



Structural Vulnerabilities and the Fight Against Corruption: A Global Assessment of Employment, Environment, and Equity

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Abstract

This study examines how structural vulnerabilities of vulnerable employment, air pollution, and standard of living shape the global effectiveness of corruption control mechanisms. It empirically assesses whether socio-economic and environmental fragilities constrain or facilitate states' institutional capacity to curb corruption. Moving beyond legalistic perspectives, it highlights broader developmental determinants often overlooked in corruption discourse. Using cross-sectional data from 57 countries (2019, WDI) and Ordinary Least Squares (OLS) regression, the study models the impact of control of corruption on vulnerable employment, PM_{2.5} air pollution, and the Gini index. Results show a statistically significant negative relationship between all variables and corruption control, explaining 64.86% of variation. High vulnerable employment, severe pollution, and inequality erode governance quality. The study urges expanding anti-corruption frameworks to include labour formalisation, environmental regulation, and income redistribution, emphasising that corruption is as much a developmental outcome as a governance failure.

Keywords: Vulnerable Employment, Air Pollution, Governance, Standard of Living, Gini Index, Inequality, Control of Corruption.



Introduction

Understanding the structural determinants of corruption control is a cornerstone for advancing institutional integrity, economic resilience, and democratic governance. This study offers empirical insights into how macro-level socio-economic and environmental conditions influence a country's capacity to combat corruption. Specifically, by analyzing the effect of vulnerable employment, air pollution, and standard of living (measured via the Gini index) on the control of corruption, this research extends the literature beyond conventional legal-institutional analyses. It contributes to the Sustainable Development Goals (SDG 8, SDG 10, SDG 11, and SDG 16), particularly by linking labor market informality (ILO, 2020), environmental degradation (WHO, 2023), and income inequality (UNDP, 2022) to anti-corruption efficacy.

Moreover, in light of mounting global concerns about the erosion of democratic institutions and widening socio-economic disparities, the findings from this research could provide timely evidence for policy-makers, international organizations, and development partners. By addressing how pollution exposure and social inequality amplify institutional vulnerability, this study provides an interdisciplinary framework to understand the resilience—or fragility—of anti-corruption structures in an increasingly interconnected global order (North et al., 2009; Kaufmann et al., 2011; Uslaner, 2008).

Research Gap

While extensive literature exists on the drivers and consequences of corruption, much of it remains narrowly focused on political regimes, legal quality, and bureaucratic discretion (Treisman, 2000; Rose-Ackerman, 2004). Few studies have empirically examined how labor informality, ecological degradation, and economic inequality intersect to influence corruption dynamics. Even fewer have conducted comparative cross-national analyses employing quantitative techniques that integrate these structural variables into corruption models. For instance, although Loayza, Servén, and Sugawara (2009) emphasized the economic risks posed by vulnerable employment, its direct effect on institutional integrity has not been fully explored. Likewise, the impact of environmental pollutants like PM_{2.5} on regulatory governance and civic oversight remains under-theorized despite growing calls for environmental justice and regulatory transparency (Cole et al., 2011; Neumayer, 2002). Furthermore, inequality studies have predominantly centered on social justice and economic growth, largely sidelining their potential ramifications on corruption resilience (Gupta et al., 2002; Chong & Gradstein, 2007).

This study bridges this interdisciplinary gap by integrating socio-economic, labor, and environmental metrics into a unified corruption model. By employing data from the World Development Indicators (2019) and applying an Ordinary Least Squares (OLS) regression approach on 57 countries, this research offers robust empirical validation to theoretical propositions across development economics, governance studies, and environmental policy.

Research Question

The central research question guiding this study is:

To what extent do vulnerable employment, air pollution, and the standard of living (as proxied by the Gini index) influence a country's ability to control corruption across a global sample of countries in the year 2019?

This question addresses both the directionality and magnitude of impact exerted by these independent variables on the institutional quality of governance.



Research Hypotheses

Based on theory and previous empirical findings, the following hypotheses are proposed:

H₁: Higher rates of vulnerable employment are negatively associated with the control of corruption, indicating that informal labor markets reduce institutional compliance and regulatory capacity (Loayza et al., 2009; Schneider & Enste, 2013).

H₂: Increased exposure to air pollution (PM_{2.5}) is negatively correlated with the control of corruption, suggesting that environmental mismanagement and weak regulation fuel institutional decay (Cole et al., 2011; World Bank, 2023).

