ( $P > 0.05$ , with values closer to 1.0 being better) and all significant regression coefficients ( $P$ -values from the  $t$ -test  $< 0.05$ , with values closer to 0 being better). The regression coefficients for the first items in the first-order constructs and the first factors in the second-order constructs were set to 1 for model identification purposes. This measurement model confirmed the second-order structure of institutional pressures and environmental performance, with good model fit (chi-squared test  $P = 0.937$ ).

Next, hypothesis testing was performed by running two structural models. The first model (**Model 1**) tested the direct impact of institutional pressures on environmental performance (**H1**). The second model (**Model 2**) tested the mediating effect of voluntary environmental regulation in the previous model (**H2**). **Table 5** presents the unstandardized regression

coefficients and fit indicators for both models, with chi-squared test  $P$ -values of 0.52 and 0.62, respectively, indicating a good fit.

Instrumental variables were included in both models to address potential endogeneity in the institutional pressures construct. The error term of the instrumented variable was allowed to correlate freely with the error terms of the mediator and dependent variables to correctly specify the model and obtain consistent estimates, as recommended by Antonakis *et al.*<sup>[61]</sup>. Introducing instrumental variables as predictors of the potentially endogenous variable addresses other threats to causal analysis, including common method variance, reverse causality, and omitted variables. This approach is considered standard best practice in causal analysis in management, psychology, and related fields.

The strength of the instrumental variables, environmental sensitivity and industry field risk, was evaluated by running a full structural model and regressing institutional pressures on both instruments. Model fit and complementary statistics demonstrated their validity as robust instruments, with a chi-squared test  $P$ -value of 0.92, Rho reliability coefficient = 0.947, highly significant regression coefficients ( $P < 0.01$ ), and  $R^2 = 0.71$ .

**Table 3.** Correlations and bird's square root for first-order constructs as evidence of discriminant validity

| First-order constructs                                | Mean | S    | 1      | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     |
|---|------|------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| Mimetic pressures (1)                                 | 3.80 | 1.89 | 0.921  |       |       |       |       |       |       |       |       |
| Environmental awareness of staff (2)                  | 6.46 | 0.63 | 0.184  | 0.694 |       |       |       |       |       |       |       |
| Regulatory compliance (3)                             | 6.47 | 0.75 | 0.123  | 0.530 | 0.786 |       |       |       |       |       |       |
| Pressure from PROFEPA (4)                             | 6.03 | 0.98 | 0.074  | 0.623 | 0.319 | 0.712 |       |       |       |       |       |
| Voluntary environmental regulation (5)                | 6.18 | 0.99 | -0.004 | 0.527 | 0.408 | 0.587 | 0.822 |       |       |       |       |
| Environmental sensitivity (instrumental variable) (6) | 6.35 | 0.77 | 0.061  | 0.683 | 0.598 | 0.600 | 0.575 | 0.737 |       |       |       |
| Restoration of natural resources (7)                  | 4.60 | 1.51 | 0.278  | 0.433 | 0.256 | 0.334 | 0.282 | 0.428 | 0.825 |       |       |
| Pollution abatement (8)                               | 6.16 | 0.88 | 0.034  | 0.533 | 0.568 | 0.455 | 0.558 | 0.657 | 0.416 | 0.757 |       |
| Prevention of environmental damage (9)                | 6.12 | 1.00 | 0.080  | 0.493 | 0.523 | 0.419 | 0.467 | 0.675 | 0.435 | 0.629 | 0.823 |



**Table 4.** Items and standard coefficients in the measurement model

| Second-order constructs   | First-order constructs  | No. of items | Item content  | Standard coefficient | t     | P < (two tails) |
|---------------------------|---|--------------|---|----------------------|-------|-----------------|
| Institutional pressures   | Pressure from PROFEPA   | 59           | PROFEPA officials encourage the company to continue in the National Environmental Audit Program and improve environmental performance.  | 0.764                | 2.02  | 0.044           |
|                           |   | 60           | Good communication with PROFEPA officials ensures successful certification.   | 0.450                | 5.32  | 0.001           |
|                           |   | 61           | PROFEPA certification is attractive because of its economic, social, and environmental benefits.  | 0.651                | 7.95  | 0.001           |
|                           |   | 62           | PROFEPA effectively incentivizes certification through recognition and awards.  | 0.841                | 9.44  | 0.001           |
|                           | Voluntary environmental regulation  | 69           | Voluntary environmental regulation motivates the creation of a solid waste management program in the company.                           | 0.830                |       |                 |
|                           |   | 70           | Voluntary environmental regulation encourages recycling or the extension of the life cycle of products used or produced by the company. | 0.926                | 14.19 | 0.001           |
|                           |   | 72           | Voluntary environmental regulation encourages the implementation of more efficient processes to reduce air emissions.                   | 0.880                | 13.41 | 0.001           |
|                           | Environmental sensitivity (instrumental variable)   | 84           | The company dedicates financial and human resources to train its employees on environmental issues.                                     | 0.831                |       |                 |
|                           |   | 86           | The company has sensitized its staff to environmental issues as an important part of business operations.                               | 0.914                | 17.79 | 0.001           |
|                           |   | 87           | Certification promotes awareness of environmental issues to create environmental awareness.   | 0.837                | 14.28 | 0.001           |
|                           |   | 88           | The company raises awareness of environmental issues among its employees.   | 0.918                | 17.88 | 0.001           |
|                           |   | 90           | Awareness-raising in the company favors learning and implementation of environmental practices.   | 0.881                | 16.85 | 0.001           |
|                           |   |              | Restoration of natural resources  | 0.542                |       |                 |
| Environmental performance | Improving environmental performance involves taking action to offset the company's impact on the environment. | 97           | The company is involved in ecosystem restoration activities.  | 0.791                |       |                 |
|                           |   | 98           |   | 0.890                | 14.66 | 0.001           |
|                           |   | 100          | Certification encourages participation in programs to restore the environment.  |                      |       | 0.001           |
|                           | Pollution reduction   |              |   | 0.794                | 6.47  | 0.001           |
|                           |   | 102          | Certification encourages participation in restoration programs.   | 0.815                |       |                 |
|                           |   | 103          | The company reduces water pollutants as a means to improve environmental performance.   | 0.835                | 12.52 | 0.001           |
|                           |   | 104          | The company reduces solid waste as a means to improve environmental performance.  | 0.851                | 12.32 | 0.001           |
|                           | Prevention of environmental damage  |              |   | 0.788                | 6.95  | 0.001           |
|                           |   | 107          | The company has a program to prevent and reduce environmental impacts as a means to improve environmental performance.                  | 0.902                |       |                 |
|                           |   | 108          | The company classifies and measures positive and negative environmental impacts.  | 0.937                | 20.89 | 0.001           |
|                           |   | 109          | The company develops and implements actions to mitigate environmental impacts.  | 0.952                | 21.90 | 0.001           |

Notes: Goodness of fit of the measurement model: Chi-squared = 435.426, degrees of freedom = 482,  $P = 0.937$ , CFI = 1.000, RMSEA = 0.000, IC 90% of RMSEA (0.000, 0.006), reliability coefficient Rho = 0.966. Estimation method: heterogeneous kurtosis.

**Table 5.** Unstandardized regression coefficients in structural models

| Independent variable        | Dependent variable                 | Model 1<br>Direct effect | Model 2<br>Mediation |
|-----------------------------|------------------------------------|--------------------------|----------------------|
| Institutional pressures     | Institutional performance          | 2.783**                  | 2.892**              |
|                             | Voluntary environmental regulation |                          | 2.333**              |
|                             | Environmental performance          |                          | 0.047                |
| Instrumental variables      |                                    |                          |                      |
| Environmental sensitivity   |                                    | 0.320**                  | 0.294**              |
| Industry field risk         | Institutional pressures            | 0.055***                 | 0.057**              |
| Goodness-of-fit indicators  |                                    |                          |                      |
| Chi-square                  |                                    | 742.53                   | 724.18               |
| Degrees of freedom          |                                    | 745                      | 737                  |
| Chi-squared <i>P</i> -value |                                    | 0.52                     | 0.62                 |
| CFI                         |                                    | 1.000                    | 1.000                |
| RMSEA                       |                                    | 0.000                    | 0.000                |
| 90% CI of the RMSEA         |                                    | (0.000, 0.020)           | (0.000, 0.018)       |

Notes: Estimation method: Heterogeneous kurtosis. Control variables: age, gender, type of certificate, location, firm size, years of operation, and nationality of the firm. \*\* $P < 0.01$ ; \* $P < 0.05$ ; \*\*\* $P < 0.1$  (two-tailed).

## 4. Results

The structural model estimates confirm **Hypothesis 1**. The impact of institutional pressures on environmental performance is positive and significant ( $\beta = 0.973$ ;  $P < 0.02$ ). This finding indicates that institutional pressures are a critical determinant of the environmental performance of companies participating in PROFEPA's National Environmental Audit Program.

However, **Hypothesis 2** is rejected, as no mediation by voluntary environmental regulation is observed in the relationship between institutional pressures and environmental performance. In this model, the direct impact of institutional pressures on environmental performance remains positive and significant ( $\beta = 0.934$ ;  $P < 0.04$ ), as does the impact of institutional pressures on voluntary environmental regulation ( $\beta = 0.678$ ;  $P < 0.03$ ). Nevertheless, the impact of voluntary environmental regulation on environmental performance is not significant ( $\beta = 0.052$ ;  $P < 0.81$ ).

Further analysis was conducted to evaluate the direct effects of the four dimensions of institutional pressures on environmental performance and the

mediating role of voluntary environmental regulation by running eight models: **1a** and **2a** for mimetic pressures, **1b** and **2b** for normative pressures (employee environmental awareness), **1c** and **2c** for regulatory compliance, and **1d** and **2d** for coercive pressures from PROFEPA. The results are presented in **Table 6**.

### 4.1. Direct effects of institutional pressures

(1) All institutional pressures, except mimetic pressures, have a positive effect on environmental performance. **Hypothesis H1a** is rejected, while **H1b** and **H1c** are accepted.

(2) Certified companies appear to improve their environmental performance not to mimic their competitors' environmental behavior but to respond to employee environmental awareness, comply with regulations, and meet PROFEPA's expectations.

### 4.2. Mediated effects via voluntary environmental regulation

(1) Mimetic pressures (**Model 2a**): Introducing voluntary environmental regulation reveals a direct effect

of mimetic pressures on environmental performance ( $\beta = 2.709$ ;  $P < 0.01$ ), which was not observed in the direct model. This is known as a suppression effect, where a suppressor variable enhances the predictive validity of another variable<sup>[73]</sup>. Voluntary environmental regulation increases the predictive validity of mimetic pressures, confirming the mediation effect and supporting **H2a**.

(2) Employee environmental awareness (**Model 2b**): A suppression effect is also observed. The impact of voluntary environmental regulation on environmental performance is negative and significant ( $\beta = -1.142$ ;  $P < 0.01$ ), while other effects in the mediated model are positive. The effect of employee environmental awareness on environmental performance becomes even more significant ( $\beta = 3.339$ ;  $P < 0.001$ ) with voluntary

environmental regulation as a mediator. **H2b** is accepted.

(3) Regulatory compliance (**Model 2c**): A full mediation effect is observed when voluntary environmental regulation mediates the relationship. The direct relationship between regulatory compliance and environmental performance becomes nonsignificant ( $\beta = 0.129$ ;  $P > 0.10$ ), while the indirect paths are positive and significant, supporting **H2c**.

(4) PROFEPA pressure (**Model 2d**): No mediation effect is observed. While PROFEPA pressure positively impacts voluntary environmental regulation ( $\beta = 0.929$ ;  $P < 0.01$ ), neither PROFEPA pressure nor voluntary environmental regulation significantly impacts environmental performance. Mixed results are observed for **H2c**.

**Table 6.** Unstandardized regression coefficients in structural models by type of institutional pressure

| Model | Independent variable               | Dependent variable         |                |                                    |   |
|-------|------------------------------------|----------------------------|----------------|------------------------------------|---|
|       |                                    | Environmental performance  |                | Voluntary environmental regulation |   |
|       |                                    | Unstandardized coefficient | R <sup>2</sup> | Non-standardised coefficient       | standardised coefficient R <sup>2</sup> |
| 1a    | Mimetic pressures                  | 4.875                      | 0.02           |                                    |   |
| 2a    | Mimetic pressures                  | 2.709**                    | 0.32           | 4.217                              | 0.00                                    |
|       | Voluntary environmental regulation | 0.580                      |                |                                    |   |
| 1b    | Environmental awareness of staff   | 1.759**                    | 0.54           |                                    |   |
| 2b    | Environmental awareness of staff   | 3.339**                    | 0.19           | 1.409**                            | 0.31                                    |
|       | Voluntary environmental regulation | -1.142**                   |                |                                    |   |
| 1c    | Compliance with regulation         | 1.378**                    | 0.49           |                                    |   |
| 2c    | Regulatory compliance              | 0.129                      | 0.45           | 1.166**                            | 0.22                                    |
|       | Voluntary environmental regulation | 1.054**                    |                |                                    |   |
| 1d    | Pressure from PROFEPA              | 1.113**                    | 0.38           |                                    |   |
| 2d    | Pressure from PROFEPA              | 3.446                      | 0.05           | 0.929**                            | 0.36                                    |
|       | Voluntary environmental regulation | -2.395                     |                |                                    |   |

Notes: Control variables: age, gender, type of certificate, location, firm size, years of operation, and nationality of the firm. Instrumental variables: environmental sensitivity and industrial setting. The estimation method used in these models is maximum likelihood, and robust, except for the 2D model, which was estimated using heterogeneous kurtosis. For all models, the chi-squared  $P$ -value was between 0.18 and 0.75, the CFI was between 0.993 and 1.000, and the 90% confidence interval of RMSEA was between 0.000 and 0.031. \*\* $P < 0.01$  (two-tailed).

