

Louvain School of Management

ESG Disclosure and Stigma in ICO Markets: Evidence from Sin Industries

Author(s): Goelhen Arthur & Hage Cyrian
Supervisor(s): Thewissen James
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NOTE

For this document, DeepL has been used to propose formulations, but the text is original, except the extracts explicitly mentioned as coming from other sources, which are mentioned in footnotes.

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Introduction

Over the past two decades, financial markets have undergone a significant change, with the growing integration of environmental, social, and governance (ESG) criteria into investment decisions. This transformation reflects a broader societal shift, in which investors and society are increasingly demanding that companies align their activities with ethical and sustainable standards (Paradis & Schiehl, 2021). The rise of socially responsible investing (SRI) has influenced capital allocation, as a growing proportion of institutional and retail investors are deliberately shunning companies whose activities conflict with prevailing moral standards (Renneboog, Ter Horst & Zhang, 2008).

In this context, companies operating in so-called “sin” industries, such as tobacco, alcohol, gambling, weapons, and pornography, find themselves at a structural disadvantage. These companies are subject to what Hong and Kacperczyk (2009) describe as the “sin price,” suffering systematic exclusion from institutional portfolios motivated by social norms rather than pure financial considerations. This exclusion generates a shortfall in demand for their shares, which translates into a valuation discount and a higher cost of capital compared to companies operating in socially neutral sectors.

Beyond market prices, this stigma also restricts access to certain financing channels, increases regulatory oversight, and exposes these companies to significant reputational risks (Fabozzi, Ma & Oliphant, 2008). Faced with these structural constraints, stigmatized firms have increasingly turned to ESG disclosure as a legitimacy-building tool, and to alternative financing mechanisms, most notably Initial Coin Offerings (ICOs), as a means of circumventing the capital market exclusion they face in traditional equity markets.

This study examines whether these two strategies, when combined, can effectively offset the stigma of sin industries in the market. Specifically, we investigate whether ESG disclosure embedded in ICO whitepapers serves as a credible legitimacy signal capable of reducing the stigma penalty faced by sin industry projects, or whether it is systematically discounted by investors as mere symbolic communication. In doing so, this paper contributes to the growing intersection of ESG research, stigma theory, and emerging literature on blockchain-based financing.

The motivation for this research stems from three converging weaknesses in the existing literature. First research tends to demonstrate that firms operating in sin industries are penalized in the financial market because many institutional investors exclude them from their portfolio for norm-based reasons. Hong

and Kacperczyk (2009) show that this exclusion reduces the investor base of sin stocks and contributes to a “price of sin”, while Fabozzi et al. (2008) suggest that the higher returns observed in these sectors may reflect litigation, regulatory and reputational risks. In parallel, the ESG literature suggests that sin firms may use CSR or ESG communication to manage legitimacy, although such strategies are often questioned when they are not perceived as credible or consistent with the firm’s core activity (Aqueveque et al., 2018; Dhandhanian and O’Higgins, 2021).

However, most studies focus only on listed firms and the traditional market. Much less is known about whether ESG communication can influence investor perceptions in Initial Coin Offering (ICO) markets. This is important because ICOs are highly international fundraising mechanisms: projects can raise capital from investors all around the world, often across jurisdictions with different regulatory frameworks, disclosure standards and investor protection rules. This international and weakly regulated environment increases information asymmetry and makes voluntary disclosure especially important. In this context, white papers become a central source of information for investors, who rely on textual, technical and credibility-related signals to evaluate project quality (Lee et al., 2021; Florysiak et al., 2022; Thewissen et al., 2022).

This research therefore examines whether ESG disclosure in ICO white papers helps sin industry projects reduce their legitimacy deficit and improve fundraising outcomes. Empirically, we construct original environmental, social, and governance scores from ICO white papers and compare sin and non-sin projects using Propensity Score Matching. We then estimate regression models to test whether sin projects disclose more ESG information, whether ESG disclosure improves fundraising outcomes, and whether governance, credibility, education and regulatory environments moderate these relationships.

The results highlight that ESG communication does not provide a straightforward solution to the stigma faced by sin industries. Contrary to the moral compensation hypothesis, sin industry ICOs disclose less ESG information than comparable non-sin projects, particularly on environmental and overall ESG dimensions. Moreover, ESG signals are not automatically perceived as credible and do not appear to function effectively as an entrance mechanism.

This research contributes to the literature in three ways. First, it extends research on sin industries by examining stigma outside traditional stock markets and within ICO-based financing. Second, it contributes to legitimacy and ESG disclosure research by showing that ESG communication does not necessarily restore investor confidence when emitted by stigmatized projects. And finally, it adds to the

ICO literature by introducing ESG disclosure and industry stigma as factors shaping fundraising outcomes, while accounting for the international and institutionally heterogeneous nature of ICO markets.

Literature review

Sin industries, Market stigma and Financial Performance

Sin industries, which typically encompass sectors such as tobacco, alcohol, gambling, pornography and weapons, occupy a distinctive position in financial markets due to the moral controversy that has always surrounded their activities. Unlike firms operating in socially neutral sectors, these companies are subject to a structural social stigma rooted in prevailing norms, ethical standards and cultural values. This stigma influences investor preferences, capital allocation, and asset pricing.

The seminal work of Hong and Kacperczyk (2009) provides strong empirical evidence of this phenomenon. The authors argue that certain institutional investors, such as pension funds, religious organisations and socially responsible investment funds, systematically exclude sin stocks from their portfolios due to norm-based constraints. This results in a segmented market equilibrium characterised by a smaller investor base and lower demand for these assets. Consequently, sin firms must offer higher expected returns to compensate investors for holding these socially controversial assets, a concept commonly referred to as the 'price of sin'.

However, the interpretation of this excess return remains subject to debate. While Hong and Kacperczyk (2009) emphasise demand-side effects driven by investor preferences and social norms, alternative explanations focus on risk-based factors. Fabozzi, Ma and Oliphant (2008), for example, argue that sin industries are exposed to elevated litigation risk, regulatory scrutiny and reputational vulnerability, factors which may justify higher expected returns as compensation for additional systematic risk. This divergence highlights a fundamental ambiguity in the literature: is the financial performance of sin stocks primarily driven by market segmentation and social norms, or by underlying risk characteristics?

Importantly, stigma does not necessarily imply poor operational performance. In fact, several studies suggest that 'sin' firms often exhibit strong and stable cash flows. For example, Kim and Venkatachalam (2011) demonstrate that such firms tend to have relatively high earnings quality, partly

because of the inelastic demand for addictive or habit-forming goods. This resilience is particularly evident during economic downturns, which highlights the paradoxical nature of sin industries: firms may exhibit robust financial fundamentals while simultaneously facing restricted access to capital due to moral screening.

Beyond asset pricing, stigma can also have broader economic consequences at an organisational level. Novak and Bilinski (2015) found that executives in 'sin industries' received higher compensation, which is consistent with the idea of a 'stigma premium' that is required to offset reputational costs. This suggests that stigma has an impact that extends beyond capital markets, affecting labour market outcomes and corporate governance structures.

Crucially, the intensity of the stigma attached to an activity is not entirely intrinsic to that activity itself but may be influenced by the way it is presented. For instance, the arms industry has increasingly been rebranded as the 'defense industry', emphasising national security and protection rather than warfare. This illustrates that legitimacy is socially constructed and potentially malleable. Consequently, communication strategies could be pivotal in shaping investor's perceptions and mitigating the adverse effects of stigma.

Taken together, the literature highlights structural tension at the heart of sin industries. While these firms may benefit from strong and stable financial performance, they simultaneously face limited access to capital due to exclusion based on social norms and reputational concerns. This creates strong incentives for firms to actively manage their perceived legitimacy in financial markets. In this context, environmental, social and governance (ESG) disclosure has emerged as a potential strategic tool through which stigmatised firms can attempt to reduce their legitimacy deficit and broaden their investor base. However, the extent to which such communication can effectively alter investor perceptions, particularly in highly opaque financing environments, remains an open empirical question.

ESG and CSR reporting as Legitimacy Tools in controversial Industries

Beyond financial considerations, companies' ability to access capital markets and maintain social acceptance is fundamentally based on their perceived legitimacy. According to Suchman (1995), legitimacy refers to the widespread perception that an organization's actions are desirable and

appropriate within a socially constructed system of norms and values, which he calls a "license to operate", shaping both stakeholder support and investor behavior.

For firms operating in stigmatized sectors, however, achieving legitimacy presents a structural challenge. Unlike companies in socially neutral sectors, 'sin firms' face a fundamental constraint: their core activities are inherently perceived as harmful or morally questionable. Consequently, they are unable to attain moral legitimacy by making substantive changes to their business models. This limitation fundamentally alters the role of ESG and CSR reporting in these industries.

This structural constraint can be explained by a fundamental logic: unlike companies operating in socially neutral sectors, sin industries cannot change their core business to restore their moral legitimacy, which necessarily pushes them toward symbolic rather than substantive communication and reporting strategies. However, while moral legitimacy remains structurally out of reach, sin industries can still attempt to establish pragmatic legitimacy by convincing investors that, despite the moral stigma, their ESG engagement reduces the perceived risk of the investment and makes it financially attractive. In their analysis of British tobacco and gambling companies, Dhandhaniah and O'Higgins (2021) perfectly illustrate this dynamic by revealing a persistent gap between the CSR rhetoric displayed and the actual practices of these companies. In the context of ICOs, this distinction takes on particular significance, as the ESG signals included in white papers are necessarily symbolic.

This symbolic dimension raises important questions about the credibility of ESG signals. According to Aqueveque et al. (2018), CSR initiatives can only enhance a company's reputation if they are perceived as authentic and consistent with its core activities. For sin industries, however, this condition is particularly difficult to satisfy, as stakeholders tend to scrutinise them more closely and are more likely to interpret their ESG initiatives as opportunistic. Such initiatives may even backfire when perceived as inconsistent or exaggerated, reinforcing negative perceptions rather than alleviating them.

This dynamic is closely related to the concept of greenwashing, which is defined by Delmas and Burbano (2011) as the strategic discrepancy between a firm's environmental communications and its actual environmental performance. When greenwashing is a concern, ESG disclosure can resemble the "cheap talk" described by signalling theory — costless and non-binding communication that fails to convey credible information. Consequently, investors may disregard ESG claims that are not backed up by verifiable actions.

Empirical evidence on ESG performance in 'sin' industries further highlights this ambiguity. Some studies suggest that firms in controversial sectors invest strategically in specific ESG dimensions to address stakeholder concerns. For example, Du and Sun (2023) found that such firms outperformed in certain social indicators, suggesting targeted efforts to enhance their public image. Conversely, Paradis and Schiehl (2021) found that sin stocks generally performed worse than non-sin firms in terms of governance and environmental factors. These contrasting findings suggest that ESG engagement in stigmatised industries may be selective and strategic rather than comprehensive. This reinforces the view that ESG disclosure often functions as a signalling device rather than as a mechanism for genuine transformation.

However, interpreting these ESG scores remains complex due to the heterogeneity of the methodologies used by different rating agencies, which can obscure the distinction between genuine commitment to sustainability and mere symbolic compliance (Cayón & Gutiérrez, 2021). It is precisely this limitation that motivates one of the central methodological choices of this study, rather than relying on third-party ESG scores that are subject to these inconsistencies, we generate our own scores using machine learning applied to ICO white papers, which allows us to capture ESG signals as they are voluntarily constructed and communicated by companies to investors.