H₃: Greater income inequality, as captured by a higher Gini index, is associated with reduced control of corruption, due to elite capture, institutional capture, and exclusionary governance structures (Gupta et al., 2002; Chong & Gradstein, 2007; Uslaner, 2008).

These hypotheses are empirically tested using OLS regression analysis, allowing for comparative insights into how structural vulnerabilities affect the quality of corruption control mechanisms across different national contexts.

Literature Review

Understanding the Nexus Between Socioeconomic Vulnerability and Corruption

The correlation between vulnerable employment and corruption control is not simple and has its roots in the weakness of the labor market. Vulnerable jobs, which are defined by work on own-accounts and family work contributing, have a tendency to be an indication of low labour protection, informality and financial insecurity. The International Labour Organization (ILO, 2020) states that over 1.4 billion people across the world are currently in vulnerable employment and constitute over 44 percent of the aggregate employment. This group is not usually a subject to union representation, wage agreement, and judicial redress, which forms an excellent environment in the abusive relationships and trainees in administrative abuses (Loayza & Rigolini, 2011; Dabla-Norris et al., 2015). Corruption is likely to flourish in high informal and precarious employment societies where the lack of accountability due to enforcement of labor rights makes institutional trust questionable (Tanzi, 1998; Dreher and Schneider, 2010; Buehn and Schneider, 2012).

The empirical data proves that both petty and grand corruption is much more likely to occur in countries with higher informal sectors (La Porta and Shleifer, 2014; Medina and Schneider, 2019). The size of informal economy is positively related to vulnerable employment and negatively impacts quality of regulations and governance. For instance, in Sub-Saharan Africa and South Asia, where informal labor exceeds 70%, World Bank Governance Indicators (2023) reveal persistently low scores for control of corruption. This suggests a vicious cycle wherein economic vulnerability constrains citizens' ability to demand transparency and good governance (Chong & Gradstein, 2007).

Air Pollution and Institutional Erosion

The issue of environmental degradation especially in the air pollution form has become a non-traditional and yet a prominent factor in the corruption discourse. Although pollution has been a traditional topic of most literature as a public health or ecological concern, newer studies have shown that corrupted practices are a major contributor to environmental mismanagement and vice versa (Fredriksson & Svensson, 2003; Cole, 2007; Pellegrini, 2011). Industrial actors get off the hook by regulatory loopholes, lax and rent seeking behavior and most of the time by making clandestine payments to environmental regulators. A cross-country study conducted by Welsch (2004) revealed that corrupt



perceptions are higher in those countries whose environmental functioning is poor, which points out the cost of governance of pollution.

The economic impact of air pollution is indirect influencing the struggle against corruption because it puts a strain on the available social resources and it causes that the people do not trust the existing system of control. The WHO (2023) estimates that 7 million premature deaths are caused by air pollution each year, and that the disproportionate effects are experienced in low- and middle-income countries. The same countries also in many cases report high perceived corruption. Moreover, a study by Zhang et al. (2017) reveals that pollution deteriorates citizen activity and group action, which are two social processes crucial in the accountability of the public institution. Therefore, CSR efforts might fail to reverse air pollution, which can act as the symptom and cause of governance failure (Brahmi, Hussain, Majeed, Qureshi, and Bansal, 2025).

Standard of Living as a Governance Determinant

The standard of living, often proxied by GDP per capita (PPP), is not only an economic metric but also a governance signal. High living standards are frequently associated with stronger institutions, transparent bureaucracies, and rule of law enforcement (Husain, Qureshi, & Hussain 2019). In contrast, countries with low GDP per capita tend to exhibit institutional weaknesses, including limited capacity to monitor and control corruption (Treisman, 2000; Kaufmann et al., 2011; Mauro, 1995). Empirical studies consistently find a negative correlation between income levels and corruption prevalence (Sung, 2004; Seldadyo & de Haan, 2006). An improved standard of living improves the level of education, access to information, and civil society participation, which lower the level of tolerance to corruption and heightens chances of whistleblow and compliance to regulations (Kolstad and Wiig, 2009).

Statistical data released by IMF (2023) and Transparency International (2022) demonstrate that the countries with GDP per capita over 30,000 are likely to be found in the upper quartile of the Corruption Perceptions Index (CPI) and countries with GDP per capita below 5,000 are prone to be located at the bottom of the list. This implies that by increasing the living standards, the governance could be reinforced indirectly by developing institutions (Husain, Qureshi, and Hussain 2019). Further, economic prosperity enables governments to invest in the auditing systems, judicial system, and e-governance systems that discourage corrupt activities (Ferraz and Finan, 2011), and promote CSR activities (Brahmi, Hussain, Majeed, Qureshi, and Bansal, 2025).

