

RESEARCH

Open Access



Public service innovation to fight corruption: metrics and policy in Mexico 2019–2022

Leonel Corona-Treviño^{1*}

*Correspondence:
leonel.corona.trevino@gmail.com

¹ Economics Faculty, Cepercyt,
Center for Economics
and Prospective of Science
Technology, National
Autonomous University
of Mexico (UNAM), Ciudad
Universitaria, 04510 Mexico City,
Mexico

Abstract

The purpose is to identify and analyze some innovations in public services, PSI, between 2019 and 2022 to evaluate their attempts to deter corruption in a context where the current government's Mexican public sector has been improving its capacity to fight corruption as the most critical problem. The research is designed to describe 12 PSI selected from the national level. Their innovativeness is measured through an IND-ICO index adapted from technology firms, which mainly has added a perception of its public value besides their use value. Corruption is measured based on the neo-institutional approach on three axes: public–private relations, its organization, and the agents' behavior. The question is to measure the impact of the innovations in deterring corruption, which is estimated by the difference in magnitude between the current and the previous one.

The findings are:

1. The neo-institutional theory highlights corruption-related aspects rooted in public–private relations, however, complemented with social and management approaches.
2. The INDICO index measures, based on a pre-established 10-point quantitative maximum scale distributed between components on capacity -knowledge of the service, training, design, peer evaluation through external links- and on innovation results in public services—its legitimization through public value, and its possible replication (diffusion), which an expert in the field of innovation qualitatively evaluates.
3. The impact of the selected Public Service Innovations shows that there is a positive effect in reducing the level of corruption. The more systemic or institutionalized corruption is, the more difficult it is to develop effective strategies proving their long-term value.

The PSIs have been managed by the government's leadership founded on legitimate authority, secured from the victory in the 2018 elections in Mexico, enabling it to put forward its top-to-bottom anti-corruption program. A more extended period, a group of experts, and more cases are desirable to assess PSI sustainability. However,

the methodology could be extended to other contexts for policymakers or practitioners in public services and corruption.

Keywords: Public services, Corruption, Public–private partnerships, Innovation metrics, Corruption metrics, Mexico

Introduction

The Mexican government inaugurated in December 2018 introduced discontinuities in the goals and operation of Mexico's public administration that can be classified as public service innovations (PSI). This context of change called the 4th transformation,¹ offers an exceptional opportunity to observe and analyze public policy innovations that are now being introduced. From the academic point of view, this context could be regarded as a public service laboratory because the government is designing and implementing its public policy innovations in many areas and is therefore challenging theoretical and methodological precepts that were the result of economic, administrative, social, and political studies of innovations in public services.

However, the problem that the government has paid the most attention to is corruption. Consequently, it is noteworthy that a large part of the transformations is focused on addressing this problem.

Corruption

In Transparency International's Perception of corruption index, Mexico ranked 126th out of 180 countries with a score of 31 in 2022 (Transparency International 2022). Its lower score of 28 in 2018 could be attributed to Mexico's General Law of the National Anticorruption System (NACS), which came into force on 18 July 2016 and paved the way for a constitutional amendment to tackle a problem that has plagued the country for far too long. The impact of corruption costs Mexico 5% of its GDP per year (OECD, 2017).

"Corruption is generally defined as the abuse of public power for private gain" and is seen in various types of corruption. Corruption is detrimental to the general welfare in several ways. It harms society by reducing human capital, heightening inequality, and lowering interpersonal trust. In the public sphere, it reduces investment, creates fiscal instability, drains public resources, and exacerbates government illegitimacy (Rose-Ackerman & Truex, 2016, p. 59).

Corruption is a social order where exchange rules are based on arbitrary exclusionary and favoritism relationships, instead of basing them on impersonal and impartial modes of authority. Such an order can manifest itself in different levels from individual or collective, and even institutionalized social behaviors, based on actions that disregard ethical principles and integrity (Sandoval Ballesteros, 2016; Stiglitz, 2012; Teorell, Seim, & McMann, 2020).

¹ Mexico's Fourth Transformation, 4 T, is, a priori, so called because it follows on from the previous three main and deep historical transformations in Mexico (DOF, 2019): 1. Independence (1810–1821), which was won after 300 years of Spanish colonial rule. 2. Reformation (1858–1861) that followed the civil war between liberals and conservatives when the "Reform Laws" were passed that separated Church and State. 3. The Revolution (1910–1917), which sparked armed conflict against the dictatorship of Porfirio Díaz. The 1917 Constitution, still in force today in Mexico, was promulgated and the distribution of agricultural lands began.

There are two leading economic theories used to analyze corruption. The first is a microeconomic theory “emphasizing a cost–benefit calculus that structures individual choices and decision-making processes”. The second theory is “neo-institutionalism, focusing on both the mechanisms that regulate interactions in corrupt exchange networks and the role played by formal and informal institutions to shape the social actor’s expectations and beliefs” (Vanucci, 2015). There is a third social theory “emphasizing how political culture affects individuals’ moral preferences and normative constraints, which are shaped and transmitted within a particular political culture” (Vannucci & Rios-Petrarca, 2020, p. 316).

Corruption is conceptualized with three axes: The Public–Private Partnerships (P–p P), which is analyzed under the neo-institutionalism theory since it involves rules, which generate costs arising from economic transactions as well as compliance costs. In Mexico, the law governing Public–Private Partnerships was passed in 2012 by a neoliberal regime to legalize the “gradual process of weakening the State” to advance business interests. However, these same interests are also represented inside the government, which defeats the benefits or advantages of public value and instead favors private interests or groups, whether nationals or foreigners, to the detriment of the general welfare (Witker, 2015). Those partnerships combine the worst of the “public” and “private” spheres because they are neither privatizations in the strict sense, in which the business community assumes risks and responsibilities, nor are they traditional public structures since they do not have any accountability mechanisms (Sandoval-Ballesteros, 2015).

Another aspect under study is the organization of corruption, which involves collaboration to infringe regulations. The organization of corruption is part of a relationship between government centralization and the distribution of rents (Bussell, 2013). Then the PSI has its own organization, but the organization of corruption influences it.

Moreover, the third axis is the behavioral perspective of social construction and internalization of social norms and the ethical values that underpin the actions of social agents that could help us understand corrupt behavior, which involves quantitative as well as qualitative issues of inter- or multi-disciplinary economic analysis (Muramatsu & Bianchi, 2021).

Public service innovation (PSI)

Public Service Innovation, PSI, focusing mainly on social welfare, is defined as the creation and implementation of new processes, products, services, and delivery methods, or their discontinuity, that involves the participation of organizations, suppliers, and clients (Moore, Sparrow, & Spelman, 1997; Mulgan & Albury, 2003; Osborne & Brown, 2005; Bason, 2005; Osborne & Brown, 2013; Mazzucato, 2014).