This strategic and targeted nature of ESG signals takes on even greater significance when considering the context in which these signals are emitted, particularly the level of asymmetrical information that characterizes the financing environment. Unlike traditional financial markets, where ESG information is supplemented by regulatory oversight and third-party verification, ICOs operate in relatively opaque environments characterized by extreme information asymmetry (Lee et al., 2021; Florysiak et al., 2022), in which investors rely almost exclusively on information voluntarily disclosed by issuers. In this context of opacity, investors become particularly sensitive to symbolic signals of professionalism, responsibility, and regulatory compliance, which gives ESG signals included in white papers a potentially disproportionate influence on their investment decisions (Bitetto & Cerchiello, 2023), a dynamic that is further amplified when projects are associated with stigmatized activities for which the lack of moral legitimacy is already structural.

Initial Coin Offering: Information Asymmetry and the Role of Whitepapers

Initial Coin Offerings (ICOs) have emerged as an alternative financing mechanism, enabling early-stage ventures to raise capital by issuing blockchain-based tokens. Unlike traditional equity markets, however, ICOs operate in largely unregulated environments with limited disclosure requirements and minimal external oversight. Consequently, investors encounter significant information asymmetry when evaluating these projects, resulting in investment decisions being made under conditions of high uncertainty.

In this context, the white paper plays a central role as the primary, and often the only, means of communication between project founders and potential investors. It usually provides an overview of the project's technological architecture, business model, tokenomics and development roadmap. However, in the absence of regulatory verification or standardized reporting frameworks, the information contained within them cannot easily be validated. Consequently, investors must treat these disclosures as indicators of project quality and credibility rather than verified facts.

This informational environment portrays ICO markets as an extreme example of signalling dynamics. Existing research emphasises the importance of such signals in shaping investor behaviour. For example, Lee, Li and Shin (2021) demonstrate that external ratings are a significant predictor of both fundraising success and post-ICO performance. This suggests that investors actively seek proxies to reduce uncertainty. Similarly, the textual characteristics of white papers have been shown to influence investment outcomes. Thewissen et al. (2022) found that linguistic errors negatively affected the amount of capital raised, indicating that investors interpreted poor language quality as a signal of low credibility. Likewise, Florysiak et al. (2022) demonstrate that more detailed and informative white papers reduce information asymmetry and are associated with greater fundraising success.

Taken together, these findings suggest that ICO markets rely heavily on soft information and voluntary disclosure. In such environments, textual signals, such as clarity, sophistication, and thematic emphasis, play a crucial role in shaping investor perceptions. In such opaque environments, these signals can effectively substitute traditional governance mechanisms and the audited financial disclosures typically found in regulated capital markets.

This unique informational setting makes ICOs particularly well suited to examining the role and effectiveness of ESG signaling. Unlike traditional financial markets, where ESG disclosures are increasingly standardized and externally verified, ESG-related communication in ICOs is entirely voluntary and unregulated. Consequently, the ESG signals embedded in white papers are unlikely to reflect actual sustainability performance; rather, they constitute strategic disclosures aimed at influencing investor perceptions.

Consequently, ICO markets provide a natural testing ground for determining whether ESG communication is perceived as a reliable indicator of project quality or dismissed as non-informative, or even opportunistic, communication. This question is particularly pertinent for projects operating in stigmatized industries, where existing distrust may affect how such signals are interpreted by investors.

ESG signaling in ICO Market: Toward Legitimacy for Stigmatized Projects

Although literature on ESG in ICO markets is still scarce, emerging evidence indicates that sustainability-related communication can influence investor behavior in these highly uncertain environments. Bitetto and Cerchiello (2023), for example, demonstrate that the presence of ESG-related keywords in white papers is positively correlated with fundraising success. This suggests that investors interpret such references as indicators of project quality and responsibility. Similarly, Guzmán et al. (2020) found that ICOs with an environmental focus attracted greater media attention and investor interest when their communication explicitly emphasized sustainability concerns.

At first glance, these findings appear to be consistent with signaling theory. In environments characterized by high information asymmetry, voluntary disclosures, such as environmental, social and governance (ESG) communication, may serve as proxies for unobservable project quality. However, this interpretation hinges on one key assumption: that investors perceive ESG signals as credible.

This assumption is far from self-evident in the context of ICO markets. As previously discussed, ESG disclosure in these environments is entirely unregulated and not subject to external verification. Consequently, ESG communication may not reflect actual sustainability performance, but instead constitute low-cost, strategic signaling. In such cases, ESG disclosure resembles 'cheap talk', whose informational value depends entirely on investor perception rather than any intrinsic credibility.

This credibility problem is likely to be particularly pronounced for projects operating in stigmatized industries. Due to the existing distrust surrounding 'sin' sectors, investors may be more inclined to discount ESG claims, viewing them as an attempt to offset a negative image rather than a genuine commitment. In line with greenwashing literature, excessive or misaligned ESG communication can backfire, exacerbating skepticism and reducing investor confidence.

Moreover, the effectiveness of ESG signaling can vary depending on the specific dimension in question. Environmental and social disclosures are often associated with ethical positioning, whereas governance-related signals, such as transparency, compliance and risk management, are typically interpreted as indicators of professionalism and reliability in traditional financial markets. However, in the context of ICOs, particularly in certain stigmatized sectors such as gambling or adult entertainment, strong governance signals may be perceived as inconsistent with the expectations of investors who value decentralization, anonymity or regulatory arbitrage. Consequently, governance-related disclosures can have a paradoxical effect, enhancing credibility in some contexts while reducing it in others.

Taken together, this body of literature suggests that ESG signaling in ICO markets is inherently ambiguous. While it may serve as a positive quality indicator under certain conditions, its effectiveness critically depends on its perceived credibility, consistency with the project's underlying activity and alignment with investor expectations. For stigmatized industries in particular, ESG communication may fail to compensate for the initial legitimacy deficit or may even exacerbate it if it is perceived as excessive, inconsistent or purely strategic.

This raises a key empirical question: does ESG disclosure in ICO markets function as a meaningful signal that influences investor behavior, or is it discounted, or even penalized, due to credibility concerns and contextual inconsistencies.

Hypotheses development

Building on the previous discussion, this study investigates whether environmental, social and governance (ESG) disclosure can function as an effective signaling mechanism in highly asymmetric and stigmatized financing environments. Although ESG communication is generally associated with

increased legitimacy and reduced information asymmetry, its effectiveness in the context of initial coin offerings (ICOs), particularly for projects operating in stigmatized industries, is uncertain.

One strand of literature suggests that firms with legitimacy deficits are strongly incentivized to increase ESG disclosure as part of a reputational repair strategy. In the case of stigmatized industries, where core activities are inherently controversial, ESG reporting may serve as a form of moral compensation, aiming to offset negative perceptions and broaden the investor base. As ESG disclosure is largely voluntary and can be constructed strategically, firms in 'sin industries' may engage more intensively in such communication to signal their alignment with societal expectations.

H1. Companies in stigmatized sectors (sin industries) tend to have higher ESG disclosure scores as part of a moral compensation strategy designed to offset their negative image.

However, the effectiveness of ESG disclosure depends critically on its perceived credibility. In ICO markets, where disclosures are unregulated and not subject to external verification, ESG communication may not be viewed as an accurate indicator of the quality of the underlying project. Instead, it may be perceived as low-cost strategic communication, or 'cheap talk', with limited informational value. In this study, we operationalize this symbolic nature empirically by constructing ESG scores exclusively from whitepaper content, voluntary disclosures drafted by issuers themselves, without external audit, standardized reporting framework, or legal consequence. This design choice reflects the structural reality of ICO markets, where the absence of any verification mechanism makes it impossible for investors to distinguish genuine sustainability commitments from purely strategic signaling. This credibility issue is likely to be exacerbated in stigmatised industries, where prior distrust may cause investors to disregard ESG claims entirely.

H2. Symbolic ESG signals are insufficient to convince investors and fail to offset the market stigma associated with sin industry ICOs.

Beyond the overall ESG signal, its various components may be interpreted differently by investors. Disclosures related to governance, such as transparency, compliance, and risk management, are generally considered to increase credibility in traditional financial markets. However, in the context of ICOs, especially in certain stigmatized sectors, such signals may conflict with the expectations of investors who value decentralization, anonymity or regulatory flexibility. Consequently, governance-

related disclosures can have a paradoxical effect, enhancing perceived legitimacy in some contexts while reducing it in others.

H3. Governance-related signals while generally positively associated with ICO success, negatively affect fundraising outcomes in stigmatized industries due to their perceived inconsistency with industry characteristics

Finally, although it is often assumed that ESG disclosure enhances investor confidence, overly strong or pervasive ESG communication can generate skepticism. Drawing on the greenwashing literature, overly prominent ESG claims may be perceived as opportunistic or disproportionate, especially if they seem unrelated to the project's core activity. From a signaling perspective, excessive ESG disclosure may reduce credibility by making the signal appear costless and strategic. This concern is particularly relevant in ICO markets, where the absence of verification mechanisms increases the likelihood of such communication.

H4. Excessive ESG disclosure is negatively correlated with successful fundraising, reflecting investor scepticism towards overly strong sustainability claims.

Exploratory analysis

Beyond the characteristics of individual firms, the broader institutional environment in which ICO projects operate may also influence their ESG disclosure strategies. In particular, the level of education and human capital in a given country can influence investor expectations and the way firms communicate.

From a theoretical perspective, higher levels of education are associated with greater awareness of sustainability issues and an improved capacity among investors and stakeholders to process complex information. In such environments, market participants may demand greater transparency, accountability, and responsible practices. Consequently, firms, particularly those operating in stigmatized industries, may be under greater pressure to adopt and communicate ESG-related practices to gain legitimacy and access to capital.

Conversely, in environments with lower levels of education, ESG disclosure may be less significant, either because investors place less emphasis on sustainability concerns, or because they find it more difficult to evaluate such information. This suggests that the relationship between stigma and ESG disclosure may depend on a country's human capital.

To explore this, we use the literacy rate as a proxy for the level of education in the country where the ICO is registered. This variable is normalized using a min–max transformation. We then estimate the effect of the literacy rate on ESG disclosure, as well as its interaction with sin industry status.

H5. Higher levels of country-level education are positively associated with ESG disclosure, with a stronger effect for projects operating in stigmatized industries.

Beyond education, the regulatory environment in which an ICO project operates may also shape its ESG disclosure strategy. Drawing on institutional theory (DiMaggio & Powell, 1983), organizations adapt their behavior to the normative and coercive pressures of their institutional environment. Under stricter regulatory frameworks, firms face greater external pressure to adopt and communicate responsible practices. This effect may be particularly pronounced for sin industry projects, which already face heightened scrutiny and may use regulatory compliance as an additional legitimacy signal to offset their inherent stigma.

To explore this, we use two complementary measures of regulatory stringency: the regulatory status of the project (RegStatus), recoded as a binary variable (1 = regulated, 0 = otherwise), and a tax haven indicator (Fin_TaxHaven), used as an inverse proxy for regulatory stringency. We then estimate the effect of these regulatory measures on ESG disclosure scores, as well as their interaction with sin industry status.

H6: Projects operating in stricter regulatory environments exhibit higher ESG disclosure scores, with a stronger positive effect for sin industry projects.

Empirical analysis

Methodology

Construction of ESG Scores

In order to empirically capture the ESG orientation of ICO projects, we have constructed original environmental (E), social (S) and governance (G) scores, based on textual and quantitative information extracted from ICO white papers. In the absence of standardized and audited ESG disclosures in ICO markets, our approach focuses on measuring ESG-related communication rather than actual ESG performance. In line with signaling theory, these disclosures are interpreted as voluntary signals through which issuers attempt to reduce information asymmetry and influence investor perceptions.

The ESG framework is structured around three pillars. The environmental dimension includes the variables 'Energy Sustainability' and 'Blockchain Encryption'. The social dimension comprises Expertise, Human Resources, Fin_Team, Service Profile and Social Media Count. The governance dimension includes Governance, Risk Management, Legal Disclaimers, Risk Disclosure, Terms and Conditions, and the binary compliance indicator Fin_Whitelist_KYC_Dummy.