Intersecting Vulnerabilities: A Holistic Framework

When examined jointly, vulnerable employment, air pollution, and low standards of living represent a triad of interrelated socioeconomic stressors that hinder the global control of corruption. Theoretical frameworks from institutional economics and development governance highlight how systemic weaknesses reinforce one another. According to North, Wallis, and Weingast (2009), societies trapped in “limited access orders” experience overlapping institutional failures, wherein corruption is both a cause and consequence of structural inequality and environmental degradation.

The literature increasingly supports a holistic model that sees corruption as embedded within a wider matrix of economic, environmental, and labor vulnerabilities. Recent advances in governance theory (Mungiu-Pippidi, 2015; Rothstein, 2011) suggest that effective anti-corruption strategies must extend beyond legalistic reform to include labor protection, environmental justice, and inclusive economic development. Empirical



validation of these interdependencies remains limited but promising, especially in light of data from cross-sectional governance indicators and environmental performance indices.

The convergence of these three domains—labor vulnerability, environmental quality, and economic wellbeing—suggests that corruption cannot be effectively addressed in isolation. Structural reforms that enhance employment stability, improve environmental regulation, and raise living standards are likely to produce multiplicative benefits in curbing corruption. As the global community strives toward Sustainable Development Goals (SDGs), particularly SDG 8 (Decent Work), SDG 16 (Peace, Justice and Strong Institutions), and SDG 13 (Climate Action), understanding these cross-domain linkages is more urgent than ever.

Theoretical Background

Institutional Economics and the Foundations of Corruption

The control of corruption has long been embedded within the theoretical discourse of institutional economics, which emphasizes the role of formal and informal institutions in shaping human behavior (North, 1990). Institutions—defined as the “rules of the game”—play a central role in determining the quality of governance, enforcement of accountability, and distribution of resources. In contexts where institutions are weak, opportunities for rent-seeking and misgovernance abound (Acemoglu & Robinson, 2012). Corruption, thus, is not merely a deviation from ideal governance, but an equilibrium outcome of dysfunctional institutional arrangements. Vulnerable employment, environmental mismanagement, and low living standards are each symptomatic of institutional fragility and, in turn, contribute to the erosion of mechanisms that could otherwise control corruption (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1999; Rothstein & Teorell, 2008).

Labor Market Theory and Vulnerable Employment

Theoretical models of segmented labor markets, particularly the dual labor market theory (Doeringer & Piore, 1971), argue that vulnerable employment emerges where institutional protections are weak or selectively enforced. This creates a bifurcation between protected and unprotected workers, with the latter facing informal, unstable, and poorly remunerated job structures. Vulnerable workers lack the voice and bargaining power to challenge unjust practices or demand accountability from employers or public authorities. The absence of formal contracts, grievance mechanisms, and collective representation diminishes their capacity to report corrupt behavior or resist exploitative systems (Standing, 2011; Chen, 2012; Hussmanns, 2005). Such conditions lower institutional transparency and weaken social capital—both critical to the integrity of governance structures (Putnam, 1993).

Furthermore, empirical studies grounded in labor vulnerability frameworks have established a positive association between high levels of informal and vulnerable employment and increased perceptions of corruption (Loayza, Servén, & Sugawara, 2009; Schneider, Buehn, & Montenegro, 2010). In countries with informal sectors exceeding 50%, Transparency International (2022) reports average Corruption Perception Index (CPI) scores below 40, highlighting how labor informality coexists with institutional opacity.

Environmental Governance and Pollution Control

The environmental Kuznets curve (EKC) has traditionally been used to analyze the relationship between economic growth and environmental degradation, but its relevance has been extended to governance and corruption studies (Grossman & Krueger, 1995; Panayotou, 1997). Pollution is likely to increase in the formation of early development



when the state is concerned with growth rather than control. Nonetheless, this process can fail to revert to sound institutional governance with the ensuing perpetuated ecological damage and institutionalized corruption. According to regulatory capture theory (Stigler, 1971), the provision of bribes or collusion of the polluting companies may lead to co-optation of the environmental regulators, and thus minimize the effectiveness of the pollution control systems. It is especially relevant in the countries where the level of air pollution is more than the WHO thresholds, which, at present, plague over 90 percent of the world population (WHO, 2023).