PSI was conceptualized as part of an evolutionary process from a firm’s technological vision, including service innovation. Then, recently, it expanded further and began to be applied to the government. Along this path, major public sector reform movements like New Public Management (NPM) and e-government emerged (de Vries et al., 2015) as potential sources of innovations. This movement tried to overlap with the Traditional Public Administration (TPA), which features bureaucratic behavior, hierarchical coordination modes, and formal political control of processes. By contrast, NPM introduces

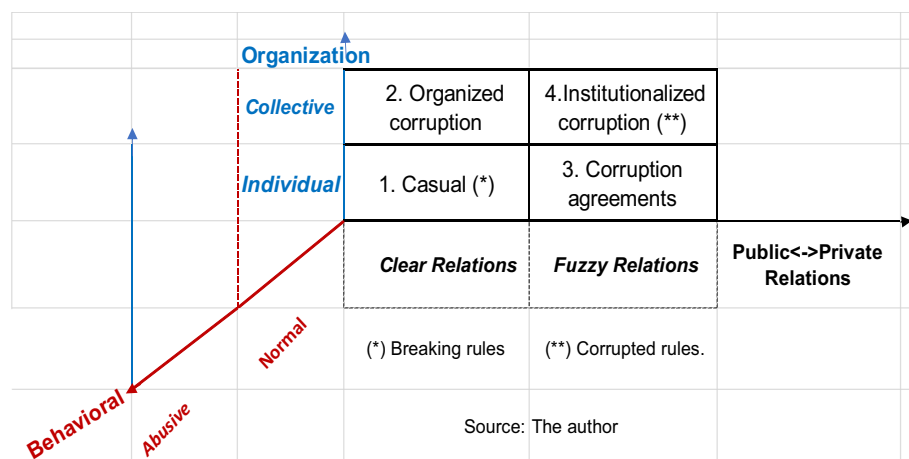


Fig. 1 Types of corruption in two out of three axes

market logic, competition, and new management styles in public administration in which citizens are approached more as customers. A further step was taken by New Public Governance (NPG), which refers to horizontal and networked governance structures and public–private relationships in collaborative innovation (Desmarchelier et al., 2019).

The evolution of theoretical perspectives in studies of service innovation began with *assimilation*, *demarkation*, *inversion*, and *integration/synthesis*; each stage “throws light on particular issues confronting public service innovation, and ... in this sphere is highly diverse” (Djellal et al., 2013). This diversity is constellated by “Public–Private innovation Partnerships” and “collaboration with civil society” themes; the private (profit, non-profit) approach by “social entrepreneurship”; and themes relating to “co-creation, co-production processes”, in which innovation happens at all levels and through all actors (Merlin-Brogniart et al., 2022, p. 9 Table 2). In big innovation projects, “the private sector finds the courage to invest only after an entrepreneurial state has already made the high-risk investments” (Mazzucato, 2014, 2017).

Three ideas are proposed for innovation in public management at the individual and organizational levels (Moussa et al., 2018): (1) leadership behaviors that have a positive effect on innovation; (2) an organizational climate and organizational culture that positively impact innovation; and (3) barriers (e.g., poor communication, lack of resources, workplace politics) that have a negative influence on innovation.

Focusing on Mexico, the two lines of research have been combined: public service innovation and the characterization of corruption.²

Methodology

What is the impact of Mexico's PSIs on deterring or diminishing corruption?

To answer this question, some types of corruption are proposed, which can be scaled in the following section.

² Combining innovation with corruption is in line with the recommended future research agenda on PSI (de Vries, et al., 2015).

Corruption typology

Corruption is first classified based on two axes that define its domain. The first axis is public–private relationships and their degree of corruption, depending on how *clear* or *blurry* (fuzzy) they are. The second axis is the degree of the agents' organization to perpetrate corruption and whether participation is *individual* or *collective* (Fig. 1).

From two axes, black and blue, four types of corruption can be described as follows (Fig. 1):

1. *Casual*: Corruption occurs in isolated cases. However, formal and informal rules (cultural and social norms) operate so that they punish acts of corruption. As a result, casual corruption only occurs *casuistically* or *opportunistically*.³
2. *Organized corruption* occurs when agreements are reached between companies or individuals to engage in corrupt practices, but the public sector does not take part and continues to penalize them. If there is collective participation, the cultural norms partially approve of corruption. This type of corruption involves *illegal associations* and *embezzlement*.
3. *Corruption agreements*: Such agreements blur the line between public and private relationships to favor a private entity by granting advantageous conditions with some gain to the civil servant involved but to the detriment of the collective welfare. While it remains at an individual level (e.g., agreements between a civil servant and a firm's executive), the rules are general to do not validate this behavior. Therefore, this behavior is divided into *extortion*⁴ and *public-office corruption*.⁵
4. *Institutionalized or systemic corruption* is an extreme and broad example of corruption in which the rules allow its replication as legal or simulating legal behavior. Laws are passed to favor people and constitute social or collective behavior. A formal differentiation is made between public and private relations, but their purposes are interwoven with systemically corrupt practices. In this context, private agents can choose what roles to play and how they play them.⁶ This type of corruption includes the two levels of *white-collar crime* and *institutional (rules) agreements*.

Second, the behavioral axis, which captures the degree to which the agent's decisions deviate from or adhere to the rules, is added. This axis is then divided into two levels: *normal* or *standard*, and *abusive*.

To sum up, these three axes, based on independent variables, allow an upright picture of corruption: (1) public–private relationships that move from one stage of formality and real differentiation to another stage in which the relationship is still formal but, in reality,

³ "The theory of individual utility maximization postulates quite simply that an individual will be involved in corruption if the benefits associated with the act are expected to outweigh the costs" (Soreide, 2014).

⁴ *Extortion*, the practice of obtaining something, especially money, through force or threats.

⁵ Corruption in *Public Office* works through the routine function of office, rather than through transgression of norms (Thompson, 1995).

⁶ This institutionalized level of corruption corresponds to "systemic corruption and not sporadic in the networks of actors involved in a careful division of tasks, specialization of functions and development of the skills required for the exercise of designated functions" (Vannucci and Rios-Petrarca, 2020). "Systemic corruption refers to the inner functioning of the system as a whole, independent of who occupies the places of power" (Vergara, 2020). In the moment that corruption is normalized, institutionalized, and becomes systemic in an organization or in a group of organizations, these three dimensions will be present recreating themselves. (Arellano Gault, 2017).

Table 1 PSI innovativeness—INDICO index components: maximum values*

Public service innovation (PSI)	Capacity	Results	Total
• Innovation selected	0.6	1.4	2
• Adaptations and replicas, which are possible outcomes		1	1
• Impact either on the public's and/or users' values, or resources and interests	0.6	1.4	2
• Depth of knowledge required for its creation, but also for its implementation and delivery	0.6	0.4	1
• Design capabilities (R&D)	1		1
• Co-value: Collaboration (entailment) as co-creation and co-production (including its delivery)	1.5	0.5	2
• Education degrees at the beginning of the innovation and training during its creation	0.7	0.3	1
Total	5.0	5.0	10

*The maximum value for innovativeness is 10. Consequently, each component has a number less than or equal to the maximum value depending on the PSI

Source: the author

tends to be fuzzy or is ignored; (2) the agent's association or organization, ranging from individual to collective; and (3) the agent's behavior and how it relates to standard or abusive corruption within the rules.