To ensure comparability across white papers of different lengths, all occurrence-based variables are first adjusted for document size. Specifically, each variable is divided by the total number of sentences in the white paper (NumberOfSentences), yielding a sentence-level intensity measure. This correction mitigates the mechanical bias whereby longer documents exhibit higher raw keyword frequencies.

All continuous variables are then normalized using a min-max transformation to rescale the values to the [0, 1] interval. Where a variable displays no variation across observations, the normalized values are set to zero to avoid division-by-zero errors. The binary governance indicator (Fin_WhitelistKYCDummy) is not adjusted for document length and is included in its original form.

Pillar-specific scores are computed as the arithmetic mean of their respective normalized components across rows, with missing values ignored when at least one component is available. The overall ESG score is defined as the simple average of the three pillars, ensuring equal weighting across the environmental, social and governance dimensions. While this aggregation method ensures transparency

and comparability, it implicitly assumes equal importance across the three pillars, which may not reflect actual investor preferences.

Propensity Score Matching (PSM)

A central empirical challenge when testing the relationship between sin industries and Environmental, Social and Governance (ESG) disclosure is potential selection bias. Initial Coin Offerings (ICOs) operating in stigmatized sectors may differ systematically from other projects in terms of structural, geographic or informational characteristics, which could confound the observed relationship.

To address this issue, we use a Propensity Score Matching (PSM) procedure based on the work of Rosenbaum and Rubin (1983). This method enables us to create a counterfactual sample by matching each ICO in the sin industry with a comparable ICO in a non-sin industry based on observable characteristics.

The propensity score is estimated using a logistic specification including the following covariates: ICO duration (Duration), geographic location (Region), white paper length (WP_pages), textual richness (lexical.diversity) and regulatory compliance (Fin_WhitelistKYCDummy). Matching is performed using a nearest-neighbour algorithm with a 1:1 ratio and a caliper of 0.1 to ensure close similarity between matched observations.

After matching, we obtain a balanced sample of sin and non-sin ICOs. First, we compare the average ESG scores across the groups and then conduct two-sample mean-comparison t-tests on the matched data. We then estimate multivariate regressions on the matched sample to assess the relationship between sin status and ESG disclosure, controlling for residual observable heterogeneity.

Credibility index

In order to capture the moderating role of perceived credibility in the relationship between environmental, social and governance (ESG) signaling and initial coin offering (ICO) fundraising success, we construct a multidimensional Credibility Index. This index approximates the extent to which a project conveys verifiable signals of quality, transparency and institutional legitimacy to potential investors.

In the context of ICO markets, which are characterised by high information asymmetry and limited external verification, credibility plays a central role in shaping investor perceptions. This is particularly true of projects operating in stigmatized industries, where environmental, social and governance (ESG) communication is more likely to be questioned, and where investors may require stronger, more tangible signals with which to assess project quality.

The Credibility Index is based on five observable proxies that are available in our dataset. Each proxy captures a different aspect of project-level credibility.

Firstly, human capital is represented by team size (`Fin_Team`), which reflects the availability of internal resources and managerial capacity. Secondly, crowd validation is captured by the number of external ratings (`Rating_count`), which indicates market visibility and collective endorsement. Thirdly, technological transparency is measured by two variables: code availability (`Code.Availability`) and GitHub presence (`SM_GitHub`). These variables signal the openness and verifiability of the underlying technology. Finally, institutional validation is indicated by the `FundBacked` variable, which shows whether the project has received backing from institutional investors.

Taken together, these dimensions capture the extent to which a project relies on externally observable and partially verifiable information, as opposed to purely narrative or symbolic communication. Consequently, the index complements the ESG score, which is based on voluntary disclosure rather than validated performance.

Each proxy is normalized using a min–max transformation to rescale values to the $[0, 1]$ interval. The Credibility Index is then computed as the arithmetic mean of the five normalized components, with missing values being ignored provided at least one component is available. This aggregation method ensures comparability across projects while maintaining transparency and simplicity in constructing the index.

The resulting index ranges from 0 to 1; higher values indicate greater reliance on credible, externally observable signals of quality and legitimacy.

Research design

To test Hypothesis 1, which suggests that firms operating in stigmatized industries disclose more information about their environmental, social and governance (ESG) practices as part of a moral compensation strategy, we estimate the following model:

$$ESG_score_i = \alpha + \beta_1 Sin + \sum \gamma Controls_i + \varepsilon_i$$

Where $S_{(in)}$ is a binary variable equal to 1 if the ICO belongs to a stigmatized industry. The dependent variable is defined either as the aggregate ESG score or as its individual components (E_score , and G_score).

All models are estimated using ordinary least squares (OLS) on the matched sample obtained from the PSM procedure. The control variables include project location (Region), white paper characteristics (WP_pages, lexical diversity, WP_Sentiment), financial and regulatory features (Fin_TaxHaven, Fin_USRestrict, Fin_Whitelist, KYC Dummy, Min Invest Dummy, Fiat Accepting Dummy, Bonus Dummy), temporal controls (ICO Year Quarter) and project characteristics, such as team size (Fin_Team) and social media presence (Social Media Count).

A positive and significant coefficient on Sin would support H1, indicating that firms in stigmatized sectors engage in higher ESG disclosure. However, given the nature of our ESG measure, such a result should be interpreted as evidence of increased ESG communication, consistent with impression management or symbolic moral compensation.

As a robustness check, we also estimate alternative specifications using log-transformed ESG measures in the form of $\log(1 + score)$, to reduce skewness and mitigate the influence of extreme values.

To test Hypothesis 2, which suggests that symbolic Environmental, Social and Governance (ESG) signals are ineffective in offsetting stigma and convincing investors, we examine the relationship between ESG disclosure and fundraising success.

The dependent variable is defined as the natural logarithm of the amount raised.

$$\log (\text{AmountRaised}_i) = \alpha + \beta_1 \text{ESG} + \beta_2 \text{Sin}_i + \beta_3 (\text{ESG}_i \times \text{Sin}_i) + \sum \gamma \text{Controls}_i + \varepsilon_i$$

This interaction specification enables us to evaluate whether the impact of ESG disclosure varies between sin and non-sin Initial Coin Offerings (ICOs).

All models are estimated using OLS on the matched sample. The control variables are identical to those used in the baseline ESG regressions, with the addition of project-level characteristics such as FundBacked, ICOcompletion and TopicDiversity.

Under H2, we expect the interaction term ($\text{ESG} \times \text{Sin}$) to be negative or insignificant, indicating that ESG disclosure is ineffective in mitigating the negative perception associated with stigmatized industries. This would suggest that investors view ESG communication in sin industries as non-credible or merely symbolic, thereby limiting its impact on fundraising outcomes.

To test Hypothesis 3, which predicts that governance- and credibility-related signals may paradoxically have a negative effect on fundraising success in stigmatized ICO sectors, we estimated the following interaction models.

$$\begin{aligned} \log (\text{AmountRaised}_i) &= \alpha + \beta_1 \text{G_score}_i + \beta_2 \text{Sin}_i + \beta_3 (\text{G_score}_i \times \text{Sin}_i) + \sum \gamma \text{Controls}_i + \varepsilon_i \\ \log (\text{AmountRaised}_i) &= \alpha + \beta_1 \text{Credibility}_i + \beta_2 \text{Sin}_i + \beta_3 (\text{Credibility}_i \times \text{Sin}_i) + \sum \gamma \text{Controls}_i + \varepsilon_i \\ \log (\text{AmountRaised}_i) &= \alpha + \beta_1 \text{G_score}_i + \beta_2 \text{Credibility}_i + \beta_3 \text{Sin}_i + \beta_4 (\text{G_score}_i \times \text{Sin}_i \times \text{Credibility}_i) + \\ &\quad \beta_5 (\text{Credibility}_i \times \text{Sin}_i) + \sum \gamma \text{Controls}_i + \varepsilon_i \end{aligned}$$

To test Hypothesis 4, which implies that excessive Environmental, Social and Governance (ESG) disclosure may negatively affect fundraising success, we examine the potential non-linear relationship between ESG communication and Initial Coin Offering (ICO) performance. While previous studies have assumed a linear relationship between ESG disclosure and fundraising outcomes, Hypothesis 4 explicitly predicts diminishing returns to ESG signaling, which could lead to a negative effect at high levels of disclosure.

To capture this nonlinearity, we extend the baseline regression model by including a quadratic term of the ESG score. The estimated model is specified as follows:

$$\log(\text{AmountRaised}_i) = \alpha + \beta_1 \text{ESG}_i + \beta_2 \text{ESG}_i^2 + \sum \gamma \text{Controls}_i + \varepsilon_i$$

Where ESG_i represents the overall ESG disclosure score of projects i and ESG_i^2 captures the potential non-linear (quadratic) effect. The dependent variable is the natural logarithm of the amount raised during the ICO. This reduces skewness and allows for a more straightforward percentage-based interpretation of the coefficients.

Including the squared ESG term enables us to test whether the marginal effect of ESG disclosure decreases, or even reverses, at higher levels. Under Hypothesis 4, we expect to see a concave (inverted U-shaped) relationship characterized by positive and negative coefficients on ESG_i and ESG_i^2 , respectively. This would suggest that moderate ESG disclosure improves fundraising success, whereas excessive communication generates investor skepticism, in line with the greenwashing and 'cheap talk' literature.

To ensure robustness and reduce potential multicollinearity between the linear and quadratic terms, the ESG score is centered on its mean prior to being squared. This transformation preserves the model's interpretation while improving its numerical stability.

All regressions were estimated using ordinary least squares (OLS) on the matched sample obtained from the propensity score matching procedure. The model incorporates the same set of control variables as in previous specifications to capture project characteristics, textual features, regulatory signals and temporal effects.

To test Hypothesis 5, which suggests that higher levels of country-level education are positively associated with ESG disclosure, with a stronger effect for projects operating in stigmatized industries, we examine the role of country-level human capital. Higher levels of education may lead to greater investor sophistication and awareness of sustainability issues, resulting in higher expectations regarding transparency and responsible practices.

We estimate the following model:

$$\text{ESG_score}_i = \alpha + \beta_1 \text{Literacy}_i + \beta_2 \text{Sin}_i + \beta_3 (\text{Literacy}_i * \text{Sin}_i) + \sum \gamma \text{Controls}_i + \varepsilon_i$$

Where Literacy_i represents the literacy rate of the country in which the ICO project is registered, normalized using a min-max transformation. The coefficient of interest is β_3 , which captures the moderating effect of education level specifically for sin industries. A positive and significant coefficient would support H5, indicating that higher levels of human capital amplify the pressure on stigmatized projects to engage in greater ESG disclosure. All models are estimated using OLS on the full dataset. The control variables are identical to those used in the baseline H1 specification.

To test Hypothesis 6, which suggests that projects operating in stricter regulatory environments exhibit higher ESG disclosure scores, with a stronger positive effect for sin industry projects, we examine the relationship between regulatory stringency and ESG disclosure. The dependent variable is defined as the overall ESG score and the social pillar score (Score_s). The estimated model follows the same structure as Hypothesis 5:

$$\text{ESG_score}_i = \alpha + \beta_1 \text{Regulation}_i + \beta_2 \text{Sin}_i + \beta_3 (\text{Regulation}_i * \text{Sin}_i) + \sum \gamma \text{Controls}_i + \varepsilon_i$$

Where Regulation_i is measured through two complementary proxies: a binary variable indicating whether the project operates under a regulated framework (RegStatus, recorded as 1 = regulated, 0 = otherwise), and a tax haven indicator (Fin_TaxHaven), used as an inverse proxy for regulatory stringency. The coefficient of interest is β_3 , which captures the moderating effect of the regulatory environment specifically for sin industries. A positive and significant coefficient would support H6, indicating that stricter regulatory frameworks force sin industry projects to engage in higher ESG disclosure.