### 4.3. Summary

Voluntary environmental regulation enhances the predictive validity of mimetic and normative pressures on environmental performance. However, mixed results are found for coercive pressures: while it fully mediates the relationship between regulatory compliance and environmental performance, it does not mediate the relationship between PROFEPA pressure and environmental performance.

## 5. Discussion

The positive relationship found between institutional pressures and environmental performance aligns with the findings of Dubey *et al.* [45] and Lu *et al.* [30]. However, when analyzing institutional pressures separately (mimetic, normative, and coercive), it was observed that both normative pressures (employee environmental awareness) and coercive pressures (regulatory compliance and PROFEPA pressure) have a direct and positive effect on environmental performance. This was not the case for mimetic pressures.

These findings are consistent with Chen *et al.* [74], who reported that normative and coercive dimensions have the potential to promote the implementation of environmentally favorable practices and drive positive changes in environmental performance.

Regarding the mediating effect of voluntary environmental regulation on the relationship between institutional pressures and environmental performance, when institutional pressures were treated as a single second-order construct, the results suggested a positive and significant relationship between institutional pressures and voluntary environmental regulation. However, the relationship between voluntary environmental regulation and environmental performance was not significant.

When analyzing different types of institutional pressures separately, it was found that voluntary environmental regulation mediates the relationship between mimetic and normative pressures and environmental performance. For coercive pressures, voluntary environmental regulation fully mediates the relationship between regulatory compliance and environmental performance but does not mediate

the relationship between PROFEPA pressure and environmental performance.

These results are similar to those reported by Henriques *et al.* [18], who found a positive association between voluntary environmental certification and environmental performance. However, they differ from those of Blackman *et al.* [31], who noted that voluntary environmental certification in emerging economies is weak and does not consistently improve environmental performance. Since no previous studies have explored the interaction of voluntary environmental regulation with different types and measures of institutional pressures, further comparison of these results is not possible.

The findings were obtained from a sample that included micro, small, medium, and large companies, both domestic and foreign. The statistical analysis included company size and nationality as control variables. This indicates that the observed relationships between institutional pressures, voluntary environmental regulation, and environmental performance are independent of company size and nationality.

Finally, the results align with those of Challenger *et al.* [75], who suggested that effective environmental policy should adopt a socio-ecosystemic and interdisciplinary approach. Such an approach recognizes that human activities inevitably coevolve with the natural environment. Socio-ecosystems are complex adaptive systems characterized by openness, dynamism, self-organization, non-linearity, nested hierarchies at multiple scales, emergent properties, irreducible uncertainties, and ecological homeostasis and resilience capacities. Voluntary environmental regulation is deemed suitable for addressing environmental issues democratically within this type of system.

## 6. Conclusions

This study examines the effects of different types of institutional pressures on the environmental performance of companies in developing countries, as well as the mediating effect of voluntary environmental regulation on this relationship. Based on survey data from 225 companies across Mexico certified by the National Environmental Audit Program administered by PROFEPA, the findings indicate that coercive and

normative pressures positively influence environmental performance by encouraging companies to adopt environmental practices that reduce their environmental impact.

Regarding the mediating effect of voluntary environmental regulation on the relationship between various types of institutional pressures and environmental performance, it was found that voluntary environmental regulation has a favorable contribution in all cases except for PROFEPA's pressure. Participants in the National Environmental Audit Program may not perceive PROFEPA as a pressure to seek certification and improve environmental performance.

It was observed that not all institutional pressures have the same effect on environmental performance. Analyzing the mediating effect of voluntary environmental regulation provides insights into the factors driving companies to participate in voluntary environmental programs in emerging economies. The study concludes that institutional pressures effectively promote improvements in environmental performance (e.g., resource restoration, pollution reduction, and environmental damage prevention) through voluntary environmental certification in a developing country characterized by institutional gaps, such as weak legal enforcement and lack of institutional coordination. Voluntary environmental regulation enhances the predictive validity of mimetic pressures and employee environmental awareness of environmental performance. It also fully mediates the relationship between regulatory compliance and environmental performance.

These results are significant in the context of institutional gaps because such gaps accelerate environmental degradation. Excessive bureaucracy and corruption perpetuate these institutional shortcomings. Therefore, further research is needed to identify the specific factors that help reduce these gaps. In this case, the analysis of voluntary environmental regulation may offer valuable insights.

Considering the importance of the business sector in the formulation and evaluation of public policies, this study highlights factors that should be considered when designing effective environmental policies in emerging economies. Voluntary environmental regulation, which promotes corporate self-regulation, is particularly

relevant, as it can be more effective in these contexts. Lastly, environmental preservation requires clear rules and an active role for the state in shaping the institutional environment.

## 6.1. Implications

This study has implications for various stakeholders:

(1) Academics: It demonstrates the utility of institutional theory and the separate analysis of different types of institutional pressures in exploring the role of voluntary environmental regulation in an emerging country.

(2) Managers: It provides evidence of the motivations driving companies to obtain voluntary environmental certifications and how these certifications help improve environmental performance.

(3) Policymakers: It highlights the effectiveness of institutional pressures in encouraging companies to adopt voluntary environmental certifications and offers empirical evidence of the positive impact of this type of regulation on environmental performance.

## 6.2. Limitations and recommendations for future research

This study has certain limitations. First, the sample only included companies certified by PROFEPA. Second, nonresponse bias may be an issue, as non-responding companies might have provided different responses.

Future research on this topic should consider collecting primary data on environmental performance to analyze the effectiveness of voluntary environmental regulation more objectively. One of the main objectives of such programs is to improve companies' environmental performance beyond legal requirements. Therefore, performance measurements should include indicators that confirm this objective is being met.

Researchers are encouraged to conduct new studies comparing the impact of institutional pressures on the environmental performance of certified and non-certified companies to confirm these conclusions regarding the effectiveness of voluntary environmental regulation. Additionally, employing different measures of institutional pressures may yield new insights into their effects on environmental performance and their interactions with voluntary environmental regulation.



**Disclosure statement**

The authors declare no conflict of interest.

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# Brazilian Universities' Profiles and the Sustainable Development Goals (2015–2023): Production and Impact on Web of Science

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## Abstract:

The Sustainable Development Goals as a global policy provide universities with the opportunity to offer information and innovative solutions in international forums. In recent years, scientific research on the SDGs has not only grown but has also diversified. However, the relevant gaps in studies on the subject affect compliance with the Agenda2030. This article aims to evaluate the Brazilian university system's research into SDGs. It also proposes a methodological objective which is to verify whether, through the analysis of scientific production, profiles can be identified, and university entities can be grouped based on their similarity in the priority they give to different topics. A bibliometric analysis is carried out where the production and normalized impact of Brazilian universities are studied, as well as a multidimensional scaling. The results reveal that the Brazilian production of each SDG is concentrated in five universities and that, in general, the entities' contribution to the SDGs achieves a lower impact than the world average except for the theme "Life on Land" (SDG15). This suggests that Brazilian research into the SDGs pursues a contribution of scientific knowledge of the local geographical scope. Furthermore, the data indicate the presence of few universities with unique profiles when it comes to prioritizing scientific contributions to the SDGs. Faced with the global challenge of more diverse and plural knowledge production, Brazilian centers can take advantage of expanding their scientific production on the SDGs on a more strategic scale with the purpose of influencing the universal political agenda. The study enriches the understanding of the scientific contribution to the SDGs by Brazilian universities.

## Keywords:

Sustainable development goals  
Sustainable development  
Brazil  
Scientific production  
Scientific impact  
Bibliometrics  
Universities  
Multidimensional scaling  
SDGs  
Brazilian universities  
Normalized impact  
Science communication  
Agenda 2030  
Science indicators  
United Nations

## 1. Introduction

Science develops within specific historical and cultural contexts, influenced by both internal factors of each discipline and external political, social, and cultural dynamics <sup>[1,2]</sup>. Accordingly, the interactions between scientific subsystems and politics are continuously reconfigured based on the dynamics of the broader social system <sup>[3]</sup>. In this context, the “2030 Agenda for Sustainable Development”—adopted unanimously by all countries at the United Nations Summit in September 2015 and to be achieved by 2030—emerges as a new universal political agenda aimed at ensuring the future of humanity. This agenda requires the participation and collaboration of all public and private social actors <sup>[4]</sup>.

The 2030 Agenda is complex, comprising 17 goals (Figure 1), 169 targets, and 232 indicators <sup>[5]</sup>. It calls upon nations, businesses, civil society, universities, and others to provide solutions and periodic updates in various national and international forums <sup>[6]</sup>. The Sustainable Development Goals (SDGs) are interdependent, addressing the three dimensions of sustainable development: economic, social, and environmental <sup>[4,7]</sup>.



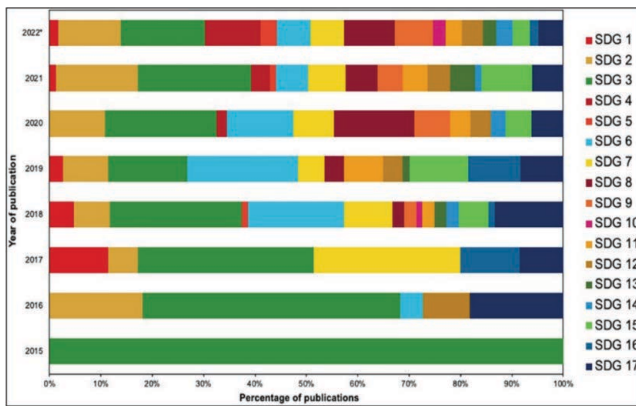
**Figure 1.** Sustainable development goals aggregated by sustainability dimensions <sup>[9]</sup>

The complexity of this initiative and the need for innovative solutions and continuous reporting position science, technology, and innovation as the key means to achieve the SDGs <sup>[6]</sup>. In its 2019 Global Sustainable Development Report, *The Future is Now: Science for Achieving Sustainable Development*, the United Nations advocated for strengthening the science-policy interface to enable policymakers and other stakeholders to make evidence-based decisions when implementing

the SDGs <sup>[9]</sup>. Furthermore, UNESCO declared 2022 the International Year of Basic Sciences for Sustainable Development. In 2023, the Global Sustainable Development Report emphasized the need for a science-policy-society interface, advocating for scientific knowledge production that is inclusive, pluralistic, and responsive to the context in which it is generated, as well as to the challenges it seeks to address <sup>[7]</sup>.

The launch of the 2030 Agenda as a global political framework, combined with the emphasis on science for achieving the SDGs and efforts by the United Nations and other international and national bodies, has led to a steady and exponential growth in scientific output related to the SDGs <sup>[9,10]</sup>. Mishra *et al.* <sup>[11]</sup> identified 12,176 articles on the SDGs published between 2015 and 2022, with more than half appearing in the last two years. In October 2022, Yamaguchi *et al.* <sup>[12]</sup> conducted a simple search using “Sustainable Development Goals” as a keyword on the Web of Science, yielding 37,037 records. This proliferation of studies and the existing body of knowledge on the SDGs enables researchers to explore this domain using various qualitative and quantitative approaches based on the literature. Initial reviews focused on qualitative approaches, addressing objectives such as evaluating national progress, identifying the role of ICT in achieving the SDGs, and analyzing implementation challenges <sup>[11]</sup>. In recent years, a wave of studies has emerged, analyzing scientific output through meta-analyses and bibliometric methods <sup>[10]</sup>.

Scientific research on the SDGs is not only growing but also diversifying in terms of research areas. As shown in Figure 2, the range of topics expanded between 2015 and 2022, with 2022 being the first year to include review articles on all SDGs <sup>[12]</sup>. However, SDG research cannot yet be considered a consolidated field due to significant research gaps, particularly in SDG 8 (Decent Work), SDG 10 (Reduced Inequalities), SDG 5 (Gender Equality), and SDG 16 (Peace, Justice, and Strong Institutions) <sup>[11,12]</sup>. UNESCO’s Science Report <sup>[13]</sup> also highlights diversification by country and existing gaps that hinder the achievement of the 2030 Agenda, which requires a balance across the economic, social, and environmental dimensions of sustainable development.