As has been proposed, there are two sub-levels per axis, which makes a potential set of 8 (2^3) corruption types in all.

Third, to refine, a further breakdown is introduced to divide each corruption sub-level into three corruption scales, resulting in 6 scales per axis. Consequently, there are potentially 216 (6^3) corruption classifications (see Table 3).

INDICO index

An INDICO (innovation, diffusion, co-value) index is applied⁷ to measure the innovativeness of each selected public innovation. This PSI Index considers a metric of 7 related innovation parameters relating to *capacities* and *results*. The PSI Innovativeness is calculated on the distribution of a maximum of 10 points (distributed between 5 to Capacity and 5 to Results), as follows (Table 1):

Hypotheses

Based on this methodology, the following hypotheses are formulated:

H1: The higher the degree of innovation, measured by the INDICO index, the better the expected results in reducing corruption (See Result 3.3.1).

H2: When corruption operates at the systemic or highest institutionalized level, more complex prescriptions must be applied longer to deter corruption significantly (Result 3.3.2).

Systemic or institutionalized corruption depends on the deeply embedded level, making eradicating it more difficult. However, it could also be a more complex issue,

⁷ The PSI INDICO is an adaptation from a former development to measure the innovativeness of private technology firms (Corona et al., 2006).

such as corruption linked to other national and international phenomena. For example, insecurity in Mexico is related to drug and liberal arms trafficking, and migration, which even could increase or diversify with some isolated or partial prescript innovations.

Results

The main objective is to develop a methodology to connect public intervention's innovativeness to deter corruption. Therefore, the selected 12 Mexico PSI and their place in the public goals are described first.

Second, the INDICO index is applied to evaluate PSI innovativeness. The PSI corruption measure is done by assigning a scale on each of the three axes and then calculating the hypotenuse value. The difference between the corruption values before and after the PSI gives the gaining in corruption for each PSI.

Third, a statistical regression shows the impact of the PSI INDICO on the anti-corruption gain. Therefore, given the result of the hypothesis.

PSI cases

The 12 innovations' identification, analysis, and documentation describe their impacts, risks, and sustainability in Mexico 2019–2022 (Table 2).

The source for innovation derives from the implementation of PSI in a way that contrasts with how services were provided in the past, i.e., during the “neoliberal” economic model, which ran from the 1982 crisis until at least 2018, to achieve “a minimal state” with less intervention, to grease the wheels of market forces.⁸

Certain cases of PSI are documented with a focus on the following issues: diagnostic problems, solutions and the involved agents, impacts (on the public and users), and co-value (intrinsic/extrinsic).

Considering that the scope of innovations is part of the government's broader main goals, they are grouped into: well-being, reducing unequal distribution, justice, democracy, honesty (absence of corruption), and sovereignty (Table 4).

PSI innovativeness

To measure the innovativeness of the PSIs, the INDICO index is applied to each Mexico case, evaluating its impact on corruption before and after the PSI. The difference between them is the anti-corruption gain (see Table 3). This analysis considers the co-value incorporated by different users of the public innovation during the understanding and improvement of its operation.

PSI impact on corruption

To sum up, the following questions and answers related to the hypothesis can present the results.

⁸ In political science, functionalist explanations state corruption can “grease the wheels” to get things done. In this view, corruption quickly cuts through burdensome regulatory requirements, distributes resources, and generates economic growth. This logic has been extended to non-investors in a neo-functionalist argument, arguing that corruption can be viewed as a form of “problem-solving”, a useful way of dealing with people's problems (Dupuy and Neset, 2018).

Table 2 List of the 12 public service innovations

Number	Public service innovations
1	<p>Welfare Bank (<i>Banco del Bienestar</i>)</p> <p>The Welfare Bank has the direct financial objective of including the portion of the population that is beyond the reach of commercial banking. The means to achieve that is by distributing resources from the government's social programs. An indirect objective, necessary for the bank is to expand the use of the internet to include this population that does not yet have access to digital services</p> <p>The first 250 branches began operating throughout the country in September 2021 (first phase). On March 16, 2022, the inauguration of the second phase was announced, with a goal of 2700 branches throughout the country</p>
2	<p>Social Security Welfare (IMSS)</p> <p>The Social Welfare Insurance (IMSS) offers free health services to the population that does not have social security coverage, especially in remote or difficult-to-access areas. In other words, anyone without social security coverage will have access to healthcare services, including those affiliated with Social Security, ISSSTE, or Popular Insurance (<i>Seguro Popular</i>). Through an agreement with the state governments (15 out of the 32 states have so far signed up), an initial assessment is conducted of the state's health personnel (doctors, nurses, and support staff) as well as facilities and equipment. The service will be permanent and basic staff will be available</p>
3	<p>PSI—Presidential Daily Press Conferences “Mañaneras”</p> <p>This PSI is a forum of presidential press conferences attended by journalists and invited government officials. They start at 7 a.m., from Monday to Friday, and last around two hours. The agenda features:</p> <ol style="list-style-type: none"> 1. Government reports on: Who is who in the prices; The pulse of health; Who is who in fakes news; Zero impunity; progress of big public works; and others 2. Open questioning by journalists from international, national, and local media relating to current issues and topics in the news 3. Reports from the Mexican press, alternating between national and local media outlets
4	<p>PSI—Young People Building the Future (<i>Jóvenes Construyendo el Futuro</i>)</p> <p>This PSI provides training opportunities for young people from 18 to 29 years old who are not studying or working to become apprentices by means of a platform that links them to firms, institutions, or organizations that act as tutors. The companies agree to provide on-the-job training to the young apprentice for 12 months. The apprentice receives a monthly government stipend of MXN 4310 (USD 215), plus medical insurance against illness, maternity and work risks. Both the tutor and the apprentice must carry out monthly evaluations of each other's performance. The apprentice may be hired by the firm or he may change jobs only once, either by his own choice or by decision of the work center</p>
5	<p>The School is Ours (<i>La Escuela es Nuestra</i>)</p> <p>This innovation consists in directly handing over the management of resources to the CEAP committees (<i>Comité Escolar de Administración Participativa</i>) whose members are the pupils' parents, to oversee the maintenance of their school</p> <p>This innovation focuses on the direct delivery of public grants, tabulated according to the number of children, to the CEAPs</p> <p>The CEAPs receive resources from the federal government and decide how to use them in accordance with their priorities to improve the infrastructure of public schools at the early, preschool, primary and secondary education levels in their different modalities and the learning communities of the National Council for Educational Development (CONAFE)</p>
6	<p>Sowing Life (<i>Sembrando Vida</i>)</p> <p>The objective is “to contribute to social welfare through sufficient income, to promote food self-sufficiency, the reconstruction of the social relationships and the inclusion of peasants in rural localities to make the land productive.”</p> <p>The target population are inhabitants of rural localities whose municipalities have medium, high and very high levels of social backwardness, or who have incomes below the poverty line (USD 143 per month*), and who have 2.5 hectares available to be worked in an agroforestry project</p> <p>The beneficiaries are given monthly economic support of MXN 5,000 (USD 250), as well as the material for agroforestry production (plants, supplies, tools), from which MXN 500 (USD 25) is set aside for a family savings and welfare fund. Agroforestry technical advice is also provided to Peasant Learning Communities</p>
7	<p>Consolidated international drug purchases</p> <p>This initiative consists of the purchase of medicines through INSABI and UNOPS (previously carried out only by IMSS) in which the principles of fair and equitable public management will be applied, through international and national public tenders. UNOPS will promote equal opportunity for all companies, implementing transparent, efficient and sustainable procurement processes</p> <p>Through this project, INSABI and UNOPS seek to support the reinforcement of the National Health System and promote the well-being of the Mexican population within the framework of the Sustainable Development Goals (SDG) and the 2030 Agenda</p>