The research has demonstrated that the high level of air pollution is associated with laxity in the enforcement of regulations and rent-seeking behavior among industrial participants (Fredriksson, Vollebergh, and Dijckraaf, 2004; Cole, Elliott, and Zhang, 2011). The Environmental Performance index (EPI), is frequently highly correlated with governance indices: the countries with low EPI rankings are also likely to have low scores on the Control of Corruption Index provided by World Bank (WGI, 2023). The presented results are supported by environmental justice and public trust theories, which assume that when a given environment is degraded due to institutional negligence, it would discourage citizens and inhibit anti-corruption actions (Aklin, Bayer, Harish, and Urpelainen, 2016).

Developmental State Theory and the Standard of Living

Standard of living, typically measured by GDP per capita (PPP), is both a consequence and determinant of institutional quality. Developmental state theory posits that economic development is shaped not merely by market forces but by the deliberate role of capable, autonomous, and embedded states (Evans, 1995). States with higher living standards are better equipped to establish transparent bureaucracies, effective law enforcement, and participatory institutions, all of which are critical for curbing corruption (Treisman, 2000; Kaufmann, Kraay, & Mastruzzi, 2011).

Empirical literature also supports modernization theory's claim that higher standards of living promote values such as individual autonomy, civic engagement, and rule of law (Inglehart & Welzel, 2005). These societal traits reduce corruption tolerance and encourage the public to hold governments accountable. A World Bank (2023) study reveals that countries with GDP per capita above \$30,000 score, on average, 70 or above on the CPI, compared to countries below \$5,000, which score below 35. Thus, economic prosperity contributes to both institutional capability and societal demand for accountability (Montinola & Jackman, 2002; Seldadyo & de Haan, 2006).

Inequality, Social Contract Theory, and Corruption

The Gini Index serves as a proxy for income inequality and is closely tied to the theoretical principles of social contract and distributive justice. High inequality undermines the legitimacy of political systems and erodes the perceived fairness of institutions, both of which are central to corruption control (Rawls, 1971; Uslaner, 2008). In unequal societies, elites can consolidate power through patronage networks while marginalized groups face barriers to participation, justice, and service delivery. The resulting clientelist structures are fertile ground for corruption and elite capture (You & Khagram, 2005; Chong & Gradstein, 2007).

Studies grounded in political economy theory consistently find that inequality fuels corruption by skewing resource distribution and policy outcomes toward elite interests (Gupta, Davoodi, & Alonso-Terme, 2002; Rothstein & Uslaner, 2005). The combination of



low incomes and high inequality is particularly damaging, as it weakens both the demand for transparency and the capacity of institutions to supply it.

Integrated Theoretical Framework: A Systemic Governance Model

The intersectionality of vulnerable employment, environmental degradation, and inequality necessitates a systemic governance approach. Theories of “limited access orders” (North, Wallis, & Weingast, 2009) and the quality of government (Rothstein, 2011) argue that corruption control is not an isolated outcome but a result of coordinated progress in multiple structural domains. Each of the three independent variables—labor precarity, environmental risk, and low living standards—erodes institutional trust, weakens enforcement mechanisms, and lowers the transaction costs of corrupt behavior.

Recent models in anti-corruption research emphasize the need for multidimensional diagnostics that integrate economic, social, and environmental drivers of institutional weakness (Mungiu-Pippidi, 2015). This systemic view is essential in light of the Sustainable Development Goals (SDGs), which prioritize inclusive work (SDG 8), environmental action (SDG 13), and institutional integrity (SDG 16). The convergence of these theoretical perspectives provides a robust foundation for empirically examining how structural vulnerabilities constrict or enable the global control of corruption.

Methodology

Research Design and Rationale

This study adopts a quantitative cross-sectional research design, drawing upon secondary data for the year 2019 from 57 countries as provided by the World Development Indicators (WDI) database. The primary objective is to statistically assess how three structural variables—vulnerable employment, air pollution, and standard of living (proxied by the Gini index)—affect the ability of countries to control corruption, operationalized using the World Bank’s Control of Corruption Index (CCI). Given the exploratory nature of the research across diverse geopolitical contexts, an Ordinary Least Squares (OLS) regression model is selected to identify the strength and direction of association between the independent variables and the dependent variable.

The theoretical motivation for the model builds on systemic governance frameworks (Rothstein & Teorell, 2008; North et al., 2009), suggesting that institutional quality is shaped not merely by legal norms, but by broader socio-economic and environmental conditions that influence enforcement capacity, citizen compliance, and public trust. Therefore, understanding these structural determinants empirically offers substantial policy relevance.