**Figure 2.** Distribution of review publications on sustainable development goals (SDGs) over time <sup>[12]</sup>

Bibliometric analyses have also addressed specific SDGs or groups of SDGs. For instance, studies have focused on SDG 1 (No Poverty) <sup>[14]</sup>, SDG 2 (Zero Hunger) <sup>[15]</sup>, SDG 3 (Good Health and Well-being) <sup>[16]</sup>, SDG 4 (Quality Education) <sup>[17-19]</sup>, SDG 9 (Industry, Innovation, and Infrastructure), and SDG 12 (Responsible Consumption and Production) <sup>[20]</sup>, as well as SDG 6 (Clean Water and Sanitation) <sup>[21]</sup>.

From a geographical perspective, bibliometric studies reveal disparities in productivity and impact across regions and countries. Research on the SDGs is more prevalent in developed countries than in developing ones. Generally, Western countries (notably the United States and the United Kingdom) and China are the leading producers of science and SDG-related research <sup>[11,12,22]</sup>. However, regarding impact, the United States and the United Kingdom significantly surpass China, with comparable productivity but nearly triple the impact <sup>[11]</sup>.

Regional thematic preferences also vary. Meschede <sup>[23]</sup> identified SDG 4 (Quality Education) as the second-most-researched SDG in Europe and South America, the fourth in Africa, and absent from the Top 5 in other regions.

In Latin America, scientific output related to the SDGs has also grown significantly. Less-developed countries in the region (e.g., Nicaragua, Guatemala, the Dominican Republic, and El Salvador) focused more intensively on specific SDGs, with 53% of their output concentrated on them during 2016–2019. In contrast, wealthier countries like Brazil, Mexico, Argentina, and Chile had a concentration of 30% during the same period <sup>[24]</sup>. Notable regional trends include a fourfold increase in research on SDG 4 and a 3.6-

fold increase in SDG 16 compared to global trends. Research on SDG 1 and SDG 10 also grew nearly three times faster in the region than globally.

The SDGs as a global policy provide universities an opportunity to contribute to their core missions: education, research, and knowledge transfer. Although this integration remains in its early stages in many cases <sup>[25]</sup>, universities and research centers are among the leading producers of knowledge in SDG-related fields <sup>[15]</sup>. The amount of SDG-related research produced by universities also influences their international rankings, such as the Times Higher Education Impact Rankings, which evaluate universities based on their research and impact on the SDGs. For instance, the University of Brasília ranked highest in Brazil for SDG 4 in 2023, placing 95th globally, while São Paulo State University ranked 25th worldwide for SDG 9 <sup>[26]</sup>.

Some studies have specifically analyzed university-level SDG research. For example, Körfigen *et al.* <sup>[27]</sup> examined articles from 13 Austrian universities, Machado and Davim <sup>[28]</sup> conducted a bibliometric analysis on “higher education for sustainability,” and Repiso *et al.* <sup>[10]</sup> analyzed Spanish universities’ SDG-related scientific output. Global studies also incorporate university-based research and impact, highlighting North American and UK universities as leaders and occasionally including the University of São Paulo in the Top 10 <sup>[11,29]</sup>.

In Brazil, bibliometric studies have addressed specific aspects of SDG-related research, such as environmental sustainability <sup>[30]</sup>, sustainability in small businesses <sup>[31]</sup>, sustainable development in the Amazon <sup>[32]</sup>, and tourism <sup>[33]</sup>. However, no comprehensive bibliometric analyses have been conducted on SDG-related scientific output from Brazilian universities.

The objective of this study is to characterize the Brazilian university system’s research on SDGs by analyzing the production and impact of each university across 16 SDGs. Additionally, this study seeks to determine whether the analysis of this output can identify profiles and group universities based on their thematic priorities.

## 2. Methodology

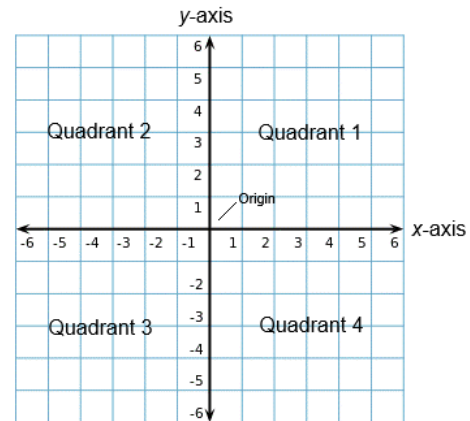
This study is a bibliometric analysis of the scientific



production of Sustainable Development Goals (SDGs) by Brazilian universities in the Web of Science Core Collection for the period 2015–2023 (up to June 2023). It utilizes filters implemented by Clarivate Analytics in the InCites platform as of February 2022. To identify works related to each SDG, Clarivate Analytics has developed a set of Micro Citation Topics, carefully curated by analysts from the company's Institute of Scientific Information™ (ISI) through a combination of bibliometric analysis and manual review <sup>[34]</sup>. This production identification methodology has been employed in other studies, such as that of Repiso *et al.* <sup>[10]</sup>, which conducted a similar analysis for Spanish universities. It is worth noting that SDG 17 is conceptualized as the conjunction of pursuing two or more goals; thus, neither Web of Science nor Scopus identifies it, which is why it is excluded from this study and existing literature.

The study provides a descriptive analysis of the production of Brazilian universities for each of the 16 SDGs. Additionally, it identifies the Normalized Impact of these outputs, allowing for an understanding of both the number of publications and the average scientific impact of these areas. The Normalized Impact calculated by InCites contextualizes the citations each article receives according to its category and publication year <sup>[35]</sup>.

Furthermore, leveraging the diversity of SDGs (16), the universities are characterized. Multidimensional Scaling (MDS) is employed to visually assess similarities between institutions based on their focus on SDG-related themes. MDS is a tool that enables researchers to obtain quantitative estimates of similarity between groups of elements, offering a visual representation of the relational structures underlying the studied system <sup>[36]</sup>. The Kendall rank correlation coefficient was used for its superior discrimination of results. This coefficient evaluates the ordinal element of the cases to analyze the order of preferences each university exhibits for the 16 SDGs, treating them as a ranking <sup>[37]</sup>. MDS plots the studied elements—in this case, Brazilian universities—on a Cartesian plane according to their similarity.



**Figure 3.** Cartesian plane ordered by quadrants

**Table 1.** Phases of data collection and analysis of Brazilian universities' SGD production

| Phase | Phases of the study  |
|-------|--|
| 1     | Identification of Brazilian universities in Web of Science (176 universities identified; only the top 25 most productive are shown in the tables, but the full dataset contains values for all universities).  |
| 2     | Search and identification of the SDG-related production of Brazilian universities for each of the 16 SDGs (InCites: 16 values for 176 universities = 2,816 identified values).   |
| 3     | Calculation of the Normalized Impact for each dataset (InCites: 16 values for 176 universities = 2,816 calculated values).   |
| 4     | Multidimensional Scaling: A comparative study of similarity among the top 25 most productive universities in SDGs, using the 16 values as analytical elements. Software: Xlstat <sup>[38]</sup> . Kendall rank correlation coefficient was applied. Visualization was conducted using Tableau. |

### 3. Results

#### 3.1. Scientific production on SDG topics

The majority of Brazil's scientific production on each SDG is concentrated in five universities. The most productive are the University of São Paulo, São Paulo State University, State University of Campinas, Federal University of Rio de Janeiro, Federal University of Rio Grande do Sul, and Federal University of Minas Gerais (Table 2). These large, generalist universities stand out in the number of publications across nearly all SDGs. However, it is important to identify the areas where



these institutions do not excel. The University of São Paulo is the leader in all areas, followed by São Paulo State University, which also performs strongly in most areas but shows lower production in SDG 8 (Decent Work and Economic Growth) and SDG 10 (Reduced Inequalities), both related to social issues. Beyond the top five, significant differences between universities are observed, allowing the articulation of similarities and differences between institutions based on patterns identified throughout the article.

In general, SDGs related to Natural Sciences show the highest levels of scientific production. The most developed SDG, SDG 3 (Good Health and Well-Being), accounts for 46% of the production by these institutions. In contrast, SDGs related to Social Sciences have relatively lower production, except for SDG 2 (Zero Hunger) and SDG 5 (Gender Equality), the latter ranking as the sixth most developed goal (3.9%). SDG 16 (Peace, Justice, and Strong Institutions) and SDG 8 (Decent Work and Economic Growth) have minimal production, jointly representing only 0.8%. Other areas with proportionally lower output in Brazilian research include SDG 10 (Reduced Inequalities) and SDG 1 (No Poverty).

The University of Brasília is among the top five producers of research on SDG 1, 8, 10, and 16, while the Federal University of Minas Gerais excels in SDG 1, 6, 7, 10, 11, and 16. Similarly, the Federal University of Santa Catarina stands out in three areas (SDG 4, 9, and 11), while the Federal University of Viçosa and Federal University of Paraná are recognized in two (SDG 2 and 13, and SDG 14 and 15, respectively). The Federal University of Pernambuco is among the top five institutions in SDG 16, and the Federal University of Lavras in SDG 2.

Except for the University of São Paulo, all other top-producing universities drop out of the top five rankings in at least five SDGs. For instance:

- (1) São Paulo State University underperforms in SDG 8, 9, 10, 11, and 16.
- (2) State University of Campinas is less prominent in SDG 2, 10, 13, 14, and 16.
- (3) The Federal University of Rio de Janeiro shows lower output in SDG 2, 4, 5, 6, and 16.
- (4) Federal University of Rio Grande do Sul

underperforms in SDG 1, 7, 14, 15, and 16.

However, SDG 16 highlights several institutions apart from the University of São Paulo, such as the University of Brasília, Federal University of Minas Gerais, Rio de Janeiro State University, and Federal University of Pernambuco.

### 3.2. Impact of Brazilian universities by SDG

When analyzing the normalized impact of the publications from Brazil's Top 25 universities by specialty and SDG (**Table 3**), it is evident that most of their contributions fall below the global citation average (below 1). Out of 400 cases, the Top 25 universities matched or exceeded the global citation average in only 81 instances (roughly 1 in 5). The worst-performing area is SDG 4 (Quality Education), where no university comes close to the global average citation rate, followed by SDG 9 (Industry, Innovation, and Infrastructure), with only one institution (the Federal University of Rio Grande do Sul) surpassing the global average. Similarly, for SDG 16 (Peace, Justice, and Strong Institutions), only one institution (Federal University of Pelotas) exceeds the global average, although some universities with high impact values, such as the Federal University of ABC (average impact of 2.42), also perform strongly. SDG 5 (Gender Equality) is another underperforming area, with only four universities meeting the global average.

On the other hand, SDG 15 (Life on Land) is the area where Brazilian universities outperform the global average most consistently, with 17 institutions from the Top 25 achieving values above the global average. Notable among these are smaller universities such as Pontifical Catholic University of Rio de Janeiro (IN = 2.62) and Vega de Almeida University (IN = 2.86).

The impact of universities on SDG research varies significantly across areas, with the influence concentrated in 12 institutions. The University of Southern Santa Catarina achieves the highest impact in three SDGs (SDG 3: 1.7; SDG 6: 1.17; SDG 11: 2.77), while the State University of Campinas (SDG 2: 1.09; SDG 4: 0.82), Vega de Almeida University (SDG 1: 5.4; SDG 15: 2.86), Federal University of ABC (SDG 14: 3.02; SDG 16: 2.42), and Federal University of Pelotas (SDG 5: 1.72; SDG 7: 1.29) lead in two SDGs each. Seven universities achieve the highest impact in only one SDG:

(1) Federal University of São Carlos in SDG 8 (1.17)

(2) Federal University of Minas Gerais and Federal University of Rio Grande do Sul in SDG 9 (1.06)

(3) Pontifical Catholic University of Rio de Janeiro in SDG 13 (1.47)

(4) Federal University of Rio Grande do Norte in SDG 10 (1.55)

(5) Federal University of Ceará in SDG 12 (1.48)

Only the last two universities are located in Brazil's northern and northeastern regions; the rest are situated in the southern and southeastern parts of the country.

The multidimensional scaling technique, used to analyze similarities and groupings, places the most generalist universities near the center of the graph. The Federal University of Minas Gerais, the Federal University of Ceará, and the Federal University of Rio Grande do Sul are among the most generalized institutions (**Figure 4**). Typically, the universities with higher total production are positioned closer to the center, while smaller universities with unique scientific profiles are on the periphery, such as the Federal University of Pelotas and Federal Fluminense University, which are strikingly complementary.