Table 2 (continued)

Number	Public service innovations
8	<p>Fuel theft (huachicol)</p> <p>The objective here is to reduce the clandestine theft of oil and gasoline, which has grown significantly. Thieves siphon oil pipelines, bribe employees and intercept fuel tank trucks</p> <p>This innovation requires the following coordination and focused efforts:</p> <ol style="list-style-type: none"> 1) Boosting the deployment of armed forces 2) Collaboration between different institutions and levels of government: PEMEX and the armed security forces (Secretary of National Defense, Secretary of Public Security) via their federal and state representations 3) Allocation of military resources to protect PEMEX oil pipelines and transport routes 4) Some suspects involved in theft or collaborating have been arrested, bank accounts have been frozen, and properties have been confiscated
9	<p>Renegotiation of energy-related contracts with Pemex and CFE</p> <p>The 2013 energy reform expanded the scheme of electricity own-generation and those involved could be registered or migrated to the category of "qualified users". These companies that generate their own electricity were also given access to a preferential or lower cost rate for so-called "carrying" or "green carrying", for the generation of electricity using wind and solar technologies. In addition, the CFE, a public enterprise, has been transferring resources via low transmission tariffs and allowing other large business chains such as OXXO, Banking, etc., to receive a share of those subsidies if they are associated users of the companies that generate their own power</p> <p>As the Mexican president's proposed 2022 electricity counter-reform failed to pass because it did not receive absolute majority backing in congress (two-thirds of all votes cast), the government is now in the process of renegotiating case-by-case the contracts that are receiving subsidies from the CFE</p>
10	<p>Alternative to a wholesale power market (CFE)</p> <p>The main objective of this innovation is for the CFE (Federal Electricity Commission) to own a 54% share in the country's total energy generation by 2024, up from 38% in 2020. According to the CFE (2022), this innovation will guarantee the country's energy security, while maintaining the value chain in the electricity sector deemed a strategic area under state control, with the purpose of offering fair rates that do not rise above inflation. One important change is that hydroelectric generation from dams is now considered green energy, which was not the case in the 2013 energy reform. Therefore, there is an upsurge in investments to modernize dam turbines and to invest in new ones</p> <p>Also, an investment fund with its own resources from current and future profits of its subsidiaries is being considered. The construction of eight new power plants (six combined cycle plants and two turbo gas plants) between 2020 and 2024 will boost investment. Approximately 64 billion Mexican pesos (USD 3.2 billion) will be allocated to their construction (IMCO, 2021). However, as the counter-reform bill did not pass in congress in 2022 because it did not receive the votes of two-thirds of representatives as required, it is expected that the CFE's share of power generation will be less than 54%</p>
11	<p>Power transmission tariffs (CFE)</p> <p>The objective is to encourage competition on an even playing field between the CFE (Federal Electricity Commission) and the companies generating their own power supply</p> <p>New carrying rates are established for different rate levels: high (MXN 0.27857 per Kw/h), medium (MXN 0.25865 per Kw/h) and low (\$0.089284 per Kw/h). In addition, tariffs are established for the transmission of renewable energies, differentiated according to the aforementioned voltage levels</p> <p>The target population are the 303 private generating plants which are associated with 70,318 partners (electricity buyers), which distorts the model of own-supply and energy cogeneration. Previous tariffs included the use of the CFE's transmission network without paying the transmission costs, causing losses of around 7.5 billion Mexican pesos per year</p> <p>The long-term beneficiaries are the final consumers of electricity, since with the minimization of losses for the CFE, it will be able to invest in the grid's modernization (García, 2020; Rodríguez, 2020)</p>
12	<p>Expansion and modernization of the national oil refining system (Pemex)</p> <p>The modernization of refineries is part of Mexico's energy self-sufficiency plan with the aim of increasing refining capacity through the renovation of its six refineries owned by Pemex. The total budget is USD 1.1bn for the following refineries: Salina Cruz, Oaxaca (90%), Tula, Hidalgo (89%), Cadereyta, Nuevo León (75%), Minatitlán, Veracruz (71%), Salamanca, Guanajuato (67%), and Madero, Tamaulipas (33%) (Increase up to 2021)</p> <p>In addition, the Olmeca refinery in Dos Bocas, Tabasco, is in the process of being built (USD 8 bn, 72%); and full ownership (51%) of the Deer Park refinery in Huston Texas has been acquired from Shell</p>

Source: Elaboration based on public sources

*These are localities that have a social backwardness index that ranges between 0.126 and 6.827. The index, which is calculated by the National Council for the Evaluation of Social Development Policy in Mexico, measures 11 indicators related to education, health, basic services, housing quality and spaces (CONEVAL, 2020)

Table 3 Corruption level in three axes: before and after the PSI

PSI innovation		Public-private relationship P-p		Organization		Behavior		Total		Institutionalized corruption		Social support	
Number in Table 2	PSI	a		b		c		a + b + c		X1		X2	
		Before	After	Before	After	Before	After	Before	After	Before- 8 (**)	Estimation		
8	Fuel theft (Huachicoleo*)	6	1	6	2	6	3	18	6	10		0.8 ^I	
7	Internationally consolidated drug purchases	6	3	4	2	6	3	16	8	8		0.2 ^{II}	
11	Power transmission tariffs (CFE)	5	2	5	2	5	3	15	7	7		0.55 ^{III}	
9	Renegotiation of energy-related contracts with Pemex and CFE (electricity own-supply)	5	2	5	3	5	2	15	7	7		0.55 ^{III}	
3	President's Daily Press Conference ("Mañaneras")	4	1	4	1	6	3	14	5	6		0.65 ^{IV}	
12	Expansion and modernization of the national oil refining system (PEMEX)	5	2	3	2	5	3	13	7	5		0.55 ^{III}	
10	Alternative to a wholesale power market (CFE)	5	4	4	3	4	3	13	10	5		0.55 ^{III}	
2	Social Security Welfare (IMSS)	5	4	2	1	5	1	12	6	4		0.75 ^V	
5	The School is Ours	3	1	4	1	4	1	11	3	3		0.59 ^{VI}	
1	Welfare Bank	3	1	3	1	4	1	10	3	2		0.51 ^{VI}	
4	Young people building the future	3	1	3	1	3	1	9	3	1		0.62 ^{VIII}	
6	Sowing life	3	1	2	1	3	1	8	3	0		0.65 ^{IX}	