Data Sources and Variables

All variables were extracted from the World Bank’s WDI (2023) and Worldwide Governance Indicators (WGI, 2023). The dependent variable, Control of Corruption Index (CCI), ranges from -2.5 (high corruption) to +2.5 (high integrity). The independent variables include vulnerable employment (% of total employment), PM_{2.5} air pollution exposure ($\mu\text{g}/\text{m}^3$), and income inequality using the Gini Index.

The use of these proxies is theoretically justified. Vulnerable employment reflects informal and insecure labor market participation, which has been associated with weaker institutional enforcement and higher corruption (Loayza, Servén, & Sugawara, 2009; Schneider & Enste, 2013). PM_{2.5} is a widely accepted proxy for air quality and environmental governance (Cole, Elliott, & Zhang, 2011; WHO, 2023), while the Gini index



measures economic inequality, a significant structural driver of both institutional mistrust and elite capture (Uslaner, 2008; Gupta, Davoodi, & Alonso-Terme, 2002).

Model Specification and Estimation Technique

The model is specified as follows:

$$CCI_i = \beta_0 + \beta_1(VEMP_i) + \beta_2(AP_i) + \beta_3(GINI_i) + \varepsilon_i$$

Where:

- CCI_i is the Control of Corruption Index for country i ;
- $VEMP_i$ is the vulnerable employment rate (% of total employment);
- AP_i represents air pollution measured in PM_{2.5} concentrations;
- $GINI_i$ is the income inequality index;
- ε_i is the error term.

OLS regression analysis was selected due to its ability to provide efficient, unbiased, and consistent estimators under classical assumptions (Wooldridge, 2013). This method is frequently applied in cross-national governance research (Treisman, 2000; Seldadyo & de Haan, 2006) and is ideal for testing the linearity and magnitude of relationships between control of corruption and its socio-economic predictors.

Data Diagnostics and Validity Checks

Prior to model estimation, the data were assessed for multicollinearity using the Variance Inflation Factor (VIF), with all values falling below the conservative threshold of 5, suggesting low multicollinearity (Kutner et al., 2005). Residuals were tested for homoscedasticity and normality using the Breusch-Pagan and Shapiro-Wilk tests, respectively. Additionally, country-level heterogeneities were addressed through robust standard errors to mitigate any potential violation of homoscedasticity assumptions (Hayes & Cai, 2007).

Descriptive statistics revealed that the average Control of Corruption Index across the sample was -0.28 , with countries like New Zealand and Finland scoring above 2.0 , while Venezuela and Somalia scored below -2.0 (WGI, 2023). Vulnerable employment ranged from 6.5% in developed economies to over 80% in Sub-Saharan African states (ILO, 2020). Air pollution varied widely, with median PM_{2.5} exposure at $32.4 \mu\text{g}/\text{m}^3$ —significantly above WHO-recommended thresholds of $10 \mu\text{g}/\text{m}^3$ (WHO, 2023). Gini index values ranged from 23 in Slovakia to above 60 in South Africa, indicating high global variation in income inequality (UNDP, 2022).

Justification of Country Selection and Year

The year 2019 was chosen to avoid distortions from the COVID-19 pandemic. The 57 countries selected represent all major world regions with adequate data availability, thus ensuring diversity in governance structures, income levels, environmental policies, and labor dynamics. Similar sampling strategies are found in cross-national governance research by Kaufmann et al. (2011) and Mungiu-Pippidi (2015), reinforcing the robustness and comparative relevance of the study.

Limitations and Scope for Further Research

While OLS is efficient in handling cross-sectional data, it assumes linear relationships and cannot infer causality. Longitudinal or panel data models may provide deeper insights into temporal dynamics of corruption and its structural antecedents (Keefer, 2007). Additionally, interaction terms (e.g., between inequality and air pollution) may yield further theoretical richness, which future studies could explore. Nonetheless, the model



presented here provides an empirically rigorous and theoretically grounded snapshot of corruption determinants in the pre-pandemic global landscape.

Research Results & Findings

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TABLE 1: Cross Sectional Regression (2019)

Dependent Variable: Control of Corruption				
Independent Variable	Coefficient	T-Stats	Prob	VIF
const	3.054	6.552	0.000	
Air Pollution	-0.025	-3.541	0.001	1.57
Vulnerable Employment	-0.019	-4.258	0.000	2.091
Gini Index	-0.048	-3.876	0.000	1.476
F-Stat	41.766	F-Prob	0.000	
Adjusted R-Square	0.649	Observation(n)	57	

Source: WDI (2019), Authors estimation

Empirical Overview and Model Significance

The Ordinary Least Squares (OLS) cross-sectional regression analysis conducted on data from 57 countries for the year 2019 revealed a statistically significant model, with an adjusted R^2 of 0.6486 (Table 1). This indicates that approximately 64.86% of the variation in the Control of Corruption Index can be explained by the three independent variables: vulnerable employment, air pollution, and standard of living (proxied by the Gini index). The model's F-statistic was highly significant at the 1% level, confirming the overall explanatory power and robustness of the regression equation. The results not only validate the conceptual framework but provide compelling empirical evidence for the structural nature of corruption.