While the overall production distribution among universities is similar, subtle nuances allow for clear groupings. The similarity matrix shows that SDG 2 (Zero Hunger) is the most commonly represented across universities, followed by SDG 16 (Peace, Justice, and Strong Institutions) and SDG 8 (Decent Work and Economic Growth). Conversely, SDG 9 (Industry, Innovation, and Infrastructure) shares the most similarities with other SDGs, making it less discriminative.

An example of grouping by priorities includes the Federal Universities of Viçosa, Santa Maria, and Lavras, which share low production in SDG 4 (Quality Education) and SDG 5 (Gender Equality). This selective focus drives their positioning in the multidimensional scaling graph.

Universities in each quadrant demonstrate distinct SDG contributions:

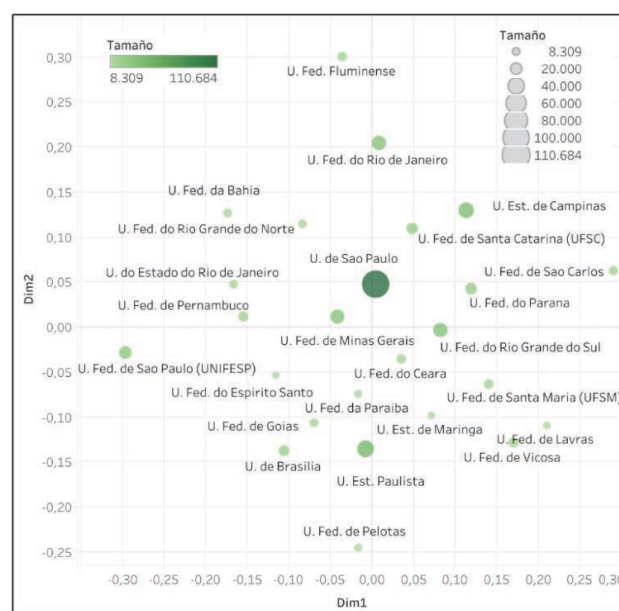
(1) First Quadrant: Focus on SDGs 1, 3, 5, 7, 8, 13, 15, 16, with notable contributions to SDGs 1, 2, and 13 and medium production in SDGs 5, 7, 13, 15. Institutions

here are located in the south (2) and southeast (3).

(2) Second Quadrant: Focus on SDGs 5, 7, 8, 11, and 15, with medium production in SDGs 5, 7, and 11 and low production in SDGs 8 and 15, except for the Federal University of Pernambuco and Federal University of Minas Gerais. Institutions are in the northeast (3) and southeast (2).

(3) Third Quadrant: Broad SDG focus, especially on SDGs 1, 2, 3, 6, 8, 10, 11, 12, 13, 14, 15, 16, with high contributions to SDGs 2, 13, and 15. Institutions are distributed across the northeast (1), southeast (3), central-west (2), and south (1).

(4) Fourth Quadrant: Contributions to SDGs 1, 6, 7, 8, 13, 15, and 16, with medium production in SDGs 6 and 7 and low production in SDGs 8 and 16, except for SDGs 1, 13, and 15. Institutions are in the northeast (1), southeast (3), central-west (2), and south (1).



**Figure 2.** Multidimensional scaling of Brazil's top 25 universities by SDG scientific production (2015–2023)

**Table 2.** Scientific production on SDG topics in Brazil (2015–2023, top 25 universities)

|   | ODS1 | ODS2  | ODS3   | ODS4  | ODS5  | ODS6  | ODS7  | ODS8 | ODS9  | ODS10 | ODS11 | ODS12 | ODS13 | ODS14 | ODS15 | ODS16 |
|---|------|-------|--------|-------|-------|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| University of Sao Paulo                   | 809  | 4,658 | 60,640 | 1,570 | 5,164 | 2,293 | 3,186 | 366  | 1,472 | 431   | 5,601 | 2,296 | 9,675 | 3,075 | 9,088 | 360   |
| University of São Paulo                   | 218  | 3,567 | 18,100 | 654   | 1,339 | 1,327 | 1,539 | 35   | 430   | 60    | 1,274 | 1,086 | 4,780 | 1,696 | 5,172 | 57    |
| University of Campinas                    | 218  | 1,312 | 17,854 | 651   | 1,818 | 1,090 | 1,700 | 159  | 858   | 116   | 2,316 | 1,196 | 2,559 | 616   | 2,676 | 79    |
| Federal University of Rio de Janeiro      | 268  | 704   | 14,150 | 453   | 1,072 | 841   | 1,095 | 202  | 793   | 194   | 2,029 | 856   | 2,863 | 1,218 | 3,181 | 94    |
| Federal University of Rio Grande do Sul   | 195  | 1,608 | 14,336 | 578   | 1,289 | 1,089 | 601   | 165  | 615   | 153   | 2,245 | 850   | 2,890 | 750   | 2,509 | 119   |
| Federal University of Minas Gerais        | 280  | 926   | 15,919 | 570   | 1,244 | 939   | 776   | 157  | 449   | 179   | 1,582 | 542   | 2,127 | 460   | 2,435 | 153   |
| University of Sao Paulo                   | 97   | 315   | 18,006 | 366   | 1,844 | 210   | 170   | 32   | 72    | 21    | 373   | 179   | 650   | 417   | 660   | 63    |
| Federal University of Paraná              | 105  | 1,372 | 7,656  | 322   | 564   | 607   | 627   | 73   | 372   | 97    | 830   | 622   | 2,434 | 854   | 2,890 | 72    |
| University of Santa Catarina              | 143  | 875   | 7,448  | 687   | 734   | 743   | 924   | 78   | 606   | 142   | 1,319 | 840   | 1,745 | 913   | 1,471 | 81    |
| University of Brasilia                    | 322  | 1,066 | 6,346  | 486   | 532   | 416   | 495   | 168  | 379   | 216   | 1,009 | 329   | 2,214 | 362   | 2,211 | 217   |
| Federal University of Pernambuco          | 116  | 684   | 6,548  | 332   | 567   | 490   | 444   | 55   | 382   | 104   | 695   | 236   | 1,532 | 825   | 1,978 | 125   |
| Federal University of Vicosa              | 132  | 3,045 | 3,447  | 71    | 187   | 499   | 315   | 46   | 84    | 53    | 440   | 275   | 3,347 | 184   | 2,641 | 8     |
| University of Santa Maria                 | 81   | 1,513 | 5,335  | 172   | 250   | 680   | 650   | 42   | 187   | 30    | 831   | 298   | 1,665 | 332   | 1,129 | 31    |
| Federal University of Ceara               | 115  | 883   | 6,161  | 266   | 530   | 498   | 407   | 53   | 288   | 58    | 672   | 331   | 1,430 | 438   | 939   |       |
| University of Sao Carlos                  | 92   | 706   | 4,745  | 340   | 394   | 810   | 798   | 43   | 411   | 56    | 553   | 1,017 | 1,066 | 317   | 1,659 | 45    |
| Univ. Fed. Fluminense                     | 158  | 208   | 6,377  | 288   | 507   | 303   | 477   | 152  | 528   | 129   | 958   | 341   | 1,159 | 553   | 632   | 77    |
| Federal University of Rio Grande do Norte | 112  | 411   | 4,709  | 292   | 412   | 567   | 438   | 30   | 286   | 60    | 758   | 217   | 1,082 | 491   | 1,204 | 41    |
| Federal University of Goias               | 97   | 866   | 5,110  | 203   | 454   | 293   | 277   | 36   | 119   | 90    | 373   | 111   | 1,235 | 199   | 1,601 | 37    |
| Federal University of Bahia               | 102  | 239   | 5,963  | 280   | 409   | 294   | 285   | 40   | 251   | 48    | 439   | 180   | 1,120 | 469   | 908   | 49    |
| Rio de Janeiro State University           | 107  | 210   | 5,551  | 186   | 626   | 292   | 186   | 78   | 124   | 91    | 831   | 147   | 1,067 | 499   | 916   | 135   |
| Federal University of Pelotas             | 94   | 1,171 | 5,103  | 103   | 574   | 171   | 118   | 11   | 53    | 36    | 411   | 115   | 1,166 | 96    | 458   | 54    |
| Federal University of Paraíba             | 95   | 601   | 3,803  | 238   | 336   | 271   | 569   | 73   | 160   | 109   | 378   | 192   | 1,081 | 316   | 1,106 | 65    |
| Federal University of Lavras              | 49   | 1,996 | 1,845  | 63    | 78    | 310   | 190   | 18   | 76    | 21    | 277   | 172   | 2,069 | 133   | 1,891 | 5     |
| Federal University of Espírito Santo      | 49   | 530   | 3,353  | 172   | 331   | 276   | 305   | 46   | 114   | 55    | 440   | 165   | 961   | 416   | 1,169 | 57    |
| Maringa State University                  | 47   | 788   | 3,315  | 101   | 235   | 562   | 156   | 28   | 82    | 59    | 337   | 170   | 1,072 | 298   | 1,035 | 24    |

**Table 3.** Normalized impact of Brazil's top universities by SDG (2015–2023)

|   | ODS1 | ODS2 | ODS3 | ODS4 | ODS5 | ODS6 | ODS7 | ODS8 | ODS9 | ODS10 | ODS11 | ODS12 | ODS13 | ODS14 | ODS15 | ODS16 |
|---|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|
| University of Sao Paulo                     | 1.14 | 1.08 | 1.21 | 0.77 | 1.06 | 0.82 | 0.88 | 0.78 | 0.78 | 0.8   | 1.17  | 0.99  | 1.09  | 0.98  | 1.19  | 0.78  |
| University of São Paulo                     | 0.73 | 0.69 | 0.87 | 0.4  | 0.85 | 0.76 | 0.71 | 1.02 | 0.89 | 0.56  | 0.87  | 0.87  | 0.78  | 0.85  | 1     | 0.36  |
| University of Campinas                      | 0.99 | 1.09 | 1.07 | 0.82 | 0.94 | 0.93 | 0.92 | 0.82 | 0.94 | 0.41  | 1.1   | 1.02  | 1.13  | 0.93  | 1.32  | 0.82  |
| Federal University of Rio de Janeiro        | 1.22 | 0.82 | 1.03 | 0.52 | 0.83 | 0.85 | 0.84 | 0.75 | 0.92 | 0.57  | 1     | 0.92  | 0.95  | 0.96  | 1.07  | 0.58  |
| Federal University of Rio Grande do Sul     | 1.25 | 0.9  | 1.4  | 0.59 | 0.97 | 1.02 | 0.78 | 0.62 | 1.06 | 1.11  | 1.3   | 1.08  | 0.93  | 0.93  | 1.11  | 0.6   |
| Federal University of Minas Gerais          | 1.65 | 0.97 | 1.31 | 0.6  | 0.87 | 0.75 | 0.75 | 1.16 | 0.75 | 1.15  | 1.06  | 0.79  | 0.94  | 0.93  | 1.24  | 0.38  |
| University of Sao Paulo                     | 0.77 | 0.85 | 1.21 | 0.56 | 0.96 | 0.87 | 0.65 | 0.52 | 0.54 | 0.39  | 0.93  | 0.92  | 0.99  | 1.11  | 1.05  | 0.48  |
| Federal University of Paraná                | 0.54 | 0.65 | 0.96 | 0.45 | 0.82 | 0.7  | 0.88 | 0.73 | 0.6  | 0.36  | 0.6   | 0.77  | 0.72  | 0.81  | 0.87  | 0.48  |
| University of Santa Catarina                | 0.76 | 0.72 | 1.52 | 0.56 | 0.87 | 0.83 | 0.81 | 0.45 | 0.64 | 0.49  | 0.97  | 1.14  | 0.98  | 0.97  | 1.05  | 0.39  |
| University of Brasília                      | 1.01 | 0.87 | 1.33 | 0.41 | 0.79 | 0.81 | 0.72 | 0.95 | 0.6  | 0.55  | 0.94  | 0.69  | 0.93  | 0.82  | 1.08  | 0.48  |
| Federal University of Pernambuco            | 0.73 | 0.92 | 0.83 | 0.66 | 0.65 | 0.71 | 0.8  | 0.79 | 0.68 | 0.6   | 0.7   | 0.55  | 0.89  | 0.8   | 1.11  | 0.72  |
| Federal University of Viosa                 | 0.64 | 0.88 | 0.83 | 0.51 | 0.57 | 0.78 | 0.69 | 0.28 | 0.45 | 0.28  | 0.87  | 0.81  | 0.83  | 0.65  | 0.93  | 0.62  |
| University of Santa Maria                   | 0.66 | 0.76 | 0.88 | 0.32 | 0.55 | 1.09 | 0.69 | 0.22 | 0.53 | 0.44  | 0.99  | 0.74  | 0.58  | 0.85  | 0.74  | 0.17  |
| Federal University of Ceara                 | 1    | 0.66 | 0.87 | 0.45 | 0.61 | 0.88 | 0.61 | 0.36 | 0.87 | 0.49  | 0.71  | 1.48  | 0.67  | 0.83  | 0.84  | 0     |
| University of Sao Carlos                    | 0.81 | 0.79 | 0.89 | 0.48 | 1.04 | 0.79 | 0.79 | 1.17 | 0.83 | 0.37  | 0.72  | 1.14  | 0.77  | 0.76  | 1.01  | 0.77  |
| Univ. Fed. Fluminense                       | 0.99 | 0.76 | 0.89 | 0.39 | 0.85 | 0.69 | 0.95 | 0.9  | 0.86 | 0.55  | 0.75  | 1.08  | 0.89  | 0.87  | 1.01  | 0.39  |
| Federal University of Rio Grande do Norte   | 1.04 | 0.77 | 0.85 | 0.81 | 0.76 | 0.83 | 1.02 | 0.68 | 0.82 | 1.55  | 0.71  | 0.79  | 1.02  | 0.98  | 1.18  | 0.75  |
| Federal University of Goias                 | 1.35 | 0.78 | 0.96 | 0.43 | 0.91 | 0.69 | 0.56 | 0.34 | 0.69 | 0.9   | 0.79  | 0.61  | 0.89  | 1.07  | 1.11  | 0.45  |
| Federal University of Bahia                 | 0.82 | 0.78 | 1.38 | 0.54 | 0.85 | 0.77 | 0.86 | 1.08 | 0.99 | 1.08  | 0.98  | 0.72  | 0.79  | 0.78  | 1.09  | 0.41  |
| Rio de Janeiro State University             | 0.79 | 0.83 | 0.96 | 0.48 | 0.88 | 0.73 | 0.63 | 1.07 | 0.46 | 0.21  | 0.79  | 0.57  | 0.91  | 0.88  | 0.89  | 0.59  |
| Federal University of Pelotas               | 1.8  | 0.94 | 1.27 | 0.36 | 1.72 | 0.82 | 1.29 | 1.06 | 0.56 | 1.11  | 0.87  | 0.68  | 0.68  | 0.77  | 0.79  | 1.22  |
| Federal University of Paraíba               | 0.69 | 0.55 | 0.77 | 0.48 | 0.8  | 0.88 | 0.82 | 0.43 | 0.36 | 0.72  | 0.9   | 0.74  | 0.8   | 0.99  | 0.97  | 0.44  |
| Federal University of Lavras                | 0.51 | 0.72 | 0.75 | 0.71 | 1.06 | 0.67 | 0.76 | 0.4  | 0.46 | 0.2   | 0.6   | 0.58  | 0.73  | 0.73  | 1.09  | 0.22  |
| Federal University of Espírito Santo        | 0.26 | 0.57 | 1.19 | 0.36 | 0.74 | 0.75 | 0.74 | 0.34 | 0.44 | 0.11  | 1.04  | 0.74  | 0.69  | 0.99  | 0.87  | 0.47  |
| Maringa State University                    | 0.73 | 0.59 | 0.84 | 0.58 | 0.67 | 1    | 0.63 | 0.67 | 0.36 | 1.12  | 1.1   | 0.66  | 0.7   | 0.73  | 1.02  | 0.46  |
| ABC Federal University                      | 1.73 | 0.84 | 0.99 | 0.74 | 0.89 | 0.66 | 0.96 | 0.28 | 0.73 | 0.47  | 1.08  | 0.65  | 1.05  | 3.02  | 1.09  | 2.42  |
| Pont. Catholic University of Rio de Janeiro | 0.82 | 0.96 | 0.91 | 0.76 | 0.81 | 0.73 | 0.65 | 0.94 | 0.75 | 0.83  | 0.9   | 1.1   | 1.47  | 1.69  | 2.62  | 1.1   |
| University of Southern Santa Catarina       | 0.55 | 1    | 1.7  | 0.34 | 0.89 | 1.17 | 0.29 | 1.1  | 0.88 | 0.04  | 2.77  | 1.01  | 1.16  | 0.94  | 1.24  | 1.06  |
| Veiga de Almeida University                 | 5.4  | 0.14 | 0.75 | 0.68 | 0.31 | 0    | 0    | 0.63 | 0.05 | 1.16  | 2     | 0.16  | 1.44  | 0.44  | 2.86  | 0     |