Table 3 (continued)

Scaling impact corruption levels by axis (0, means no corruption)					
P-p corruption			Behavior		
		Organizational			
Impact	Characteristic	Impact	Characteristic	Impact	Characteristic
1	High clarity	1	Individual	1	Opportunist
2	Medium clarity	2	Group of persons	2	More than once
3	Low clarity	3	Collusion with public officers	3	Low-frequency abuse
4	Slightly fuzzy	4	Public office corrupted	4	Medium frequency abuse
5	Moderately fuzzy	5	Public office plus other government branches	5	High-frequency abuse
6	Highly fuzzy	6	Corruption of three branches of state: Executive, Legislative, and Judiciary	6	Abuse is the rule

*"Huachicol" in Mexico refers to the illegal acts of stealing and selling oil or gas

(**) 8 is the lowest value of the "before" column

Corruption values are given by PSI's experts on each PSI

Source: Elaborated by the author

Social support estimation: X2

I Expert perception: 0.80

II Expert perception: 0.20

III Energy Reform Deputies in favor/ Total votes: 275/ 498 = 0.55

IV Audience: 0.65

V Cover States: 24/ 32 = 0.75

VI Cover schools: 103,000/ 173,000 = 0.59

VII Bank branches/ total goal: 1342 / 2600 = 0.51

VIII Young 18–29 years old: 2.5 / 4.0 million people

IX Cover States: 21/ 32 = 0.65

What is the impact of innovations on the fight against corruption?

Public and user values will be assigned to each PSI case to evaluate their impact on reducing or increasing corruption.

The innovativeness values (INDICO index) of the 12 PSI cases ranged from a minimum of 2.74 to a maximum of 5.79, while the gain in anti-corruption ranged from 1.72 to 6.65 points (see Table 4).

Consequently, the regression analysis proves that public service innovations have a neutral, instead of a positive, effect in diminishing corruption (H1).

A positive impact of innovation on anti-corruption gain is obtained with a quadratic function, but with a low level of explanation:

$$Y = -3.40 + 3.28X - 0.34X^2; R^2 = 0.22$$

$$t \text{ Stat } (-0.70) (1.58) (-1.60)$$

$$P \text{ value } (0.50) (0.15) (0.14)$$

Hence, two other variables have been added to the regression analysis: The institutionalized embeddedness of corruption (X_1) and the public and social support for the PSI (X_2) (Table 3) (Figs 2, 3).

$$Y = -1.45 + 0.61X + 0.43X_1 + 1.04X_2, R^2 = 0.64$$

$$t \text{ Stat } (-0.76) (2.28) (3.77) (0.59)$$

$$P\text{-value } (0.47) (0.05) (0.005) (0.57)$$

So, we can conclude that Social Support (X_2) and public awareness of systemic corruption (X_1) are needed in addition to the PSI (X). The marginal impacts on the anti-corruption gains (Y) are 1.04 for systemic corruption, 0.61 for the PSI, and 0.43 for social support. Accordingly, with the t Stat, the social support (X_1) can better explain the anti-corruption gain; then is innovation (X), and finally, the level of institutionalization of corruption (X_2). Therefore, considering that this is an important variable, and since there are only 9 degrees of freedom, its statistical test with a higher PSI number is pending.

How does the PSI's initial application affect the level of corruption?

When the level of corruption is higher at the beginning of the PSI application, it is expected that more complex solutions will be needed, and the impact on corruption will be uncertain (H2).

Therefore, we will examine below the three PSI cases with the highest level of corruption in the three axes (P-P corruption, Organization, and Behavior) at the beginning of the PSI application. The maximum corruption is 18 points, as each axis has a maximum of 6 points (see Table 3).

- 8. Fuel theft or "Huachicoleo"⁹

It had a maximum corruption level (Fig 1), a score of 18 points. The anti-corruption gain is 6.65 points, the highest of all the 12 PSIs (see Table 3).

The innovation consisted of the deployment, at the same time, of a large contingent of soldiers and civil guards to watch over oil pipelines and cut off oil supply, thereby drastically diminishing the exposition of oil to crime. This action had nationwide and

⁹ The PSI is listed with their identification numbers in Table 2.

significant negative impacts on the oil supply to consumers. Military surveillance was coupled with gasoline transported by trucks to service stations. Although the end users were not consulted, they did accept the temporary but harsh collateral effects of gasoline shortages. Until 2022 fuel and gasoline theft was stable at around 3–4% of the initial losses, as few criminal groups continued to operate.

- 7. Internationally consolidated drug purchases

The score at the beginning of the PSI intervention is 16 points. The anti-corruption gain was 4.69 points (see Table 3).

To eradicate institutional corruption, a strategy was devised to move from a corrupt national delivery system to an international call for tenders from pharmaceutical firms selected by the United Nations Office for Project Services (UNOPS). This change did away with entrenched corrupt practices in which 10 big commercial companies held 80% of the market. However, there were some shortages of medicines, which led to social protests for the scarcity of childhood cancer drugs.

- 11. Power transmission tariffs; and 9. Renegotiation of energy contracts with Pemex and the Federal Electricity Commission (CFE).

Both cases had 15 corruption points before the PSIs, and the anti-corruption gain is 4.54 points (Table 3).

Since 1992, Mexico has allowed large companies to generate their energy supply. On the supposed target of producing energy at a lower cost than that supplied by the CFE, to compete on the world market and under the rules of the 1994 Free Trade Agreement (FTA). In 2010, these companies with their private power supply were also granted a preferential or lower cost rate for the so-called “green carrying”. Mexico’s 2013 electricity reform expanded the scheme so that those who generate their electricity supply could be registered or be migrated to the group of “qualified users”. The CFE has been transferring resources via low transmission tariffs and allowing other large business chains without direct power generation to receive a share of those subsidies if they are associated as users of the energy-generating companies.

The PSI proposed a 2022 electricity reform bill that failed to pass by Congress (because it did not garner an absolute majority in Congress, two-thirds of total votes). Then, the Mexican government is renegotiating case-by-case the CFE supply contracts receiving subsidies.

As a result, given a high level of initial corruption, mainly institutional corruption, another variable to deter corruption is to have broad public support from users and other agents, depending on how embedded the corruption is in the institutions and society.¹⁰ Also, the PSI would expected to substantially diminish the transaction costs (Disch et al., 2009, p. 55).

¹⁰ “Civil-society groups can be an important source of support, helping citizens resist corrupt demands and push for systemic reform. Social media, too, can serve as a platform for reformers and concerned citizens and provide a means to encourage whistleblowing and investigative journalism (Rose-Akermann, 2018, p. 109).