Control Variables

In order to isolate the effects of ESG disclosure and sin industry status on ICO outcomes, we have included a comprehensive set of control variables that capture project characteristics, financial features, textual attributes and temporal dynamics.

First, we control for project-level characteristics that may influence both ESG disclosure and fundraising success. These include the geographic location of the ICO (Region), which captures

institutional and market differences across jurisdictions, as well as white paper characteristics such as length (WP_pages) and lexical richness (lexical.diversity). These variables account for differences in the quantity and sophistication of information disclosed to investors.

Secondly, we include several financial and regulatory controls. The *Fin_TaxHaven* variable indicates whether the ICO is located in a tax-favorable jurisdiction, which may influence investor perception and strategic disclosure behavior. The *Fin_USRestrict* dummy variable indicates whether US investors are excluded from participating, reflecting regulatory constraints that may affect capital access.

Compliance-related variables, such as *Fin_WhitelistKYCDummy*, proxy for regulatory legitimacy and transparency.

We also control for features related to the ICO's fundraising structure, including *Fin_MinInvestDummy* (minimum investment requirement), *Fin_FiatAcceptingDummy* (acceptance of fiat currencies) and *Fin_BonusDummy* (the presence of bonus incentives). These variables may affect investor participation independently of ESG considerations.

Thirdly, we include controls for project credibility and visibility, such as team size (*Fin_Team*) and social media activity (*SocialMediaCount*). These are commonly interpreted as signals of project quality and legitimacy in ICO markets.

Fourthly, we control for textual sentiment using the *WP_Sentiment* variable, which captures the tone of the white paper. This enables us to distinguish ESG-related communication from more general narrative optimism or promotional bias.

Finally, we apply temporal controls using the *ICOYearQuarter* variable, which captures time-specific effects such as market cycles, regulatory changes or shifts in investor sentiment.

For the exploratory analyses (H5 and H6), the set of control variables has been adapted to reflect the specific research design, while ensuring consistency with the baseline specification employed in H1. In both cases, the dependent variables are defined as ESG disclosure scores and the control variables are similar to those in the main model.

More specifically, we retain a comprehensive set of project-level controls that capture geographic, textual, financial and organisational characteristics, which may influence both ESG disclosure and

project attributes simultaneously. These include regional fixed effects (Region), which account for cross-country institutional differences, as well as white paper characteristics such as length (WP_pages) and lexical diversity (lexical.diversity), which serve as proxies for the quantity and sophistication of disclosed information.

We also control for regulatory and financial features that could influence both disclosure strategies and perceived legitimacy. These features include tax haven status (Fin_TaxHaven), restrictions on US investors (Fin_USRestrict) and compliance-related variables, such as Fin_WhitelistKYCDummy. These variables capture the extent to which projects operate within or outside of formal regulatory frameworks.

In addition, we control for project visibility and organisational capacity through team size (Fin_Team) and social media presence (SocialMediaCount). These are commonly interpreted as signals of project quality and credibility in ICO markets. Finally, we account for general narrative tone by including textual sentiment (WP_Sentiment), thereby distinguishing ESG-related communication from broader promotional language.

Within this framework, the key independent variables are the literacy rate in H5 and the regulatory proxy in H6, as well as their interaction with the sin indicator. This approach enables us to isolate the impact of country-level characteristics on ESG disclosure, while accounting for a broad spectrum of observable project-level confounders.

Taken together, these controls aim to reduce omitted variable bias by accounting for alternative explanations of ESG disclosure and ICO performance. However, as in most observational settings, unobserved heterogeneity may still persist, and our estimates should therefore be interpreted with caution.

Results

Propensity Score Matching: “Sample Balance”

Prior to estimating the main regressions, a Propensity Score Matching (PSM) procedure was implemented to address potential selection bias arising from systematic differences between sin and non-sin ICO projects. As ICOs operating in stigmatized sectors may differ structurally from non-sin projects in terms of geographic location, white paper characteristics and regulatory compliance, a direct

comparison between the two groups without prior balancing would risk confounding the estimated effects with pre-existing differences unrelated to sin industry status.

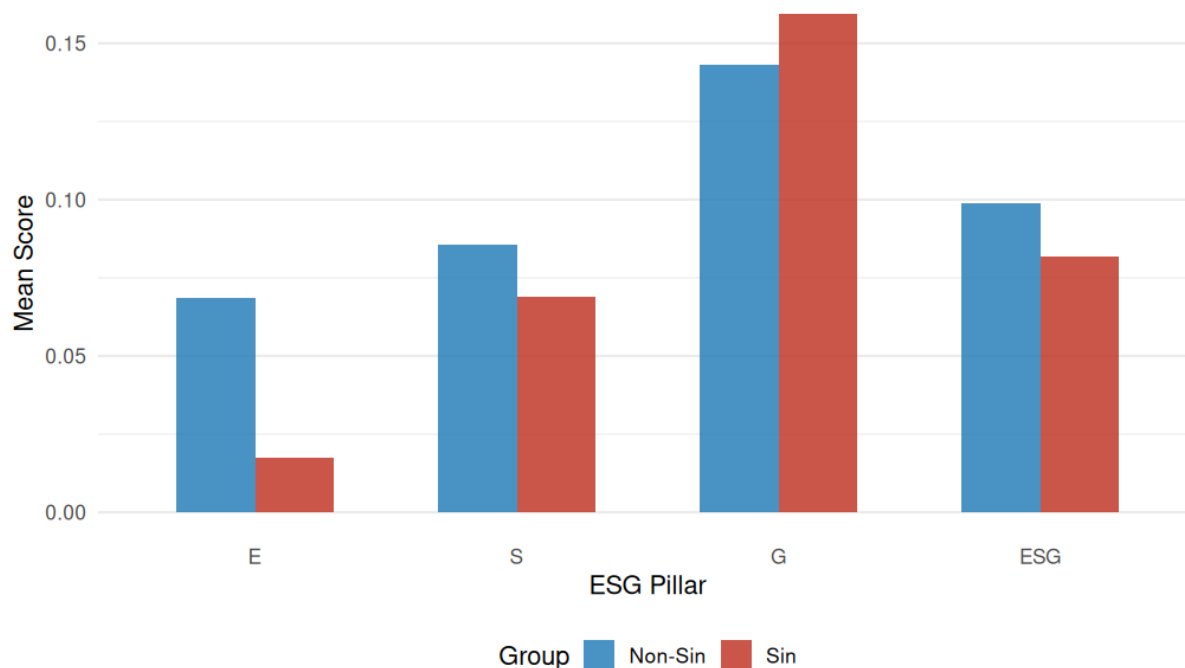
Following the nearest-neighbor matching algorithm with a 1:1 ratio and a caliper of 0.1, a balanced sample of 64 sin and 64 non-sin projects was obtained. The quality of the matching was assessed through covariate balance checks, which confirm that the matched groups are comparable on all observable dimensions included in the propensity score specification (see Appendix, figure1- 4). Mean ESG scores across the matched groups are reported in Table 1 and illustrated in figure 1.

Table 1 — Mean ESG scores by group after PSM

Score	Sin	Non-Sin	p-value
E_score	0.017	0.068	< 0.001***
S_score	0.069	0.086	0.056+
G_score	0.159	0.143	0.346
ESG_score	0.082	0.099	0.025*

Figure 1 — Mean ESG scores by group after PSM

Sin vs Non-Sin ICO projects



As shown in Figure 1, sin industries exhibit lower scores than non-sin projects across all ESG dimensions except governance, where the pattern is reversed. This visual contrast is particularly striking for the environmental pillar, where the gap between the two groups is the largest. These findings provide a first indication that sin industries do not engage in higher ESG disclosure as a compensatory strategy, on the contrary, they systematically disclose less, particularly on environmental and overall dimensions. This preliminary evidence already points toward a rejection of H1 in its original formulation, a finding that will be formally confirmed in the multivariate regressions presented below.

Hypothesis 1: “Sin industries and ESG disclosure”

Table 2 reports the results of the OLS regressions estimated on the matched sample, with ESG disclosure scores as dependent variables. The coefficient on sin is negative and statistically significant for the overall ESG score ($\beta = -0.016$, $p < 0.01$) and the environmental pillar ($\beta = -0.044$, $p < 0.01$), while no significant effect is observed for the social pillar. The governance pillar exhibits a marginally positive coefficient ($\beta = +0.014$, $p < 0.1$), suggesting heterogeneity in ESG practices across dimensions. These results are robust to log-transformation of the dependent variables, as confirmed by the robustness specifications reported in Table 3, where sin remains negative and significant for $\log(\text{ESG})$ ($\beta = -0.006$, $p < 0.01$) and $\log(E)$ ($\beta = -0.019$, $p < 0.001$).

Table 2 — Sin industries and ESG disclosure (matched sample)

	ESG	E	S	G
(Intercept)	2.578 (12.469)	0.061 (0.084)	18.769 (17.871)	-22.232 (18.943)
sin	-0.016** (0.005)	-0.044** (0.016)	-0.011 (0.007)	0.014+ (0.008)
Fin_WhitelistKYCDummy	0.057*** (0.006)		0.007 (0.009)	0.165*** (0.010)
Fin_Team	0.116* (0.050)		0.203** (0.072)	0.114 (0.076)
SocialMediaCount	0.009 (0.068)		0.221* (0.097)	-0.125 (0.103)
WP_Sentiment	-0.943* (0.438)		0.970 (0.627)	-2.635*** (0.665)
Num.Obs.	128	127	128	128
R2	0.649	0.597	0.446	0.839
R2 Adj.	0.587	0.253	0.349	0.810
AIC	-532.6	-294.2	-440.4	-425.5
BIC	-472.7	-123.5	-380.5	-365.6
Log.Lik.	287.291	207.100	241.220	233.767
RMSE	0.03	0.05	0.04	0.04

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

All models include control variables (Region, WP_pages, lexical.diversity, Fin_TaxHaven, Fin_USRestrict, Fin_WhitelistKYCDummy, Fin_MinInvestDummy, Fin_FiatAcceptingDummy, Fin_BonusDummy, ICOYearQuarter, Fin_Team, SocialMediaCount, WP_Sentiment). + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.

Table 3 — Robustness check (log-transformation)

	log(ESG)	log(E)	log(S)	log(G)
(Intercept)	0.894 (4.895)	3.470 (12.100)	7.207 (7.017)	-19.361 (16.030)
sin	-0.006** (0.002)	-0.019*** (0.005)	-0.004 (0.003)	0.012+ (0.006)
Fin_WhitelistKYCDummy	0.023*** (0.002)	-0.000 (0.006)	0.003 (0.004)	0.146*** (0.008)
Fin_Team	0.046* (0.020)	0.013 (0.049)	0.082** (0.028)	0.102 (0.064)
SocialMediaCount	0.002 (0.027)	-0.027 (0.066)	0.082* (0.038)	-0.110 (0.087)
WP_Sentiment	-0.371* (0.172)	-0.485 (0.425)	0.379 (0.246)	-2.212*** (0.563)
Num.Obs.	128	128	128	128
R2	0.657	0.220	0.442	0.850
R2 Adj.	0.596	0.083	0.344	0.824

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Standard errors in parentheses. + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.

These findings lead us to reject H1 in its original formulation. Rather than engaging in higher ESG disclosure as a moral compensation strategy, sin industries systematically disclose less ESG information than their non-sin counterparts, particularly on environmental and overall dimensions. This result is consistent with Paradis and Schiehl (2021), who find that sin stocks exhibit overall lower ESG performance across all three pillars, and challenges the view that stigmatized firms proactively use ESG communication to restore their legitimacy.