Negative Effects of Vulnerable Employment

The regression coefficient for vulnerable employment was negative and statistically significant at the 1% level, supporting the hypothesis that higher informal and precarious labor participation weakens institutional enforcement and regulatory capacity. This result aligns with the theoretical arguments advanced by Loayza, Servén, and Sugawara (2009), who found that economies characterized by a high degree of labor informality tend to suffer from limited fiscal resources and reduced administrative oversight. Similarly, Schneider and Enste (2013) argue that vulnerable employment erodes social trust and increases the perceived arbitrariness of institutions, which are known precursors to corrupt practices. The ILO (2020) further confirms that in several Sub-Saharan and South Asian economies, vulnerable employment exceeds 75%, coexisting with low corruption control scores below -1.5 on the WGI scale.

The result is also consistent with Uslaner's (2008) moral foundations theory, which posits that structurally disadvantaged individuals—particularly those operating outside formal labor protections—are more likely to rationalize or accept corrupt exchanges due to systemic exclusion. Countries such as Nigeria and Pakistan, which exhibit high levels of informal labor and weak corruption controls (WGI, 2023), exemplify this structural linkage.



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TABLE 2: Heteroskedasticity-Corrected Model (2019)

Dependent Variable: Control of Corruption				
Independent Variable	Coefficient	T-Stats	Prob	VIF
const	2.494	5.742	0.000	
Air Pollution	-0.022	-3.697	0.001	1.57
Vulnerable Employment	-0.014	-4.629	0.000	2.091
Gini Index	-0.041	-4.001	0.000	1.476
F-Stat	36.090	F-Prob	0.000	
Adjusted R-Square	0.653	Observation(n)	57	

Source: WDI (2019), Authors estimation

Adverse Impact of Air Pollution

The model found a significant negative association between PM_{2.5} air pollution levels and the control of corruption. This suggests that elevated pollution levels reflect not only environmental degradation but also governance failures in enforcement, oversight, and accountability. Cole, Elliott, and Zhang (2011) demonstrated that in regions with high air pollution, environmental mismanagement often stems from regulatory capture, where powerful actors circumvent state control for private gain. Neumayer (2002) similarly linked environmental performance with institutional quality, arguing that lower regulatory standards are often symptomatic of broader governance dysfunction.

Empirical support is also found in WHO (2023) data, which shows that countries with the highest PM_{2.5} levels—such as Bangladesh (83.3 µg/m³) and India (77.1 µg/m³)—score below -1.0 in control of corruption, revealing a convergence of poor environmental and institutional health. These findings corroborate the hypothesis that air pollution serves as a latent proxy for governance failure, consistent with North, Wallis, and Weingast's (2009) concept of limited access orders where elites monopolize environmental resources without public accountability.

Inequality and the Dismantling of Anti-Corruption Systems

The Gini index, representing income inequality, exhibited a negative and statistically significant impact on the Control of Corruption Index. Countries with high income disparities were found to have weaker corruption control mechanisms, consistent with the literature suggesting that inequality fuels institutional distrust and elite capture (Chong & Gradstein, 2007; Gupta et al., 2002). According to the UNDP (2022), countries like South Africa (Gini index > 63) and Brazil (Gini > 53) consistently register below average in corruption control despite democratic institutions, highlighting that inequality can erode both civic participation and institutional transparency.

This finding supports the framework proposed by Rothstein and Teorell (2008), who argue that inequality undermines impartiality in governance. When citizens perceive unequal access to justice or public goods, their willingness to report or resist corruption diminishes, creating a self-reinforcing cycle. Treisman (2000) further posits that high



inequality increases the leverage of powerful economic actors to shape regulatory environments in their favor, often through corrupt means.

Discussion and Analysis

The regression findings of this cross-sectional analysis, using data from 57 countries in 2019, illuminate a profound and statistically significant relationship between structural vulnerabilities—namely vulnerable employment, air pollution, and inequality in the standard of living—and a nation's capacity to control corruption. The adjusted R-squared value of approximately 0.6486 confirms that nearly 65% of the variance in corruption control can be explained by the selected independent variables. Each of the three determinants exhibited a significant negative effect, suggesting that these stressors jointly erode institutional robustness, governance efficiency, and social contract enforcement.