Table 4 Impact of PSI on corruption

			INDICO				Corruption		
			Capacities	Results	INDICO	Efficiency	Before 2018	After 2021	Anti-Corruption gain
Goals	Number	Public service innovations (PSI)	C	R	C + R	R/C	1. hypotenuse (**)	2. hypotenuse (**)	(h 1)–(h 2)
Well-being	1	Welfare Bank	3.01	2.77	5.78	0.92	5.83	1.73	4.10
	2	Social Security Welfare (IMSS)	2.60	1.57	4.17	0.60	7.35	4.24	3.11
Democracy	3	President's Daily Press Conference ("Mañaneras")	2.27	3.17	5.44	1.40	8.25	3.32	4.93
Diminishing inequality	4	Young People Building the Future	3.59	3.53	7.12	0.98	5.20	1.73	3.46
	5	The School is Ours	2.52	1.64	4.16	0.65	6.40	1.73	4.67
Honesty	6	Sowing Life	3.03	2.76	5.79	0.91	4.69	1.73	2.96
	7	Internationally consolidated drug purchases	2.26	1.96	4.22	0.86	9.38	4.69	4.69
	8	Fuel theft (Huachicoleo*)	2.19	2.02	4.21	0.93	10.39	3.74	6.65
	9	Renegotiation of energy-related contracts with Pemex and CFE (Electricity own-supply)	1.59	1.52	3.12	0.96	8.66	4.12	4.54
Sovereignty	10	Alternative to a wholesale power market (CFE)	2.02	0.73	2.74	0.36	7.55	5.83	1.72
	11	Power transmission tariffs (CFE)	2.17	1.47	3.64	0.67	8.66	4.12	4.54
	12	Expansion and modernization of the national oil refining system (PEMEX)	3.05	1.61	4.66	0.53	7.68	4.12	3.56
Ranges (max, min)					5.79 2.74	1.40 0.36			6.65 1.72

Source: The author

(*) "Huachicol", in Mexico, used to mean the adulteration of alcoholic drinks. Today it refers to the illegal acts of stealing and selling oil or gas

(**) Hypotenuse calculated based on Table 3 data $(a^2 + b^2 + c^2)^{1/2}$

Discussion

The findings of this article can be presented as follows:

- 1) The neo-institutional theory sheds light on aspects of embedded corruption in public–private relationships, whether formal or informal. Its main concern could be that systemic corruption increases transaction costs. However, the societal and administration perspectives are necessary to gain an effective diminishing of corruption.

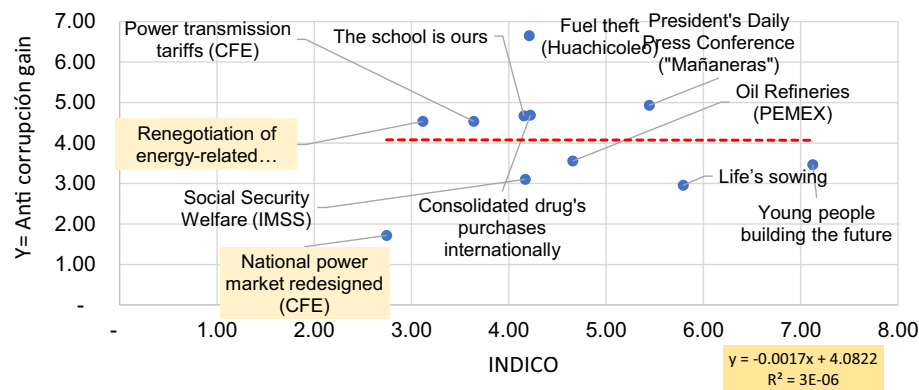


Fig. 2 12 ISP, impact on anti-corruption gain

2) Metrics: An Indico index adapted from technology firms to PSIs was used to measure their innovativeness. For the level of corruption, three axes (P-P partnerships; corruption organization; and corrupt behavior) were evaluated, dividing each axis into a higher and lower-case corruption. Each case is further deployed on three levels generating 216 possible values.

3) Context: Mexico's present government (2018–2024) has established an anti-corruption program containing a myriad of PSIs, from which 12 have been selected from 2019 to 2022.

PSI selected are implemented from top-to-bottom to tackle the institutionalized corruption in the public and private sectors. However, this approach could be complemented with bottom-to-top innovations, fostering an intrapreneur environment. "Intrapreneurship is a process whereby employee(s) recognizes and exploits opportunities by being innovative, proactive and by taking risks" (Neessen et al., 2019), located in public organizations to generate public value and get better service performance.

4) Results: The impact of the PSIs in deterring corruption has been estimated. However, regression needs other variables to obtain anti-corruption gains: the degree of institutionalization and social support of the PSI. Also, a larger number of PSI will perform better statistical results.

Conclusions

Mexico's government, since 2019, has assigned the highest priority to fighting corruption. Its strategies are based on universal values of sovereignty, honesty, equality, democracy, and well-being.¹¹

A methodology is developed and applied to measure the PSI's innovation and its impact on reducing corruption during the government of Mexico 2019–2024. This methodology could be applied in other contexts but considering its characteristics. For example, an important aspect not sufficiently explicit in this article is the leadership of the Mexico group in power to build and apply anti-corruption strategies.

¹¹ "Successful political/economic systems have evolved flexible institutional structure that can survive the shocks and changes that are a part of successful evolution. But these systems have been a product of long gestation. We do not know how to create adaptive efficiency in the short run (North, 1994, p. 367).