Four universities are included which, without being in the top 25 productive universities, stand out for having a great international impact in some of the SDGs studied. Values below 1 are shown in red letters, except for exceptions for reasons of contrast.



## 4. Discussion and conclusions

The Sustainable Development Goal (SDG) with the highest development in Brazilian universities is SDG 3 (Health and Well-being), accounting for 46% of the scientific output, followed by SDG 13 (Climate Action) and SDG 15 (Life on Land), each contributing slightly more than 10%. The fourth most productive goal is SDG 2 (Zero Hunger) with 6.3%, while SDG 5 (Gender Equality) and SDG 7 (Affordable and Clean Energy) rank fifth and sixth, with 3.9% and 3.1%, respectively. These proportions change slightly when considering only the top 25 universities, where the output on Gender Equality surpasses that of Zero Hunger in many cases. The four SDGs with the least scientific output are, in descending order, SDG 1 (No Poverty) with 0.8%, SDG 10 (Reduced Inequalities) with 0.48%, and SDG 16 (Peace, Justice, and Strong Institutions) and SDG 8 (Decent Work and Economic Growth), each with 0.4%.

In general, Brazilian universities do not stand out for their impact on SDGs, with the exception of smaller, peripheral universities where lower output achieves relatively high impact. In most cases, the impact remains below the global average. This trend is partly attributed to the national focus of much Brazilian research, published in domestic journals addressing local issues<sup>[39]</sup>. A significant portion of the output aims for local impact, though one national theme surpassing the global average is “Life on Land” (SDG 15), followed by Health and Well-being (SDG 3).

The thematic profiles of Brazilian universities show disparities in output quantity, while normalized impacts are mostly similar and below 1. The distribution of SDG contributions is also quite uniform, requiring Kendall's coefficient to highlight differences in priorities among the universities. Larger universities tend to align more closely with the overall profile, exemplified by the University of São Paulo. Conversely, smaller universities occupy the extremes, with unique profiles, such as the Federal Universities of Fluminense, São Carlos, Pelotas, and São Paulo, which display uncommon output distributions.

Studies measuring and comparing scientific output on SDGs have consistently shown similar overall trends. Most research focuses on life sciences, biomedicine<sup>[23]</sup>, natural sciences, engineering/

technology<sup>[40]</sup>, and environmental sciences<sup>[12]</sup>. Social sciences follow in productivity<sup>[41]</sup> and impact<sup>[42]</sup>. The primary focus areas include SDG 3 (Health and Well-being)<sup>[16,22,23,43]</sup> and SDG 13 (Climate Action)<sup>[44]</sup>, along with climate-related SDGs such as SDG 7 (Affordable and Clean Energy), SDG 11 (Sustainable Cities and Communities), and SDG 12 (Responsible Consumption and Production)<sup>[12,22,40]</sup>.

The top 5 universities identified for SDG-related scientific output largely coincide with global rankings. As in this study, the University of São Paulo leads among Brazilian universities in rankings such as Times Higher Education<sup>[26]</sup>, SCImago Institutions Rankings<sup>[45]</sup>, and QS World University Rankings<sup>[46]</sup>. The SCImago Institutions Rankings agree on the top four universities: São Paulo, UNESP, Campinas, and Federal University of Rio de Janeiro. The QS World University Rankings align in university presence but differ in order due to incorporating sustainability parameters: São Paulo, Campinas, Federal University of Rio de Janeiro, and UNESP. The Times Higher Education Impact Rankings, which include university research output and impact on SDGs, rank São Paulo, Campinas, Federal University of Rio Grande do Sul, and UNESP in the top four, differing slightly in the positions.

The SDGs have been subject to critical reviews since their inception, exacerbated by the slow progress in meeting the established targets regarding their ambition (too many in too short a time for some and insufficiently ambitious in structural terms for others)<sup>[47]</sup>; their content (including the weak presence of human rights and the weakening of global governance and democracy, particularly in SDG 16, Peace, Justice, and Strong Institutions)<sup>[48,49]</sup>; their targets, both in formulation and attainability<sup>[50]</sup>; their indicators<sup>[51]</sup>; and their funding<sup>[52]</sup>. They have also been widely criticized as a global public agenda by Trumpist right-wing movements, national-populist parties, climate change deniers, some multinationals dissatisfied with accountability mechanisms and the role assigned to corporations, and even by governments in developed countries reluctant to allocate the necessary resources for financing the SDGs, as outlined in SDG 17 and the Addis Ababa Action Agenda<sup>[4]</sup> on development financing. In summary, they have faced resistance from a reactionary



status quo <sup>[52]</sup>.

On the other hand, there is broad consensus that the 2030 Agenda faces systemic risks (humanitarian, economic, environmental, and governance-related) that must be managed at a planetary level <sup>[7,47,52]</sup>. Thus, while the SDGs are an imperfect tool, they outline a way of understanding the world with a long-term, multilateral, and globally cooperative vision that should endure, as the alternatives are isolationism, autocracy, and short-termism, which are gaining traction across much of the world <sup>[53]</sup>. Therefore, these criticisms cannot be ignored when using scientific production on SDGs to characterize a university system and the institutions within it.

Bibliometric analyses enable an understanding

of the evolution of research on the topic, provide an overview, and identify trends, gaps, and imbalances among the SDGs studied <sup>[11]</sup>. However, the databases used <sup>[54,55]</sup>, the keywords selected, the tools employed, as well as the approach <sup>[56]</sup> or method applied <sup>[57]</sup>, can result in different outcomes and inconsistencies <sup>[54]</sup>. These factors can even perpetuate inequalities based on the level of development of countries, the capacity of their scientific systems to appear in major journals and databases, as well as the overrepresentation of certain countries, languages, and approaches <sup>[23,43]</sup>, alongside the underrepresentation of other countries or development objectives.

### Disclosure statement

The authors declare no conflict of interest.

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# Internal Logic and Practical Path of Education, Science and Technology, and Talent Enabling New Quality Productivity

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## Abstract:

To promote the high-quality development of Chinese society, the current General Secretary of the Chinese Communist Party put forward the concept of new quality productivity, whose main features are centered on three aspects: “innovation-led”, “science and technology-driven” and “talent-led”. From the connotation of new quality productivity, its “new quality” is organically linked to education, science and technology, and talents, and in the three aspects of high quality, high level, and high quality, for the empowerment of new quality productivity clear internal logic. Therefore, in accordance with the development requirements of the new quality of productive forces, education, science and technology, talent empowerment of the practical path lies in: deepening the “trinity” to jointly promote the “concept of education”; and strengthening scientific and technological innovation as the lead to promote industrial upgrading; improve the income distribution mechanism to release the talent multiplier effect, which is important for the development of the new quality of productive forces. Release the talent multiplier effect, which is of great significance to writing a new chapter on the great cause of Chinese modernization.

## Keywords:

New-quality productivity  
Education  
Science and technology  
Talent

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## 1. Introduction

Productivity is the most dynamic and revolutionary factor driving social development. To advance Chinese-style modernization, the fundamental approach lies in achieving the modernization of productivity. Consequently, new-quality productivity has become an essential requirement for high-quality development and represents the latest demand for the modernization of productivity. Currently, to effectively utilize new-quality productivity for promoting high-quality



development, efforts should focus on facilitating the smooth flow of various factors into this domain, while promoting the deep integration of education, technology, talent, and new-quality productivity.

## 2. Analysis of the “new quality” of new-quality productivity

“The core of the concept of new-quality productivity lies in productivity itself, and it falls within the scope of productivity”<sup>[1]</sup>. The essence of new-quality productivity remains rooted in productivity, with its “new quality” reflecting changes triggered by sufficient quantitative accumulation or theoretical advancements. These “new qualities” represent emerging phenomena that conform to the laws of historical development and signify new directions for growth. In essence, the “new quality” is primarily characterized by innovation-led, technology-driven, and talent-guided features, forming a novel, higher-quality, and more advanced form of productivity.

### 2.1. Innovation-led view of new productivity

The current General Secretary of the Chinese Communist Party (CCP) emphasized: “Adapting to and guiding the new normal of economic development in our country depends fundamentally on technological innovation to transform growth drivers”<sup>[2]</sup>. Innovation is an essential attribute of the “new” in new-quality productivity. It is through innovation that traditional productivity achieves a qualitative leap based on quantitative accumulation.

First, new-quality productivity surpasses traditional productivity by innovating its components:

(1) Revolutionizing laborers’ quality: In the accelerated progress of modernization, laborers are transitioning from engaging in simple, repetitive, and mechanical physical labor to more complex and creative intellectual labor. With systematic and specialized training, workers in new-quality productivity demonstrate stronger subjective awareness, heightened innovation consciousness, and proficient use of intelligent tools to creatively solve problems.

(2) Innovating labor tools: As the “soul” of production tools, scientific and technological advancements must be continuously accelerated to drive the evolution of tools, which serves as the fundamental

driver of new-quality productivity.