Examining ESG disclosure by sin industry category (Table 4) reveals that drugs ($\beta = +0.022$, $p < 0.1$) and gambling ($\beta = +0.015$, $p < 0.1$) projects exhibit marginally higher ESG scores than alcohol projects (the reference category), suggesting heterogeneity within sin industries. This nuance is consistent with Du and Sun (2023), who demonstrate that certain stigmatized sectors allocate ESG resources more strategically than others.

Table 4 — ESG disclosure by sin industry category

	ESG	log(ESG)	E	log(E)	log(G)
(Intercept)	-16.261 (9.904)	-6.530 (3.984)	-9.102 (12.802)	-3.873 (5.361)	-23.647** (8.686)
sin_categorydrugs	0.022+ (0.011)	0.009+ (0.005)	0.038* (0.015)	0.016* (0.006)	0.006 (0.010)
sin_categorygambling	0.015+ (0.008)	0.006+ (0.003)	0.001 (0.011)	0.000 (0.004)	0.017* (0.007)
sin_categoryporn	0.014 (0.011)	0.006 (0.004)	-0.001 (0.014)	-0.000 (0.006)	0.018+ (0.009)
Fin_WhitelistKYCDummy	0.050*** (0.005)	0.020*** (0.002)	0.006 (0.007)	0.002 (0.003)	0.059*** (0.005)
Fin_Team	0.231*** (0.057)	0.092*** (0.023)	0.010 (0.074)	0.005 (0.031)	0.155** (0.050)
Num.Obs.	63	63	63	63	63
R2	0.884	0.884	0.425	0.426	0.908
R2 Adj.	0.824	0.825	0.130	0.132	0.861

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Standard errors in parentheses. + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.

Hypothesis 2: ESG signals and fundraising success

Table 5 reports the results of the interaction models examining whether ESG disclosure mitigates the negative market perception associated with sin industries in terms of fundraising success. Across all four specifications, using both raw and log-transformed ESG scores as well as the environmental pillar, the interaction term $ESG \times sin$ is negative but not statistically significant ($\beta = -8.939$, $p > 0.1$ in the main specification). The sin dummy itself is marginally positive ($\beta = +1.106$, $p < 0.1$) in some specifications, suggesting that sin projects raise slightly more funds on average, independently of their ESG engagement.

Table 5 — ESG signals and fundraising success

	ESG × sin	E × sin	log(ESG) × sin	log(E) × sin
(Intercept)	1187.826+	1250.390+	1194.399+	1220.179+
	(660.246)	(665.538)	(657.598)	(670.141)
ESG_score	0.132	-2.695		
	(8.339)	(8.095)		
sin	1.106+	0.287	1.139+	0.202
	(0.655)	(0.350)	(0.670)	(0.390)
FundBacked	1.368*	1.349*	1.338*	1.321*
	(0.599)	(0.608)	(0.593)	(0.613)
ICOcompletion	1.427***	1.473***	1.441***	1.446***
	(0.313)	(0.314)	(0.310)	(0.318)
E_score	1.501	1.856		24.691
	(3.215)	(3.258)		(43.890)
Fin_WhitelistKYCDummy	0.363	0.258	0.220	0.346
	(0.571)	(0.573)	(0.463)	(0.584)
Fin_BonusDummy	0.794*	0.789*	0.786*	0.788*
	(0.387)	(0.391)	(0.385)	(0.393)
Fin_Team	4.416	3.634	4.154	3.876
	(2.896)	(2.865)	(2.818)	(2.888)
SocialMediaCount	1.269	1.651	1.125	1.616
	(3.638)	(3.653)	(3.610)	(3.664)
ESG_score × sin	-8.939			
	(6.956)			
E_score × sin		3.108		
		(9.561)		
log10(1 + ESG_score)			7.439	-10.596
			(13.442)	(20.730)
log10(1 + ESG_score) × sin			-23.489	
			(17.117)	
log10(1 + E_score)				-59.781
				(115.883)
log10(1 + E_score) × sin				12.906
				(25.494)
Num.Obs.	128	128	128	128
R2	0.395	0.386	0.394	0.388
R2 Adj.	0.247	0.235	0.253	0.230

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Standard errors in parentheses. + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.

These results confirm H2: Symbolic ESG signals embedded in ICO whitepapers are insufficient to offset the market stigma associated with sin industries. Investors do not appear to reward ESG disclosure from sin projects in a way that compensates for their inherent legitimacy deficit. This finding is consistent with Dhandhanian and O’Higgins (2021), who demonstrate that CSR rhetoric in controversial sectors is largely perceived as disconnected from core operational practices, thereby limiting its effectiveness as a legitimizing tool. The sector-level analysis (Table 6) further confirms the absence of significant interaction effects across all sin categories, except for a marginally significant negative coefficient for gambling, suggesting that ESG disclosure may even be slightly counterproductive in that specific context.

Table 6 — ESG signals by sin industry category

	ESG × category	E × category
(Intercept)	-319.319 (903.088)	-270.936 (772.225)
log10(1 + ESG_score)	-72.182 (74.905)	
sin_categorydrugs	-8.294 (10.492)	0.800 (1.944)
sin_categorygambling	-1.727 (2.082)	-2.179+ (1.151)
sin_categoryporn	-1.259 (2.377)	1.320 (1.761)
Fin_BonusDummy	1.212+ (0.616)	1.481** (0.511)
Fin_Team	12.387+ (6.301)	9.548* (4.679)
SocialMediaCount	-19.129+ (9.590)	-16.879* (7.677)
log10(1 + ESG_score) × sin_categorydrugs	206.353 (217.051)	
log10(1 + ESG_score) × sin_categorygambling	43.296 (60.602)	
log10(1 + ESG_score) × sin_categoryporn	62.422 (72.221)	
Num.Obs.	63	63
R2	0.595	0.686
R2 Adj.	0.239	0.411
+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001		
Standard errors in parentheses. + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.		

Hypothesis 3: The paradoxical effect of governance and credibility

Table 7 reports the results of the models testing whether governance quality and credibility signals have a paradoxically negative effect on fundraising success for sin ICOs. While the interaction $G_{\text{score}} \times \text{sin}$ is negative (-3.560) but not statistically significant, the interaction credibility index $\times \text{sin}$ is negative and marginally significant ($\beta = -2.424$, $p < 0.1$), indicating that a higher credibility index is associated with lower fundraising success specifically for sin industry ICO projects. This effect is robust to the simultaneous inclusion of both governance and credibility in the combined specification ($\beta = -2.504$, $p < 0.1$).

Table 7 — The paradoxical effect of governance and credibility

	G $\times$ sin	Credibility $\times$ sin	G + Cred $\times$ sin
(Intercept)	1276.373+	1559.354*	1594.409*
	(659.792)	(648.137)	(652.041)
G_score	4.368		4.549
	(3.652)		(3.606)
sin	0.790	1.015+	1.306*
	(0.504)	(0.538)	(0.655)
FundBacked	1.299*	1.493*	1.448*
	(0.592)	(0.611)	(0.614)
ICOcompletion	1.462***	1.447***	1.440***
	(0.310)	(0.301)	(0.302)
Fin_WhitelistKYCDummy	-0.296	0.260	-0.320
	(0.650)	(0.327)	(0.644)
Fin_BonusDummy	0.778*	0.807*	0.820*
	(0.384)	(0.372)	(0.373)
Fin_Team	3.422		
	(2.726)		
SocialMediaCount	1.572	5.892+	5.843+
	(3.622)	(2.976)	(2.983)
G_score $\times$ sin	-3.560		-2.058
	(2.819)		(2.794)
credibility_index		-0.383	-0.204
		(1.130)	(1.143)
credibility_index $\times$ sin		-2.424+	
		(1.459)	
sin $\times$ credibility_index			-2.504+
			(1.482)
Num.Obs.	128	128	128
R2	0.395	0.412	0.421
R2 Adj.	0.255	0.282	0.279

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Standard errors in parentheses. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

These results partially confirm H3, although the governance pillar alone does not produce a statistically robust paradoxical effect, the broader credibility signal, capturing team size, code availability, GitHub presence, rating count and fund-backed status, appears to be negatively perceived by investors in sin industry contexts. This finding supports the theoretical argument that investors in sin ICOs, who often seek decentralization and regulatory avoidance, may interpret high credibility and institutional alignment as fundamentally inconsistent with the nature of the industry, thereby penalizing projects that signal excessive legitimacy-seeking behaviour.

Hypothesis 4: The non-linear effect of ESG disclosure on fundraising success

Table 8 reports the results of the quadratic models examining whether excessive ESG disclosure negatively affects fundraising success. The linear term ESG_centered is negative but not statistically significant ($\beta = -3.655$, $p > 0.1$), while the quadratic term ESG_centered_sq is positive and significant ($\beta = +132.857$, $p < 0.05$). These results are robust to log-transformation of the ESG score, as confirmed by the robustness specification where logESG_centered_sq remains positive and significant ($\beta = +886.744$, $p < 0.05$).

Table 8 — Non-linear effect of ESG disclosure on fundraising success

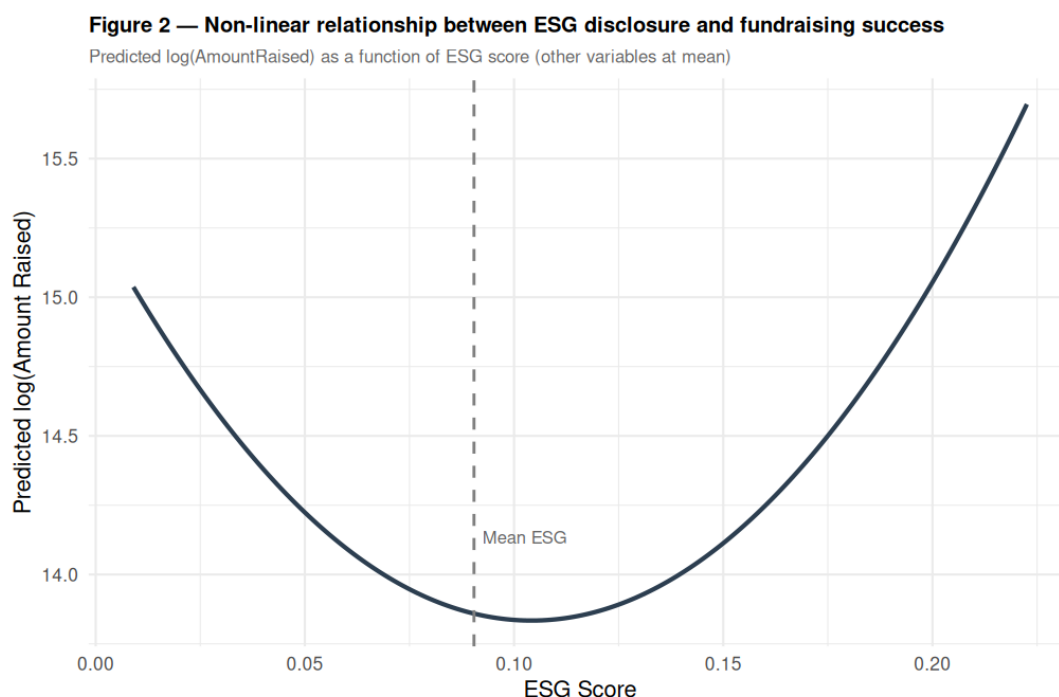
	ESG quadratic	log(ESG) quadratic
(Intercept)	1173.038+	1167.130+
	(650.236)	(649.669)
ESG_centered	-3.655	
	(5.541)	
ESG_centered_sq	132.857*	
	(64.856)	
sin	0.321	0.319
	(0.276)	(0.276)
FundBacked	1.368*	1.376*
	(0.587)	(0.587)
ICOcompletion	1.409***	1.405***
	(0.308)	(0.307)
Fin_BonusDummy	0.738+	0.743+
	(0.380)	(0.380)
ICOYearQuarter	-0.058+	-0.057+
	(0.032)	(0.032)
Fin_Team	3.557	3.536
	(2.718)	(2.715)
SocialMediaCount	0.432	0.404
	(3.598)	(3.595)
logESG_centered		-8.514
		(13.706)
logESG_centered_sq		886.744*
		(420.345)
Num.Obs.	128	128
R2	0.407	0.408
R2 Adj.	0.269	0.270

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Standard errors in parentheses. + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.