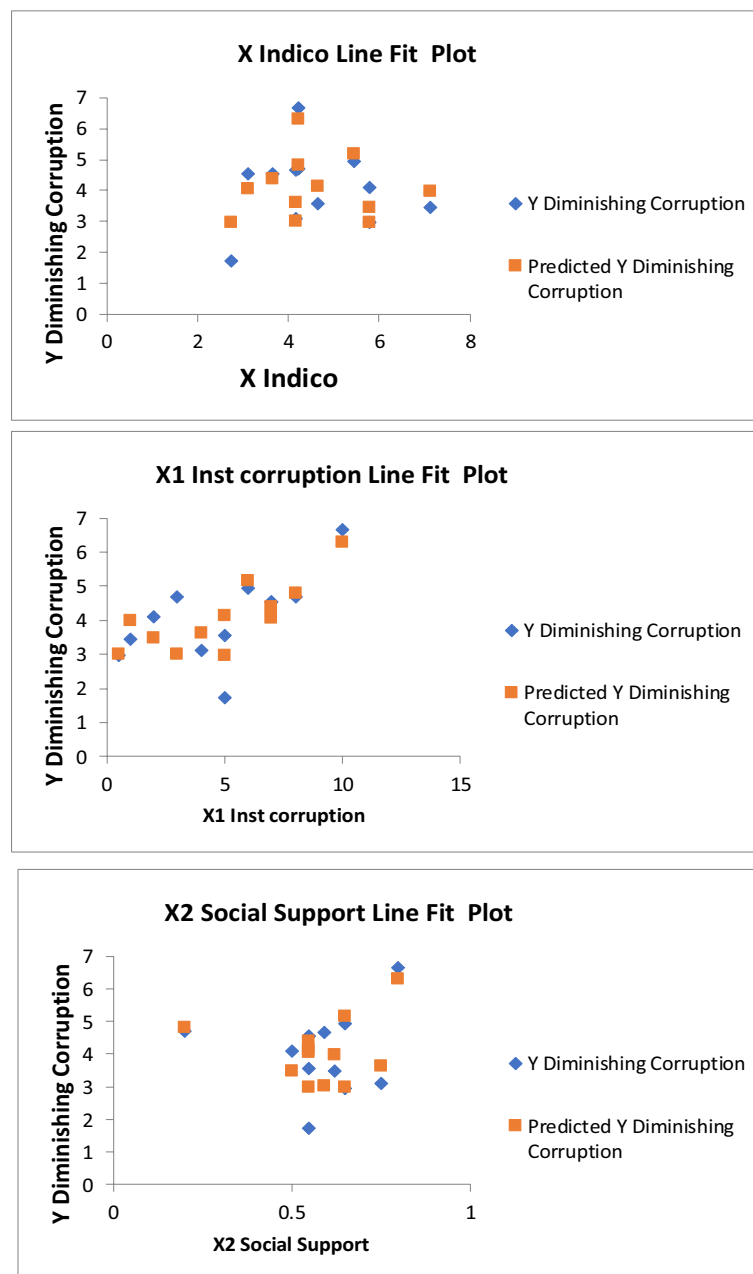


Fig. 3 Impact of INDICO, Institutional corruption, social support

The innovativeness of the 12 PSI from the statistical point of view has no impact on diminishing corruption (hypothesis 1); therefore, the innovativeness is complemented by the degree of corruption institutionalization and by adding specific social support. Then innovativeness, institutionalized corruption, and social support positively impact the anti-corruption gains.

The more prevalent systemic or institutionalized corruption, the higher the cost of time and resources needed to reduce it. Social support from users is necessary since the institutional and cultural apparatus supporting corruption must be transformed.

Developing effective strategies to demonstrate their worth over the long run is more difficult. Such is the case of the PSIs, *Fuel theft*, *Enhancing drug public purchasing internationally*, and *Power transmission tariffs*, which before the PSIs had the highest corruption index (Table 3).

Therefore, the validation of the hypothesis implies that: (1) the type and complexity of PSIs to fight institutionalized corruption require coordination with the relevant agencies, along with systemic strategies; (2) PSI innovativeness must be greater to deter institutional corruption and (3) the sustainability of the anti-corruption gains could be tested in the long run using a follow-up of the institutional changes and disrupted innovations.

Even if corruption occurs at the individual level, its reduction (or elimination) would require greater scale costs because preventing and controlling isolated cases is expensive (Graf Lambsdorff, 2015).

One important and positive aspect of the government's anti-corruption strategy is that public corruption savings fund social programs and big infrastructure projects.¹²

The overlooked corrupt public–private partnerships to separate the economic interests from the public values will require regulations of standards and specific rules to obtain corruption-free impacts. This challenge requires permanent public and social monitoring to separate economic interests from political goals. This opens new lines of research in which public service innovations, PSI, described in the framework of the evolutionary economic theory, is accompanied by institutionalist theory, mainly rules and incentives to prevent and punish, and the evaluation of transaction costs of corruption, as well as the management, particularly on the role PSI leadership, and the analysis of the social approach of corruption.

Abbreviations

CCSNA	Coordinating Committee of the National Anticorruption System of Mexico
CEAP	Scholar's Committees for the Management of maintenance resources
CFE	Federal Electricity Commission, is the state-owned electric utility of Mexico
CONEVAL	National Council for the Evaluation of Social Development Policy in Mexico
CUSMA	Canada–United States–Mexico Agreement
DOF	Official Journal of the Federal Government
IMCO	Mexican Institute for Competitiveness
IMSS	Mexican Institute of Social Security
INDICO	Innovation, Diffusion, Co-Valuation Index to measure innovativeness
OECD	Organization for Economic Co-operation and Development
PEMEX	Mexican state-owned petroleum company
PSI	Public service innovation
P-pP	Public–private partnership
SIDA	The Swedish International Development Cooperation Agency
4T	Mexico's Fourth Transformation, 2019 and on →

Acknowledgements

DGAPA UNAM Research Project IN 300822. This article is based on the results of the Papiit research project at UNAM IN300822 "Innovation in public policies in Mexico in 2019–2024".

To UNAM's scholars that help in collecting some data and support for the analysis: Alexis Camacho, Blanca Borja, Felipe Hernández, Antonio Millán, Azucena Cardoso, Maurifany Pérez, Daira Avila, Jessica Olivares, Lizeth Garcia, Remzi Xheltmace.

An explanation of why your manuscript should be published in the *Journal of Innovation and Entrepreneurship*

Innovation is considered under the case of public service, PSI.

¹² The public estimated savings generated by fighting corruption are: from "fuel theft" USD 10 billion; from public works USD 10 billion; from government austerity, USD 15 billion; and from not condoning taxes owed by big companies, USD 85 billion. Therefore, the total amount of savings from anti-corruption and austerity is USD 120 billion. (Lopez-Obrador, 2022).

Based on evolutionary economic theory, the metric used to assess innovativeness in the public sector is adapted from previously developed firm innovations called INDICO.

So, the current public policies are interpreted as innovation and are oriented mainly toward fighting corruption in Mexico, becoming a special national moment laboratory to develop ways for their analysis.

Entrepreneurship is applied in the discussion section considering the possibility of complementing those policies with intrapreneurship.

Confirmation that all authors have approved the manuscript for submission

I do approve the manuscript uploaded.

Confirmation that the content of the manuscript has not been published, or submitted for publication elsewhere (see our Duplicate publication policy)

The content of the manuscript has not been published or is in the process of submission elsewhere.

If you are submitting a manuscript to a particular special issue, please refer to its specific name in your covering letter

The manuscript is submitted to the JIAE, Journal of Innovation and Entrepreneurship, and not to a special issue.

If you have chosen the “No revisions option”, please briefly state this in your cover letter

I have not chosen that option as I agree with this submission's revision process.

Author contributions

The originality is the proposal to measure the PSI's innovation and its impact on the reduction or dissuasion of corruption in the context of the current government of Mexico. These metrics could be replicated in other contexts.

Author information

Leonel Corona-Treviño is a full-time Professor at the Graduate School of Economics at the National University of Mexico since 1975. He founded the Economy of Technology Field Studies. He has a Ph.D. in Operation Research from the National University of Mexico (1975) and a master's degree in industrial engineering from the University of Louvain (1966). He received the “Alfonso Reyes” award (1989) from the Mexican Academy of Science as well as the “National University” in Economics and Management Research award (1992), and he is an Emeritus member of the National Research System. He has published about 200 articles, chapters, and books on contemporary problems arising from the interaction of Science, Technology, and Society.