The significant negative association between vulnerable employment and the control of corruption aligns with the broader theoretical insights linking labor informality to weak institutional oversight and increased susceptibility to illicit exchanges. As discussed by Brohi et al. (2024a), precarious employment arrangements—characterized by insecure contracts, weak protections, and absence of formal benefits—can intensify individual-level vulnerability, encouraging bribe-seeking behavior and institutional circumvention. Ahmed et al. (2023) reinforce this through their exploration of high-performance work systems and their mediating effect on innovation and governance. In the absence of structural labor guarantees, workers often lack agency to resist corrupt demands, a view supported by the human capital theory presented in Brohi et al. (2018a, 2018b), where servant leadership and psychological safety are framed as prerequisites for ethical compliance and productivity.

The same is the case with air pollution which has a negative correlation that is significant with corruption control. The observation is consistent with Ahmed et al. (2022b) whose study found that the lack of governance in the agricultural sector is worsened by environmental degradation, as well as with Ahmed et al. (2020) who claim that organizational behavior and employee welfare are directly affected by corporate social responsibility (Brahmi, Hussain, Majeed, Qureshi, and Bansal, 2025) and environmental triggers. The rampant air pollution is an indication of regulatory laxity and industrial cloudiness, which are antecedents to institutionalized corruption. The article by Ahmed et al. (2022a) further states that the environmental sustainability and emission control programs are closely interconnected with the institutional legitimacy, which supports the fact that environmental vulnerability is usually accompanied by the laxity of the enforcement regimes and corruption.

Of equal significance is the statistically significant adverse influence of income inequality, which is proxied by the Gini index, on the control of corruption. Political patronage, elite capture, and transactional governance thrive well in societies that are defined by gross inequalities, as discussed in Mahboob (2020) and Mahboob et al. (2022). Such relations are even enhanced in Rehman et al. (2023) where digital inequities proved to increase financial exclusion and institutional distrust. When unequal distribution of the standard of living is observed, the marginalized tend to feel ignored or unfair by the public institution, which negatively affects the credibility of the anti-corruption campaign. This is reflective of Mahboob et al. (2021) who contended that financial crises and the failure of governance are often built on distributive injustices and lack of transparency in economic decision-making.



All these results confirm the assumption that corruption is not just a failure in governance, but a developmental outcome of socio-economic and environmental negligence. Luo et al. (2022) are right in highlighting strategic importance of digital infrastructure towards transparency and institutional efficiency, but they do not consider the fact that they are not able to reduce corrupt tendencies solely because of technology without filling the underlying social and ecological gap. In the same vein, the model suggested by Ahmed et al. (2022c) on diversifying energy could emphasize the necessity of structural change in seeking systemic resilience - just as the integrated approach to anti-corruption measures that would cross the limits of legal formalism.

Further, the idea of human capital and ethical corporate behavior investigated in Mahboob (2022), and the normative implication of leadership and sustainability determined in Brohi et al. (2024b) evoke that the effective corruption control requires a holistic framework that incorporates the socio-environmental, economic, and behavioral aspects. The overlap of environmental, labor, and inequality-related susceptibility with the loss of control over corruption trends indicates the multidimensional crisis which requires similarly multidimensional policy reactions.

These findings support the claim that corruption prospers in structurally unstable environments that have informal labor, environmental negligence, and disparities of wealth undermining institutional controls and civic credibility. Reforms that are only grounded in regulatory or judicial frameworks might lack effectiveness as it seems, as it is confirmed in a variety of research works (Ahmed et al., 2021; Ahmed et al., 2023; Brohi et al., 2024a), reforms that simultaneously tackle socio-economic and ecological determinants are more likely to be effective.

Comparative Analysis and Theoretical Reinforcement

The results confirm that the structural variables, and not legal or political ones alone are of paramount importance in comprehending corruption control. The strength of association here is complementary to the one made by Kaufmann, Kraay, and Mastruzzi (2011), that governance quality is highly affected by social cohesion, labor structure, and environmental justice.

The study also builds on the suggestion made by Rose-Ackerman (2004) that corruption is not merely a failure of transaction; it is a system-wide equilibrium that is dependent on inequalities rooted in the system and misaligned incentives. The empirical evidence confirms the usefulness of incorporating environmental economics, labor research, and inequality indicators into the study of corruption- a method that is not seen as a cohesive one in existing sources.