(3) Expanding labor objects: New-quality productivity encompasses traditional labor objects as well as those created through scientific and technological innovation, particularly in areas such as renewable energy and big data. These novel objects possess higher functional value, significantly enhancing production efficiency.

Second, new-quality productivity emphasizes innovative combinations of multiple elements. It integrates technological innovation into the allocation of production factors, promoting leaps in the optimization of laborers, tools, and objects. Technological innovation acts as a “booster,” enabling effective utilization and configuration of factors within the productivity system. This results in novel combinations of production factors and conditions, facilitating the full release of multifactor productivity, enhancing traditional industrial efficiency, and creating new industries.

### 2.2. Technology-driven view of new productivity

Science and technology are the primary productive forces. Marx stated that “science is also included in the concept of productivity”<sup>[3]</sup>. While science and technology exist abstractly, they must permeate other elements of the productivity system to unleash their immense potential and transform into tangible productivity. Advanced technologies empower workers, enhancing their capabilities, and when applied in practice, significantly boost productivity. In doing so, they contribute to the accumulation of knowledge, theoretical innovation, and the advancement of tools and labor objects.

Technological applications not only streamline production processes but also improve management efficiency, reduce waste, and resolve conflicts. By reshaping productivity components and their combinations, technology becomes a powerful driver of new-quality productivity.

Modern science and technology fuel high-quality development with new momentum. The current General Secretary of CCP stressed the importance of innovation, particularly technological innovation, in achieving shifts in growth dynamics. Historical breakthroughs in productivity have been linked to technological advances—e.g., the steam engine in the industrial

age revolutionized industries. In the information era, technologies such as “green,” “digital,” and “intelligent” innovations, especially in the burgeoning information industry, serve as growth points for upgrading traditional industries and fostering high-quality development. Fully harnessing the high connectivity and penetration of contemporary technologies is crucial for propelling emerging and future industries forward.

### 2.3. Talent-guided view of new productivity

While the components of new-quality productivity remain similar to those of traditional productivity, modernization introduces new forms, qualities, and characteristics. Among these, laborers—the most dynamic factor—are now highly skilled, digitalized, and proactive, enabling the activation of other productivity elements. Talent is undoubtedly the cornerstone of new-quality productivity.

Talent is the creator, user, and leader of new-quality productivity. At its core, productivity relies on people. It is through their interaction with nature in production activities that productivity emerges. The development of new-quality productivity requires cultivating a pool of skilled talent capable of adapting to digitalized and intelligent production. Compared to traditional productivity, new-quality productivity primarily relies on intellectual laborers and technical workers as revolutionary forces.

As the current General Secretary of CCP highlighted at the talent conference, “We must refine talent management systems, prioritizing talent, trusting, respecting, nurturing, and accommodating them”<sup>[4]</sup>. Furthermore, the 20th Party Congress Report reaffirmed that “talent is the primary resource,” providing a foundational and focal point for developing new-quality productivity. The quality of laborers determines productivity level, and without highly skilled laborers, new-quality productivity cannot emerge. Talent remains the defining factor in the development of new-quality productivity.

## 3. The internal logic of empowering new-type productivity with education, science, and talent

In a system where education, science, and talent

empower new-type productivity, education serves as the foundation, science as the driving force, and talent as the mainstay. Each has its distinct focus as a “primary” element. Recognizing the holistic connections among these factors while understanding the internal logic of their role in empowering new-type productivity is essential for exploring practical paths to this empowerment and laying a solid theoretical foundation.

### 3.1. High-quality education: The fundamental path to cultivating the subjective elements of new-type productivity

Talent constitutes the subjective element of new-type productivity. The current General Secretary of CCP pointed out in *Out of Poverty*: “The processes of educational development, scientific progress, and economic revitalization are interconnected, sequential, and unified, with education serving as the foundation”<sup>[5]</sup>. High-quality education is pivotal in cultivating high-caliber talent, making it possible for new-type productivity to drive high-quality development.

High-quality education fosters new-type productivity by reproducing labor power. Labor power, encompassing the physical and mental capacities of laborers, is a critical productive force. Karl Marx noted that “education produces labor power”<sup>[6]</sup>. Laborers’ technical skills determine the level of productivity. A workforce skilled in technology, management, and services provides the intrinsic vitality of new-type productivity. High-quality education not only imparts knowledge but also guides laborers in converting it into productive capabilities. Furthermore, by promoting collaboration between schools, enterprises, and social innovation spaces, education can help transform innovative ideas into practical outputs, advancing the formation and development of new-type productivity.

High-quality education accelerates the upgrading of new-type productivity by expanding workers’ knowledge.

First, it shapes workers’ values, liberates their minds, and updates their perspectives, enabling the reproduction of new knowledge based on existing frameworks. In the information age, where knowledge grows explosively, workers face challenges such as information overload. High-quality education equips

them to discern valuable information, overcome traditional dependencies, and constantly innovate their knowledge frameworks, fostering creative thinking to drive the growth of new-type productivity.

Second, as a means of reproducing scientific knowledge, high-quality education nurtures scientific innovation capabilities essential for new-type productivity. The ongoing technological and industrial revolutions demand updated talent cultivation plans informed by new-type productivity's developmental needs. High-quality education thus serves as the logical starting point for empowering new-type productivity.

### **3.2. Advanced science and technology: The key premise for innovating the intermediate elements of new-type productivity**

Labor tools are the core elements of productivity, acting as intermediaries between laborers and labor objects. The intermediate elements of new-type productivity remain production tools, which have become more advanced and intelligent with technological progress. High-level science and technology drive the invention and application of advanced tools, promoting the evolution of labor tools toward intelligent systems and laying the groundwork for innovating new-type productivity.

Advanced science and technology enable the leap from quantitative to qualitative change in production tools. Marx stated: "The distinction between economic eras lies not in what is produced but in how it is produced and with what labor tools" [7]. Progress in production tools signifies productivity enhancement and societal advancement. The third industrial revolution brought dramatic changes in social production, ushering in an era of intelligent tools characterized by electronic computing and internet integration. Advanced technology not only frees laborers from physical exertion but also enhances their competencies in various ways. Through advancements in productivity, China is breaking free from technological blockades imposed by Western capitalist nations, further advancing its modernization efforts.

Advanced science and technology propel the invention and application of new forms of labor tools across fields. While Marx acknowledged the role of science and technology in productivity, he offered limited elaboration. History and practice have demonstrated

that new-type productivity is fundamentally driven by technological innovation. This involves disruptive innovations that integrate multiple disciplines and fields, sparking industrial transformations, opening new markets, and introducing novel labor tools. Technologies such as quantum computing, brain-like computing, and humanoid robotics exemplify labor tools born from such innovation. Advanced science and technology are thus critical drivers of the transformative changes underpinning new-type productivity.

### **3.3. High-caliber talent: The core driving force for expanding the objective elements of new-type productivity**

The technologically advanced objective elements of new-type productivity comprise its labor objects. High-caliber talent integrates more natural resources into production, and processes and applies them to endow them with labor-object attributes, thereby fostering new-type productivity.

As the primary driving force of new-type productivity, high-caliber talent serves as both the discoverer and user of technologically advanced labor objects. Labor objects encompass unprocessed materials introduced into production. With the advent of the information age and rapid advancements in intelligent technology, high-caliber talent is no longer confined to traditional labor objects. Instead, they leverage AI to uncover new labor objects, such as new energy sources, advanced materials, and abstract big data, broadening the scope of labor objects and enhancing their diversity. By discovering and utilizing previously unknown properties of raw materials during production, talent further accelerates the development of new-type productivity.

High-caliber talent explores emerging fields, opens new markets, and develops industries, thereby transforming them into labor objects that nurture new-type productivity. Disruptive technologies such as the metaverse, generative AI, and future networks are emerging under the leadership of talented individuals. Markets, as unique resources, generate valuable information, which, when analyzed, guides efficient production and prevents resource wastage. This dynamic promotes industrial restructuring and economic transformation to meet evolving societal demands. The



discovery, innovation, and transfer of value from labor objects hinge on high-caliber talent as the core driver. Therefore, high-caliber talent is the intrinsic force accelerating the formation of new-type productivity and serves as its primary resource.

#### **4. Practical pathways for empowering new productivity with education, technology, and talent**

Technological innovation relies on talent for propulsion, and talent cultivation depends on education to be realized. “Education, technology, and talent form foundational and strategic support for building a modern socialist nation”<sup>[8]</sup>. The 20th National Congress of the Communist Party of China for the first time elucidated the intrinsic consistency of coordinated planning and integrated advancement of education, technology, and talent. Therefore, it is crucial to establish a positive cycle among education, technology, and talent to generate a multiplier effect that empowers new productivity.

##### **4.1. Adopting a systematic perspective: deepening the “three-in-one” approach with a broad view of education**

The mutual support for the goals of building a strong nation in education, technology, and talent underscores the necessity of integrating and advancing these three elements to enhance quality and efficiency in high-quality development. Hence, in the new era, education must adopt a “three-in-one” broad view to cultivate top-notch innovative talent, scientific leaders, and innovation teams while training vast numbers of high-caliber workers to solidify the foundation for forming and developing new productivity.

First, multi-stakeholder collaboration is essential to foster students’ innovative thinking and creativity—currently a shortfall in primary, higher, and vocational education. To meet the demands of high-quality development, all educational entities must address the new requirements posed by the formation of new productivity. This involves providing students with more practical opportunities and open learning environments while focusing on nurturing innovative thinking and creativity. Primary education institutions

should compile science-themed books suitable for early education and organize science education activities and training, including innovation contests and exhibitions. Universities must embrace the “main theme” of industry-academic collaborative innovation, enhancing in-depth cooperation with industries. By aligning curriculum systems with the nation’s major development strategies and advanced technological fields, higher education institutions can cultivate elite, innovative technological talent proficient in production, management, and services. Vocational education must work on interdisciplinary integration, continuously updating traditional courses to address the evolving technical landscape and embedding the concept of developing new productivity into professional training and career guidance.

Second, updated educational philosophies should enhance students’ information technology literacy. Digitalized education serves as a pivotal breakthrough in opening new avenues and building fresh developmental advantages. Schools should offer information technology courses aligned with national digital education initiatives, equipping students with foundational skills in using and understanding tools such as computers, search engines, and social media. They should also instill knowledge of cybersecurity and privacy to better adapt to the demands of new productivity. Companies, enterprises, and institutions in the education market must closely observe how these requirements affect educational demands, anticipate opportunities for projects and products, and supply essential resources. Collaborating with education authorities, they should focus on training exceptional, high-skilled, high-quality talent.

##### **4.2. Emphasizing innovation thinking: leading industrial upgrading through technological innovation**

As the engine of new productivity, technological innovation requires industries as carriers and industrial upgrading as a foundation. Therefore, to maturely develop new productivity, sustained iteration and optimization of industrial clusters under the guidance of technological innovation are essential.

Although new productivity is characterized by advanced technologies, it is not confined to a singular mode. As emphasized by the current General Secretary

of CCP, “Developing new productivity does not mean neglecting or abandoning traditional industries” <sup>[9]</sup>. Traditional industries offer numerous application scenarios and infrastructure for emerging industries. Each region should develop new productivity based on its resource endowments and actual conditions. To enhance innovation capabilities in traditional industries, enterprises should continually recruit practical, experienced talent, optimize structures, and improve the quality and quantity of products. By integrating new production factors such as big data and renewable energy with traditional elements, enterprises can ensure more stable product quality and performance, enabling traditional industries to transform from “manufacturing” to “intelligent manufacturing.”

Amid a new wave of technological and industrial transformation, readiness and foresight are crucial. Developing new productivity entails both “upgrading” and “starting anew.” Government departments should prioritize creating digital clusters to solidify development conditions for new productivity. Specifically, the central government should select regions with strong digital economic foundations as demonstration zones, implement policies to drive the comprehensive development of core digital economy clusters and promote disruptive technological breakthroughs. These clusters emphasize original and groundbreaking technologies, fostering independent innovation while pursuing intelligent development paths. The entire system must integrate ecological, safety, and economic considerations, achieving higher output with lower energy consumption and carbon emissions. Furthermore, promoting deep integration between industries, regions, and enterprises—regardless of size—can catalyze resource coordination and collaborative innovation. Aiming for intelligent, green, and integrated development, the modern industrial system can propel the advancement of new productivity.

### **4.3. Maintaining focus: Optimizing income distribution mechanisms to unlock talent’s multiplier effect**

The qualitative changes in productivity elements stem primarily from the driving force of individuals as producers. Unlike traditional accumulative methods, new productivity requires exploring mechanisms that integrate

labor-based distribution with factor-based distribution, ensuring talent, the pivotal multiplier element, fully unleashes its potential vitality.