Funding

I wish to thank three anonymous referees who offered valuable critiques and provided me with constructive suggestions, thereby improving the article substantially.

Availability of data and materials

Not applicable.

Declarations

Competing interests

I do declare that there are no potential competing interests.

Received: 2 March 2023 Accepted: 26 October 2023

Published online: 30 November 2023

References

- Arellano Gault, D. (2017). Corruption as an organizational process: Understanding the logic of the denormalization of corruption. *Contaduría y administración* vol.62 no.3 jul./sep.
- Bason, C. (2010). *Leading public sector innovation: Co-creating for a better society*. Bristol University Press.
- Bussell, J. (2013). Varieties of Corruption: The Organization of Rent-Seeking in India. *Westminster Model of Democracy in Crisis*, pp. 1–49.
- Corona, L., Doutriaux, J., Mian, S. (2006). *Building Knowledge regions in North America*. UK: s.n.
- de Vries, H., Bekkers, V., Tummers, L. L. (2015). Innovation in the Public Sector. *SSRN Electronic Journal*.
- Desmarchelier, B., Djellal, F., Gallou, F. (2019). Benoît Desmarchelier, Faridah Djellal, Faiz Gallouj. Towards a servitization of innovation networks: a mapping. *Public Management Review, Taylor and Francis (Routledge)*.
- Disch, A., Vigeland, E., Sundet, G. and Gibson, S. (2009). *Anti-Corruption Approaches: A Literature Review*, Oslo: SIDA, Swedish International Development Cooperation Agency, Norad Norwegian Agency for Development Cooperation.
- Djellal, F., Gallouj, F., & Miles, I. (2013). Two decades of research on innovation in services: Which place for public services? *Structural Change and Economic Dynamics*, 27, 98–117.
- DOF. (2019). *Plan Nacional de Desarrollo 2019–2024*. [En línea]. Available at: https://www.dof.gob.mx/nota_detalle.php?codigo=5565599andfecha=12/07/2019. [Accès le 02 02 2020]
- Dupuy, K. and Neset, S. (2018). *The cognitive psychology of corruption. Micro-level explanations for unethical behaviour*, Chr. Michelsen Institute, Norway: U4 Issue.
- Graf Lambsdorff, J. (2015). *Preventing corruption by promoting trust: Insights from behavioral science*. Universität Passau, Wirtschaftswissenschaftliche Fakultät.

- Lopez-Obrador, A. M. (2022). *Mexico Government*. [En ligne]. Available at: <https://www.gob.mx/presidencia/articulos/versi-on-estenografica-4-informe-de-gobierno?idiom=es>.
- Mazzucato, M. (2014). *The entrepreneurial State: Debunking Public vs Private Sectors Myths*. Anthem Press.
- Mazzucato, M. (2017). *El Estado emprendedor: Mitos del sector público frente al privado*. s.l.:RBA Economía.
- Merlin-Broggiart, C., Fuglsang, L., Magnussen, S., Peralta, A., Révész, E., Rønning, R., Rubalcaba, L., Scupola, A. (2022). Social innovation and public service: A literature review of multi-actor collaborative approaches in five European countries. *Technological Forecasting and Social Change*.
- Moore, M., Sparrow, M. and Spelman, W., (1997). Innovation in policing: From production line to jobs shops. Dans: *Innovation in American Government*. s.l.:Brookings Institution, pp. 274–298.
- Moussa, M., McMurray, A., Mu, N., (2018). Innovation in public sector organisations. *Cogent Business and Management*.
- Mulgan, G. and Albury, D., (2003). *Innovation in the Public Sector*. s.l.:Cabinet Office Strategy Unit.
- Muramatsu, R., & Bianchi, A. M. A. F. (2021). Behavioral economics of corruption and its implications. *Brazilian Journal of Political Economy*, 41(1), 100–116.
- Neessen, P. C. M., Marjolein, C. C. J., Vos, B., & de Jong, J. P. (2019). The intrapreneurial employee: Toward an integrated model of intrapreneurship and research agenda. *International Entrepreneurship and Management Journal*, 15, 545–571.
- North, D. C. (1994). Economic performance through time. *The American Economic Review*, 84, 359–368.
- OECD. (2017). *OECD. Integrity Review of Mexico. Taking a stronger stance against corruption*. OECD.
- Osborne, S., & Brown, K. (2005). *Managing change and innovation in public service organizations*. Routledge.
- Osborne, S., & Brown, L. (2013). *Introduction: Innovation in public services*. Edward Elgar Publishing.
- Rose-Akermann, S. (2018). Corruption and purity. *Daedalus*, 147(3), 98–110.
- Rose-Akermann, S., & Palifka, B. J. (2016). *Corruption and government: Causes, consequences and reform*. 2nd ed. Cambridge University.
- Rose-Akermann, S. and Truex, R., (2016). *Corruption and Policy Reform*. working paper, Copenhagen Consensus.
- Sandoval-Ballesteros, I. E. (2015). *Opacidad y nula rendición de cuentas en las Asociaciones público privadas*. IIS UNAM.
- Sandoval Ballesteros, I. E., (2016). Enfoque de la corrupción estructural: poder, impunidad y voz ciudadana. *Revista Mexicana de Sociología*, enero-marzo, 78(UNAM-IIS), pp. 119–152.
- Soreide, T. (2014). *Drivers of Corruption*. World Bank.
- Stiglitz, J., (2012). *The Price of Inequality: How Today's Divided Society Endangers Our Future*. s.l.:W. W. Norton and Co.
- Teorell, J., Seim, B., McMann, K., (2020). Why low levels of democracy promote corruption and high levels diminish it. *Political Research Quarterly*, 00(University of Utah), 1–15.
- Thompson, D. F. (1995). *Ethics in Congress: From Individual to institutional corruption*. Brookings Institution.
- Transparency International. (2022). *Corruption Perception INDEX*. [En ligne]. Available at: <https://www.transparency.org/en/cpi/2022/index/mex>
- Vannucci, A., (2015). Three paradigms for the analysis of corruption. *Labour and Law*.
- Vannucci, A., Rios-Petrarca, F., (2020). Corruption and how to fight it: state of the art and analysis perspectives. *CIVITAS, Revista de Ciencias Sociais*, pp. 315–316.
- Vergara, C. (2020). *Systemic Corruption. Constitutional ideas for an anti-oligarchic republic*. Princeton University Press.
- Witker, J., (2015). Asociaciones público privadas y captura del Estado. Dans: *Interés público, asociaciones público/privadas y poderes fácticos*. Mexico: IIS UNAM, pp. 76–96.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Submit your manuscript to a SpringerOpen[®] journal and benefit from:

- Convenient online submission
- Rigorous peer review
- Open access: articles freely available online
- High visibility within the field
- Retaining the copyright to your article

Submit your next manuscript at ► [springeropen.com](https://www.springeropen.com)