The non-linear relationship between ESG disclosure and fundraising success is illustrated in Figure 2, which plots the predicted log(AmountRaised) as a function of the ESG score, holding all other variables at their mean values. The U-shaped curve clearly shows that projects at both extremes of the ESG distribution — those with very low disclosure and those with very high disclosure — raise more funds than projects clustered around the mean. The minimum of the curve is located near the sample

mean ESG score, indicated by the dashed vertical line, which represents the zone of maximum ambiguity in ESG signaling.



Contrary to the concave (inverted U-shaped) relationship predicted by H4, the results reveal a convex (U-shaped) relationship between ESG disclosure and fundraising success. This suggests that projects with either very low or very high levels of ESG disclosure raise more funds, while projects with intermediate levels of ESG disclosure perform less well. Rather than confirming that excessive ESG disclosure generates investor scepticism, this finding suggests that what penalizes fundraising is ambiguity — projects that are neither clearly committed to nor clearly distanced from ESG communication fail to send a coherent signal to investors. In this sense, H4 is partially confirmed in that a non-linear effect exists, but the direction of the relationship diverges from the initial prediction. This result is consistent with signalling theory, which emphasizes that the credibility of a signal depends not only on its content but also on its coherence and clarity

Hypothesis 5: Country-level education and ESG disclosure

Table 9 reports the results of the interaction models examining whether the level of education in the country of registration moderates the relationship between sin industry status and ESG disclosure. The literacy rate is positively and significantly associated with the overall ESG score ($\beta = +0.086$, $p < 0.05$) and the social pillar ($\beta = +0.103$, $p < 0.05$), indicating that projects registered in more educated countries exhibit higher ESG disclosure quality across all projects, regardless of their sin industry status. The

interaction term literacy $\times$ sin_dummy is marginally significant for the governance pillar ($\beta = +2.607$, $p < 0.1$), suggesting that sin industries in high-education environments face greater institutional pressure to adopt rigorous governance practices.

Table 9 — Education level and ESG disclosure

	ESG	E	S	G
(Intercept)	-0.069 (0.047)	-0.072 (0.085)	-0.143* (0.066)	0.008 (0.093)
literacy_norm	0.086* (0.034)	0.062 (0.062)	0.103* (0.048)	0.093 (0.068)
sin_dummy	-1.025 (0.633)	0.089 (1.146)	-0.752 (0.890)	-2.412+ (1.253)
Fin_Team	0.125*** (0.035)	-0.027 (0.064)	0.356*** (0.050)	0.047 (0.070)
literacy_norm $\times$ sin_dummy	1.090 (0.678)	-0.119 (1.227)	0.784 (0.953)	2.607+ (1.343)
Num.Obs.	189	189	189	189
R2	0.258	0.071	0.291	0.241
R2 Adj.	0.189	-0.016	0.225	0.170

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Standard errors in parentheses. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

These results partially confirm H5: country-level education is positively associated with ESG disclosure for all projects, with a marginally stronger effect on governance for sin industries specifically. This finding is consistent with institutional theory, which suggests that higher levels of human capital in each environment create stronger normative pressures on firms — including stigmatized ones — to adopt and communicate responsible practices. Notably, the team quality variable (Fin_Team) remains the strongest determinant of ESG scores across all specifications ($\beta = +0.125$, $p < 0.001$ for ESG global; $\beta = +0.356$, $p < 0.001$ for S), confirming that internal human capital is a more powerful driver of ESG disclosure than the broader country-level educational environment.

Hypothesis 6: Regulatory environment and ESG disclosure

Table 10 and 11 report the results of the interaction models examining whether the regulatory environment moderates the relationship between sin industry status and ESG disclosure. The sin_dummy coefficient

remains highly significant and negative across all specifications ($\beta = -0.022$, $p < 0.001$ for overall ESG; $\beta = -0.025$, $p < 0.01$ for the social pillar), further confirming the structural ESG disclosure deficit of sin industries documented in H1. The interaction term regulated $\times$ sin_dummy is marginally positive for the overall ESG score ($\beta = +0.019$, $p < 0.1$), indicating that regulatory constraints tend to slightly improve ESG disclosure among sin industry projects.

Table 10 — Regulatory environment and overall ESG score

	ESG - Regulated	ESG - Tax Haven
(Intercept)	0.060 (0.040)	0.057 (0.040)
regulated	0.003 (0.003)	
sin_dummy	-0.022*** (0.006)	-0.013* (0.006)
Fin_Team	0.127*** (0.014)	0.128*** (0.014)
regulated $\times$ sin_dummy	0.019+ (0.011)	
tax_haven		0.004 (0.003)
tax_haven $\times$ sin_dummy		-0.011 (0.011)
Num.Obs.	1202	1202
R2	0.157	0.155
R2 Adj.	0.144	0.143
+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$		
Standard errors in parentheses. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.		

Table 11 — Regulatory environment and Social score (S)

	S - Regulated	S - Tax Haven
(Intercept)	0.003 (0.051)	0.003 (0.051)
regulated	0.002 (0.004)	
sin_dummy	-0.025** (0.008)	-0.017* (0.008)
Fin_Team	0.344*** (0.018)	0.345*** (0.018)
regulated × sin_dummy	0.013 (0.014)	
tax_haven		-0.001 (0.004)
tax_haven × sin_dummy		-0.012 (0.014)
Num.Obs.	1202	1202
R2	0.252	0.252
R2 Adj.	0.241	0.241
+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001		
Standard errors in parentheses. + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.		

These results partially confirm H6: stricter regulatory environments are associated with marginally higher ESG disclosure for sin industries, consistent with institutional theory suggesting that coercive pressures force stigmatized firms to adopt more responsible communication practices. However, the tax haven proxy produces no significant moderating effect, and the overall magnitude of the regulatory interaction remains modest. Taken together with the education findings from H5, these exploratory results suggest that institutional context, both educational and regulatory, plays a meaningful but limited role in shaping ESG disclosure among stigmatized ICO projects.

Additional exploratory analyses examining the moderating role of whitepaper size and readability on the relationship between sin industry status and market performance (AbnormalIR and AbnormalBHR) yield no statistically significant results, suggesting that textual communication strategies — whether quantitative or qualitative — are insufficient to offset stigmatization in ICO markets. Specifically, neither

whitepaper length (measured through WP_pages, NumberOfWords and Characters) nor readability (measured through the Flesch score and the FOG index) produces a significant moderating effect on short-term or long-term abnormal returns for sin industry projects. The results of these analyses are reported in Tables A1 to A4 in the Appendix

Discussion

This study investigates whether Environmental, Social and Governance (ESG) strategies, when combined with Initial Coin Offering (ICO)-based financing, can offset the market stigma associated with 'sin industries'. Overall, the empirical results suggest that this is not the case. Sin industry ICOs do not appear to use ESG disclosure as a systematic compensation strategy. In fact, they disclose less ESG-related information than non-sin projects, particularly with regard to environmental and overall ESG dimensions. Furthermore, when sin projects do communicate ESG-related information, investors do not seem to recognise this in terms of fundraising success. This indicates that ESG disclosure in sin ICOs is generally insufficient to overcome the credibility deficit associated with stigmatized activities.

Rejecting H1 is one of the most important findings of this study. Contrary to the expectation based on legitimacy theory that stigmatised firms should compensate for their moral deficit through stronger environmental, social and governance (ESG) communication, sin Initial Coin Offerings (ICOs) exhibit significantly lower ESG disclosure scores. This challenges the idea that controversial firms systematically engage in moral compensation strategies. It also contradicts the theory proposed by Suchman (1995) that firms facing legitimacy deficits should attempt to restore social acceptance by aligning their communication with prevailing norms and expectations. In our study, however, sin ICOs do not appear to follow this logic.

This finding aligns with the results of Paradis and Schiehl (2021), who demonstrated that sin firms exhibit weaker ESG performance than non-sin firms across various ESG dimensions. Our results extend this insight to the ICO market, demonstrating that lower ESG engagement is not confined to listed sin stocks, but also evident in blockchain-based fundraising environments. However, the sector-level analysis modifies this conclusion. The marginally higher ESG scores observed for drugs and gambling projects align with the findings of Du and Sun (2023), who propose that certain controversial firms may selectively invest in particular ESG dimensions to address stakeholder concerns. This suggests that ESG engagement in sin industries may be heterogeneous and sector-specific rather than uniform.

One possible explanation for the lower level of ESG disclosure among sin ICOs is that these projects may deliberately avoid communicating such information because their target investor base does not value it. In sectors such as gambling and adult entertainment, as well as other controversial blockchain applications, investors may prioritise decentralisation, anonymity and regulatory flexibility over sustainability-oriented disclosure. Another possibility is that sin projects may view ESG communication as inauthentic or counterproductive, causing them to avoid making claims that could be perceived as insincere. This is consistent with the findings of Dhandhanian and O'Higgins (2021), who demonstrate that CSR reporting in controversial sectors is often marred by a discrepancy between rhetoric and actual practices.

The results for H2 reinforce this interpretation. The negative but non-statistically significant interaction between ESG disclosure and sin industry status suggests that ESG signals do not help sin ICOs to raise more capital. This finding is consistent with signalling theory and the notion that, in opaque environments, low-cost, unverifiable disclosure may be dismissed as 'cheap talk'. As ICO white papers are not externally verified, investors may disregard ESG claims, particularly those from projects operating in morally contentious sectors. This result also echoes that of Aqueveque et al. (2018), who argue that corporate social responsibility (CSR) initiatives in controversial industries can only improve reputation when they are perceived as authentic and consistent with the firm's core activities. In the context of sin ICOs, however, this condition appears difficult to satisfy.

The absence of a positive effect of ESG disclosure on sin ICOs calls into question the findings of Bitetto and Cerchiello (2023), who demonstrated a positive association between ESG-related keywords in white papers and ICO fundraising success. Our results suggest that this positive ESG effect may not be consistent across all types of projects. More specifically, ESG signals appear to be less effective when emitted by projects operating in stigmatised industries. This is an important finding because it shows that the impact of ESG communication in ICO markets depends not only on the presence of ESG-related language, but also on the issuer's perceived credibility and moral consistency.

H3 adds an important nuance to this argument. Although signals related to governance alone do not produce a statistically robust negative effect, the broader credibility index has a negative and marginally significant interaction with sin industry status. This suggests that conventional credibility signals, such as team size, GitHub presence, code availability, rating count and institutional backing, may be

interpreted differently in sin ICO contexts. Traditional ICO research generally suggests that such signals reduce information asymmetry and increase investor confidence (Lee, Li and Shin, 2021; Florysiak et al., 2022; Thewissen et al., 2022). However, our results suggest that these signals may not operate in the expected direction for sin ICOs.