Conclusion

This study set out to examine how vulnerable employment, air pollution, and the standard of living—measured via the Gini index—affect the global control of corruption. Using 2019 cross-sectional data from 57 countries and employing an Ordinary Least Squares (OLS) regression model, the analysis confirmed the statistically significant and negative impact of all three variables on the ability of nations to control corruption. With an adjusted R^2 of 0.6486, the model demonstrates substantial explanatory power and affirms the theoretical argument that socio-economic and environmental vulnerabilities systematically undermine institutional integrity.

The negative coefficient for vulnerable employment reinforces prior findings that informal labor weakens state capacity by eroding the tax base, limiting regulatory oversight, and



disempowering large segments of the population (Loayza, Servén, & Sugawara, 2009; ILO, 2020; Schneider & Enste, 2013). High informality fosters conditions conducive to bribery, patronage, and low regulatory compliance (Kaufmann, Kraay, & Mastruzzi, 2011), and the global average of vulnerable employment in low-income countries exceeds 70%, compared to less than 12% in high-income nations (World Bank, 2020).

The results also confirm the environmental governance hypothesis, where air pollution not only reflects weak environmental regulation but also signifies broader institutional fragility (Cole, Elliott, & Zhang, 2011; Neumayer, 2002; Dasgupta, Laplante, & Mamingi, 2001). When populations are exposed to unsafe air, often surpassing WHO limits (WHO, 2023), the public's trust in institutions declines, and opportunities for corruption in environmental monitoring, permits, and enforcement proliferate (Fredriksson & Svensson, 2003; Damania, Fredriksson, & List, 2003).

Lastly, the significant and negative effect of income inequality on corruption control, as proxied by the Gini index, validates the institutional capture theory and the moral economy approach (Uslaner, 2008; Chong & Gradstein, 2007). High inequality exacerbates elite capture, reduces citizen voice, and undermines democratic accountability (Gupta, Davoodi, & Alonso-Terme, 2002). Countries with high Gini indices consistently perform poorly on Transparency International's Corruption Perceptions Index (2020), affirming the cyclical relationship between socio-economic exclusion and institutional weakness.

Recommendations

The findings suggest that effective corruption control cannot be decoupled from broader structural reforms. First, governments must prioritize formalizing labor markets by investing in social protection, simplifying business registration processes, and ensuring occupational safety and labor rights enforcement (ILO, 2020; La Porta & Shleifer, 2014). Reducing informality strengthens institutional legitimacy and fiscal capacity, two prerequisites for effective anti-corruption policies (North, Wallis, & Weingast, 2009).

Second, environmental governance must be reformed through strengthened regulatory frameworks, independent oversight bodies, and citizen-inclusive monitoring mechanisms (OECD, 2022; Fredriksson, Neumayer, & Damania, 2004). Air pollution should be treated not just as a health hazard but as a governance indicator, where regulatory failures often signal deeper institutional pathologies.

Third, policies aimed at reducing income inequality—such as progressive taxation, investment in public education, and universal health access—can foster social cohesion and rebuild public trust in institutions (UNDP, 2022; IMF, 2020). As shown by this study, countries with lower Gini coefficients are statistically more likely to exhibit stronger control of corruption metrics.

Implications

Theoretically, this research reinforces the interdisciplinary understanding that corruption is not merely a consequence of weak legal systems but is deeply embedded in the socio-economic and environmental fabric of nations. By operationalizing vulnerable labor, air pollution, and inequality as predictors, this study calls for a paradigm shift in corruption studies—from institution-focused diagnostics to systems-level analyses.

Practically, these findings have far-reaching policy implications. Multilateral development banks, international donors, and national governments must adopt a multisectoral approach to anti-corruption strategies, integrating labor market formalization, environmental regulation, and income redistribution into governance



reform packages (World Bank, 2023; OECD, 2022). A singular focus on anti-bribery legislation, without addressing these structural drivers, is unlikely to yield sustainable improvements in corruption metrics.

Future Research Directions

Future research should explore longitudinal and panel data methodologies to assess causality and temporal dynamics. Moreover, incorporating interaction effects between inequality and air pollution or between labor informality and governance decentralization could provide deeper insights into context-specific policy design. Comparative case studies could also enrich the quantitative findings by revealing the mechanisms through which these variables interact across political regimes and development levels.

This study provides a critical foundation for such endeavors, affirming that controlling corruption is not solely a matter of political will or legal reform, but also of reducing social and environmental vulnerability.

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