First, establish an evaluation system for income distribution mechanisms that include knowledge, technology, and innovation, maximizing intrinsic motivation among talent. Measures like refining salary systems, setting up reward funds, and offering career advancement opportunities can invigorate labor, knowledge, technology, and innovation as productive factors while better reflecting their market value. This incentivizes talent to engage proactively in innovation activities. Reforming the scientific and technological evaluation system is crucial for accurately measuring contributions to innovation. Incorporating these contributions into income distribution is essential to respect labor, knowledge, technology, and creativity, fostering vibrant competition among various talents and driving efficient development of new productivity.

Second, foster a supportive talent ecosystem to ensure a conducive external environment for equitable income distribution mechanisms. “When the environment is conducive, talent converges, and success thrives; otherwise, talent disperses, and endeavors fail” <sup>[10]</sup>. The current General Secretary of CCP’s statement underscores the significance of the environment in the talent ecosystem. Building interdisciplinary teams, promoting openness to international talent, and encouraging cross-field collaboration are vital for stimulating creativity. Additionally, societal understanding and tolerance of innovation failure should be promoted to cultivate a culture of open-mindedness. Innovation encouragement funds and start-up capital should support those willing to explore freely, bearing the risks of innovation. Finally, designing fair remuneration and reward systems ensures talent engaged in advancing new productivity receives compensation proportionate to their labor and contributions. This equitable income distribution mechanism fosters a just external environment, continuously energizing the development of new productivity.

## **5. Conclusion**

New productivity represents the CCP’s development



and innovation of Marxist production theory, serving as a scientific concept to break through productivity bottlenecks and support high-quality development. In advancing the construction of a strong nation in education, technology, and talent, and in the historical process of realizing the great rejuvenation of the Chinese

nation, it is necessary to continuously explore dynamic practices of empowering new productivity through education, technology, and talent. This will help establish a well-coordinated framework to support China's high-quality development.

### Disclosure statement

The authors declare no conflict of interest.

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# Effects of a Subscription Service on Cultural Consumption According to Experience in Arts and Cultural Education

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## Abstract:

This study aims to determine whether the impact of arts and cultural subscription services on cultural consumption differs by the experience of arts and cultural education. Arts and cultural subscription services were divided into movies and music, and cultural consumption was divided along three dimensions: taste, cultural consumption, and cultural consumption diversity, confirming the different influences of arts and cultural education experiences. The analysis found that consumers' tastes did not change even after using the subscription service, and the amount of cultural consumption did not increase when they had experienced cultural and arts education. There were differences in cultural consumption diversity by field, and in the case of movies, the consumption genre was expanded but music was reduced. The results of this study suggest that subscription services can alleviate inequality in cultural consumption.

## Keywords:

Arts and cultural subscription service  
Curation  
Cultural consumption  
Arts and cultural education  
Cultural capital

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## 1. Introduction

The development of the internet has enabled consumers to selectively and unlimitedly consume various types of content without spatial or temporal constraints <sup>[1]</sup>. Content can now be accessed across multiple devices, including PCs, smartphones, and tablets, leading to significant changes in consumer behavior regarding content consumption <sup>[2]</sup>. Among these, over-the-top (OTT) services, epitomized by Netflix, have achieved

remarkable growth under the sudden environmental shift caused by COVID-19 through a subscription-based economic model.

A subscription economy refers to a model where consumers pay a fixed fee to access products or services for a specified period. This model aligns with the consumption habits of the Millennial and Generation Z cohorts (MZ generation), who prioritize experiences over ownership, thereby driving the expansion of

its scope. Subscription economy models leverage curation features that collect extensive consumer data to deliver personalized services based on customer preferences. This approach is favored as it reduces the burden of searching for new content while offering recommendations aligned with individual tastes.

Cultural content subscription services are particularly widespread among consumers, yet empirical research on this area remains scarce compared to the market's enthusiastic response. Most existing studies have focused on analyzing consumer behavior related to subscription services. For instance, some studies identify factors influencing the intention to use digital content subscription services <sup>[3]</sup>, while others investigate satisfaction and continued use intentions for OTT subscription services <sup>[1]</sup>. Additional studies analyze factors influencing user expectations for Netflix's recommendation services <sup>[4]</sup> or explore the impact of Netflix usage on user intention and engagement <sup>[5]</sup>.

While these studies are meaningful in highlighting factors that drive consumers to continue using subscription services by focusing on their functional aspects, research on the broader impact of subscription services on consumers remains limited. Unlike in the past, when cultural consumption was considered synonymous with on-site viewing, the post-COVID-19 era has normalized viewing cultural and artistic content through media as a form of cultural consumption. Analyzing the impact of subscription services on consumers' cultural capital under these circumstances is a meaningful endeavor.

Thus, this study analyzes the varying effects of cultural content subscription services on cultural consumption, considering whether individuals have experience with cultural and arts education. With music streaming services becoming routine and OTT users surpassing 30 million <sup>[6]</sup>, cultural consumption has become more active than ever. Nonetheless, differences in cultural consumption may arise depending on the cultural capital an individual possesses.

This study assumes that the outcomes of using subscription services will differ depending on whether individuals have received cultural and arts education throughout their lives beyond formal schooling. Cultural consumption is analyzed from three perspectives: cultural

preferences, the volume of cultural consumption, and the diversity of cultural consumption. Additionally, the study examines whether the effects vary by cultural and artistic field.

Cultural and arts education expands individual cultural preferences and encourages more active cultural consumption. However, previous studies have focused exclusively on on-site consumption. This study seeks to verify whether cultural and arts education experiences positively influence cultural consumption through media, in addition to on-site consumption.

To this end, hypotheses were tested using survey responses on film and music subscription services, the most widely utilized areas of cultural content subscription services. The findings suggest that cultural and arts education plays a significant role in shaping and expanding preferences. They also imply that cultural and art subscription services could alleviate cultural inequalities.

## **2. Theoretical background and hypotheses**

### **2.1. Subscription services**

Subscription services are experiencing rapid growth worldwide. Unlike the traditional model where payments were made for individual products or services, subscription services represent a new economic model where customers pay a fixed fee to access products and services for a set period <sup>[7]</sup>. Traditionally used for newspapers and magazines, the scope of subscription services has recently expanded to include clothing, groceries, furniture, and cultural arts.

The growth of subscription services can be attributed to changes in consumer consumption patterns. While the focus used to be on owning products or services, it has shifted to valuing the experience itself. Consumers now prefer products tailored to their tastes and seek meaning in expanding their preferences through recommendation services <sup>[8]</sup>. From the corporate perspective, subscription services have transformed from one-time sales models to those offering personalized services, with services evolving from one-directional to more interactive and relational. The vast amount of data generated through subscriptions allows for personalized

curation, fostering a customer-centric approach <sup>[8]</sup>.

The classification of subscription service types has only recently emerged and varies among scholars and institutions. From the perspective of consumer motivation, the reasons for purchasing products or services can be divided into utilitarian and hedonic motivations <sup>[9]</sup>. Utilitarian products focus on functional value, while hedonic products emphasize consumer enjoyment and satisfaction <sup>[10]</sup>. Hedonic products seek sensory enjoyment through consumption, whereas utilitarian products are evaluated based on their functional benefits to consumers.

Among subscription services, newspapers and magazines exemplify strong utilitarian attributes, while cultural and artistic content such as art, movies, and music represent hedonic attributes. Cultural arts subscription services, which allow unlimited access to movies, dramas, and music without time or location constraints for a fixed fee, align with the consumption preferences of Millennials and Generation Z, who prioritize experience and convenience.

Notably, OTT services, exemplified by Netflix, are experiencing continuous market expansion alongside qualitative improvements in content. Users can actively select content based on their preferences, and advances in network technology enable access to content on various devices, including PCs, smartphones, and tablets. This has led to a consumer migration toward OTT subscription services <sup>[1]</sup>. AI-based curation services enhance this experience by recommending content that aligns with individual tastes, fulfilling consumers' desires for convenience and new experiences.

Consumers receive content tailored to their preferences, while companies recommend engaging content to stimulate consumption. The curation function encourages consumers to spend more time on the platform and visit more frequently, prompting companies to improve its accuracy <sup>[4]</sup>. Curation is actively utilized in the cultural content sector. For example, in the case of movies, recommendations are generated based on viewing history, considering factors such as actors, directors, and genres. As these criteria are relatively well-defined, recommendations often show high relevance <sup>[11]</sup>.

Additionally, content recommendations sometimes diverge from consumers' established preferences but

spark interest and curiosity <sup>[4]</sup>. Through these functions, consumers can either reinforce their existing tastes or discover new preferences.

## 2.2. Cultural arts education

Unlike Western societies, where public cultural arts education is more widespread, in the Republic of Korea, the quantity and quality of cultural arts experiences are determined by parents' economic capacity and cultural capital <sup>[12]</sup>. For older generations, opportunities for cultural arts education were limited, and for subsequent generations, the cultural capital transmitted by parents was similarly constrained, making private education a common means of supplementation. From after-school special activities to neighborhood art or piano academies and cultural center courses, cultural arts education outside of formal schooling has been a significant factor in cultural reproduction, widely adopted by the middle class and above driven by the desire to acquire cultural capital.

Research analyzing the relationship between cultural arts education and cultural capital shows that informal cultural arts education positively impacts the consumption of high culture or promotes a balanced consumption of both high and popular culture <sup>[13]</sup>. Given that cultural arts education is a key variable in determining cultural consumption patterns, investment in children's education, particularly private education expenses, remains a priority expenditure across all socioeconomic classes and has been steadily increasing <sup>[12]</sup>.

Cultural reproduction has traditionally centered on the intergenerational transmission of high culture. According to Bourdieu's theory of cultural capital, cultural tastes are shaped by socioeconomic class. Preferences for genres categorized as either high or popular culture reflect social hierarchies and are reproduced through institutions such as schools and academies. Cultural arts education strengthens class-specific tastes, thereby contributing to class reproduction <sup>[14]</sup>.

Individual cultural preferences are not formed suddenly but develop over a long period, particularly influenced by cultural arts education. Families and schools act as primary agents in reinforcing these cultural preferences. While the household is the main institution for transmitting cultural capital, Republic of Korean



parents have shown a strong tendency to provide their children with cultural arts education outside the school system to cultivate higher levels of cultural capital. Investments in piano lessons, art academies, and ballet classes enable children to acquire more refined cultural capital.

Previous studies indicate that adolescents who received cultural arts education outside of school exhibited significant impacts on music listening, movie viewing, and attendance at exhibitions and performances, demonstrating that cultural arts education plays an essential role in shaping cultural consumption patterns<sup>[12]</sup>. In the Republic of Korea, cultural arts private education is therefore a major determinant of cultural consumption activities, and the cultural preferences developed through such education are not easily altered. Consequently, even when using subscription services that provide access to diverse genres, existing preferences may remain unchanged or even intensify. Users are more likely to consume greater quantities of their preferred genres rather than expand their tastes.

This study measures cultural arts education experiences based on whether individuals have received cultural arts education outside of formal schooling, aiming to examine the influence of private cultural arts education on cultural preferences and the quantity of cultural consumption.

H1: Those with cultural arts education experience will not exhibit significant changes in preferences after using subscription services.

H2: Those with cultural arts education experience will show an increase in cultural consumption quantity after using subscription services.

While cultural arts education positively impacts in-person attendance at cultural arts events, its effects may vary across genres when accessed via online media. According to Bourdieu's theory of cultural capital, the upper class traditionally invests significant time in cultivating cultural refinement, such as music and art, which cannot be acquired quickly. The middle class, driven by anxiety over a lack of cultural sophistication, also continues to invest in cultural pursuits. Parents frequently invest in music and art education for their children; in fact, one study found that music accounted for the largest proportion of cultural arts education

experiences outside of school during adolescence, followed by art and calligraphy<sup>[12]</sup>.

Music, as a representative form of cultural education, can be pursued throughout life and is one of the most familiar cultural fields. Consequently, musical preferences tend to form early and solidify over time. When using subscription services, the curation features, which automatically provide playlists tailored to users' preferences, may lead to a narrowing of consumed genres. A study showed that 60% of people listen to music while performing other tasks, while only 40% listen consciously and attentively, suggesting that most people listen habitually rather than for the sake of enjoying the music itself<sup>[15]</sup>. Those with established preferences through cultural arts education may be more likely to listen habitually to their playlists or curated content, focusing on their preferred genres.

On the other hand, movies, as a form of popular culture, generally develop later in life without prior educational influence. Being outside the domain of high culture, parents rarely invest in movie education to cultivate cultural capital. Thus, movie preferences naturally evolve through experience and may easily change depending on exposure. If pre-existing movie preferences are supplemented by cultural arts education, there may be a tendency toward an omnivorous consumption pattern, embracing diverse genres<sup>[16]</sup>. This tendency is likely to be more pronounced with subscription services, which allow unlimited consumption for a fixed fee.

H3: The impact of subscription services on the diversity of consumption genres will differ based on cultural arts education experience.

H3-1: Those with cultural arts education experience will exhibit a narrowing of music consumption genres after using subscription services.

H3-2: Those with cultural arts education experience will exhibit an expansion of movie consumption genres after using subscription services.