Rather than reassuring investors, high credibility and institutional alignment may appear to be inconsistent with the expectations of investors attracted to 'sin' ICOs, who tend to value decentralisation, anonymity and regulatory avoidance. This paradoxical outcome expands upon the existing legitimacy literature by demonstrating that strategies aimed at achieving legitimacy may be counterproductive when they conflict with the identity and expectations of the target investor base. In this sense, the study builds on the work of Dhandhanian and O'Higgins (2021) and Aqueveque et al. (2018) by demonstrating that credibility depends not only on signal strength, but also on contextual fit.

The results for H4 offer a further refinement. Contrary to the initial prediction of an inverted U-shaped relationship, the analysis reveals that there is a positive correlation between ESG disclosure and fundraising success. This suggests that fundraising performance is poorest at intermediate levels of ESG disclosure, with projects having either very low or very high levels of disclosure performing better. This suggests that investors may penalise ambiguity rather than excessive communication of ESG factors. Projects that clearly distance themselves from ESG positioning or adopt a strong, coherent strategy send a clearer signal to the market. Conversely, moderate ESG disclosure may be perceived as ambiguous, insincere, or insufficiently credible.

This result can be interpreted through the lens of signalling theory. For a signal to be valuable, it must reduce uncertainty and be perceived as meaningful by the audience receiving it. In ICO markets, where information asymmetry is particularly high, ambiguous ESG disclosure may fail to reduce uncertainty, potentially increasing investor scepticism. This interpretation is consistent with the work of Delmas and Burbano (2011), who emphasise that concerns about greenwashing arise when there is a discrepancy between sustainability communication and actual performance. In our setting, intermediate ESG disclosure may fall into this ambiguous zone where the signal is visible enough to be noticed, but not strong enough to be credible.

Taken together, these findings suggest that environmental, social, and governance (ESG) factors do not automatically enhance legitimacy in initial coin offering (ICO) markets. Rather, its effectiveness depends on the credibility, coherence, and contextual fit of the signal. For sin industries, using ESG disclosure successfully appears particularly difficult because investors may view it as inconsistent with the project's core activity or the expectations of the ICO investor base. Therefore, ESG communication is not inherently valuable; rather, it becomes valuable when it is sufficiently credible and coherent to reduce uncertainty rather than increase skepticism.

Exploratory analyses further show that institutional context matters, albeit to a limited extent. Higher country-level education is positively associated with Environmental, Social, and Governance (ESG) disclosure, particularly for the overall ESG score and the social pillar. This suggests that human capital may increase expectations for transparency and responsible communication. Similarly, stricter regulatory environments are associated with marginally higher ESG disclosure among sin projects. These findings align with institutional theory, particularly DiMaggio and Powell's (1983) argument that organizations adapt their behavior to normative and coercive pressures in their environment. However, the modest size of these effects indicates that project-level characteristics and investor expectations are more significant than country-level institutional pressures.

Overall, the results offer a nuanced response to the research question. ESG strategies and ICO-based financing do not systematically offset the stigma associated with sin industries. This finding aligns with the broader sin stock literature, as outlined by Hong and Kacperczyk (2009), which demonstrates that social norms can result in long-lasting market penalties for controversial activities. However, our study builds on this literature by demonstrating that stigma in ICO markets affects not only investor exclusion and asset pricing, but also the interpretation of voluntary ESG and credibility signals. In highly asymmetric markets such as ICOs, legitimacy cannot be achieved simply by adding ESG language to white papers. Instead, it requires signals that are strong, consistent, and sufficiently aligned with investor's expectations to be perceived as meaningful.

Theoretical implication

This study contributes to several areas of literature. First, it broadens the scope of research on sin industries by shifting the focus from traditional stock markets to alternative financing environments. Previous studies have primarily examined how social norms influence the valuation, expected returns,

and investor base of publicly traded sin firms. This study demonstrates that stigma also plays a role in ICO markets, albeit through a different mechanism. Rather than being reflected only in asset prices or institutional exclusion, stigma influences how investors interpret voluntary disclosure and legitimacy-seeking behavior.

Second, the findings contribute to legitimacy theory by demonstrating that ESG disclosure does not automatically restore legitimacy for controversial firms. Traditionally, it was thought that stigmatized firms could use corporate social responsibility (CSR) or environmental, social, and governance (ESG) communication to compensate for their legitimacy deficit. However, our results indicate that this strategy is ineffective in ICO markets. In fact, sin ICOs disclose less ESG information than non-sin ICOs, and investors do not appear to reward them for it when they do. These results indicate that the effectiveness of legitimacy strategies depends strongly on the credibility of the signal and the audience evaluating it.

Third, the study advances signaling theory by emphasizing the difference between signal presence and signal credibility. In ICO markets, ESG disclosure is voluntary, unregulated, and difficult to verify. Consequently, it may be perceived as cheap talk rather than a reliable indicator of project quality. The findings suggest that investors do not respond positively to the mere presence of ESG disclosure. Rather, they appear to evaluate whether the signal is coherent, credible, and aligned with the project's broader identity.

Fourth, the convex relationship identified in H4 adds to the existing literature by demonstrating that the impact of ESG disclosure may be nonlinear. The results suggest that intermediate levels of ESG disclosure are associated with weaker fundraising outcomes, whereas very low and very high levels perform better. These findings challenge the assumptions that "more ESG" is always better and that excessive ESG communication necessarily leads to skepticism. The key theoretical insight is that ambiguous ESG positioning may be more damaging than clear non-engagement or strong commitment.

This study contributes to the growing body of literature on ICOs by introducing environmental, social, and governance (ESG) signaling and stigma as important factors in fundraising success. Previous studies have emphasized the importance of white paper quality, ratings, team characteristics, and technological transparency. This study adds that the moral and symbolic content of disclosure matters, particularly for projects operating in controversial sectors. ICO investors evaluate not only technical and financial signals, but also the consistency between a project's identity, its disclosures, and its legitimacy claims.

Conclusion

This thesis examined whether environmental, social, and governance (ESG) strategies combined with initial coin offering (ICO)-based financing can offset the market stigma associated with sin industries. Using legitimacy and signaling theories and the literature on information asymmetry in ICO markets as a basis, the study analyzed whether ESG disclosure helps stigmatized projects attract capital and restore investor confidence.

Empirical findings suggest that ESG disclosure does not systematically offset the stigma associated with sin industries. Contrary to the moral compensation hypothesis, sin initial coin offerings (ICOs) disclose less environmental, social, and governance (ESG) information than non-sin ICOs, particularly on environmental and overall ESG dimensions. Furthermore, ESG signals do not significantly improve the success of fundraising for sin projects, indicating that investors do not consider ESG communication from stigmatized projects to be credible.

The results also reveal a paradoxical effect of credibility. Although conventional credibility signals are typically associated with increased investor confidence, the credibility index has a negative moderating effect on sin ICOs. This suggests that institutional legitimacy and transparency may conflict with the expectations of investors who value decentralization, anonymity, or regulatory flexibility in certain stigmatized ICO contexts.

At the same time, the analysis revealed a nonlinear relationship between ESG disclosure and fundraising success. Rather than demonstrating that excessive ESG communication is penalized, the results imply that ambiguous ESG positioning poses the greatest challenge. Projects with very low or very high levels of ESG disclosure perform better than those with intermediate levels. This suggests that clarity and coherence may be more important than the mere presence of ESG language.

Exploratory analyses show that country-level education and regulatory environments can influence Environmental, Social, and Governance (ESG) disclosure, though the effects are modest. These results suggest that, although project-level characteristics and investor expectations remain the dominant drivers of ESG signaling outcomes, institutional context matters.

In conclusion, this study finds that ESG strategies and ICO financing do not offer a straightforward solution to the stigma associated with sin industries. In opaque and weakly regulated markets, ESG

disclosure is not automatically credible. For ESG signals to influence investors, they must be coherent, verifiable, and aligned with the project's identity and target audience. Therefore, the central implication is that ESG communication is not a universal tool for achieving legitimacy. In stigmatized ICO markets, it can be ignored, discounted, or penalized when it lacks credibility and consistency.

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Appendix

Table A1 — Whitepaper size and short-term market performance (AbnormalIR)

	IR - WP_pages	IR - NbWords	IR - Characters
(Intercept)	-0.259 (0.337)	-0.244 (0.342)	-0.168 (0.371)
WP_pages_norm	0.229 (0.194)		
sin_dummy	-0.102 (0.299)	-0.144 (0.317)	0.041 (0.196)
Fin_Team	-0.425 (0.277)	-0.450 (0.289)	-0.497+ (0.272)
WP_pages_norm × sin_dummy	0.450 (1.497)		
NumberOfWords_norm		0.096 (0.269)	
NumberOfWords_norm × sin_dummy		0.927 (2.167)	
Characters_norm			-0.091 (0.230)
Characters_norm × sin_dummy			-0.349 (1.017)
Num.Obs.	238	238	238
R2	0.087	0.081	0.081
R2 Adj.	0.012	0.006	0.006

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Standard errors in parentheses. + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.

Table A2 — Whitepaper size and long-term market performance (AbnormalBHR)

	BHR - WP_pages	BHR - NbWords	BHR - Characters
(Intercept)	1.129 (2.865)	1.347 (2.901)	-0.771 (3.120)
WP_pages_norm	-0.352 (1.644)		
sin_dummy	-4.442+ (2.541)	-2.380 (2.688)	0.931 (1.647)
Fin_Team	-2.526 (2.349)	-2.880 (2.449)	-2.320 (2.291)
RegStatusREGULATED	-3.060** (0.975)	-3.043** (0.977)	-3.072** (0.965)
RegStatusUNREGULATED	-2.728* (1.069)	-2.711* (1.072)	-2.647* (1.063)
WP_pages_norm × sin_dummy	15.513 (12.710)		
NumberOfWords_norm		-1.402 (2.283)	
NumberOfWords_norm × sin_dummy		5.844 (18.392)	
Characters_norm			2.467 (1.935)
Characters_norm × sin_dummy			-15.810+ (8.557)
Num.Obs.	238	238	238
R2	0.096	0.092	0.107
R2 Adj.	0.022	0.017	0.034

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Standard errors in parentheses. + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.

Table A3 — Whitepaper readability and short-term market performance (AbnormalIR)

	IR - Flesch	IR - FOG
(Intercept)	-0.313 (0.367)	-0.264 (0.338)
Flesch_norm	0.051 (0.152)	
sin_dummy	-0.306 (0.592)	0.062 (0.327)
Fin_Team	-0.420 (0.278)	-0.397 (0.282)
WP_pages_norm	0.248 (0.193)	0.259 (0.194)
Flesch_norm × sin_dummy	0.415 (0.868)	
FOG_norm		-0.088 (0.149)
FOG_norm × sin_dummy		-0.280 (0.922)
Num.Obs.	238	238
R2	0.088	0.088
R2 Adj.	0.008	0.009
+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001		
Standard errors in parentheses. + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.		

Table A4 — Whitepaper readability and long-term market performance (AbnormalBHR)

	BHR - Flesch	BHR - FOG
(Intercept)	1.272 (3.125)	1.024 (2.869)
Flesch_norm	-0.261 (1.299)	
sin_dummy	-3.661 (5.046)	-0.754 (2.777)
Fin_Team	-2.500 (2.371)	-1.927 (2.394)
RegStatusREGULATED	-3.088** (0.981)	-2.947** (0.981)
RegStatusUNREGULATED	-2.722* (1.080)	-2.550* (1.077)
WP_pages_norm	-0.053 (1.644)	0.329 (1.650)
Flesch_norm × sin_dummy	3.198 (7.402)	
FOG_norm		-1.627 (1.261)
FOG_norm × sin_dummy		-3.131 (7.829)
Num.Obs.	238	238
R2	0.091	0.098
R2 Adj.	0.011	0.019

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Standard errors in parentheses. + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.