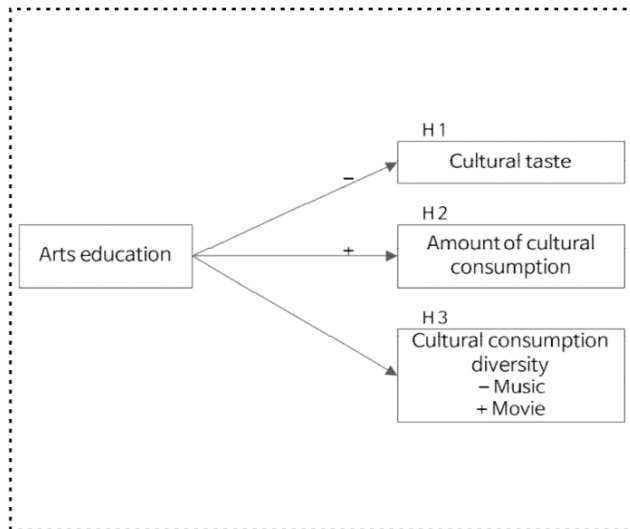


Figure 1. Research model

### 3. Empirical analysis

#### 3.1. Data

To test the hypotheses, this study conducted a survey targeting 101 university students and graduate students enrolled in universities located in the Seoul and Gyeonggi regions. According to the 2023 Broadcasting Media Usage Behavior Survey, 77% of the population uses OTT services, and 33% pay for music streaming platforms such as Melon and Genie, indicating a rapid increase in consumers paying for video and audio content. Conversely, the use of traditional media content services, such as books, newspapers, and magazines, remains low, reflecting a consumer trend toward spending on video and audio content.

This study focused on two genres, film and music, and constructed two separate sets of questionnaires. Respondents were randomly assigned one of the questionnaires and provided their answers accordingly. The demographic characteristics of the participants revealed an average age of 27 years, with ages ranging from 21 to 51. The majority were female (83 participants, 82.2%), while males accounted for 18 participants (17.8%). Additionally, 78 participants (77.2%) were income earners, and 23 participants (22.8%) had no income.

#### 3.2. Variables

The dependent variables used in this study are “preference

change,” “cultural consumption volume,” and “cultural consumption diversity.” According to Bourdieu’s theory of cultural capital, social class shapes cultural preferences<sup>[17]</sup>. However, the homology hypothesis, which posits a correspondence between cultural preferences and class, has faced ongoing criticism. In this context, American scholar Peterson introduced the concept of the “omnivore,” revealing that those with highbrow tastes often display openness to other genres<sup>[18]</sup>. This suggests a shift in cultural consumption patterns from exclusivity to tolerance.

Subsequent studies have continued to refine methods for measuring omnivorousness, with recent approaches considering three dimensions: preferences, the absolute quantity of consumption, and the diversity of cultural genres<sup>[19]</sup>. Accordingly, this study analyzes cultural consumption in terms of three aspects: preference change, cultural consumption volume, and cultural consumption diversity.

The dependent variable “preference change” was measured using the question, “Has your preference changed due to the recommendation features of subscription services?” Responses were recorded on a 5-point Likert scale (1 = Not at all, 5 = Very much). “Cultural consumption volume” was measured using the question, “Has the amount of content you consume increased since using subscription services?” with responses also recorded on a 5-point Likert scale. “Cultural consumption diversity” was calculated as the difference in the number of genres consumed before and after using subscription services.

For music, respondents were asked to check the genres they consumed before and after using subscription services across 14 categories: dance, ballad, international pop, R&B, hip-hop, trot, indie, jazz, classical, rock, folk/blues, traditional Korean music, acoustic, and new age. For films, respondents were selected from 13 genres: action, thriller, sci-fi/fantasy, melodrama/romance, comedy, animation, art/documentary, war/disaster, noir/crime, horror, music, documentary, and family. On average, the number of film genres consumed increased by 0.3, while music genres increased by 0.7 after using subscription services.

The independent variable, “cultural arts education experience,” was measured by asking, “Have you ever

received cultural arts education outside of school?” Responses were coded as “1” for yes and “0” for no.

Control variables expected to influence cultural consumption included overall satisfaction with subscription services, the importance of curation features in choosing a subscription service, and the frequency of cultural activities, all measured on a 5-point Likert scale. Additionally, age and whether the participant’s major or occupation was art-related was included as a continuous variable and a dummy variable, respectively.

Descriptive statistics for each variable are shown in **Table 1**. In the table, *N* represents the sample size, Min and Max indicate the minimum and maximum values, and Ave and SD represent the mean and standard deviation for each response. **Table 2** presents the correlation matrix. Due to multicollinearity concerns, film and music variables were excluded from the correlation analysis.

As shown in **Table 2**, the dependent variable preference change exhibited a significant positive (+) correlation with subscription service satisfaction and age, while showing a significant negative (-) correlation with cultural arts education. Cultural consumption volume was positively correlated with subscription service satisfaction but showed a negative (-) correlation with cultural arts education and art-related majors.

**Table 1. Statistics**

|                                   | N   | Min | Max | Ave  | SD   |
|-----------------------------------|-----|-----|-----|------|------|
| A change of taste                 | 101 | 1   | 4   | 1.83 | 0.86 |
| Amount of cultural consumption    | 101 | 1   | 5   | 4.08 | 0.98 |
| Arts education                    | 101 | 0   | 1   | 0.85 | 0.35 |
| Movie                             | 101 | 0   | 1   | 0.55 | 0.50 |
| Music                             | 101 | 0   | 1   | 0.45 | 0.50 |
| Subscription service satisfaction | 101 | 2   | 5   | 3.86 | 0.64 |
| Curation function importance      | 101 | 1   | 5   | 3.06 | 1.15 |
| Age                               | 101 | 21  | 51  | 27   | 4.66 |
| A major in the arts               | 101 | 0   | 1   | 0.28 | 0.45 |
| Frequency of cultural activities  | 101 | 1   | 5   | 3.12 | 1.09 |

**Table 2. Correlations**

|    | 1                  | 2                   | 3       | 4                   | 6      | 7       | 8 |
|----|--------------------|---------------------|---------|---------------------|--------|---------|---|
| 1. | 1                  |                     |         |                     |        |         |   |
| 2. | 0.028              | 1                   |         |                     |        |         |   |
| 3. | -0.277**           | -0.193 <sup>+</sup> | 1       |                     |        |         |   |
| 4. | 0.173 <sup>+</sup> | 0.252*              | -0.003  | 1                   |        |         |   |
| 6. | 0.231*             | 0.066               | -0.003  | 0.131               | 1      |         |   |
| 7. | 0.014              | -0.215*             | 0.088   | -0.178 <sup>+</sup> | 0.041  | 1       |   |
| 8. | -0.085             | -0.118              | 0.259** | -0.073              | -0.070 | 0.513** | 1 |

Note: <sup>+</sup>*P* < 0.10, \**P* < 0.05, \*\**P* < 0.01. 1: A change of taste; 2: Amount of cultural consumption; 3: Arts education; 4: Subscription service satisfaction; 5: Curation function importance; 6: Age; 7: A major in the arts; 8: Frequency of cultural activities.

### 3.3. Results

The results of testing **Hypothesis 1**, which posits that individuals with cultural arts education experience will not exhibit preference changes due to curation features, are shown in Model 1 (M1) of **Table 3**. The analysis reveals that cultural arts education experience has a significant negative (-) effect on preference change, supporting **Hypothesis 1**.

**Table 3. H1, H2 regression result**

|                                   | M1                         | M2              |
|-----------------------------------|----------------------------|-----------------|
| Constant                          | 0.546 (0.879)              | 3.930** (1.023) |
| Subscription service satisfaction | 0.200 (0.129)              | 0.320* (0.150)  |
| Curation function importance      | 0.143 <sup>+</sup> (0.073) | 0.031 (0.085)   |
| Age                               | 0.018 (0.022)              | -0.034 (0.025)  |
| A major in the arts               | -0.077 (0.223)             | 0.066 (0.259)   |
| Frequency of cultural activities  | 0.066 (0.081)              | 0.070 (0.095)   |
| Arts education                    | -0.711** (0.243)           | -0.567* (0.283) |
| N                                 |                            | 101             |
| F                                 |                            | 2.979*          |
| R <sup>2</sup>                    |                            | 0.106           |

Note: <sup>+</sup>*P* < 0.10, \**P* < 0.05, \*\**P* < 0.01.

According to Bourdieu's theory of cultural capital, individual preferences are naturally internalized through family and school. When cultural capital is intentionally acquired through cultural arts education outside of school, preferences are similarly formed, and these established preferences are not easily altered. Even when subscription services introduce new genres through a variety of options, pre-existing cultural preferences tend to remain unchanged. This demonstrates that cultural arts education profoundly influences individual preferences, making them resistant to external changes.

To test **Hypothesis 2**, which asserts that individuals with cultural arts education experience will exhibit increased cultural consumption volume after using subscription services, regression analysis was conducted, with results shown in Model 2 (M2) of **Table 3**. The analysis indicates that cultural arts education experience has a significant negative (-) effect on cultural consumption volume. These findings suggest that individuals without cultural arts education experience consume quantitatively more content. Thus, **Hypothesis 2** is rejected.

Interestingly, individuals without cultural arts education experience consumed more cultural content. Since cultural consumption volume requires both time and financial resources, higher income and educational levels are associated with more frequent cultural consumption. Cultural consumption volume is closely linked to cultural capital, as supported by various previous studies<sup>[20,21]</sup>. However, the contrasting results in this study make it difficult to definitively explain the cause. It is possible that individuals with lower cultural capital actively consumed more culture through subscription services to compensate for their deficiencies.

Previous studies also report that lower-class individuals with limited cultural capital demonstrate greater enthusiasm for their children's education to overcome feelings of inferiority, showing a negative (-) relationship between parental cultural capital and children's academic achievement<sup>[22]</sup>. The finding that subscription services, accessible at the same cost for everyone, can provide opportunities to acquire cultural capital highlights their potential to mitigate cultural inequality.

**Hypothesis 3**, which posits that the effect of

subscription services on the diversity of consumed genres will differ depending on cultural arts education experience, was tested using t-tests for both film and music. As shown in **Table 4**, the results revealed statistically significant differences between those with and without cultural arts education experience.

**Table 4.** H3 t-test result

|       |                  | N  | AVE   | df | t        |
|-------|------------------|----|-------|----|----------|
| Movie | Arts education O | 86 | 0.325 | 99 | 0.169*   |
|       | Arts education X | 15 | 0.200 |    |          |
| Music | Arts education O | 86 | 0.558 | 99 | -2.842** |
|       | Arts education X | 15 | 1.933 |    |          |

Note: \* $P < 0.10$ , \* $P < 0.05$ , \*\* $P < 0.01$ .

For films, individuals with cultural arts education experience ( $M = 0.325$ ) consumed a more diverse range of genres than those without such experience ( $M = 0.200$ ). However, for music, those with cultural arts education experience ( $M = 0.558$ ) consumed fewer genres compared to those without such experience ( $M = 1.933$ ). These findings support **Hypothesis 3**.

The results for films align with prior research, indicating that cultural capital acquired through cultural arts education promotes the consumption of diverse genres, even when using subscription services. However, the opposite result emerged for music. Given that cultural arts education outside of school often focuses on music or visual arts, it is likely that strong pre-existing preferences for music limited cultural receptivity. Consequently, subscription services may have reduced the range of genres consumed compared to pre-subscription behavior.

This suggests that the unconscious and habitual nature of music consumption leads individuals to repeatedly listen to their preferred genres. Thus, subscription services may reinforce existing preferences rather than broaden them.

## 4. Conclusion

This study conducted an empirical analysis to determine whether the impact of subscription services on cultural consumption varies depending on cultural arts education

experience. In the context of limited research on the effects of cultural arts subscription services, this study holds significance by examining the influence of individual cultural capital on cultural preferences, the volume of consumption, and qualitative aspects from various perspectives.

However, this study has several limitations. First, it did not adequately measure the type of cultural arts education the respondents received. Specifically, it was not clear whether the education was theoretical or experiential, and the implications may vary depending on the nature of the experience. Additionally, different results might emerge depending on whether the respondents received music education or visual arts education. Future studies could investigate specific fields of education to discuss how differences in cultural arts

education fields relate to cultural consumption patterns influenced by subscription services.

Second, the average age of the respondents was in their twenties, but most were employed and some had postgraduate education, indicating a certain level of economic and cultural capital. While this study is meaningful in that it differentiated between fields within cultural arts subscription services and analyzed the varying effects of cultural arts education experience on cultural consumption, the specificity of the sample limits the generalizability of the findings and presents challenges in interpretation.

Future research could focus on young adults without income or further analyze differences by age group to verify whether the results align with this study's findings. Such work would provide valuable insights.

### Disclosure statement

The author declares no conflict of interest.

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