Figure 1

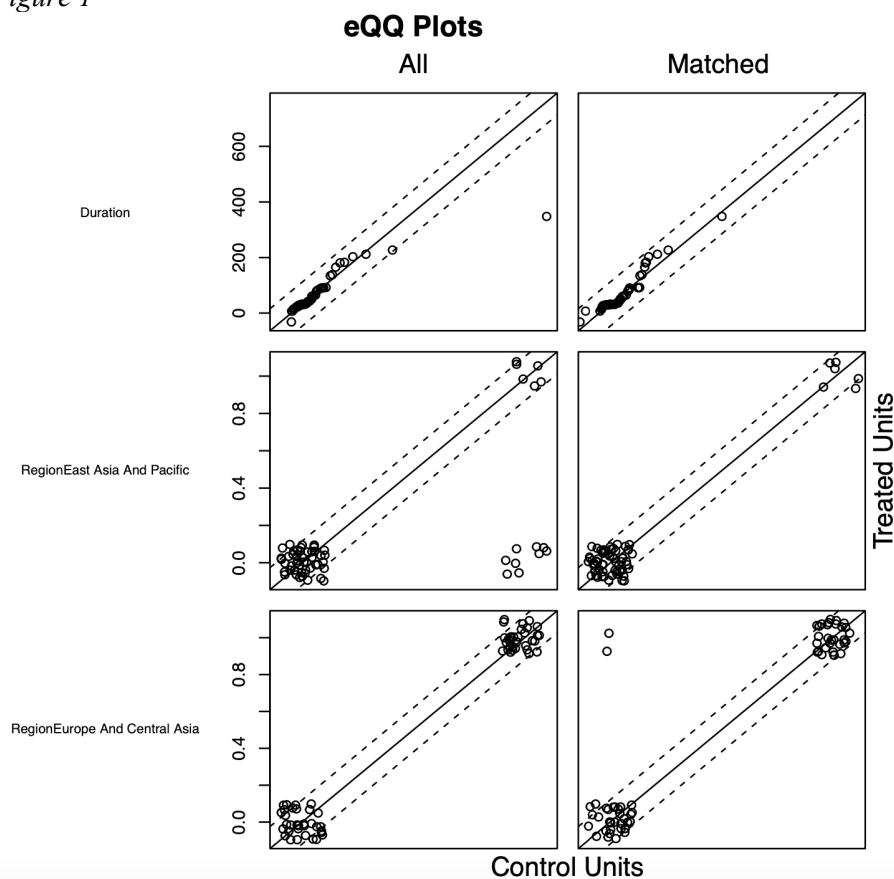


Figure 2

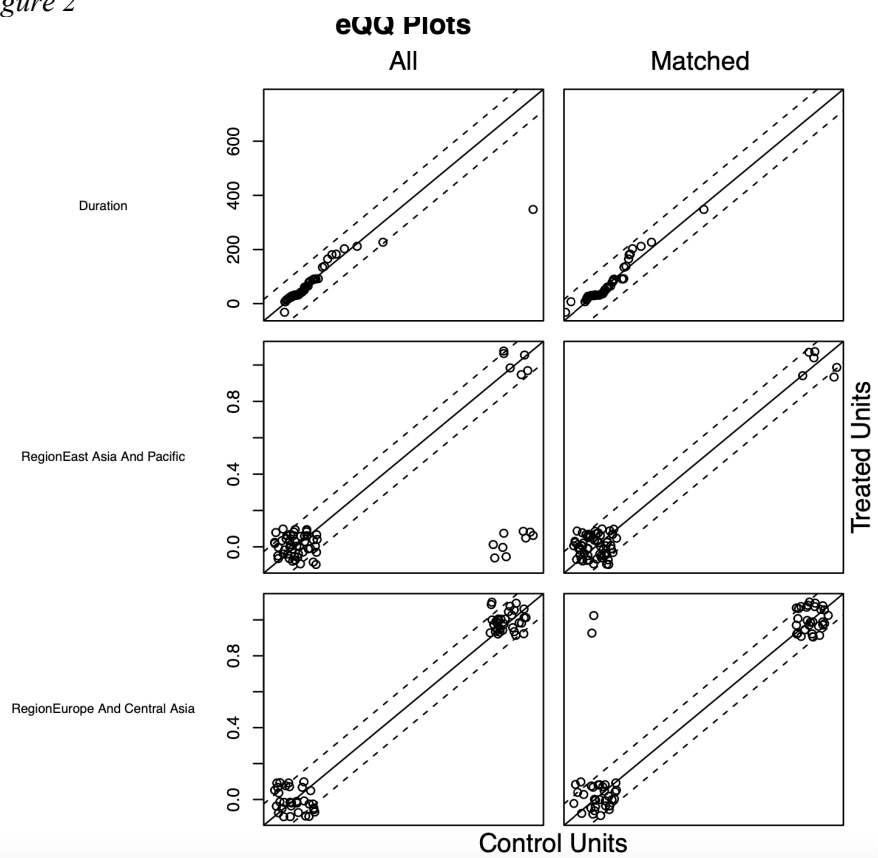


Figure 3

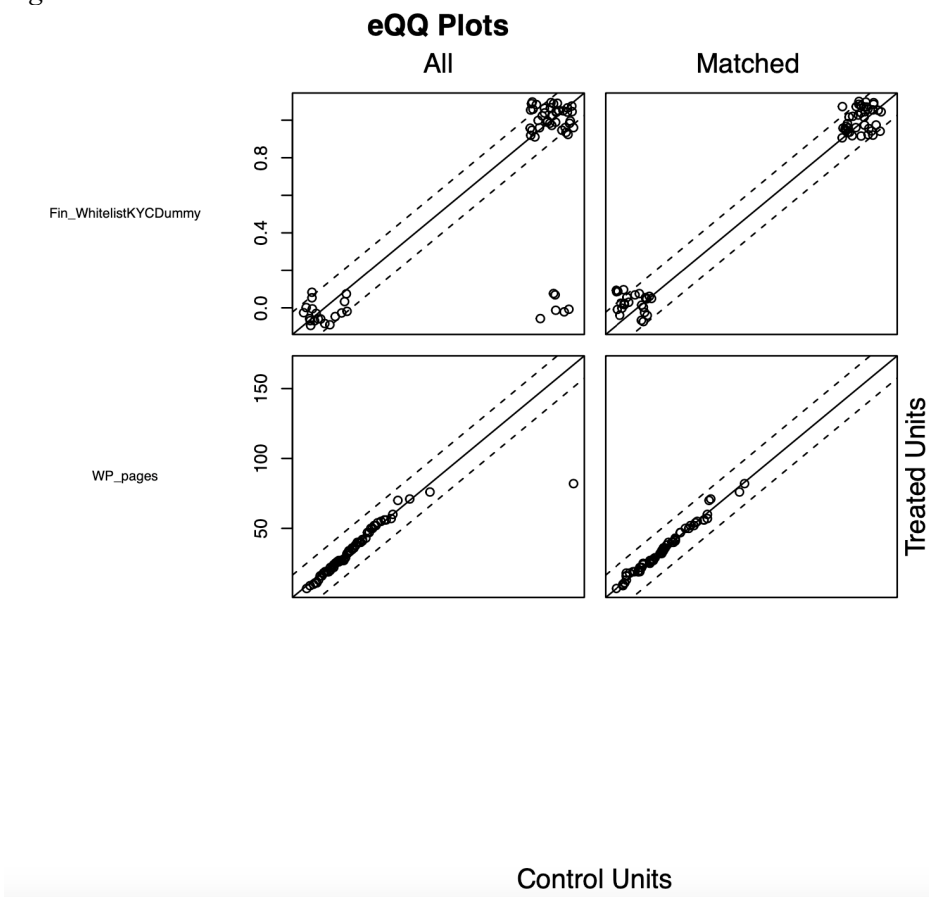
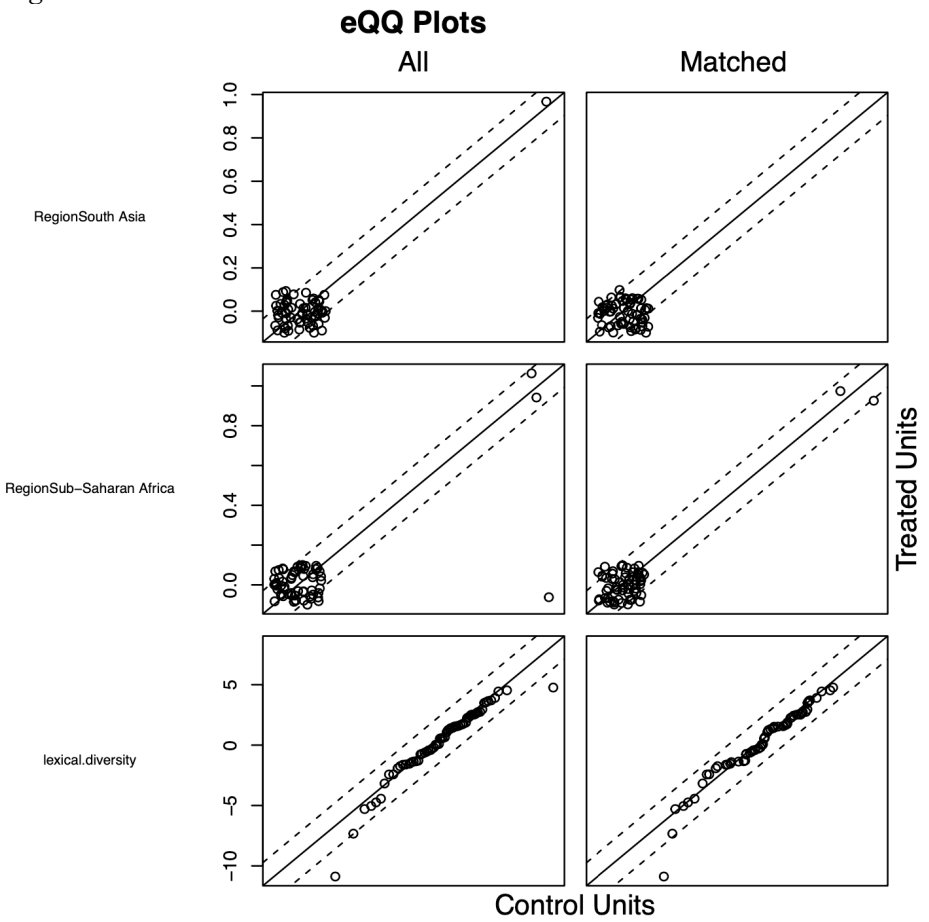


Figure 4



Abstract :

This study examines whether disclosing environmental, social and governance (ESG) information can mitigate the market stigma faced by initial coin offerings (ICOs) operating in so-called 'sin' sectors.

Using theories of legitimacy and signalling as a basis, we calculate ESG scores from ICO white papers and compare 'sin' and 'non-sin' projects via propensity score matching and regression analyses. Our findings show that ICOs in 'sin' sectors disclose significantly less ESG information than comparable projects outside these sectors, particularly with regard to environmental and overall ESG dimensions.

Furthermore, the disclosure of ESG information does not significantly improve fundraising outcomes for ICOs in sin sectors. These findings suggest that in opaque, lightly regulated ICO markets, ESG communication is insufficient to overcome the legitimacy deficit associated with stigmatised activities. This study contributes to the literature on 'sin' industries, ESG signalling and ICO financing by demonstrating that the effectiveness of ESG disclosure depends on its perceived credibility and contextual appropriateness.

UNIVERSITÉ CATHOLIQUE DE LOUVAIN
Louvain School of Management

Place des Doyens, 1 bte L2.01.01, 1348 Louvain-la-Neuve
Boulevard Emile Devreux 6, 6000 Charleroi, Belgique
Chaussée de Binche 151, 7000 Mons, Belgique
www.uclouvain.be/lsm